A Multiple Case Study: Using Thinking Maps and Thinking Hats to promote engagement and improve comprehension with reading of children who are severe and profoundly d/Deaf in primary school.

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Abbreviations

ASD Autism Spectrum Disorder

ADHD Attention-Deficit / Hyperactivity Disorder

BATOD The British Association of Teachers of the Deaf

BOR Syndrome Branchiootorenal (BOR) syndrome

BSL British Sign Language

CRIDE Consortium for Research into Deaf Education

DHH Deaf and Hard of Hearing

DfE Department for Education

EAL English as an Additional Language

EEF Education Endowment Foundation

EHCP Educational Health Care Plan

GCSE General Certificate of Secondary Education

KS1 Key Stage 1

KS2 Key Stage 2

Ofsted Office for Standards in Education, Children's Services and Skills

NDCS National Deaf Children's Society

NatSIP The National Sensory Impairment Partnership

QS Quality Standard

QToD Qualified Teacher of the d/Deaf

RADLDW Raise Awareness of Development Language Disorder Worldwide

SEND Special Educational Needs and Disability

ToM Theory of Mind

YARC York Assessment of Reading Comprehension

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Abstract

This study investigates using Thinking Maps (Hyerle and Alper, 2011) and Thinking Hats (De Bono, 1999, 2000) to promote engagement and improve comprehension skills with reading of children who are severe and profoundly d/Deaf in primary school

The research took place in a school with resource provision for children who are d/Deaf. The intervention used a number of metacognitive strategies to support children who are d/Deaf with reading comprehension and to encourage engagement and enjoyment of reading.

Snowling et al's (2009, 2011) York Assessment of Reading Comprehension (YARC) was used both pre and post as a means of measuring the impact of the intervention. The intervention was delivered for 9 months across an academic year with resources designed by the researcher. Observations were made and responses from the children were gathered and analysed in a multiple case study approach.

The school that the research took part in is a founding member of the Thinking Schools Academy Trust. They are an accredited Advanced Thinking School (Kleine, 2022).

Keywords: Children, d/Deaf, metacognition, reading, comprehension, Thinking Hats, Thinking Maps.

1 Introduction

This study will investigate using Thinking Maps (Hyerle and Alper, 2011) and Thinking Hats (De Bono, 1999, 2000) to promote engagement and improve comprehension skills with reading of children who are severe and profoundly d/Deaf in primary school (Key Stage 1 and Key Stage 2).

There is a focus by the National Deaf Children's Society (NDCS, 2019, 2020, 2021, 2022) and researchers, such as Marschark and Knoors (2012), to improve the outcomes for these children. They have identified that there are significant gaps between children who are d/Deaf and their hearing peers and they extol Qualified Teachers of the d/Deaf (QToDs), and Government to assist in closing the gap. There is also research published by the Education Endowment Foundation (EEF, 2021) showing that metacognition strategies can improve outcomes for children by 7 + months; but this research is based on the general population. The EEF (2021) suggest that disadvantaged pupils may benefit from interventions in the field of metacognition and recommend that research in this area should be carried out. There is also research showing benefits of metacognition to support retention of young people who are d/Deaf in further education (Franklin et al, 2018). Strategies are still being explored and, as yet, there is not a significant body of research to explore how to close the gaps and if metacognition will help in doing so and benefit children who are d/Deaf.

This study has set out to explore if metacognition strategies may support in helping children who are d/Deaf to close gaps in reading comprehension. Reading in particular is a skill needed to access the curriculum and it is important for children, and is of particular value to children who are d/Deaf (Daza et al, 2014). It is an area that should be explored as it is an important life skill they will need in their future to engage in the world around them.

2 Literature Review

2.1 Why is reading important to close the attainment gap?

Achieving in exams can be a platform to access further study, training and skilled employment. Crawford et al (2016) note that achieving a level 2 qualification, and in particular a GCSE grade 9 to 4 or A* to C, in both maths and English, opens the doors to further education and the opportunities for improvement in socio-economic status and social mobility and the Government recognises this is crucial (Education skills and funding, 2014, Social mobility indicators, 2022, DfE, 2014, see appendix 1). The NDCS (2019, 2020, 2021, 2022) notes that the current grades are limiting d/Deaf students of this generation. The analysis of 2020's GCSE results, NDCS (2021) records that the average grade for children who are d/Deaf was grade 4 in comparison to an average grade 5 for their hearing peers. NDCS (2022) collated data over a number of years showing the difference between children who are d/Deaf and the results in GCSE's (see tables 1, 2 and 3). NDCS (2022) also collated data on reading in Key Stage 2 (see table 4) showing the significant gap between children who are d/Deaf and their hearing peers, on average a 20.5-point gap. NDCS (2022) data on progress indicates the attainment gap is widening (see table 5) with a negative 0.7 point illustrating that as children who are d/Deaf chronologically progress through school, the gap is not closing but it is widening for them. Although this study focuses on reading, the data available has the combined scores of both English and Maths.

Table 1: NDCS (2022) data on the previous 5 years percentage of children achieving a GCSE grade 5 or above in both English and Maths

Year	Deaf children	All children	Percentage gap between deaf and all children
2021	37.7	51.9	27
2020	35.1	49.9	30
2019	29.3	43.2	32
2018	30.6	43.3	29
2017	28.6	42.7	33
(NDCS, 2022, 'Percentage of children achieving a grade 5 or above in both English and Maths')			

Table 2: NDCS (2022) data on the previous 11 years percentage of children achieving a GCSE grade 4/C or above in both English and Maths

Year	Deaf children	All children	Percentage gap between deaf and all children
2021	59.4	72.2	18
2020	58	71.2	19
2019	48.2	64.6	25
2018	48	64.2	25
2017	46.1	63.9	28
2016	47	63	25
2015	44.6	59.2	25
2014	38.4	58.9	35
2013	43.1	61.3	30
2012	37.9	59.3	36
2011	40	58.7	32
(NDCS, 2022, 'Percentage of children achieving a grade 4/C or above in both English and Maths')			

Table 3: NDCS (2022) data on the previous 7 years attainment percentage gap between deaf and all children

Year	Deaf children	All children	Percentage gap between deaf and all children
2021	43.6	50.9	14
2020	43.6	50.2	13
2019	38.6	46.7	17
2018	39.2	46.5	16
2017	37.5	46.3	19
2016	42.5	49.9	15
2015	41	48.4	15
(NDCS, 2022, 'Average attainment scores')			

Table 4: NDCS (2022) data proportion of children achieving expected standard at Key Stage 2 for reading

Year	Deaf children	All children
2019	54	73
2018	56	75
2017	48	72
2016	46	66
(NDCS, 2022, 'Proportion of children achieving expected standard at Key Stage 2 for reading')		

Table 5: NDCS (2022) data average progress of children at Key Stage 2 compared to children with same prior attainment at Key Stage 1

Year	Deaf children	All children
Reading	-0.7	0.0
Writing	-0.5	0.0
Mathematics	-0.5	0.0
(NDCS, 2022, 'Average progress of children at Key Stage 2 compared to children with same prior attainment at Key Stage 1')		

Wray (2006) acknowledges that reading is one of the underpinning skills needed across the curriculum and, in addition, Douglas (2012) explains that by being a proficient reader, children can access not only the course textbooks, but also comprehend the examination questions.

Douglas (2012) expands this stating a reading age of 15 years and 7 months is necessary to access GCSE papers. GL Assessment (2020), found that 25% of the general population of 15-year-olds have a reading age of below 12, it is clear that d/Deaf pupils need to close the attainment gap in order to improve decoding and reading comprehension to enable them to access GCSE papers. The NDCS (2021) have asked for swift action to close the gap. It is therefore essential that we, as QToDs, use best practice to help them in this endeavour to read.

Simpson (2018) draws attention to the significantly declining number of all children reading for pleasure after the age of 11, suggesting that QToDs need to consider how to tackle this issue for their pupils. Williams (2004, cited in

Dirks and Wauters, 2018:261) notes that it is ‘even more important for DHH children who need more explicit opportunities to participate and profit from literacy activities to develop their emergent literacy skills to the same level as hearing children’. Daza et al (2014:3527) state ‘Learning how to read is one of the most important tasks deaf children have to face’.

NDCS data from 2018 highlights that children who are d/Deaf are not catching up from their lower starting points as they move through Key Stage 3 and 4, and the NDCS (2019) report suggests that it will take 21 years to close the gap and have recommended further funding to be made available to d/Deaf pupils.

It is important to note the effect of learning and assessing d/Deaf pupils during lockdown, as 63% of d/Deaf pupils found remote lessons ‘difficult to understand’ (NDCS, 2021:1). In the future, the impact of the pandemic and online learning upon d/Deaf pupils may widen the gap further.

2.1.2 What is needed in order to read?

Dombey and Bearne (2010) and Cain (2010), both recognise the challenge for fluent adult readers to appreciate the enormity of the task for learners, and the undertaking of delivering effective strategies to gain the skill. The abilities that learners need to develop to read are numerous; they need to decipher what the word is by decoding the graphemes into sounds to make a word. For this, children need to recognise the marks as a word (Cain, 2010) and to be able to track left to right (Primary National Strategy, 2006). The correspondence between letters (graphemes) and sounds (phonemes) needs to become familiar for the reader, as well as the visual analysis of letter patterns. The reader then needs to understand what the word means and how the text relates to this (Cain, 2010). Nutbrown *et al*. (2005) explains the three aspects such as storytelling, phonological awareness and oral language as key to children’s literacy. Gough and Tunmer (1986, cited in Rose, 2006:77) illustrates that there is a need of both decoding and comprehension for successful reading and that an imbalance of either or both can make reading challenging (see figure 1). Raise Awareness of Development Language Disorder Worldwide (2016, RADLDW) explains that in order to read you need to use a range of speech and language skills such as;

phonics, phonological understanding, word meanings, working memory, inferencing, ambiguous language and grammar.

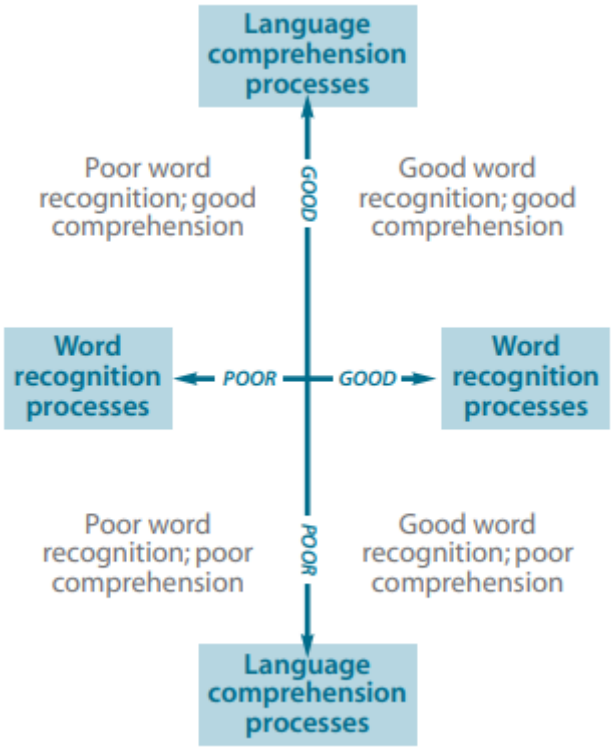


Figure 1: Gough and Tunmer (1986, cited in Rose, 2006:77) simple view of reading

2.1.3 What is needed specifically for those who are d/Deaf to read?

Ehri, (2005) and Storch & Whitehurst (2002, cited in Dirks and Wauters 2018:261) suggest 'To become a good reader, children need to possess skills such as expressive language, word knowledge, conceptual knowledge, narrative skills, and print knowledge'. Musselman (2000:26) highlights the importance of 'encoding the surface features of print' by using 'phonological, sign or visual codes'. Holding the sequence of sounds in short-term working memory enables the pupil to match the sounds to a word in their long-term memory. However, this then raises one of the difficulties in the development of d/Deaf readers, as their internal lexicon is not as developed as their hearing counterparts, due to their lack of incidental language acquisition (Friedmann and Szterman, 2011, Brown and Watson, 2017, NDCS, 2013). Marschark and Hauser (2011), Kyle and Harris (2010), and Kyle and Cain (2015) concur that vocabulary has a correspondence to reading, provided the child has an

extensive sign lexicon, which is not always the case if it is not the first language in the home. For those children who do have access to sign, the use of it, as suggested by Musselman (2000) would address this, as well as the concern raised by Benedict et al (2015) of the comprehension of the words not just the decoding. Ofsted (2010) emphasised the importance of speaking and listening in a variety of situations; this would also give opportunities to develop pupils' bank of vocabulary but in a contextual way. Marschark and Knoors (2012) explore the differences of how children who are d/Deaf and their hearing peers might experience learning differences in executive functioning and cognitive functioning. They observed children who are d/Deaf face challenges gaining independence and they suggest executive function has a role in this. This study suggests that providing familiar metacognitive strategies for children who are d/Deaf may provide opportunities to gain independence as Bernardi et al (2018:306) states they can 'Regulate, monitor and control their own behaviour towards a goal'.

There are so many skills needed to read. Perseverance is valued when you understand the magic that happens between the writer and reader. Iser (1978:16) recognises literature is the 'plain between the writer's text and the readers' interpretation'.

Children who are d/Deaf may also find colloquial language difficult to understand and research suggests a delay in the development of Theory of Mind (Russell et al, 1998) (Marschark et al, 2000) (Morgan, 2006). Kyle and Harris (2010), and Kyle and Cain (2015), recognise the lack of access to incidental language as expressly impacting the reading of d/Deaf children, and explain they are disadvantaged by the reduced access to this type of learning. It is therefore important to expressly teach vocabulary.

2.1.4 Higher order thinking

To ensure that children are engaged and comprehending, Preston and Taylor (2012) maintain the importance of higher order questioning and this concurs with The National Oracy Project (cited in Corden, 2000:134) and Bloom (1956). Preston and Taylor (2012) reason that higher order questioning develops

comprehension; learners need to think at a deeper level and to elaborate their oral (or signed) and written responses to literature. It also helps learners to make connections and interact on a more personal level, ensuring a deeper engagement, with reflection to embed the learning.

2.2 What is metacognition?

Flavell (1979) defines an early explanation of metacognition. Metacognition is the process of thinking and actively monitoring learning and making changes to one's own learning behaviours and using and adapting strategies based on this monitoring. Nelson and Narens (1990:129) further developed the theory of metacognition, exploring monitoring and control, and the decisions made and the effect on 'acquisition, retention and retrieval' (see figure 2). For Hacker (2009:3) metacognition refers 'as a minimum, taking charge requires students to be aware of their learning, to evaluate their learning needs, to generate strategies to meet their needs, and to implement those strategies'. Rhodes (2019:168) concurs stating 'metacognition refers to a set of processes an individual uses in monitoring ongoing cognition so as to effectively control his or her own behavior' and discusses the modern view of metacognition as 'monitoring of cognition plays a causal role in self-regulation of cognitive processes, making it imperative that monitoring of cognition is accurate'. Rhodes (2019) concludes in his work that metacognition has an impact across all areas of life. Strassman (1997:140) explores the role of metacognition in reading with children who are d/Deaf. She defines metacognition 'as both the knowledge and the control an individual has over their own thinking and learning.'

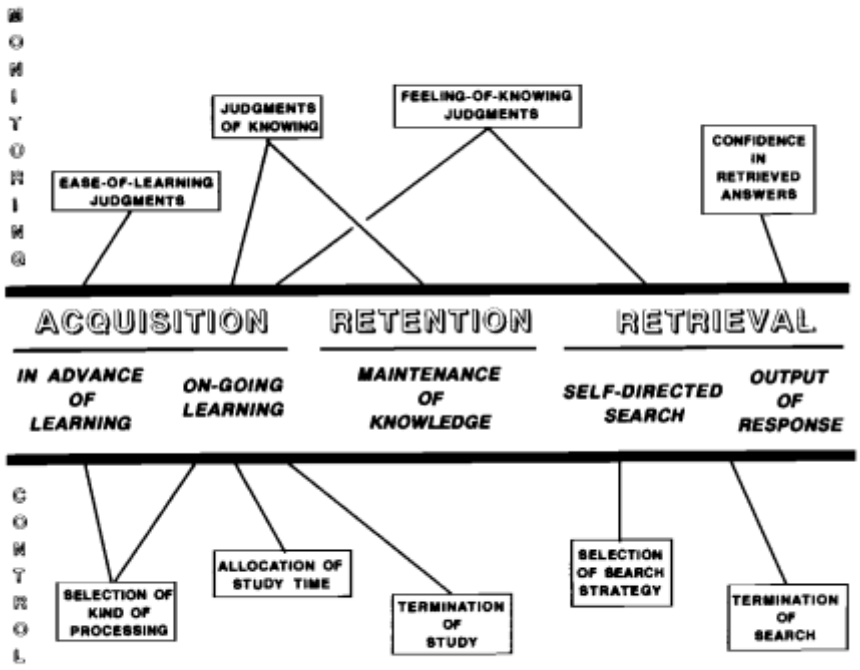


Fig. 2. Main stages in the theoretical memory framework (listed inside the horizontal bars) and some examples of monitoring components (shown above the horizontal bars) and control components (shown below the horizontal bars).

Figure 2: Metamemory framework

Narens and Nelson (1990:129) Metamemory framework.

2.2.1 The role of metacognition in improving attainment in pupils who are d/Deaf

Franklin et al (2018) suggests that teaching metacognition skills has an impact on the retention of d/Deaf pupils in higher education. There is a lack of research in this area but in the article Franklin (2018) explains that the pupils were invited to a two-week summer course and were taught metacognition strategies.

When critically analysing the article, I considered that there were three potential reasons why these pupils were successful: the metacognition strategies, developing social connections, and an increased familiarity of the setting. This study takes place in higher education yet this approach may support younger children who are d/Deaf.

Strassman (1997) found that metacognition benefitted children who are d/Deaf. This study explored if reviewed 25 years later, metacognitive strategies

would be able to increase engagement and attainment in reading comprehension.

2.2.2 What is metacognition as a strategy?

The Education Endowment Foundation (2020) explains it is essential to have a range of cognitive strategies to be metacognitive. Terada (2017:3) notes that metacognitive awareness in successful students enables them to journey from 'being familiar within a topic to understanding it deeply'. Terada (2017) highlights those students who do not have this range of cognitive strategies leads to them becoming disillusioned and reluctant to try.

Terada (2017) notes that developing and using cognitive strategies such as being aware of the difference between the familiarity of a subject or topic and understanding it, having a conscious awareness of the role in learning, a growth mindset, and the opportunity for retrieval practise (low stakes quizzing), would address the journey a pupil who is d/Deaf has to make to become a successful and confident student.

2.2.3 The role of metacognition within deaf education

The Department of Education Specification for Mandatory Qualifications for Specialist Teachers of Children and Young People who are d/Deaf (2018), states that in promoting positive behaviour encourages d/Deaf learners to be resilient and to persevere with their learning when difficulties arise. This extols why it is essential that a range of cognitive strategies are taught. In accordance with the NDCS (2020:8), QS03 (a quality standard for resource provision), advocates an inclusive school environment and, as the school where the study takes place uses metacognition tools, it is important that the children who are d/Deaf can access the shared language and cognitive strategies to become successful learners and access the full curriculum.

The Education Endowment Fund 'Teaching and Learning Toolkit', (2021) is an accessible summary of the international evidence on teaching 5 to 16-year-olds, and reports that metacognition is one of the highest impact intervention strategies with more than seven month's progress gained in 'extensive' evidence-based research and has one of the lowest cost implications. It is

important that much of the research evidence relates to the general population rather than d/Deaf pupils in particular.

2.2.4 Children who are d/Deaf face many challenges

The NDCS (2016:8) recognise that, 'Deafness can impact on: listening skills, language development, attention and concentration, working memory, auditory memory, processing time, incidental learning (through overhearing others), social skills, self-esteem, learning style and stamina, as these learners have to work hard to hear' and the challenges shown in table 6. It is therefore important that appropriate strategies are developed to minimise the impact of these challenges on children who are d/Deaf.

Table 6: Quality standards

Standard	The Mandatory Qualification (2018:19 and 23)
4.4	expects QToDs to have an understanding of the impact of deafness on the cognitive, emotional and social development of children who are d/Deaf, and also to understand the importance of access to language and how poor language access impacts on language development.
6.5	Also notes that a child who is d/Deaf does not have the same ability to mature linguistically, socially, and emotionally at the same rate as their peers and it can have a negative impact on their health and wellbeing.
	It is also important to understand that long-standing or progressive hearing loss can have an impact on the emotions, learning, behaviour, mental health, outcomes and quality of life of d/Deaf learners and their families (6.8).

Sidera *et al*. (2020) explains that children who are d/Deaf and hard of hearing (DHH) and born to hearing parents are delayed in their social-cognitive development and in particular in their Theory of Mind (ToM). The case study pupils face these challenges and have many of the risk factors that NatSIP (2016) identify in 2.1. and 5.2 (see table 7).

Table 7: NatSIP (2016: 2.1, and 5.2) identified risk factors for children who are d/Deaf to not making progress

Risk factors as identified by NatSIP (2016) for not making progress for children who are d/Deaf
• from homes where there was limited exposure to language and limited life experiences
• later diagnosed and later fitted with hearing technology
• who had experienced poor or inconsistent use of amplification, hearing aids or cochlear implants
• new to the UK who had not benefited from early identification and/or hearing technology
• from homes where English is spoken as an additional language
• with additional needs which may not be identified or supported
• with a mild/moderate loss who were not known to the service

In order to support and address some of these risk factors, Quality Standards for Resource Provisions (NDCS, 2015) section 4, recommends teachers consider the tools a pupil will require to be successful. QS04 states that the information should be presented to make use of the d/Deaf pupil's visual memory skills and this research explores metacognition tools to support children who are d/Deaf in improving their reading comprehension.

2.2.5 Thinking Maps

Thinking Maps do not rely on the auditory channel alone (and in this case for auditory we mean words whether signed, spoken or text that is read). Hyerle and Alper's (2011) Thinking Maps illustrate the learning and although this is designed for the general population, this tool may be effective for children who are d/Deaf to illustrate their thinking and their learning and for the teacher to use this to assess and give feedback quickly and to address any misconceptions.

Hyerle and Alper's, (2011) Thinking Maps provide a common language in the school where the study is taking place and is taught across the school from nursery to staff training. Looking at the maps in more detail here we can see each map considers a different way of thinking (see figure 3).

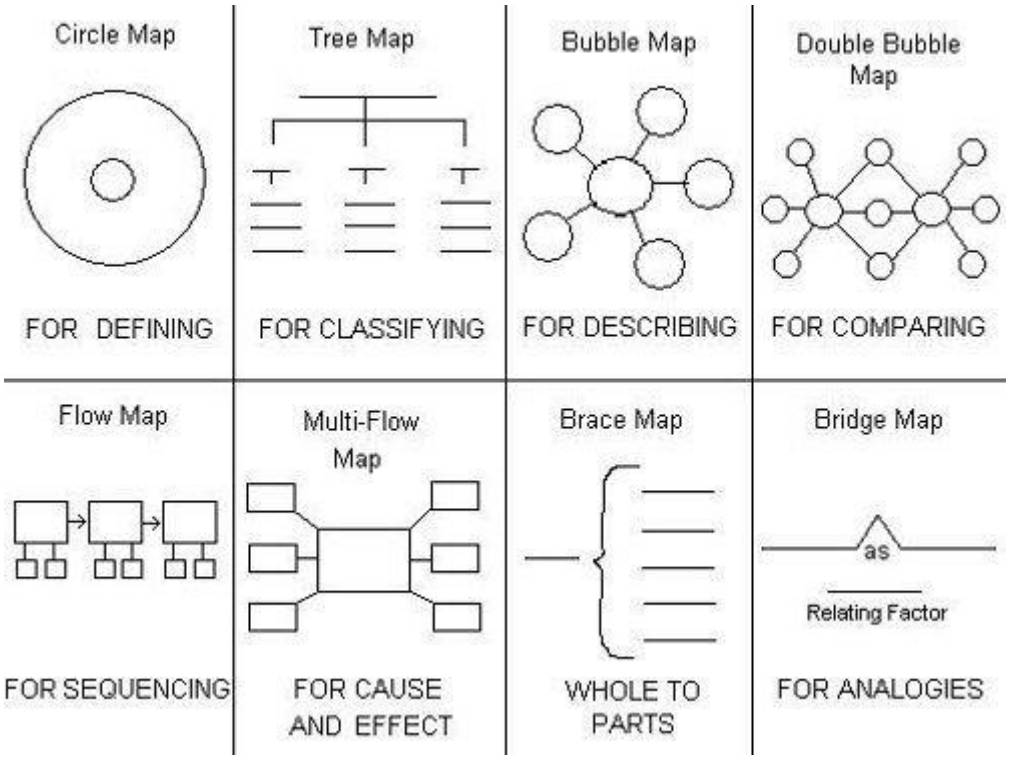


Figure 3: Thinking Maps and what that map is used for. (Thinking Maps Mini Course, 2017)

Thinking Maps gives us the opportunity to dual encode. The theory of dual encoding is an established one and attributed to Paivio (1971). Dual encoding (see figure 4) means we can utilise two channels, both of the visual and audio senses (again when we refer to audio we are looking at spoken, signed or read text).

What is important is that using this familiar tool to hook the learning on, reduces the cognitive load on those pupils so they can focus on the learning and develop their higher order thinking (Hyerle and Alper, 2011). Coulter and Goodluck (2015:68) suggest assigning 'thematic roles' to questions to support children who are d/Deaf in understanding the syntactic structure and Miller (2002, cited in Coulter and Goodluck, 2015:90)

Table 8: Quality standards

Standard	The Department of Education Specification for Mandatory Qualifications (2018:19)
4.11.	expects QToD to 'Understand the nature and use of visual manual support for language development'.

5.18.	recommends encouraging d/Deaf learners to become more independent by helping them to develop organisational, information processing, problem solving and thinking skills.
5.19.	encourages d/Deaf learners to take responsibility for their own learning and independence, including use of specialist equipment by involving them in making decisions about the types and levels of support they receive.

By teaching metacognitive strategies such as Thinking Maps we can address points raised in the table 8 and encourage pupils to become independent.

If we look at the dual coding visual (see figure 4) by Caviglioli (2020) we can see how the brain takes in the two forms of stimuli but processes it in different ways. We can see that the auditory stimulus is processed in an auditory loop and this needs sequential processing (one word at a time), whereas the visual information can be absorbed synchronously which Caviglioli (2000 and 2020, 2022: Point, 108.9) explains 'the eye can take in and understand many elements at the same time'.

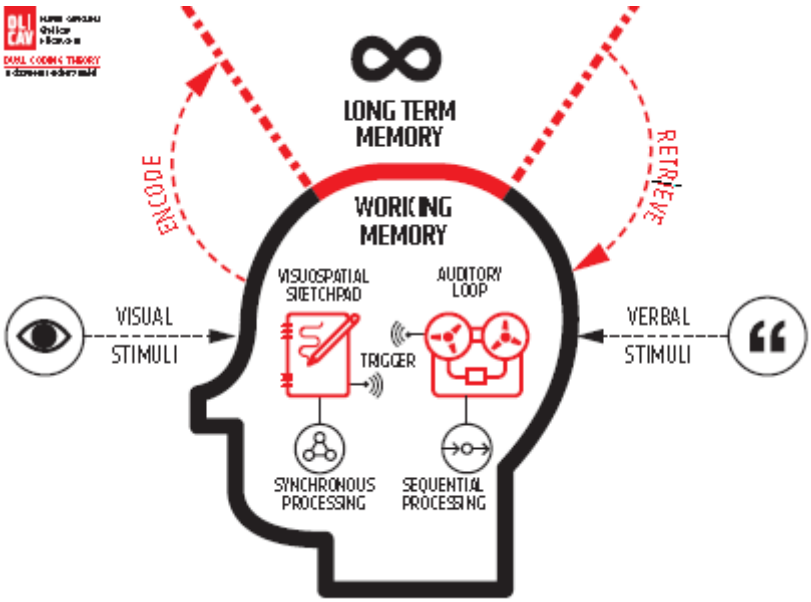


Figure 4: Caviglioli, O. (2019) Image: 'Allan Paivio's Dual Coding Theory'

When we use just one channel, such as a picture or text, it is hard to transfer the one source of information into the long-term memory. For example, if a teacher is giving a spoken dialogue of the schema in his head, then the pupil is

expected to process the information and attempt to recreate the schema from the spoken words (we call this ‘guess what’s in my head?’ Caviglioli, 2020: point 52.7). This helps us to understand the difficulties children who are d/Deaf might face from this style of teaching, such as not hearing all the information in the first place, to not being able to understand the meaning of certain words and therefore missing the comprehension of a whole section of text. Friedman (1985) and Sharp (1985) cited in Easterbrooks (2004:255) and more recently Marschark and Knoors (2012) note that children who are d/Deaf can find organising and ‘manipulating information in a logical manner’ challenging and they explain the affect this can have on the development of critical thinking.

The idea behind dual encoding exploits the links between these two channels, pictures and words, and if you can make those connections and those links for the pupils then it is much easier and stronger for them to send and to retrieve from the long-term memory; we look at this, as our pupils developing their own schemas (see figure 5). Using the visuals alongside the modelled explanation gives us direct access to knowledge.

2.2.6 Schemas

Schemas are the knowledge the pupil has, and the links between the knowledge (Harris and Caviglioli, 2003). The aim is for learners to develop a schema, a rich web of understanding, similar to an amazing library with all the books in the correct place where new learning can be slotted into their secure prior understanding and, as equally quickly, retrieved.

In the image (see figure 5) the first model has pockets of knowledge but not any connections between them. The second and third models are schemas with lots of knowledge and lots of rich association.

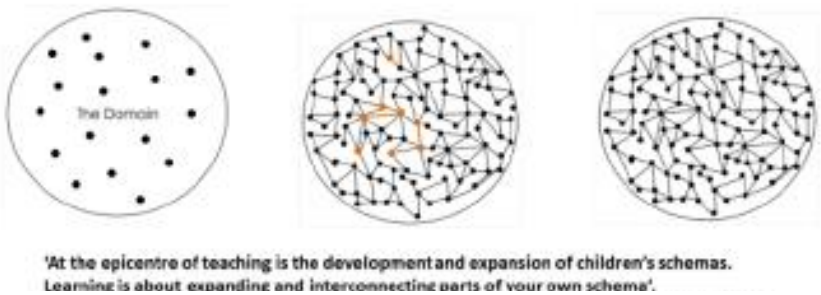


Figure 5: Harris and Caviglioli (2003) the developing schema

To enable students to retrieve prior knowledge, Jones (2020) explains the process of retrieval practice such as using a visual they have seen before, low stakes quizzing, cue-based activity and then encourages the learner to explain the association of how and why it fits into the learning to improve that retention.

2.2.7 How Thinking Maps might support children who are d/Deaf

Thinking about the challenges some children who are d/Deaf face to shared gaze (Nowakowski *et al.* 2009) this visual stimulation enables a way of directing the pupil's attention. This is in accordance with The Mandatory Qualification (2018:19, see table 9).

Table 9: Quality standards

Standard	The Department of Education Specification for Mandatory Qualifications (2018:19)
4.7.	which expects QToD to 'know how to adapt general and technical vocabulary, when it is appropriate to do so, using strategies to accelerate language development'.
4.8.	And to understand the importance and range of non-language communication skills (e.g. conversational turn-taking, appropriate eye gaze) and how to encourage good practice in d/Deaf learners.

Marschark and Knoors (2012) note that for extra time for children who are d/Deaf to benefit from the effective practice of dual encoding (Paivio, 1971) should be given to ensure they can have that time to the look at the visual.

2.2.8 The Thinking Hats

Explanation of the hats (see table 10).

Table 10: The six Thinking Hats De Bono (2000)

	The White Hat calls for information known or needed. "The facts, just the facts."
	The Yellow Hat symbolizes brightness and optimism. Under this hat you explore the positives and probe for value and benefit.
	Risks, difficulties, Problems – The risk management Hat, probably the most powerful Hat; a problem however if overused; spot difficulties where things might go wrong, why something may not work, inherently an action hat with the intent to point out issues of risk with intent to overcome them.
	The Red Hat signifies feelings, hunches and intuition. When using this hat you can express emotions and feelings and share fears, likes, dislikes, loves, and hates.
	The Green Hat focuses on creativity; the possibilities, alternatives, and new ideas. It's an opportunity to express new concepts and new perceptions.
	The Blue Hat is used to manage the thinking process. It's the control mechanism that ensures the Six Thinking Hats® guidelines are observed.

Image De Bono (2019- 2029) © The de Bono Group (see table 10).

De Bono (1999, 2000) created the Six Thinking Hats to support lateral thinking. The main difficulty of thinking is the arrangement and the organisation of information. The hats help the thinker to organise their thoughts into categories with a 'simple mental hook' (De Bono, 1999, 2000:8). These help to focus the attention to one aspect at a time. It is a strategy to consider possibilities, to parallel think and to forge a way forward.

The practice of using Red Hat Thinking, aligns with NDCS (2020:12) QS07 Social and Emotional Well-being 'Hearing and deaf peers are taught how to communicate with each other so that there is good communication and social interaction between deaf and hearing children and young people'. This use of Red Hat Thinking is in accordance with the aims of the Mandatory Qualification (2018:24) Standard Health and Well-being Standard 6.18 and provides

opportunities for d/Deaf learners to develop positive self-esteem, emotional well-being, self-advocacy skills and promotes positive behaviour.

Morgan (2006) and Sidera *et al.* (2020) research suggests that providing opportunities for children who are d/Deaf to view things from alternative perspectives can develop their Theory of Mind. De Bono's (1999, 2000) Thinking Hats can be a positive way to encourage learners to think carefully and critically and to think beyond their own perspectives, and could therefore promote development of Theory of Mind. This familiar visual tool enables them to be deeper thinkers with very simple low cognitive load prompts according to De Bono's (1999, 2000).

With this in mind, pre-teaching vocabulary and ensuring that there are many opportunities to experience and use words in context is vital. This is where teaching in a thinking school is of benefit to children who are d/Deaf providing knowledge banks, modelling and retrieval practice to support the pupils to develop and build their word lexicon, world knowledge and schemas.

2.3 Fostering a love of reading

One of the things we need to aim for is for children to want to read and love reading so much that they become self-motivated and therefore perpetuate the reading cycle and inspire the next generation. Whether it is through non – fictional texts, as Green (2011) advocates, or through traditional stories as Tannock (2011) commends, these learners need to be exposed to a wide variety of genres and text so that they can find stimulation and satisfaction.

Marschark and Hauser (2011) explain that research shows by reading more, learners become better readers. They go on to explain by being a better reader, children are likely to find reading more enjoyable, thus perpetuating the cycle. They recognise time on reading tasks is an important factor in developing readers. As already identified, the significantly declining number of children reading for pleasure after the age of 11, suggests that QToD need to consider how to tackle this issue for their pupils.

2.3.1 The rationale

The rationale for this study shows that there is little research and evidence of the impact of metacognition skills in d/Deaf pupils, and the research into the theories that surround it such as schemas in children who are d/Deaf such as Schirmer et al (2004) and Strassman (1997) are dated. It is an area that should be explored, because potentially being able to illustrate thinking graphically will be of particular value to children who are d/Deaf. It is important to understand the impact of Thinking Maps and Thinking Hats to promote comprehension, language and narrative engagement and the impact on the pupils, and in doing so it may enable children who are d/Deaf to access exam papers and therefore increase opportunities for social mobility.

3 Methodology

3.1 Definition of research

There are aspects of practice that need exploration to see if they are effective and research can be used to analyse these to discover the efficacy. Naughton *et al*. (2006) defines research as the discovery that creates knowledge. Clark (2005:289) suggests that education research as 'the scientific construction of the causes of effective teaching' should be considered cautiously as there can be many causations. However, when exploring an aspect of teaching, it is perhaps being immersed in the situation that gives us a unique position to not only identify an unresolved aspect (Bryman 2012) but also the position to explore it (Thomas 2017) and to have an impact on future practice.

3.1.2 Literature search

Searches using the University of Hertfordshire library produced relevant readings for this literature review. The Scopus search engine was used to find pertinent research and then this research was explored to find relevant papers (see table 11).

Table 11: Literature search

Search Terms	Database	Titles
Deaf + metacognition	Scopus	27
Hard of Hearing + metacognition	Scopus	14
Deaf + thinking hats	Scopus	0
Deaf + thinking maps	Scopus	3
Deaf + dual encoding	Scopus	4
Deaf + comprehension	Scopus	932
Deaf + reading	Scopus	1,893

3.2 Research design and reflexivity

Hallenbeck *et al*. (2019) note the importance of consideration and declaration of approaches in action research study in education for those children who are d/Deaf. I considered both the interpretivist and positivist approach.

In the positivist approach (Comet, 1848, in Thomas, 2017:108) the researcher would be independent and from outside the organisation, able to select participants and samples. This approach allows decisions on variables being made ahead of the study and data being quantitative.

For this study, I will be taking the interpretivist approach, as I am an 'insider' and have an understanding of the setting, the participants and the variables are 'valued' (Mead,1863–1931 in Thomas, 2017:111). This approach acknowledges that 'feelings, thoughts and perceptions' can be explored to find patterns and all this information can feed into the study as it recognises that 'knowledge is socially constructed' (Thomas, 2017: 109).

3.2.1 Data analysis methods and reflexivity

Alongside analysis of the quantitative data, a qualitative interpretation will be combined to create a richer and deeper awareness. Bryman (2012:624) states quantitative data can 'engage with' the interpretivist stance, and Thomas (2017:119) acknowledges that these approaches 'are not in opposition' but can 'complement each other'.

Assessments prior and post the intervention using the York Assessment of Reading Comprehension (YARC) (Snowling et al 2009, 2011) provided quantitative data and progress was measured. The children were asked if they enjoy reading and to indicate this on a Likert scale (see figure 6) in order to measure engagement. Thomas (2017) explains the Likert scale (1932) is useful in measuring attitude. This study uses the Likert scale to regularly measure engagement. Although this provides quantitative data, it relies on the child's view of their feelings towards the subject so it could be considered to offer both quantitative and qualitative data. As part of the study the pupil's voice was noted to enrich the data.

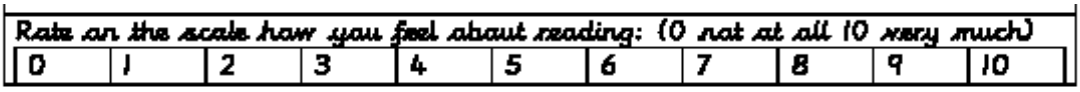


Figure 6: Likert scale of pupils view of reading

The Likert scale was later revised and included the word 'like' to support children's understanding of the scale (see figure 7 below).

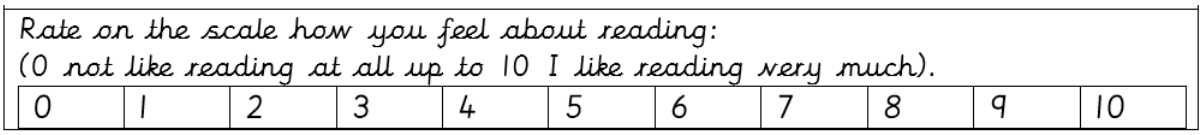


Figure 7: Revised Likert scale of pupil's view of reading

Although I am undertaking the role of the researcher, I am also part of the study as the teacher undertaking the intervention, and the pre and post assessor. It is important to be critical and objective and to have a 'duty of doubt' (Haldane, 1928, in Thomas, 2017:124). There are benefits of undertaking action research within one's own setting, and David and Sutton (2004) suggest that in studying in the workplace we can explore our own practices and can benefit from the information that provides. Bryman (2012) proposes that this type of practice supports the researcher enabling them to gain a better understanding of their setting and practices, developing an empirical understanding, including the negative aspects, for example, a tendency to lack objectivity.

3.3 Multiple case study approach

Thomas (2017:156) explains that a case study enables 'in-depth' research. He suggests that multiple case studies give an opportunity to explore and compare; in this case, how the intervention affects more than one subject. Bryman (2012:74) concurs that using multiple case studies enables the development of the theory and offers greater possibilities to explore the causality. This would enable exploration of how the intervention has had an impact upon each subject. Cannon *et al.* (2016) stress the importance of more research into interventions, in particular with those children who are d/Deaf, and those children who are both deaf and have English as an additional language. Hallenbeck *et al*. (2019) extol the benefits of the case study approach in learning more about and developing our understanding of education for those children who are d/Deaf, and how this might influence future practice and this approach would enable exploration of this intervention of those in this study.

3.3.1 Sampling

Thomas (2017:141) explains that sampling is often used for 'experimental research' as it takes a representative group of a wider population and for the purposes of this research the sample size needed to be manageable. Deafness is described as a high impact with low incidence (World Health Organisation, WHO, 2021) and this determines the accessibility of candidates for research. A non-probability sampling in the form of a convenience sample (Bryman, 2012) was used. This is a purposive sample recruited from the educational setting

where the study took place. Whilst this could be considered a relatively small sample, Bryman (2012) notes that useful preliminary data can be collated that can have an impact on practice, but the findings will be less generalisable to the population as a whole.

3.3.2 Variables

All participants were d/Deaf and aged 6-10 years. I am aware there is a significant range of variables within the group (see tables 12, 13, and a large copy in appendix 7, table 48).

Table 12: Variables of participants

Table to show the variables of participants
• Pupils have a range of hearing equipment.
• The range of pupils are verbal and non-verbal.
• Preferred communication varies: British Sign Language (BSL), sign supported English, and aural and oral.
• A number of the pupils in the sample are classified as English as an additional language (EAL).
• There is a range of ages.
• Participants have a range of specific learning needs such as ASD, ADHD.
• Pupils have differing levels of deafness ranging from *severe-profound.
*Severe hearing loss ranges from 71 to 95 dB, profound hearing loss is in excess of 95dB, according to British Association of Teachers of the Deaf (BATOD, 2009).

Table 13: Participant's information

Participants	Age in Oct 2020 Years and months	Year group	Time in provision hours per day, hours and minutes	Primary mode of communication	Type and degree of loss	Current form of amplification Cochlear Implants (C.I) Hearing Aids (H.A)	Aetiology	Additional SEND	Home language
A	6yr 4mth	2	3 hr 40 mins	TC	Bilateral profound sensorineural	CI Cochlear Nucleus7	Unknown congenital with progressive element	Glasses	Lithuanian and English
B	6yr 9mth	2	3 hr 40 mins	Aural/Oral	Bilateral severe mixed with microtia and atresia	BAHA Oticon Ponto 3 SP	BOR Syndrome	Glasses	English
C	7yr 1mth	3	3 hr 40 mins	TC	Bilateral profound sensorineural	CI Medel synchrony +Flex 24	Unknown		English
D	7yr 5mth	3	3 hr 40 mins	TC	Bilateral profound sensorineural	HA PHONAK, 1-SKY V UP	Family history of progressive hearing loss	Glasses	English
E	7yr 8mth	3	3 hr 40 mins	BSL	Bilateral profound sensorineural	CI AB Naida Q90	Family history of hearing loss	SEMH	English
F	9yr 0mth	4	3 hr 40 mins	BSL	Bilateral profound sensorineural	HA PHONAK, 1-SKY V 70 UP	Family history of Hearing loss	Glasses	BSL
G	9yr 10mth	5	3 hr 40 mins	BSL	Bilateral Profound mixed with microtia and atresia	CI Advanced Bionics Neptune	Atypical Treacher-Collins Syndrome	Core Autism ADHD Glasses	BSL
H	9yr 6mth	5	3 hr 40 mins	TC	Bilateral profound sensorineural	CI Naida AB	Connexion 26	SEMH	Punjabi
I	10yr 7mth	6	3 hr 40 mins	TC	Bilateral severe sensorineural	HA PHONAK SKY Q 70 SP	Family history of hearing loss	Glasses	Slovak Roma
J	10yr 2mth	6	0	TC	Bilateral severe mixed	HA PHONAK 1-SKY V 70-UP	Family history of progressive hearing loss	Glasses	English

3.3.3 The provision for d/Deaf pupils

The provision has places for up to 25 pupils who are d/Deaf; these pupils have an Educational Health Care Plan (EHCP) and their primary need is their severe to profound hearing loss. At the time of this study, most of the children who are d/Deaf in years 2 – 6 took part in small group teaching for core subjects; English, reading and maths in the morning, and joined their mainstream classes for the foundation subjects in the afternoon (see table 13, and 48).

According to Consortium for Research into Deaf Education (CRIDE) annual survey (2021:11) the children in the provision who took part in this research are part of the '6% of Children who are d/Deaf who attend mainstream schools with resource provisions'. Therefore, this is typical of the provision for a limited percentage of pupils who are d/Deaf and will not represent the majority of d/Deaf pupils. It is worth noting that CRIDE (2021) report that 8% of pupils who are d/Deaf have a severe hearing loss and 12% of children who are d/Deaf

have a profound hearing loss. The provision offers a total communication approach. According to CRIDE (2021) 7% of children who are d/Deaf access signed supported spoken English.

CRIDE (2021) report 14% of children who are d/Deaf have English as an additional language but of the children who took part in this study 33% have English as an additional language; this is a much higher level than the national average. Some pupils have additional special educational needs; one has a formal diagnosis of Core Autism ASD and ADHD and 22% are non-verbal. According to CRIDE (2021) 23% of d/Deaf children are recorded as having an additional special educational need.

3.3.4 Reliability and replicability

The YARC was used as suggested on the NDCS website (2022) as the measuring instrument in pre and post testing as this offers test and retest reliability (Thomas, 2017). Errors can be recorded in different ways and a coding system was used to analyse miscues in decoding (coding system see appendix 2: figures 37 and 38). The reading rate was calculated, and comprehension questions asked. Although the YARC is not standardised on children who are d/Deaf it has been used in a number of research studies with children who are d/Deaf (Mayer et al, 2016, Harris et al, 2017, and Worsfold et al, 2018). The YARC test calculates reading rate, reading accuracy and comprehension, and this provided a way of measuring the impact of the intervention. Although other assessment batteries were considered, the YARC offered the most robust method to analyse the results.

The testing procedure was carried out with the participant and the researcher, and a further QToD and conducted in the usual classroom setting. To enable a smooth delivery, further notes were taken by another QToD. Thomas (2017) raises an awareness of bias in testing and the need to be aware of unconscious bias, however by using a reliable tool such as the YARC which provides good test-retest reliability, the miss-cueing system mitigates against bias as it is less subjective as the results of the miscues can be compared between the two assessors. Observation is a useful tool as it gives richer analysis to support

quantitative findings but it is much more difficult to make comparisons between two assessors and to some extent mitigates subjectivity.

3.4 Data collection methods

To enable analysis of reading comprehension the participants took part in testing both pre and post the intervention.

The pupils took the baseline assessment in October 2020 and endline assessment in July 2021 and had the opportunity to be part of the intervention for 9 months across an academic year.

Every week of term time throughout the year data was also collected on the pupil's attitude to reading in the form of the Likert scale, and at the end of the study as part of gathering pupil voice the children ranked the books and had an opportunity to discuss the books read. Whilst this was an informal measure and not as robust, observations such as this can enrich the data (see table 16).

3.5 The setting

The research took place in a mainstream primary school with resource provision for d/Deaf pupils which is the researcher's usual place of work. This is one of the founding members of the Thinking Schools Academy Trust. They are accredited by Exeter University (2018) as a Thinking School and reaccredited as an Advanced Thinking School in (Kleine, 2022). The school uses Thinking Skills to support all pupils in their education. The school is a one-form entry with places for 250 pupils. In the latest Ofsted (2020) inspection the school was judged to be good. The Ofsted (2020:3) inspection noted that 'the school's provision for pupils with special educational needs and/or disabilities (SEND) is particularly strong.'

3.6 Process of the study

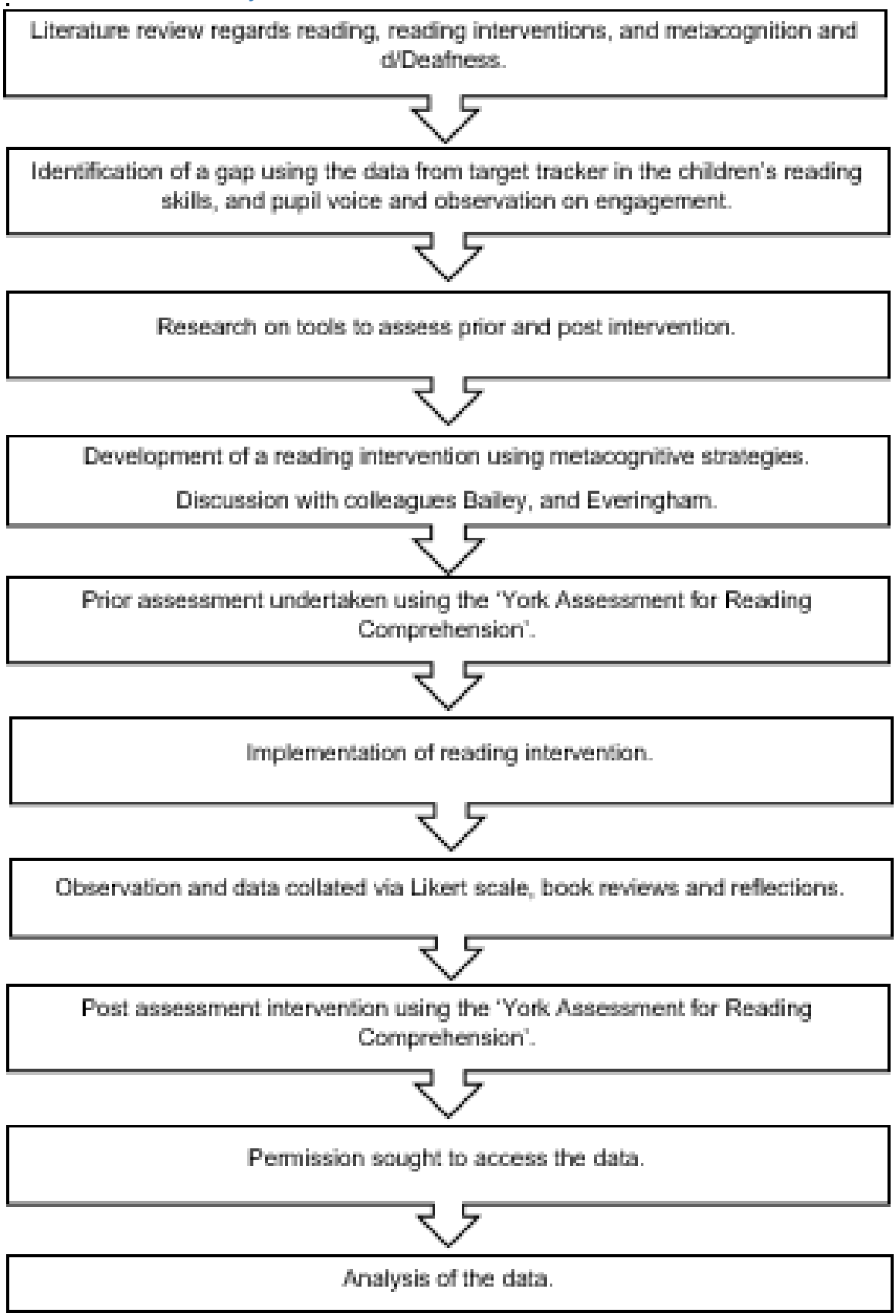


Figure 8: Showing the process of the study

3.7 Intervention

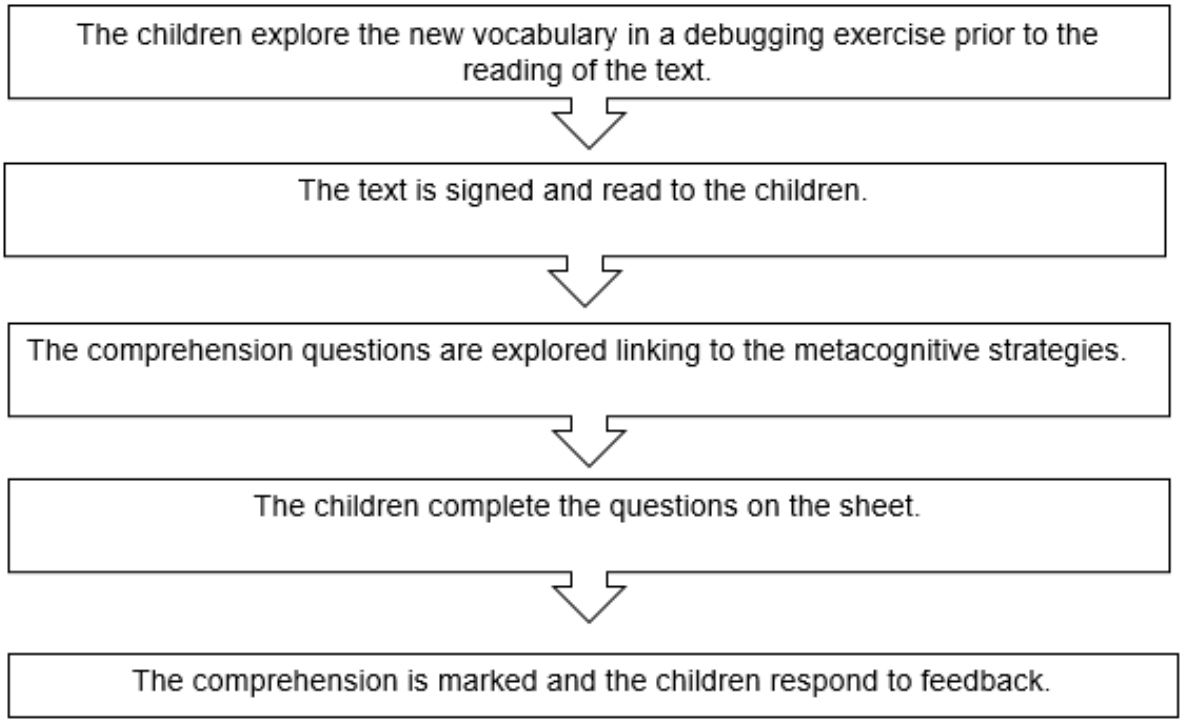
The participants took part in a guided reading intervention in a small group of mixed age but developmentally matched group in their normal small group classroom setting. The children were grouped according to their developmental stage as mapped on Target Tracker (Target Tracker, Juniper Education, 2022) and taught by a QToD and a Specialist Teaching Assistant.

3.7.1 Intervention codicil

The intervention was to have taken part in two classrooms within the resource base and did so at the beginning of the year with the pupils in two groups of 4 with a QToD and a Specialist Teaching Assistant. However, during the pandemic the school put in several different strategies to mitigate spread of COVID-19. This meant that the groups were amalgamated and for those children attending they were taught as one group. For the most part when in school the children were taught by a QToD and a Specialist Teaching Assistant. The group varied in size up to 9 children who are d/Deaf.

3.7.2 The structure of the intervention

The structure of the intervention (see figure 9). From Monday to Thursday, the children took part in guided reading sessions that followed this structure;



On Friday, the children took part in guided reading sessions that folllowed this structure.

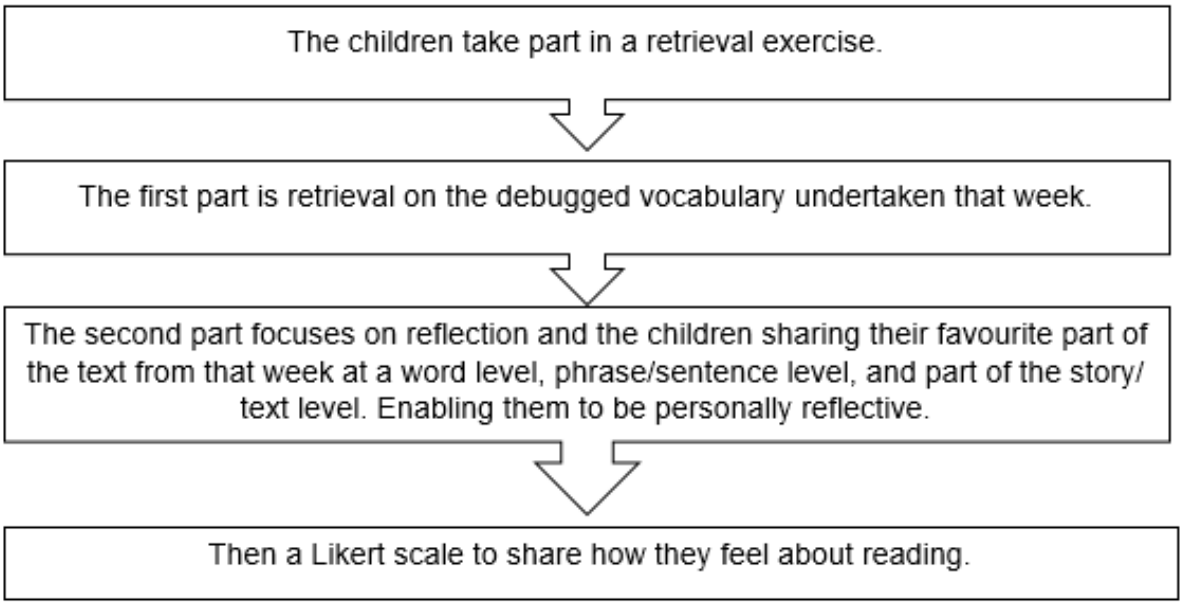


Figure 9: The reading intervention structure and process (Monday to Friday)

At the end of each book the children reviewed it and the pupil voice was gathered.

3.7.3 Debug

Monday to Thursday the group studied extracts of text from the book they read. Consideration was given to words that the participants were not familiar with, which aligns with Kyle and Harris (2010), and Kyle and Cain (2015) research which suggests children who are d/Deaf would benefit from support to understand new vocabulary. In order to debug vocabulary, a visual was provided and a definition (see figure 10), the QToD and pupils used it in context, it was found in the book/text, and read in context and then added to the vocabulary wall within the word class (see figure 12), so that the children could select and use it in their writing. Then once a week a retrieval practise exercise was completed with the new words learnt that week, Agarwal (2022, 2019) explains that retrieval practice gives pupils a level of challenge to recall previous knowledge (see figure 11).

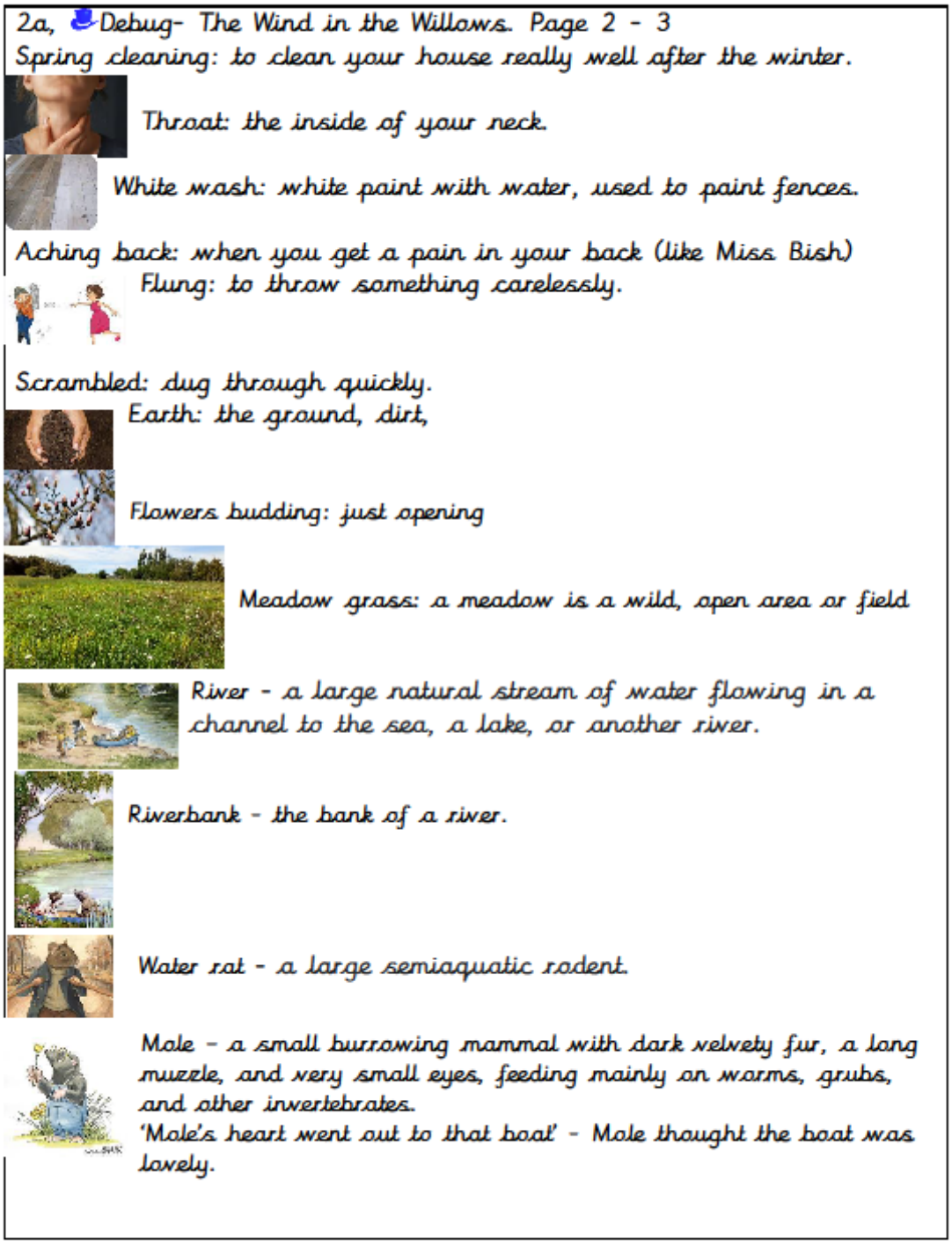


Figure 10: The debug section of reading comprehension

In this example (see figure 11 below), the children took part in the retrieval practise by completing the sheet adding the word, picture, or definition. The challenge was to complete as much as they could in a timed session and then to refer to their book to make amendments and complete the rest. This type of retrieval is an example of low stakes quizzing according to Jones (2020).

2a, Debug – Book cover – page 7 Chapter 1 Wind in the Willows.

		– to clean your house really well after the winter.
_____		–
River		–
Riverbank		– the bank of a river.
Water rat		– a large semiaquatic rodent.
Mole		–
Waggled		– "his tail began to wag"
Weasels		–
Stoats		–
Rower		– person who rows a boat, especially as a member of a racing team.
Toad		– a tailless amphibian with a short stout body and short legs.

Figure 11: Example of retrieval practice Friday vocab

The vocabulary wall (see figure 12) was grouped using the word classes and has a definition, and a heading using both the word classes' name and the shape, using the SHAPE CODING™ system developed by Ebbels (2020). Calder *et al* (2020:299) explains SHAPE CODING™ as a 'Metalinguistic technique that can be used explicitly to teach grammar through metacognitive strategies using visual supports and graphic organisers'.

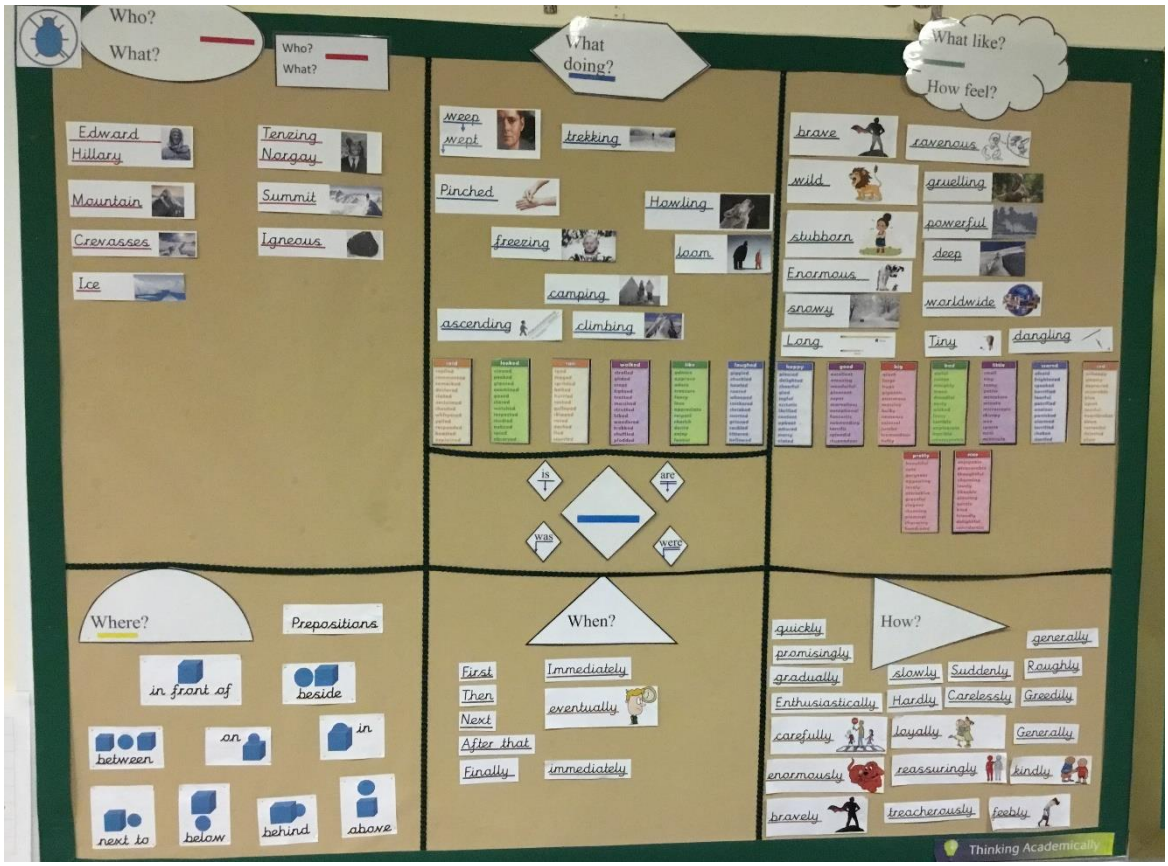


Figure 12: The vocabulary wall

3.7.4 Metacognitive strategy: Thinking Hats

To reduce cognitive load, a De Bono (1999, 2000) Thinking Hat™ was used, and correlated to a question content domain. This is not a definitive list (see table 14, and example figure 14).

Table 14: Correlation of Thinking Hats and content domain relating to questions.

Thinking Hat	Content Domain Reference
2a, Blue hat thinking relates to organising.	2a give / explain the meaning of words in context.
2b, White hat thinking relates to facts.	2b retrieve and record information / identify key details from fiction and non-fiction.
2c, Blue hat thinking relates to organising.	2c summarise main ideas from more than one paragraph.

 2d,  2d, Red hat thinking relates to emotions. Green hat thinking relates to creativity coming up with an idea.	2d make inferences from the text / explain and justify inferences with evidence from the text.
  2e, Prediction key Green hat thinking relates to creativity coming up with an idea.	2e predict what might happen from details stated and implied
 2f, Green hat thinking relates to creativity coming up with an idea.	2f identify / explain how information / narrative content is related and contributes to meaning as a whole
 2g, Blue hat thinking relates to organising.	2g identify / explain how meaning is enhanced through choice of words and phrases
 2h, White hat thinking relates to facts.	2h make comparisons within the text
 Yellow hat thinking relates to find the positives.	
 Black hat thinking relates to finding the limitations.	
 Orange hat thinking relates to P4C.	
Purple hat thinking relates to editing and improving.	
(White, Red, Black, Yellow, Green, and Blue Thinking Hats™ accredited to De Bono, 1999, 2000), (Orange and Purple Hats accredited to All Faiths Children's Academy Thinking Drive Team, 2017), (Standards and Testing Agency (2016:7) Content Domain, Thinkers Keys accredited to Ryan (2014).	

3.7.5 Metacognitive strategy: Thinking Maps

Hyerle and Alper's Thinking Maps, (2011) enable participants to structure their thinking to communicate an idea. Here a range of Thinking Maps have been used to support the children in answering guided reading questions. The table

below illustrates how maps might be linked to the content domain questions (see table 15). This is not a definitive sample as maps are selected according to the question (see figure 13, and example figure 14).

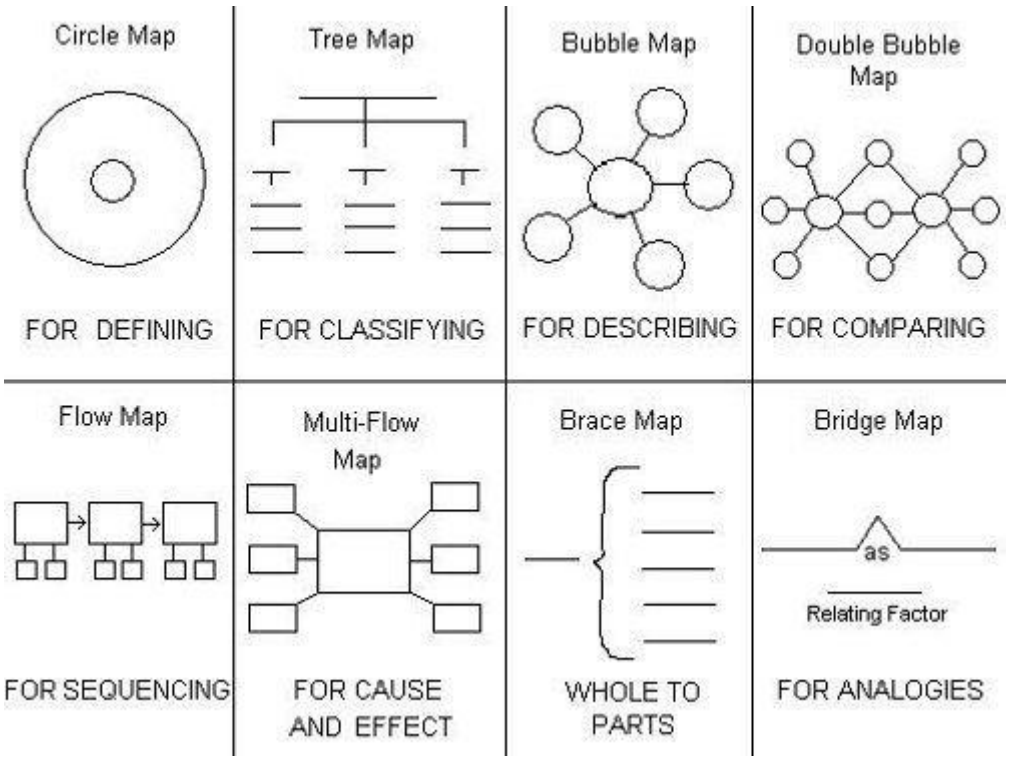
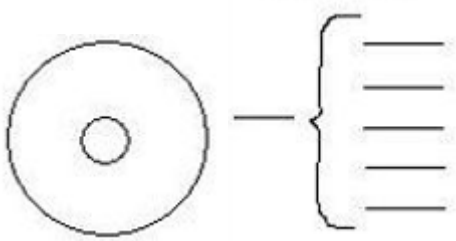
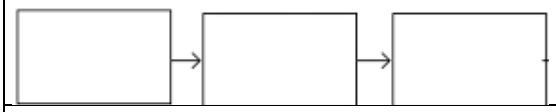
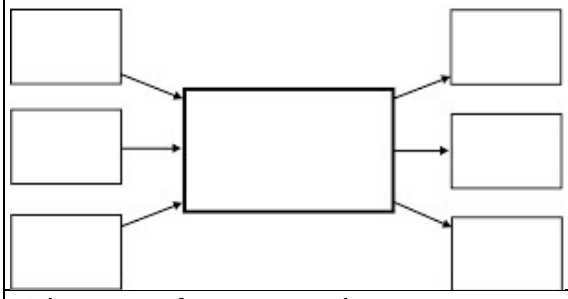
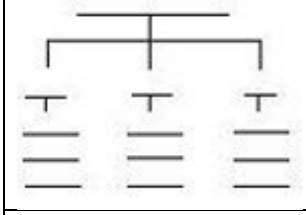
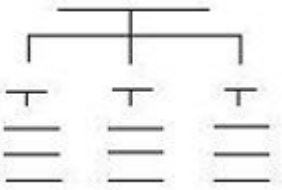
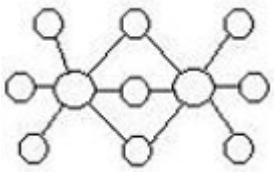


Figure 13: Thinking Maps and what that map is used for

Thinking Maps and their uses image (2017) Mini Thinking Course.

Table 15: Correlation of Thinking Maps and content domain relating to guided reading questions

Thinking maps	Content domain reference
Bridge map for analogies. 	2a give / explain the meaning of words in context.
Circle map for defining. Brace map whole to parts. 	2b retrieve and record information / identify key details from fiction and non-fiction.

Flow map for sequencing. 	2c summarise main ideas from more than one paragraph.
Multi flow map to show cause and effect. 	2d make inferences from the text / explain and justify inferences with evidence from the text.
Flow map for sequencing. 	2e predict what might happen from details stated and implied.
Tree map for classifying. 	2f identify / explain how information / narrative content is related and contributes to meaning as a whole.
Tree map for classifying. 	2g identify / explain how meaning is enhanced through choice of words and phrases.
Double bubble map to support comparisons.  Part of a multi flow map to show cause and effect. * 	2h make comparisons within the text.
(Hyerle and Alper's Thinking Maps (2011) and Standards and Testing Agency (2016:7) Content Domain.	

The maps can be broken down to build pupil's confidence of how to use the map.

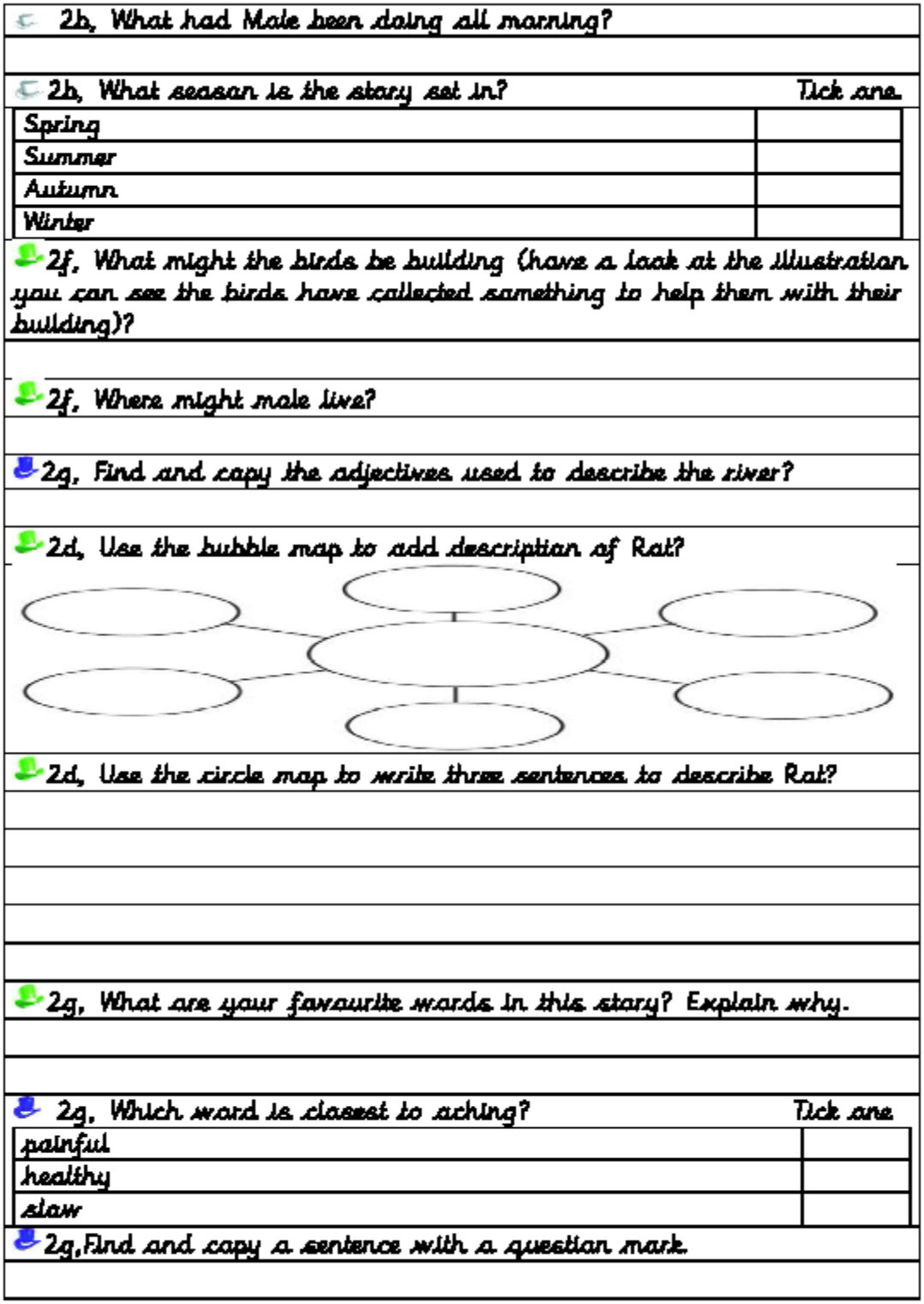


Figure 14: An example of a comprehension sheet with metacognitive strategies

3.7.6 Developing schemas

In order to develop the children's schema (Harris and Caviglioli, 2003) the text is related as much as possible to the children's experiences, by linking it to their home or school life and making explicit links to a previous text or texts. The children are immersed in the experience where possible to enable them to hook the new learning on to a previous experience.

Acting was used to explore language, acting out verbs or emotions. Grant and Mistry (2010) report that acting is an effective strategy to enable children who have EAL to develop their language alongside their assimilation of the curriculum. They feel that using this as a strategy should not be limited to a Key Stage. Annandale et al (2004:107) suggests acting as a strategy as it provides an opportunity for children to read the text, 'organise key information they have understood in it, then share their understanding with others in the retell'. Annandale et al (2004:107) explains retells can be; drama, drawing or oral/signed retellings. NDCS (2016:5) suggest that 'pretending' helps in developing language acquisition and improve learning.

Reading aloud is important in developing the skills and knowledge for reading and this should not be limited to younger children according to Adams (1991) and Corbett (2009). The text is read aloud and signed to enable an extended range of vocabulary to be developed.

A simplified version is created of the text or story on a flow map/story map (see figure 15), which uses a strategy in Talk for Writing by Corbett (2009) and in the 'Reading Map Development' strategy by Annandale et al (2004:109). These strategies enable the pupils to dual encode the story or text (Paivio, 1971, Caviglioli, 2020, and Marschark and Knoors, 2012). These are also read chorally and signed as this enables the children to build a lexicon of the story (Corbett, 2009 and Annandale et al, 2004).

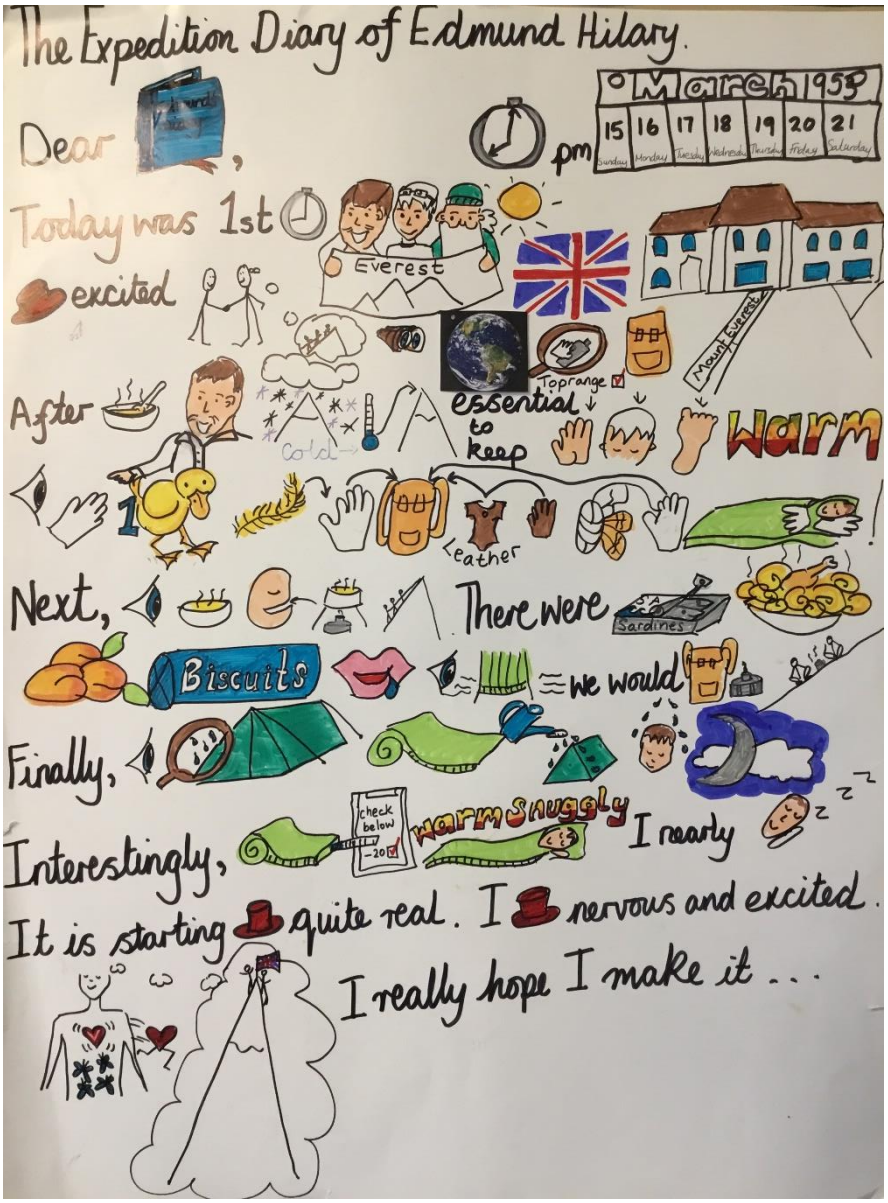


Figure 15: Flow map (story map) showing a diary entry, Welstead (2021)

3.8 Limitations

There are limitations to this study, as mentioned before, the use of a convenience sample means there is not an unbiased balanced sample and there are many variables and as Bryman (2012:206) states this then has an impact on ‘generalisability’. Consideration should be made of the time; the participants took part in the study for 9 months so potentially an increase in results may be due to natural maturation or pupils may make greater gains over a longer period. Attendance may have affected the results due to COVID-19 and changes to the provision as we negotiated COVID-19 guidelines.

3.9 Ethics

As the study was part of the children's normal education, ethics permission was sought to access the data. This is considered low risk research and ethics approval was given from the University of Hertfordshire and permission from the school to access the data. See ethics approval notice and permission forms (see appendix 3: figure 39, and appendix 4: figure 40).

4. Results

Table 16: Results

The results of this study are a combination of:
• YARC pre and post testing
• responses to the Likert scale
• book review scores
• pupils' attendance percentage figures
• pupil voice
• observations
• reflections

4.1 Case studies

The following tables show the results of the pre and post testing using the YARC. Standardised scores are a more robust method for analysing results, but for the purposes of this study and in order to make comparisons with research such as EEF (2021) and NDCS (2022) the results will focus on reading ages. The confidence intervals make plotting progress challenging as smaller steps of progress can be hard to see.

Table 17: How accelerated progress was calculated

Accelerated progress = comprehension age (July 2021) - comprehension age (October 2020) – 9 months natural maturation

Likert scales were positioned at the end of the Friday guided reading session and not regularly completed by participants so dates varied between case studies. Due to time constraints and attendance these were not always systematically completed.

Books were reviewed by the participants. Table 18 below is the key for the colour coding system that is used in the graphs.

Table 18: Title of books read and the colour coded key for the graphs

Books read	Colour code
The Dragon Machine	
George and the Dragon	
The Paper Bag Princess	
The Jungle Book	
George Saves the World by Lunchtime	
Deadly Predators	
Charlie and the Chocolate Factory	
Iron Man	
Greek Myths	
Wind in the Willows	
Key for the colour coding system that is used in the graphs and table. See graphs in figures: 17, 19, 20, 22, 25, 27, 29, 31, 33, and 36. And in table 34.	
(Authors of the stories: Hughes, 2005, Jones, 2019, Milbourne, 1999, Munsch, 1981, Readman, & Roberts, 2006, Singer, 2020, Stewart, 2013, Ward, & Anderson, 2007, Williams, 2006, Williams, 2014, and Wormell, 2003).	

4.1.1 Results for participant A

Table 19: Results for Participant A

Pupil Name: A	Chron. age Oct 20: 6.04			Chron. age July 21: 7.01			Time between testing: 9 mths					
	Ability			Standard			Percentile			Age Equivalent		
	Oct-20	Jul-21	progress	Oct-20	Jul-21	progress	Oct-20	Jul-21	progress	Oct-20	Jul-21	progress
Accuracy	33	45	12	103	107	4	58	68	10	6.06	7.09	1.03
Rate	27	53	26	105	108	3	63	70	7	6.10	7.09	0.11
Comprehension	8	43	35	78	98	20	7	45	38	<4.10	6.10	2.00

During the period of the intervention Child A's attendance was 98.26%. When looking at the comprehension results (see table 19), it is not known how far below the 4 years 10 months age equivalent Child A was, but 4 years 10 months was used as this is the lowest recorded age on the mark scheme. It illustrates that Child A has made at least 2 years progress in comprehension and this is 1 year 3 month's accelerated progress. Child A's comprehension age is still below the chronological age, however, if this intervention and the rate of progress was to continue, this gap should narrow. The accuracy of reading has increased by 1 years 3 months and this is an accelerated progress of 6 months. The reading accuracy age has exceeded their chronological age by 8 months. The rate is also still ahead but is now 8 months ahead of their chronological

age. They have made 1 year 1 month's progress with 4 month's accelerated progress. Their reading accuracy has made greater progress than their reading rate but it could be argued that the rate may decrease as the accuracy increases as they are now able to read more words, improving comprehension. As comprehension is the area that is the focus of this study, it is worth noting Child A has moved 38 points in the percentile ranking from a percentile rank of 7 which is classified as severe difficulty to a percentile rank of 45 which is classified as average.

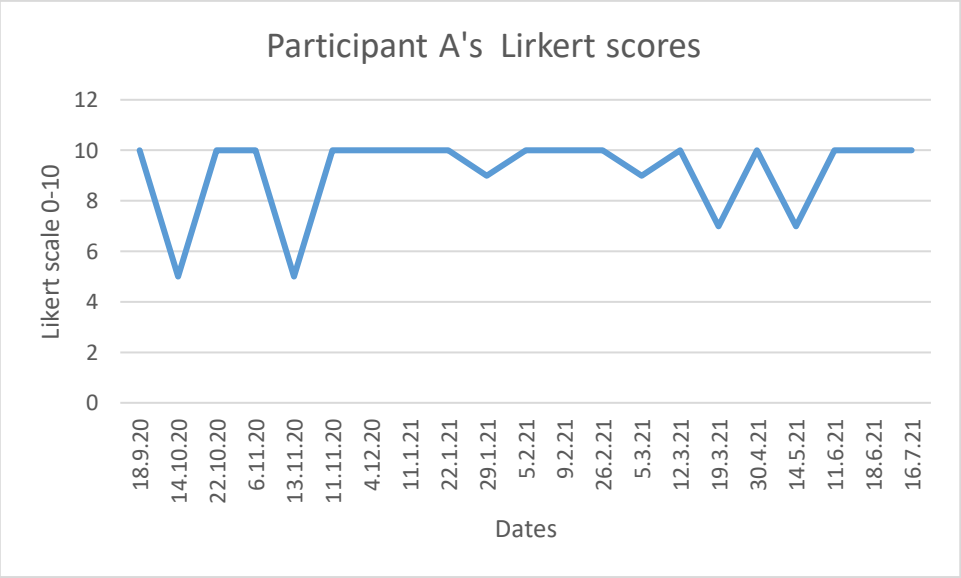


Figure 16: Participant A's Likert scores measuring engagement

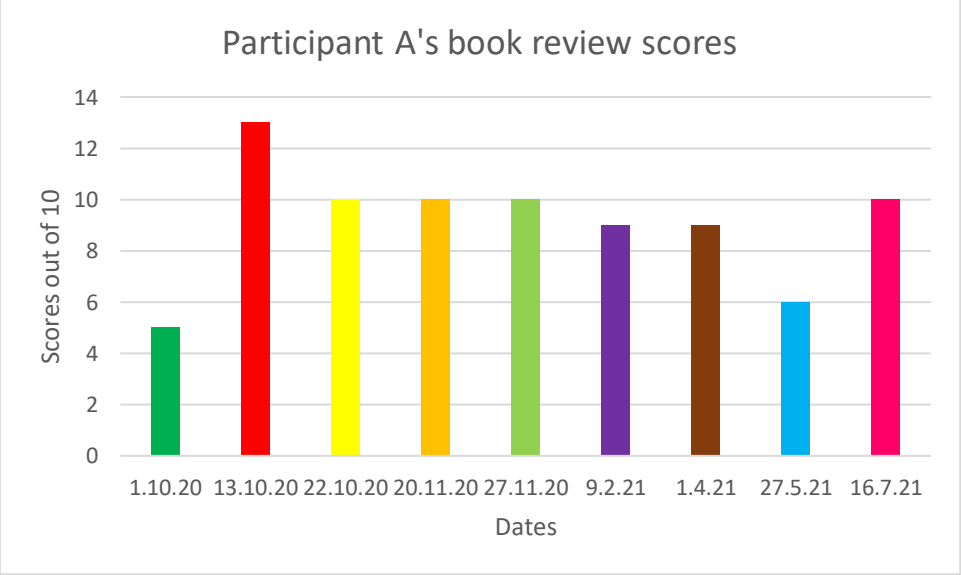


Figure 17: Participant A's book review scores

Participant A's Likert scale results show a greater engagement in reading. There is a dip on the 14.5.21 (see figure 16), when comparing the data from the book review scores (see figure 17) given by participant A they scored the book 'low' and they appeared to dislike this book which produced a spiky profile. That term they had studied a selection of Greek myths and this shows that Child A was reflecting on the reading material and showing preferences.

Table 20: Participant A's comments

Notes from Pupil A's comments on guided reading (see appendix 5 for further notes)
'I act out the story with my dolls it was quite fun and I remember the story and the order of the story.'
In the end of year reflections, Child A wrote, *'I really love it!!!'*

In Child A's comments (see table 20) they have responded to homework set about retelling the story by acting it out with dolls. Child A recognised that this has enabled recall of the story.

4.1.2 Results for Participant B

Table 21: Results for Participant B

Pupil Name: B	Chron. age Oct 20: 6.09			Chron. age July 21: 7.06			Time between testing: 9 mths					
	Ability			Standard			Percentile			Age Equivalent		
	Oct-20	Jul-21	progress	Oct-20	Jul-21	progress	Oct-20	Jul-21	progress	Oct-20	Jul-21	progress
Accuracy	48	45	-3	113	102	-11	81	55	-26	8.03	7.09	neg. 0.06
Rate	61	57	-4	117	105	-12	87	63	-24	8.07	8.02	neg. 0.05
Comprehension	40	47	7	98	98	0	45	45	0	6.07	7.04	0.09

During the period of the intervention Child B's attendance was 93.98%. During this period this child had some personal circumstances change that may have affected their ability to focus on learning. This child's area of need was comprehension, as they were able to read text, but appeared to find it difficult to comprehend what they had read. Although some of their data shows negative progress (see table 21), it is worth noting that the accuracy result is still exceeding the chronological age by 3 months, and the reading rate is also exceeding the chronological age by 8 months. The comprehension results are just below the chronological age by 2 months. There has been progress in comprehension but not accelerated progress. Child B also moved percentile ranks in comprehension from a percentile classification of severe difficulty into the percentile rank of average.

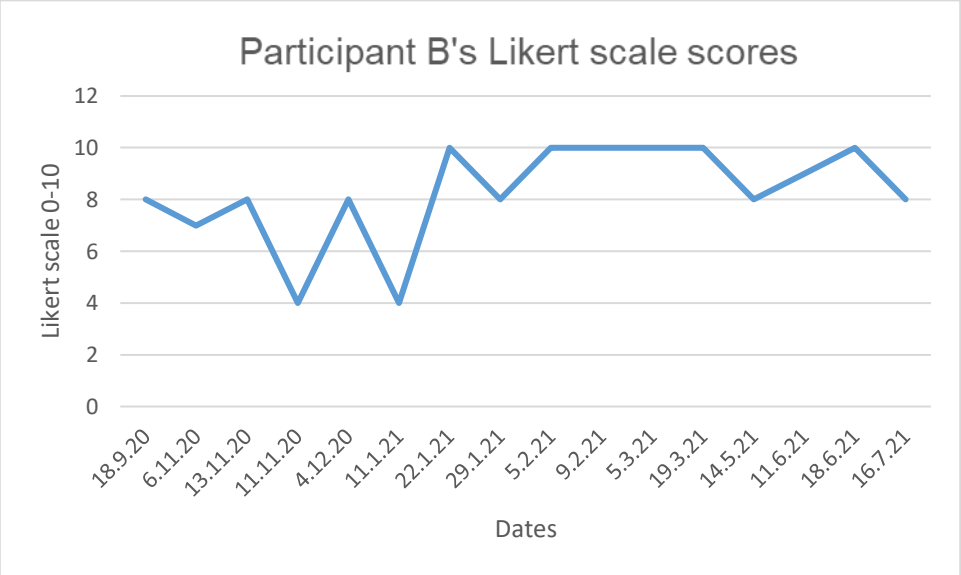


Figure 18: Participant B's Likert scores measuring engagement

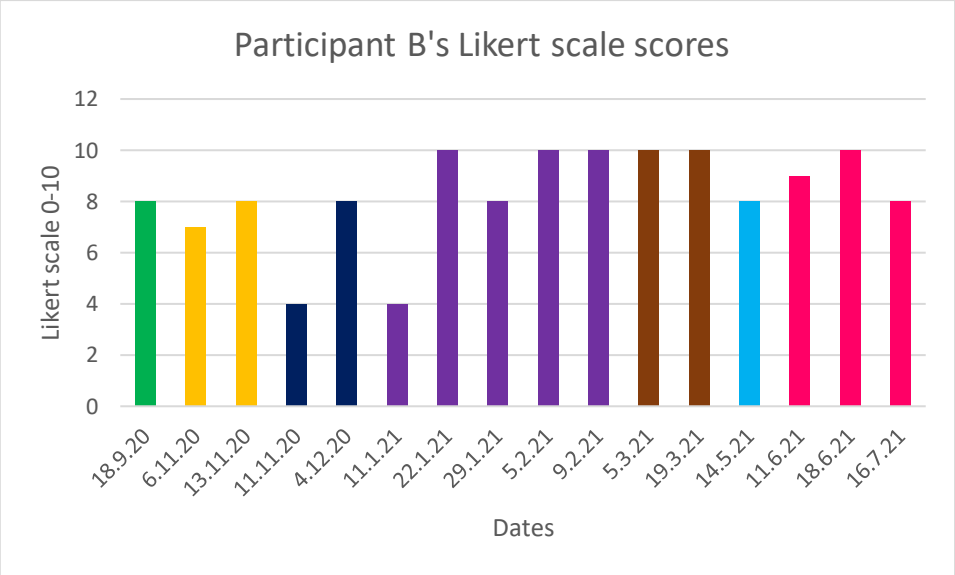


Figure 19: Participant B's Likert scores measuring engagement

From participant B's scores we see an increased enjoyment of reading over time (see figure 18). The dips appear to occur at the start of a new book (see figure 19) and this might show that Child B needs time to become secure in the new characters and settings but, once established, begins to enjoy reading again (see figure 20).

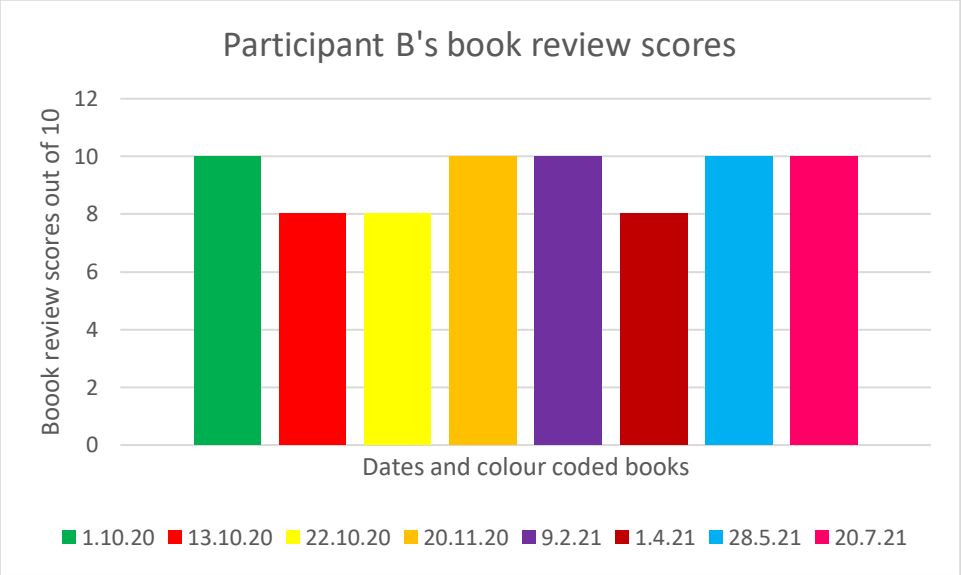


Figure 20: participant B's book review scores

Table 22: Participant B's comments

Notes from Pupil B's comments on guided reading (see appendix 5 for further notes)
'The Blue Hat and Green Hats [used in this study for inference] *are difficult to me, and White Hats* [retrieval] *are easy, sometimes, and I write them, and then I get a bit stuck the Green Hat, it's a bit hard.'*
'If the last answer is draw something, it makes me happy, because my talent is drawing, and it makes go shorew (their sound for whizzing through something) through it'.
'The Friday retrieval I am improving a lot. I like it when I improve and get smarter.'

Here (see table 22) Pupil B is able to recognise the hats have meaning and relate to different content domain questions. Pupil B is able to reflect and identify areas of challenge. Child B shows how using an already established strength, such as drawing, to support a skill a child finds challenging to acquire such as reading, can encourage engagement.

4.1.3 Results for Participant C

Table 23: Results for Participant C

Pupil Name: C	Chron. age Oct 20: 7.01			Chron. age July 21: 7.11			Time between testing: 9mths					
	Ability			Standard			Percentile			Age Equivalent		
	Oct-20	Jul-21	progress	Oct-20	Jul-21	progress	Oct-20	Jul-21	progress	Oct-20	Jul-21	progress
Accuracy	28	48	20	89	103	14	23	58	35	6.02	8.03	2.01
Rate	DNS	61	NM	DNS	106	NM	DNS	66	NM	<5.07	9.01	3.06
Comprehension	37	54	17	93	105	12	32	63	31	6.04	8.07	2.03

During the period of the intervention Child C's attendance was 92.62%. Child C made progress in all areas closing the gap and exceeding the chronological age (see table 23). Progress of 2 years 1 month in reading accuracy was achieved, 1 year 4 month's accelerated progress. The reading accuracy was 1 year 1 month below the chronological age and this has been closed and is now 4 months ahead. Child C's reading rate has also improved; the reading rate was too low to measure on the test (as they had scored too many errors) but if we take the lowest age possible on the test for their age group then that shows a reading rate of less than 5 years 7 months. By taking this base line of 5 years 7 months then the gap has been closed and now exceeds the chronological age by 3 years 6 months, making 3 years 6 month's progress and 2 years 9 month's accelerated progress. Child C's comprehension score at initial testing was 9 months below the chronological age, the gap has closed and been exceeded by 8 months, making 2 years 3 month's progress, of that 1 year 6 months is accelerated progress.

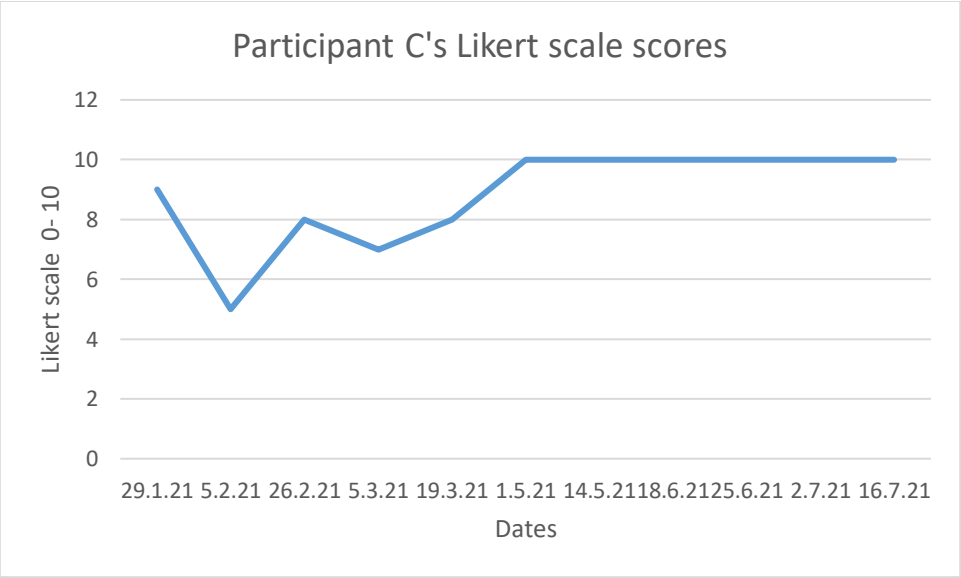


Figure 21: Participant C's Likert scores measuring engagement

Participant C's Likert scores (see figure 21) show an increased engagement in reading and from figure 22 we can see Child C can separate book preferences from engagement.

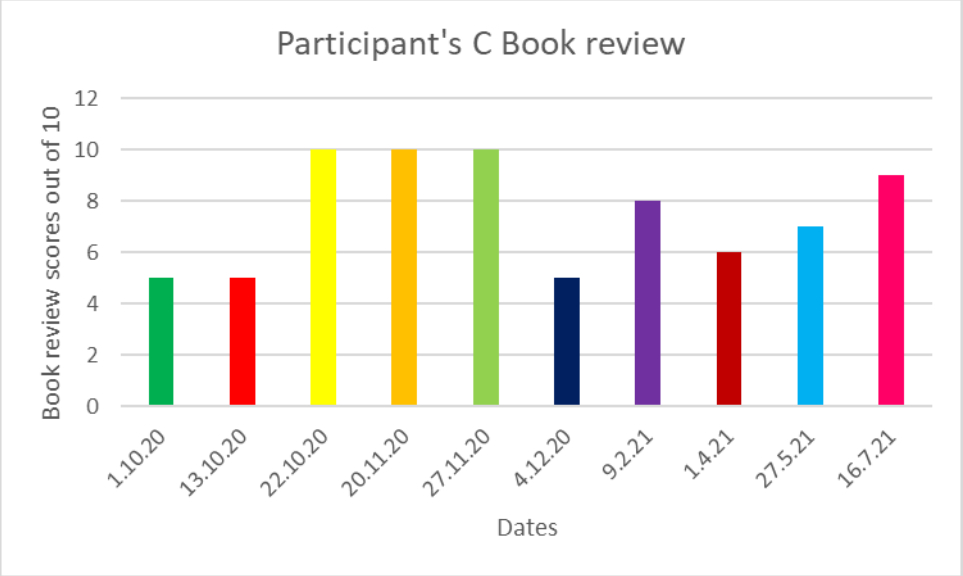


Figure 22: Participant C's book review scores

Table 24: Participant C's comments

Notes from Pupil C's comments on guided reading (see appendix 5 for further notes)
"I feel very proud. I've made 17 points progress in reading' [target tracker steps (Target Tracker | Juniper Education, 2022)]. *The acting helps me remember what the book is about for the big quiz it can help me. There is a challenge and it is quite hard to do but at the end of a book we have a quiz and it gives you hard questions you have to remember what the answer is. Using the story flow map, it describes what the story is in a quicker way rather than the whole story, so you can quickly know what the story is about. It makes me feel more confident to answer the questions. The retrieval is hard on a Friday but I am improving."*

Here (see table 24) pupil C can identify that understanding that using the story map enables them to view the story as a whole supports confidence in answering questions. Grant and Mistry (2010) and Annandale (2004) both suggest that acting can support children in understanding and retelling the story aiding the child in reading. Above Child C discusses how the acting involved in

the intervention supports them. Below is an example of how the families are recognising improvements (see figure 23).

Figure 23: Child C reported in the family and child's Views in their Person-Centred Annual Review

In the end of year reflections, Child C wrote, 'I like this story because it is funny and the boy Charlie wins a ticket it makes me happy and proud for him' showing empathy for the character and a deeper understanding as recommended by Terada (2017:3).

4.1.4 Results for Participant D

Table 25: Results for Participant D

Pupil Name: D	Chron. age Oct 20: 7.05			Chron. age July 21: 8.02			Time between testing: 9mths					
	Ability			Standard			Percentile			Age Equivalent		
	Oct-20	Jul-21	progress	Oct-20	Jul-21	progress	Oct-20	Jul-21	progress	Oct-20	Jul-21	progress
Accuracy	31	41	10	90	92	2	25	30	5	6.04	7.03	0.11
Rate	58	76	18	108	120	12	70	91	21	8.03	11.07	3.04
Comprehension	51	62	11	105	114	9	63	82	19	8.00	10.10	2.10

During the period of the intervention Child D's attendance was 97.95%. Child D has made progress in all areas (see table 25). The progress in reading comprehension was 2 years 10 months with an accelerated rate of progress of 2 years 1 month. This has resulted in a comprehension reading age 2 years 8 months above the chronological age. The reading rate is 3 years 5 months above the chronological age. Three years 4 months progress has been made with 2 years 7 month's accelerated rate of progress in this area. The accuracy rate, although still 1 year 1 month below the chronological age, has improved with 11 month's progress made and 2 months of accelerated progress.

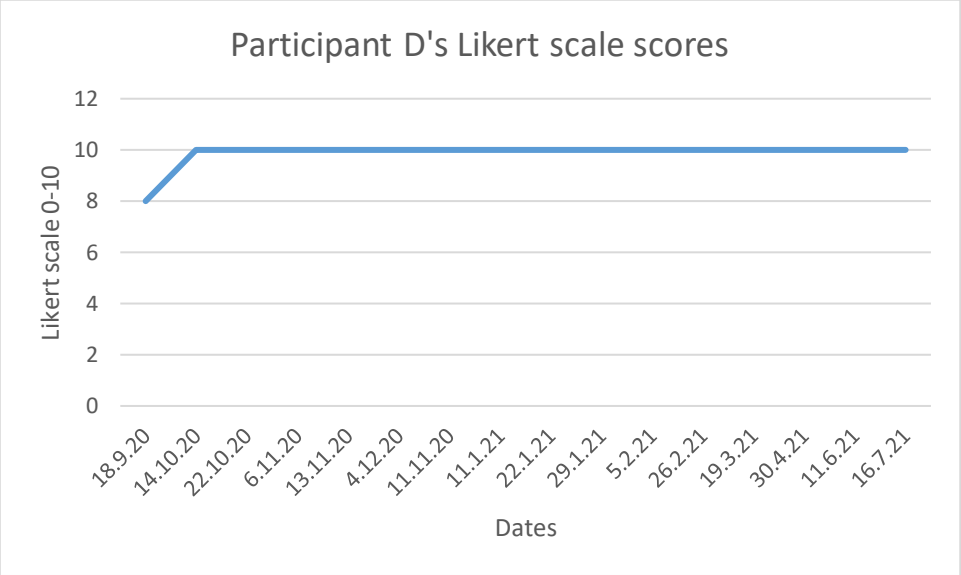


Figure 24: Participant D's Likert scores measuring engagement

The Likert results show an increased engagement in reading with a sustained enjoyment of reading (see figure 24) and from the book review scores an enjoyment of the books read (see figure 25).

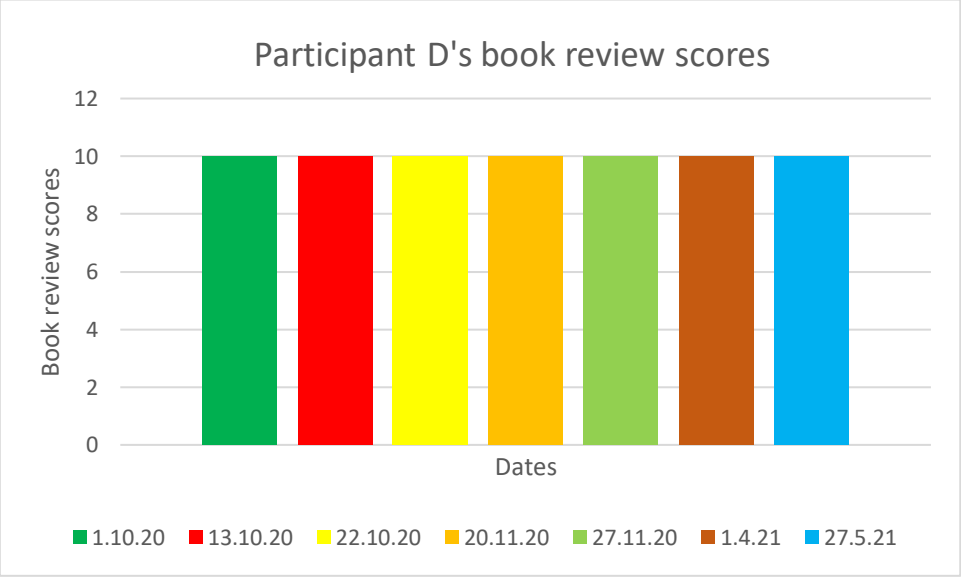


Figure 25: Participant D's book reviews scores

Table 26: Participant D's comments

Notes from Pupil D's comments on guided reading (see appendix 5 for further notes)
"I think the debug helps me learn new words and what they are".

'I think guided reading and writing is challenging. But I think I like being challenged.' Child D: 'The retrieval on Friday I am getting better'.
Child D Reported in their Person-Centred Annual Review: **What I like about school/college:** *I like using my drawing to help me come up with ideas and to remember what my plan is for my writing. I like the books we have read in guided reading; Theseus and the Minotaur, Beowulf, The Paper Bag Princess, Alice's Adventures in Wonderland.* ***I like*** *using the hats* [Thinking Hats, De Bono, 2000] *to think about the questions in guided reading. We think about questions in guided reading and we have a challenge to answer it. I like it when we link what we are reading with things at home.*
What you need to know about how I like to be supported, and what I find difficult: *'I think guided reading and writing is challenging. But I think I like being challenged.'*
But what do you like about yourself… Child D 'I think what I like about myself is when we are doing acting I can make pretty good funny faces and I like that.' *Child D: 'The acting normally helps me to know what it feels like to be in the book it's like someone's writing you it's like you are famous. It's pretty fun when we dress up it's like we are the people we do the movements.'*

From Pupil D's comments (see table 26) we can see they are identifying the importance of expanding knowledge of vocabulary. The Department of Education Specification for Mandatory Qualifications for Specialist Teachers of Children and Young People who are d/Deaf (2018), states that in promoting positive behaviour encourages deaf learners to be resilient and to persevere with their learning when difficulties arise. Here we can see Child D notes that they like challenge and shows they are building resilience. Child D also recognises they are making links and in doing so developing their schema.

Grant and Mistry (2010) and Annandale et al (2004) both suggest that acting can support children in understanding and retelling the story aiding the child in

reading. Here Child D discusses how the acting involved in the intervention supports them.

In end of year reflections, Child D wrote, ‘I loved it because it was funny when a dragon is scared of a mouse’ showing good inference, providing an elaboration as Preston and Taylor (2012) recommend for readers.

4.1.5 Results for Participant E

Table 27: Results for Participant E

Pupil Name: E	Chron. age Oct 20: 7.08			Chron. age July 21: 8.05			Time between testing: 9mths					
	Ability			Standard			Percentile			Age Equivalent		
	Oct-20	Jul-21	progress	Oct-20	Jul-21	progress	Oct-20	Jul-21	progress	Oct-20	Jul-21	progress
Accuracy	24	38	14	79	88	9	8	21	13	5.10	6.11	1.01
Rate	2	52	50	<70	104	34	2	61	59	<5.07	7.08	2.01
Comprehension	19	40	21	72	87	15	3	19	16	5.02	6.07	1.05

During the period of the intervention Child E’s attendance was 78.78%. Despite low attendance Child E has made progress in all areas, although the reading ages are still below the chronological age. In reading comprehension 1 year 5 month’s progress was made, of this 8 month’s accelerated progress (see table 27). In reading accuracy 1 year 1 month progress was made with 4 month’s accelerated progress. The reading rate increased by at least 2 years 1 month, 1 year 4 month’s accelerated progress. In reading comprehension Child E moved from a percentile rank of 3 which is classified as severe difficulty to a percentile rank of 19 which is classified as average. In both reading accuracy and reading rate Child E moved from the percentile rank classified as severe difficulty to average. If the intervention and the rate of progress was to continue then Child E should close the gap.

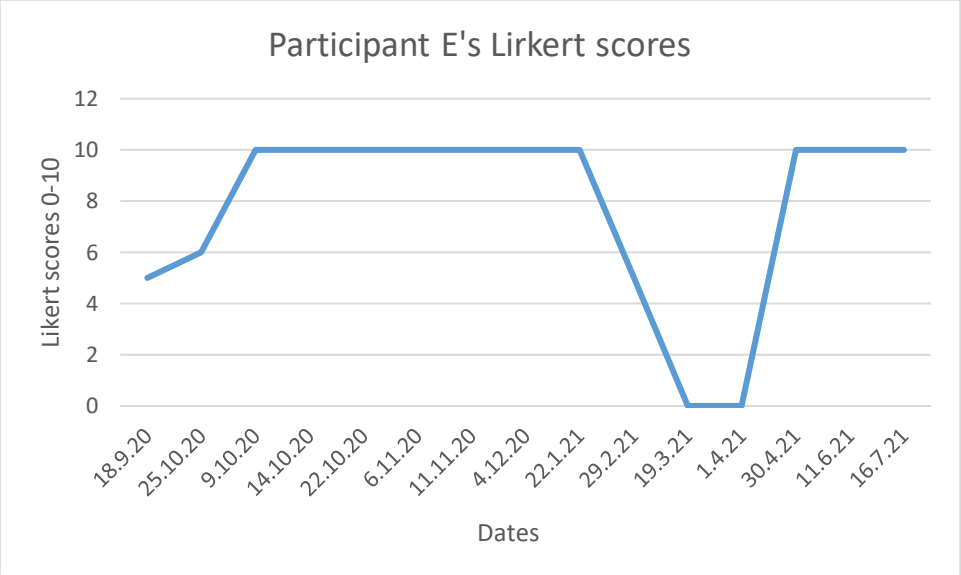


Figure 26: Participant E's Likert scores measuring engagement

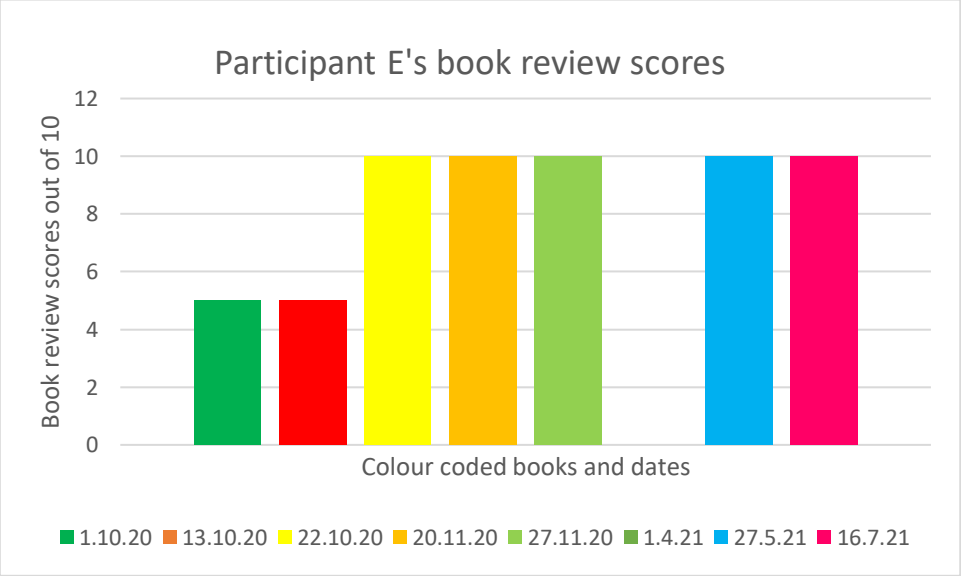


Figure 27: Participant E's book reviews scores

Participant E's engagement is directly connected to their view of the book; when they dislike the book their engagement score dips, however when they like the book their engagement score raises again (see figure 26 and 27). They are reflecting on the books they read and are showing opinions.

Table 28: Participant E's comments

Notes from Pupil E's comments on guided reading (see appendix 5 for further notes)

'I like drawing what things mean it helps me to find the word again and when I read it again in a book I feel a little bit more confident.'
'The words we learn are in the shape on the wall and it helps with English and [retrieval, pointed to the retrieval sticker]. I know, the nouns the naming words, the verbs what doing words, 'How feel' and 'what like' they are adjectives, 'where words' prepositions, 'how are' adverbs, Determiners; the, a, and an, conjunctions; for, and, nor, next, Pronouns; she he her these, this.'

Pupil E shows a good understanding of the debug element of guided reading and utilising the retrieval task to build their schema and lexicon of words (see table 28). Pupil E has a secure understanding of the SHAPE CODING™ system developed by Ebbels (2020).

In the end of year reflections, Child E wrote, '...because I like the illustrations', Child E's comment shows that they are now using language associated with books. In Child E's comment development of their schemas can be seen, building their knowledge and developing the links between their knowledge (Harris and Caviglioli, 2003).

4.1.6 Results for Participant F

Table 29: Results for Participant F

Pupil Name: F	Chron. age Oct 20: 9.00			Chron. age July 21: 9.09			Time between testing: 9mths					
	Ability			Standard			Percentile			Age Equivalent		
	Oct-20	Jul-21	progress	Oct-20	Jul-21	progress	Oct-20	Jul-21	progress	Oct-20	Jul-21	progress
Accuracy	28	35	7	76	76	0	5	5	0	6.02	6.08	0.06
Rate	DNS	52	NM	DNS	81	NM	DNS	10	NM	<5.07	7.08	2.01
Comprehension	28	38	10	71	79	8	3	8	5	5.09	6.04	0.07

During the period of the intervention Child F's attendance was 71.94% this is the lowest attendance of the participants and it equates to 78 sessions missed (39 days absence). Child F made progress across all areas but only accelerated progress was made in their reading rate of 1 year 4 months (see table 29). Child F moved from the percentile of 3 which is classified as severe difficulty and following the intervention moved to percentile 8 which is still severe difficulty but one rank from moving to the classification below average. With more access to the intervention, it would be interesting to see if this child

would move up the ranking. The chronological age has not been exceeded in any area.

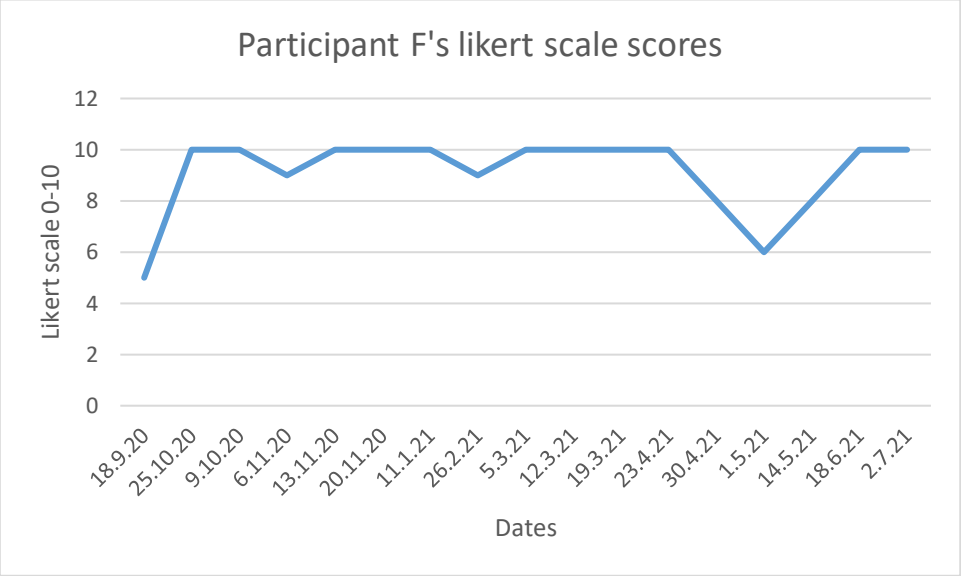


Figure 28: Participant F's Likert scores measuring engagement

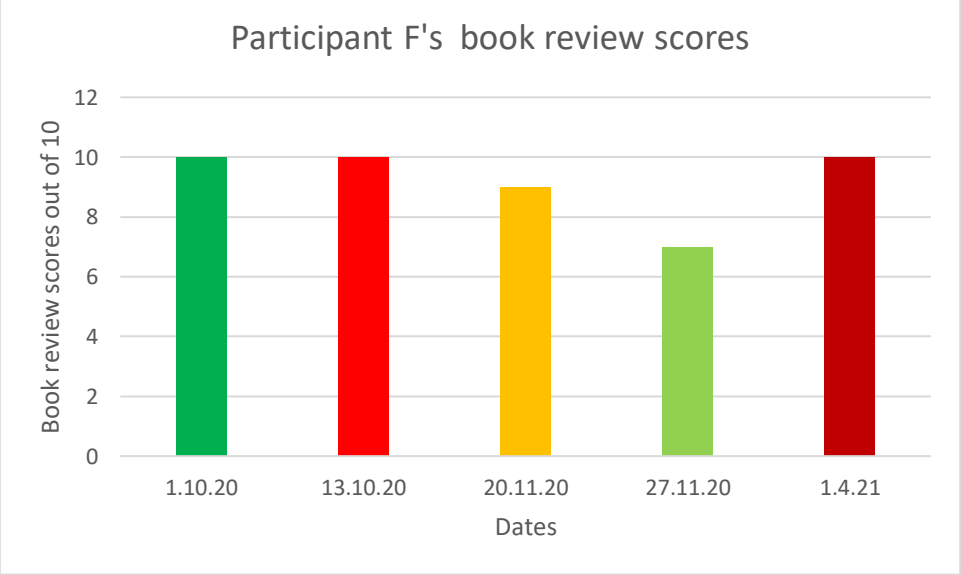


Figure 29: Participant F's book review scores

Participant F's Likert scores show an increased engagement score (see figure 28) apart from a dip when studying the Greek myth 'Arachne the Weaver'. Child F stated that they did not like this myth. This shows that their engagement in reading correlates with their opinion on the reading material (see figure 29). However, other books Child F rated as 'infinity out of 10' which shows acknowledgement of ownership of the scale.

Table 30: Participant F's comments

Notes from Pupil F's comments on guided reading (see appendix 5 for further notes)
'I love the story map you can practice it and then you know the story. You can look at the walls and it helps you and there are other words (synonyms) ways to say words and you can put it in your writing and practise thinking the teacher helps.'

Here (see table 30) we see that Child F is utilising the strategies in guided reading to support learning.

4.1.7 Results for Participant G

Table 31: Results for Participant G

Pupil Name: G	Chron. age Oct 20: 9.10			Chron. age July 21: 10.07			Time between testing: 9 mths					
	Ability			Standard			Percentile			Age Equivalent		
	Oct-20	Jul-21	progress	Oct-20	Jul-21	progress	Oct-20	Jul-21	progress	Oct-20	Jul-21	progress
Accuracy	DNS	22	NM	DNS	<70	NM	DNS	<2	NM	<4.10	5.09	0.11
Rate	DNS	24	NM	DNS	<70	NM	DNS	<2	NM	<5.07	6.08	1.01
Comprehension	1	38	37	<70	76	6	2	5	3	<4.10	6.04	1.06

During the period of the intervention Child G's attendance was 96.62%. Child G did not close the gap in their chronological age but did make accelerated progress in all areas of reading (see table 31). The reading accuracy improved by 11 months, 2 month's accelerated. Reading rate improved by 1 year 1 month with 4 months accelerated. The greatest progress of 1 year 6 months was in comprehension with 9 month's accelerated progress. Child G moved from being below testable scores to scoring at a rate that was testable. Child G also moved classification ranks from below a measurable score to severe difficulty.

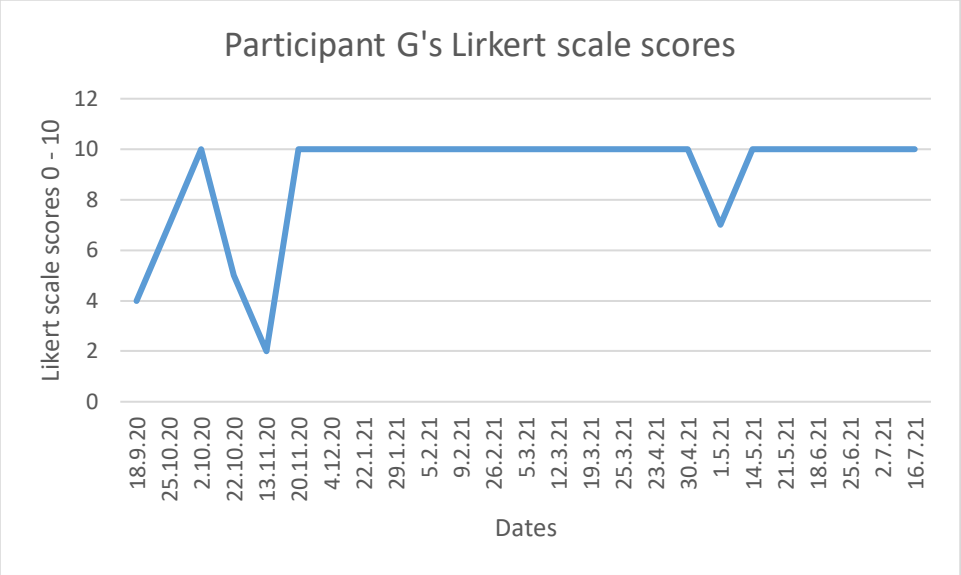


Figure 30: Participant G's Likert scores measuring engagement

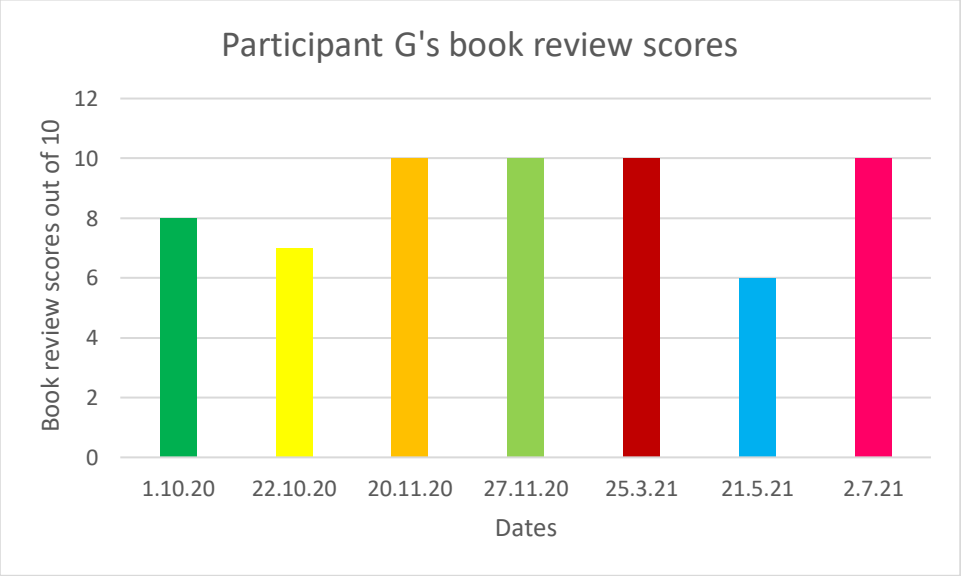


Figure 31: Participant G's book reviews scores

On 13.11.20 Child G's score appeared to be affected by a concern outside of school. 18.6.21 Child G added an A+ to the Likert scale; this shows that pupil G is beginning to have ownership of the scoring and monitoring themselves (Bernardi et al, 2018). Participant G's Likert scores show an increased engagement in reading (see figure 30). When comparing data from the Likert score and the book reviews (see figure 31), Child G is beginning to have a consistent enjoyment of reading and can separate book preferences from engagement.

Table 32: Participant G's comments

Notes from Pupil G's Pupil voice and observation comments on guided reading (see appendix 5 for further notes)
In a session with a Deaf artist and Deaf actor from 'Big D Live' Child G was observed responding to a question, 'Do you like reading?' They leant forward gaining eye contact with other children nodding and signing to them, 'You know, remember,' and listed books we had read and explained to the course facilitators how much they liked reading and began to explain the strategies pointing to the story maps.

This observation (see table 32) shows Child G is advocating reading to others and anticipating a shared engagement.

4.1.8 Results for Participant H

Table 33: Results for Participant H

Pupil Name: H	Chron. age Oct 20: 9.06			Chron. age July 21: 10.03			Time between testing: 9 mths					
	Ability			Standard			Percentile			Age Equivalent		
	Oct-20	Jul-21	progress	Oct-20	Jul-21	progress	Oct-20	Jul-21	progress	Oct-20	Jul-21	progress
Accuracy	34	39	5	77	77	0	6	6	0	6.07	6.11	0.04
Rate	30	50	20	73	77	4	4	6	2	6.11	7.06	0.07
Comprehension	38	45	7	79	82	3	8	12	4	6.04	7.01	0.09

During the period of the intervention Child H's attendance was 79.51%. COVID-19 had an impact on this child accessing school and the intervention. There were also significant changes to homelife that may have made it more challenging for the child to access the work sent home and being able to focus when in school. Child H has made progress but it is below the chronological months of the intervention and still below the chronological age (see table 33). Child H moved from percentile rank 8 which is classified as severe difficulty to percentile rank 12 which is classified as below average.

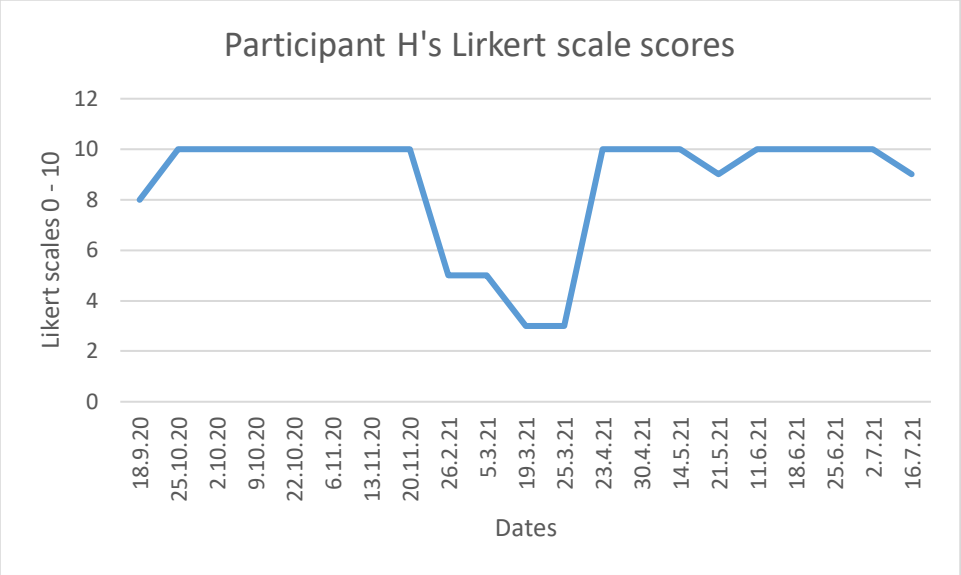


Figure 32: Participant H's Likert scores measuring engagement

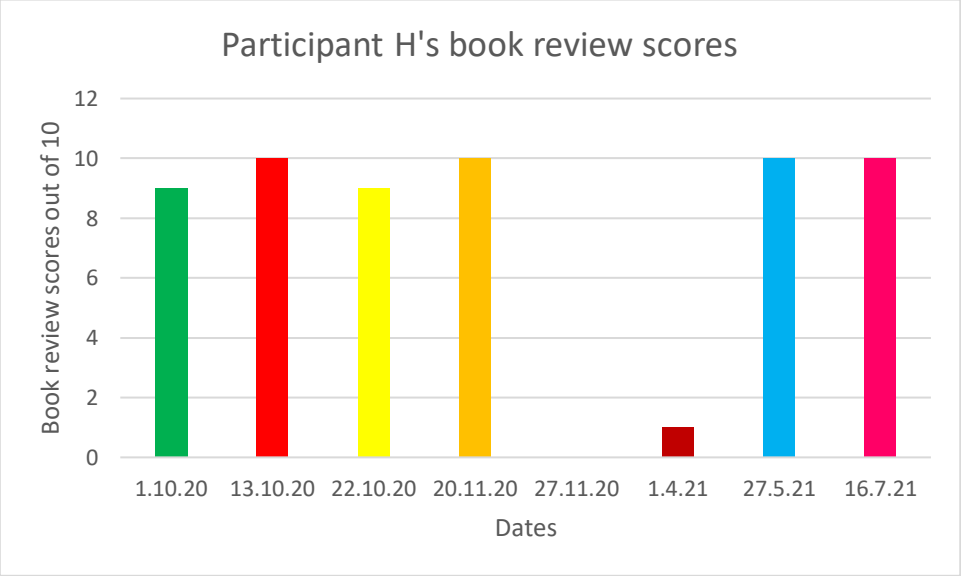


Figure 33: Participant H's book reviews scores

Child H's scores dipped low at a point of challenging circumstances (see figure 32). There was also a correlation between reading engagement and Child H's opinion of the book as seen in the book review scores (see figure 33). Silvestri and Wang (2018) noted the benefit of taught metacognitive strategies for reading, but they reported that where they observed this, the students would have benefited from being taught to use these independently. Child H shows a real ownership of the monitoring as they added words and extra numbers to the Likert scale. Table 34 has been added to show additional notes made by Child H.

Table 34: Participant H's annotations to scores out of 10

Date	18.9.20	25.10.20	1.10.20	2.10.20	9.10.20	13.10.20	22.10.20	6.11.20
H Lirkert scale	8	10		10	10 fun		10	10
H Book review			9			100	9	

13.11.20	20.11.20	27.11.20	26.2.21	5.3.21	12.3.21	19.3.21	25.3.21	1.4.21	23.4.21
10	"10!"		5	5	diff work	3	3		10
	1000	0 (tired)						1	

30.4.21	14.5.21	21.5.21	27.5.21	11.6.21	18.6.21	25.6.21	2.7.21	16.7.21
10000	10	9		1000000	100000	10000	10090	9
			91005					19024

Table 35: Participant H's comments

Notes from Pupil H's Pupil voice and observation comments on guided reading (see appendix 5 for further notes)
'The map shows you what the story is. You can draw and then write it.'
Child H recorded themselves independently reading a story written by themselves, on our online homework platform. Child H added a Thinking Hat to reflect on their feelings about the story, and included one for me, to reflect on how I felt about the story. Child H also included a Likert scale where they added their thought, about how I would feel. Saying I would feel 'very big numbers' about their story.
In the end of year reflections, Child H rated their favourite '198000000/100' (Wind in the Willows).

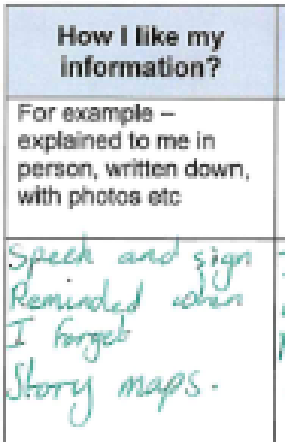


Figure 34: Child H Reported in their Person-Centred Annual Review

Here we see Child H asking for information to be presented in a story map form (see figure 34). Child H is an excellent artist who can often portray greater understanding through drawings rather than verbally/manually or in writing.

Observations in table 35 shows Child H appears to have embedded the use of the strategies. Silvestri and Wang (2018) noted that children would benefit from using metacognitive strategies independently and we can see in this example that Child H is doing so. Sidera et al. (2020) highlights the challenges children who are d/Deaf have in developing Theory of Mind. This extract shows Child H's developing Theory of Mind.

4.1.9 Results for Participant I

Table 36: Results for Participant I

Pupil Name: I	Chron. age Oct 20: 10.07			Chron. age Jul 21: 11.05			Time between testing: 9 mths					
	Ability			Standard			Percentile			Age Equivalent		
	Oct-20	Jul-21	progress	Oct-20	Jul-21	progress	Oct-20	Jul-21	progress	Oct-20	Jul-21	progress
Accuracy	37	44	7	75	78	3	5	7	2	6.1	7.08	0.10
Rate	44	58	14	73	78	5	4	7	3	7.03	8.03	1.00
Comprehension	51	60	9	87	95	8	19	37	18	8	10.02	2.02

During the period of the intervention Child I's attendance was 76.04%. Despite not accessing the work sent home, when in school Child I was engaged and made progress across all areas (see table 36). Whilst reading is still below the chronological age in all areas the gap narrowed. The rate of accuracy improved by 10 months with 1 month being accelerated. One-year progress was made in reading rate age, with 3 months being accelerated. The greatest progress was made in the target area of comprehension by 2 years 2 months with 1 year 5 months of accelerated progress.

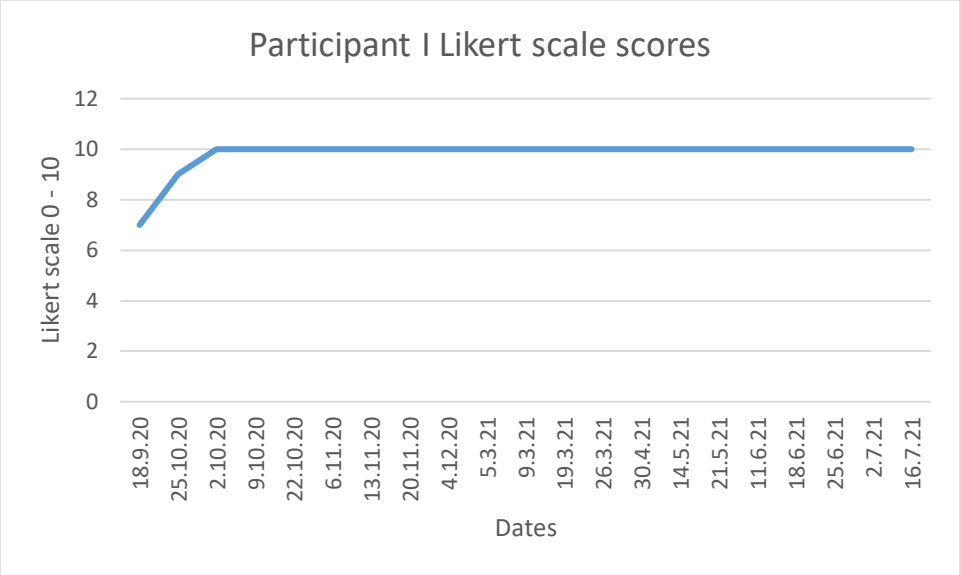


Figure 35: Participant I's Likert scores measuring engagement

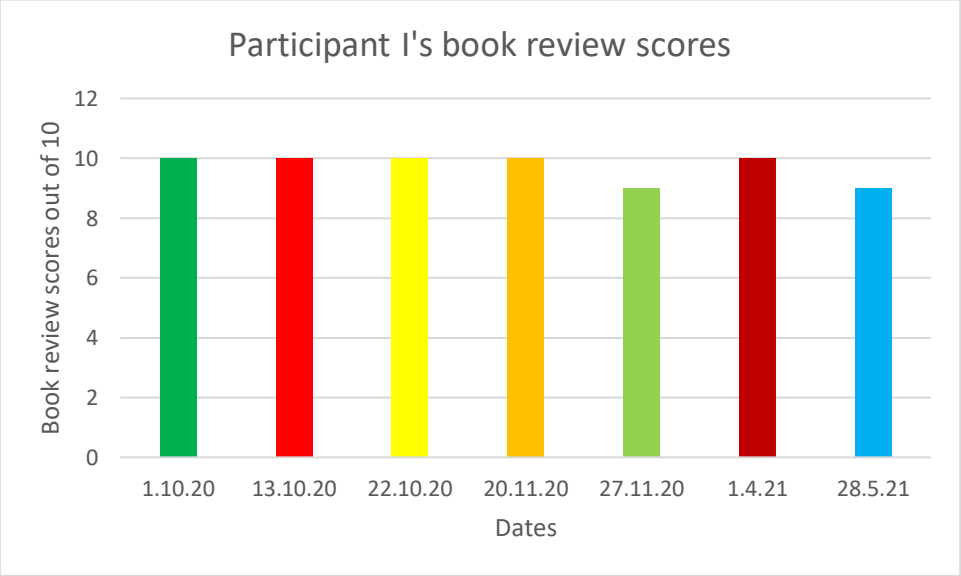


Figure 36: Participant I's book reviews scores

Participant I's Likert score shows an increased and sustained enjoyment of reading and the book reviews show they were able to give opinions on books (see figure 35 and 36).

Table 37: Participant I's comments

Notes from Pupil I's Pupil voice comments on guided reading (see appendix 5 for further notes)
like reading books. I liked the Dragon Machine story. I like the book we are eading now 'The Jungle Book'. Having fun. When we are learning and reading

book and we are signing altogether and doing the red word, and the blue word nd the shape coding then it makes me happy too.'

From this observation (see table 37) it can be seen Child I enjoys reading and signing the story map chorally, and is seeing reading as fun.

4.1.10 Results for Participant J

Table 38: Results for Participant J

Pupil Name: J	Chron. age Oct 20: 10.02			Chron. age July 21: 10.11			Time between testing: 9 mths					
	Ability			Standard			Percentile			Age Equivalent		
	Oct-20	Jul-21	progress	Oct-20	Jul-21	progress	Oct-20	Jul-21	progress	Oct-20	Jul-21	progress
Accuracy	56	66	10	83	88	5	13	21	8	9.10	<12.05	1.07
Rate	66	82	16	92	109	17	30	73	43	9.05	<12.05	3.00
Comprehension	73	70	-3	120	112	-8	91	79	-12	<12.05	<12.05	NM

During the period of the intervention Child J's attendance was 98.36%. Pupil J did not take part in the intervention as they were in mainstream. This could be considered an example of a control group (Thomas, 2017). Child J's accuracy rate increased 1 year 7 months which is an accelerated progress of greater than 10 months and had increased from 4 months below the chronological age to 1 year 6 months above the chronological age (see table 38). The reading rate also rose; it was 9 months below their chronological age and at final testing point it was 1 years 6 months above chronological age, a rise of 3 years with 2 years 3 months being accelerated. The comprehension levels however dropped from a percentile rank of 91 to 79, a decrease of 12 points. The comprehension age equivalent was not measurable due to limitations of the scoring system. However, this result shows that the reading comprehension age equivalency score is still above the chronological age by 1 year 6 months. There is no explanation obvious as to why the comprehension results data has reduced. It could be that they had opportunities to read with STA's but less time on comprehension activities.

Caveat intervention length.

Due to when a birth date and test date falls some of the data may appear to stretch 8, 9 or 10 months, however the intervention ran for 9 months.

4.2 Combined results from all participants

4.2.1 Comprehension results for all participants

Table 39: All participant's comprehension results

Comprehension																		
Year group	Participants	Chronological age		Ability			Standard score			Percentile rank			Rating		Age equivalent			
		Oct-20	Jul-21	Oct-20	Jul-21	Progress	Oct-20	Jul-21	Progress	Oct-20	Jul-21	Progress	Oct-20	Jul-21	Oct-20	Jul-21	Progress	Attendance percentage
2	A	6.04	7.01	8	43	35	78	98	20	7	45	38	sev diff.	average	<4.10	6.10	2.00	98.26%
2	B	6.09	7.06	40	47	7	98	98	0	45	45	0	average	average	6.07	7.04	0.09	93.98%
3	C	7.01	7.11	37	54	17	93	105	12	32	63	31	average	average	6.04	8.07	2.03	92.62%
3	D	7.05	8.02	51	62	11	105	114	9	63	82	19	average	average	8.00	10.10	2.10	97.95%
3	E	7.08	8.05	19	40	21	72	87	15	3	19	16	sev diff.	average	5.02	6.07	1.05	78.78%
4	F	9.00	9.09	28	38	10	71	79	8	3	8	5	sev diff.	sev diff.	5.09	6.04	0.07	71.94%
5	G	9.10	10.07	1	38	37	<70	76	6	2	5	3	sev diff.	sev diff.	<4.10	6.04	1.06	96.62%
5	H	9.06	10.03	38	45	7	79	82	3	8	12	4	sev diff.	below ave	6.04	7.01	0.09	79.51%
6	I	10.07	11.05	51	60	9	87	95	8	19	37	18	average	average	8.00	10.02	2.02	76.04%
6	J	10.02	10.11	73	70	-3	120	112	-8	91	79	-12	above ave	average	<12.05	<12.05	NM	98.36%

Table 40: All Participant's comprehension progress

All Participants comprehension progress				
Participant	Progress in years and months	Progress in months	Accelerated progress	Accelerated progress
A	2 years 0 months	24	15	1 year 3 months
B	9 months	9	0	0 months
C	2 years 3 months	27	18	1 year 6 months
D	2 years 10 months	34	25	2 years 1 month
E	1 years 5 months	17	8	8 months
F	7 months	7	- 2	- 2 months
G	1 years 6 months	18	9	9 months
H	9 months	9	0	0 months
I	2 years 2 months	26	17	1 year 2 months
Total	14 years 3 months	171	90	6 years 2 months
Average	1 year 7 months	19	10	10 months

Range of progress made in comprehension is 7 months to 2 years 10 months and the range of accelerated progress in comprhension is - 2 months to 2 years 1 month. In comprehension reading equivalency results, the total progress in months of all those who started the study is 171 months, making an average of 19 months progress (see tables 39 and 40). If we subtract 9 months for normal maturation, the average accelerated progress is 10 months (see table 17).

4.2.2 Reading rate results of all participants

Table 41: All participant's reading rate results

Rate																		
Year group	Participants	Chronological age		Ability			Standard score			Percentile rank			Rating		Age equivalent			
		Oct-20	Jul-21	Oct-20	Jul-21	Progress	Oct-20	Jul-21	Progress	Oct-20	Jul-21	Progress	Oct-20	Jul-21	Oct-20	Jul-21	Progress	Attendance percentage
2	A	6.04	7.01	27	53	26	105	108	3	63	70	7	average	average	6.10	7.09	0.11	98.26%
2	B	6.09	7.06	61	57	-4	117	105	-12	87	63	-24	above ave	average	8.07	8.02	neg 0.05	93.98%
3	C	7.01	7.11	DNS	61	NM	DNS	106	NM	DNS	66	NM	DNS	average	<5.07	9.01	3.06	92.62%
3	D	7.05	8.02	58	76	18	108	120	12	70	91	21	average	above ave	8.03	11.07	3.04	97.95%
3	E	7.08	8.05	2	52	50	<70	104	34	2	61	59	sev diff.	average	<5.07	7.08	2.01	78.78%
4	F	9.00	9.09	DNS	52	NM	DNS	81	NM	DNS	10	NM	DNS	below ave	<5.07	7.08	1.01	71.94%
5	G	9.10	10.07	DNS	24	NM	DNS	<70	NM	DNS	<2	NM	DNS	sev diff.	<5.07	6.08	1.01	96.62%
5	H	9.06	10.03	30	50	20	73	77	4	4	6	2	sev diff.	sev diff.	6.11	7.06	0.07	79.51%
6	I	10.07	11.05	44	58	14	73	78	5	4	7	3	sev diff.	sev diff.	7.03	8.03	1.00	76.04%
6	J	10.02	10.11	66	82	16	92	109	17	30	73	43	average	average	9.05	<12.05	3.00	98.36%

Table 42: All participant's reading rate progress in years and months

Rate		
Participant	Progress	Progress in months
A	0.11	11
B	neg 0.05	neg 5
C	3.06	42
D	3.04	40
E	2.01	25
F	1.01	13
G	1.01	13
H	0.07	7
I	1.00	12
Total	14.00	158

In reading rate equivalency results, the total progress in months of all those who started the study was 158 months, making it an average of 17.55 month's progress (see tables 41 and 42). If we subtract 9 months for normal maturation the average accelerated progress was 8.55 months.

4.2.3 Reading accuracy results of all participants

Table 43: All participant's accuracy results

Accuracy																		
Year group	Particpants	Chronological age		Ability			Standard score			Percentile rank			Rating		Age equivalent			
		Oct-20	Jul-21	Oct-20	Jul-21	Progress	Oct-20	Jul-21	Progress	Oct-20	Jul-21	Progress	Oct-20	Jul-21	Oct-20	Jul-21	Progress	Attendance percentage
2	A	6.04	7.01	33	45	12	103	107	4	58	68	10	average	average	6.06	7.09	1.03	98.26%
2	B	6.09	7.06	48	45	-3	113	102	-11	81	55	-26	average	average	8.03	7.09	neg 0.06	93.98%
3	C	7.01	7.11	28	48	20	89	103	14	23	58	35	average	average	6.02	8.03	2.01	92.62%
3	D	7.05	8.02	31	41	10	90	92	2	25	30	5	average	average	6.04	7.03	0.11	97.95%
3	E	7.08	8.05	24	38	14	79	88	9	8	21	13	sev diff.	average	5.10	6.11	1.01	78.78%
4	F	9.00	9.09	28	35	7	76	76	0	5	5	0	sev diff.	sev diff.	6.02	6.08	0.06	71.94%
5	G	9.10	10.07	DNS	22	NM	DNS	<70	NM	DNS	<2	NM	DNS	sev diff.	<4.10	5.09	0.11	96.62%
5	H	9.06	10.03	34	39	5	77	77	0	6	6	0	sev diff.	sev diff.	6.07	6.11	0.04	79.51%
6	I	10.07	11.05	37	44	7	75	78	3	5	7	2	sev diff.	sev diff.	6.10	7.08	0.10	76.04%
6	J	10.02	10.11	56	66	10	83	88	5	13	21	8	below ave	average	9.10	<12.05	1.07	98.36%

Table 44: All participant's accuracy progress in years and months

Accuracy		
Participant	Progress	Progress in months
A	1.03	15
B	neg 0.06	neg 6
C	2.01	26
D	0.11	11
E	1.01	13
F	0.06	6
G	0.11	11
H	0.04	4
I	0.10	10
Total	7.05	90

In reading accuracy equivalency results, the total progress in months of all those who started the study, was 90 months making it an average of 10 month's progress (see tables 43 and 44). If we subtract 9 months for normal maturation the average accelerated progress was 1 month.

4.3 Attendance data

Table 45: Attendance data

Participant	Comprehension progress	Attendance percentage
Child C	27	92.62%
Child D	34	97.95%
Child I	26	76.04%
Child A	24	98.26%
Child G	18	96.62%
Child E	17	78.78%
Child B	9	93.98%
Child F	7	71.94%
Child H	9	79.51%

Attendance during this study was significantly impacted due to the COVID-19 pandemic.

4.4 Using the Likert scale to measure reading engagement

The results of the Likert scale show an increased enjoyment of reading. The Likert scale was a useful tool as it enabled the pupils to have control, monitoring and recognition of their learning, but it had some limitations as it was not completed as regularly as possible and their enjoyment or dislike for some particular books reflected in their scores.

4.5 Additional observations

Children who took part in this study are now recording more reading minutes at home via their reading record books. They have progressed through the reading scheme, choosing to have extra books from the school library to complement their school reading book. In the end of year reflections, it was interesting to see that when they were looking at the books there were smiles, nodding and talk about the books they appeared to have a real fondness for.

5 Discussion

5.1 Caveat attendance

The attendance of some of the children who were part of the study dropped due to COVID-19 (see table 45), and there were a series of lockdowns which also occurred in schools. Later in the pandemic it was identified that children with EHCPs should attend school. The school where this study took place opened to children with EHCPs but according to the DfE (2021) not all schools reinstated their offers. The children in this study all have an EHCP however, due to personal circumstances, families did not always take up those places. In most cases, attendance was sporadic as family members needed to isolate and on occasion our bubble needed to close (schools adopted a bubble system and this bubble refers to the class the children were in). The DfE (2021: point 16) reported that the attendance of children with EHCPs was 5% in late March and it was only by the close of summer term that attendance in this group rose to 27%. The DfE (2021: point 9) recognised that the 'stay at home message' had been very effective and, consequently, families were reluctant to send children back to school. This was also the experience of the school that took part in this study, as families needed a lot of reassurance to resume face to face education.

In this study, although there appears to be a correlation between attendance and progress, the impact of other external factors cannot be measured within the remit of this study. The circumstances under which the study occurred were very atypical and therefore the results may not reflect the progress which could have been made in more typical educational circumstances as potentially greater gains may have been noted in more 'normal' conditions.

5.2 Metacognition

According to the Education Endowment Fund 'Teaching and Learning Toolkit' (2021), interventions that use metacognitive strategies should be able to gain seven-month's progress. It is important that much of the research evidence relates to the general population rather than d/Deaf pupils in particular. The EEF (2021) also identified that metacognition strategies were not being taught to those who might be considered disadvantaged, and it was their recommendation that it should be used to support those children in order to

close the gaps. The children who took part in the study have a number of risk factors such as severe or profound deafness, social status, late diagnosis, EAL, additional SEN, etc, (in accordance with NatSIP, 2016) and it is pleasing to see that this intervention with children who are disadvantaged has in the most part equalled the progress of their advantaged peers. NDCS (2022) data on progress (see tables 5 and 46) shows a negative 0.7 month's progress in reading, and this illustrates that as children who are d/Deaf chronologically progress through school they do not close the gap but normally it widens for them (see tables 4, 5 and 46).

Table 46: NDCS (2022) progress of d/Deaf children nationally using the 2019 figures

Year	Deaf children	All children
Reading	-0.7	0.0
Writing	-0.5	0.0
Mathematics	-0.5	0.0

However, this study, although limited with a small number of pupils in one setting, has challenged that progress, and for the participants who were able to continue to take part in this study, and in the most part, this has been a successful outcome with an average of 10 month's accelerated progress being made (see tables 39 and 40).

The average progress of those who started the study is 19 months. The intervention has made more progress than natural maturation. However, it is worth noting the NDCS (2022) statistic of the same year reported minus 0.7 month's progress. If we subtract 9 months for normal maturation the average accelerated progress is 10 months (see table 40). It is worth noting that for many of the children who took part in the study, they were not making natural maturation progress with many starting the study with reading comprehension ages below their chronological ages.

The EEF (2021) also notes that metacognition has one of the lowest cost implications. This study has not incurred significant costs with only an outlay for the reading material, the cost of the YARC test, and the initial time for the

researcher to produce the material, which once made can be reused. The cost of training regarding ‘Thinking Strategies’ and tools is part of the ongoing training provided in house. The researcher has a large bank of resources now and has shared these resources and trained other staff in the school and it is now being used with younger children who are d/Deaf, and benefiting mainstream classes. It is also been shared with the resource provision in the local secondary school.

This study has focused on results of engagement and comprehension, as the YARC measures results for reading rate (this is a measure of the speed of reading) and accuracy and, in the simple view of reading, these are important components (Gough and Tunmer, 1986 cited in Rose, 2006:77). However, in future, tasks could be included that address fluency (to be able to read fast enough in order to remember a whole sentence and access meaning), accuracy (correctly decoding words) and speed of sight word reading (of high frequency words). There are two approaches or a combination of them both might be used for children who are d/Deaf; the phonic approach or sight whole word reading, depending on their access to sound.

As the study has worked on debugging it would have been interesting to have formally tested if there had been an expansion in their word lexicon and this is a limitation of this study. It would also be interesting to look at the interrelation between vocabulary growth and comprehension scores as the literature review shows this is very interrelated. This is an important aspect of reading in accordance with RADLDW (2016), and Cain (2010), Ehri (2005) and Storch and Whitehurst (2002, cited in Dirks and Wauters 2018:261). This method addresses concerns about the challenges children who are d/Deaf to acquire language incidentally (Freidman and Szterman, 2011, Marschark and Hauser, 2011, Kyle and Harris 2010, and Kyle and Cain, 2015) as debugging teaches it explicitly. This also helps the children understand the word when they come across it in context and read it in the text as advocated by Ofsted (2010) a concern of Benedict et al (2015).

The children who took part in the study are not only building their lexicon, but they are recalling the words in the retrieval practise as advocated by Jones

(2020) and they are also retaining and using the words in their speech and writing. The children made positive comments (see individual case studies and appendix 5) and this shows the retrieval practise gives the children the level of challenge to recall knowledge as Agarwal (2022, 2019) recommends and develops their schema as suggested by Harris and Caviglioli (2003).

5.3 Likert scale

This study agrees with Marschark and Knoors (2012) that d/Deaf children can have a higher self-perception of their reading skills, but this intervention wanted to give the control to the child as Clay (1985) states children should be 'active participants' and Bernardi et al (2018:306) and Flavel (1979) suggests the child should monitor themself. By using a Likert scale to support engagement this provided a metacognitive self-monitoring strategy to enable the child to recognise the correlation between engagement and enjoyment of reading. We can see from the Likert score scales that there is an increased enjoyment of reading over the time period of the study (see the graphs in the individual case studies).

5.3.1 Engagement

When considering if the study has increased engagement, there is another strand to consider. As part of the normal gathering of pupil voice the children rated the books they favoured over the academic year. They also reviewed the books after each book and then at the end of the year and, as a whole class, they added comments about the books. One of the interesting considerations is that they could recall all of the stories and were able to give opinions. They were all able to order and pick a favourite book. The children had read a wide range of books and the top two favourites would be considered traditional tales which is advocated by Tannock (2011). Green (2011) encourages the use of non-fiction texts, but the third favourite book was a mixture of fact and fiction. Months later they were able to recall facts from the book

This study concurs with Marschark and Hauser (2011) notes on research which states that with an increase in engagement with reading, learners become better readers and in doing so they perpetuate the cycle. When reflecting on some of the comments that the children made, we can see they gained

pleasure from reading. Simpson (2018) noted that there are significantly declining numbers of children reading for pleasure after the age of 11 and calls for action to address this. However, the results of this study show an increase in additional reading.

Douglas (2012) clarifies how reading is needed across the curriculum and specifically in accessing and comprehending exam questions. It was noted that not only have most children in the study made progress in the YARC comprehension test, in the year following the intervention the children who took part in the study also continued to make progress on Target Tracker (Target Tracker, Juniper Education, 2022, see table 47). On Target Tracker (Juniper Education, 2022) expected progress is 6 steps.

Table 47: The children who took part in this study – Target Tracker results

Target Tracker progress in reading from record of meeting data		
Pupil	Steps progress the year before	Steps progress the year following the intervention
A	5	6
B	6	6
C	-	17
D	6	7
E	1	18
F	3	10
G	3	22
H	2	22
I	-	-
J	5	7

(Target Tracker, Juniper Education, 2022)

The comments in the case studies show that the children are reflecting on the strategies used in guided reading, and recognition of these strategies is an important part of the metacognition process, such as, the children's comments on the story maps used in the intervention. Corbett (2009), Annandale et al (2004), advocate the use of story maps (see figure 15), or images to support understanding Paivio (1979), and Caviglioli (2020), Marschark and Knoors (2012) explain how this dual encoding can help children. Friedman (1985) and Sharp (1985) cited in Easterbrooks (2004:255) and more recently Marschark and Knoors (2012) explain that children who are d/Deaf can find 'manipulating information in a logical manner' challenging.

The positive comments that the children made, as shown in the results section, confirm that the children have an increased enjoyment and engagement in reading; they are reading more, creating a self-perpetuating cycle. This is building their resilience and confidence and they are becoming more established and proficient readers. By the children becoming more confident readers and through the ‘debugging’ process, they are increasing their word lexicon and their general knowledge, and they appear to be building a greater resilience to their risk factors.

6. Conclusion

This study has investigated using Hyerle and Alper's, (2011) Thinking Maps and Thinking Hats (De Bono, 1999, 2000) to promote engagement and comprehension skills with reading in severe and profoundly d/Deaf students in primary school (KS1 and KS2).

There is a focus by NDCS (2019, 2020, 2021, 2022) and by all researchers such as Marschark and Knoors (2021) to improve the outcomes of children who are d/Deaf. They have identified that there are significant gaps between children who are d/Deaf and their hearing peers. They extol QToD and Government to assist in closing the gap. Also, the recommendations of EEF (2021) suggest that disadvantaged pupils may benefit from interventions in the field of metacognition. Franklin's (2018) research shows the benefits of metacognition to support retention of young people who are d/Deaf in further education. Despite this there is not a significant body of research to explore how to close the gaps and whether metacognition may help in doing so and benefit children who are d/Deaf.

This study has set out to explore whether metacognition strategies may support in helping children who are d/Deaf to close gaps in reading comprehension and increase engagement in reading. The study was restricted by the COVID-19 pandemic and, due to this, the children's education was disrupted and their consistent access to the intervention was affected.

The findings of this study support the EEF (2021) research that metacognition can make 7 month's accelerated progress for children in the general population, and they suggest the strategy may support those considered disadvantaged and they recommend further research for this group. In this limited study, children who are d/Deaf, and would be classified as disadvantaged, have made on average 10 month's accelerated progress in comprehension. This is a greater than average increase to their non-disadvantaged peers.

6.1 Recommendations for further study

Recommendations would be to study the group in a longitudinal study, to see if the progress was sustained and the chronological gaps narrowed further. Also,

it would be interesting to replicate the study with other pupils in different settings. If similar results could be obtained, the study could be generalised to the wider population of children who are d/Deaf. It would be interesting to explore how this study supports receptive and expressive vocabulary in both oral and written work. Replicating this study in a non-pandemic context may have an impact on outcomes.

This work has been identified by Exeter University as a '*key area in which the school has developed specific and sound knowledge and understanding, and… would strongly encourage the further dissemination of this important and interesting work*,' (Kleine Staarman, 2022, from Exeter University, see appendix 6) and recommended for further dissemination, in a published journal or professional magazine.

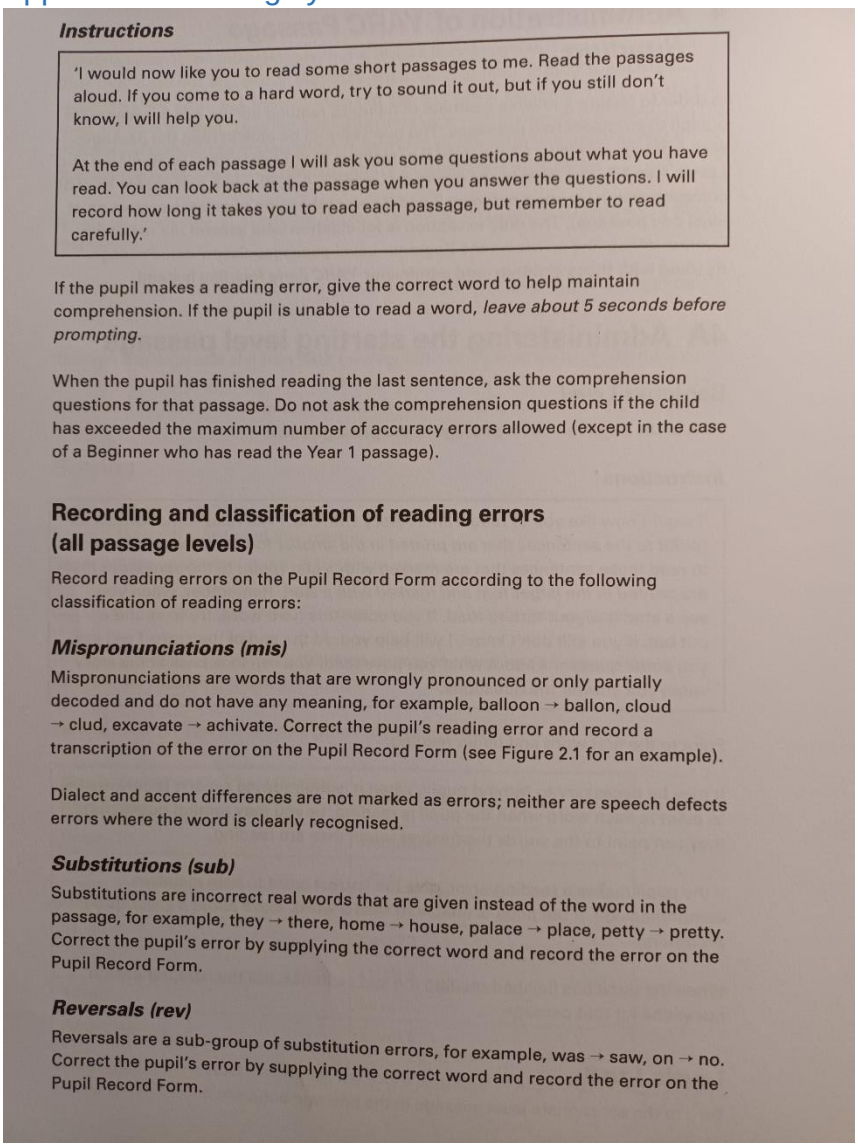
Given the strength of feeling from bodies such as the NDCS and the need to find interventions to support d/Deaf children in closing gaps, the evidence from this research suggests that the use of metacognition strategies can support children who are d/Deaf to make progress towards closing gaps and making accelerated progress and increase engagement in reading.

Appendices

Appendix 1: Social mobility

According to Social mobility indicators, (2022:8.2) ‘Good performance at GCSE is required if children are to be successful in post-16 education and the labour market’. DfE Social Mobility and Child Poverty Commission (2014:1) state ‘Mastering basic skills and achieving good GCSEs both matter profoundly to how well children do in the labour market as adults’. Social mobility indicators, (2022:10.2) ‘achieving an A level leads to significant returns in the labour market and allows students to progress to higher education. For example, those with 2 or more A levels earn on average 14% more than those without’.

Appendix 2: Coding system for YARC



Instructions

'I would now like you to read some short passages to me. Read the passages aloud. If you come to a hard word, try to sound it out, but if you still don't know, I will help you.

At the end of each passage I will ask you some questions about what you have read. You can look back at the passage when you answer the questions. I will record how long it takes you to read each passage, but remember to read carefully.'

If the pupil makes a reading error, give the correct word to help maintain comprehension. If the pupil is unable to read a word, *leave about 5 seconds before prompting*.

When the pupil has finished reading the last sentence, ask the comprehension questions for that passage. Do not ask the comprehension questions if the child has exceeded the maximum number of accuracy errors allowed (except in the case of a Beginner who has read the Year 1 passage).

Recording and classification of reading errors (all passage levels)

Record reading errors on the Pupil Record Form according to the following classification of reading errors:

Mispronunciations (mis)

Mispronunciations are words that are wrongly pronounced or only partially decoded and do not have any meaning, for example, balloon → ballon, cloud → clud, excavate → achivate. Correct the pupil's reading error and record a transcription of the error on the Pupil Record Form (see Figure 2.1 for an example).

Dialect and accent differences are not marked as errors; neither are speech defects errors where the word is clearly recognised.

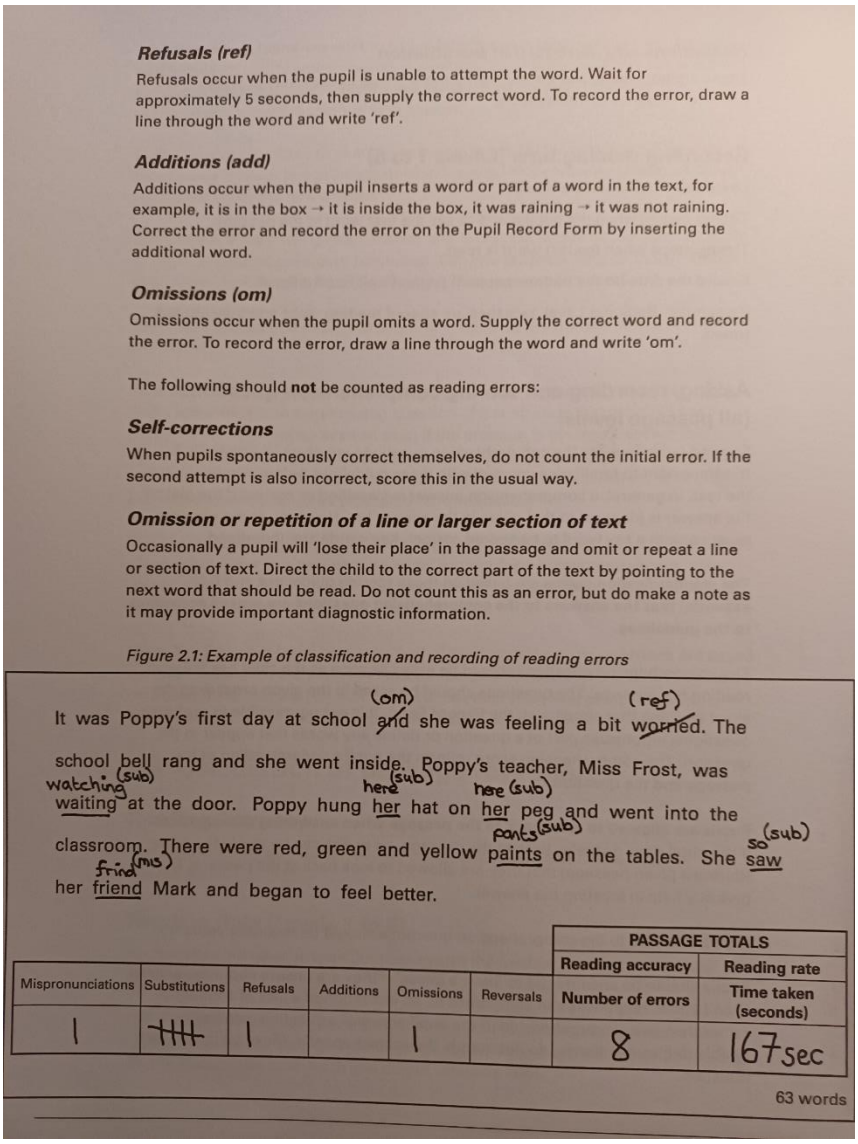
Substitutions (sub)

Substitutions are incorrect real words that are given instead of the word in the passage, for example, they → there, home → house, palace → place, petty → pretty. Correct the pupil's error by supplying the correct word and record the error on the Pupil Record Form.

Reversals (rev)

Reversals are a sub-group of substitution errors, for example, was → saw, on → no. Correct the pupil's error by supplying the correct word and record the error on the Pupil Record Form.

Figure 37: Coding system for YARC



Refusals (ref)

Refusals occur when the pupil is unable to attempt the word. Wait for approximately 5 seconds, then supply the correct word. To record the error, draw a line through the word and write 'ref'.

Additions (add)

Additions occur when the pupil inserts a word or part of a word in the text, for example, it is in the box → it is inside the box, it was raining → it was not raining. Correct the error and record the error on the Pupil Record Form by inserting the additional word.

Omissions (om)

Omissions occur when the pupil omits a word. Supply the correct word and record the error. To record the error, draw a line through the word and write 'om'.

The following should **not** be counted as reading errors:

Self-corrections

When pupils spontaneously correct themselves, do not count the initial error. If the second attempt is also incorrect, score this in the usual way.

Omission or repetition of a line or larger section of text

Occasionally a pupil will 'lose their place' in the passage and omit or repeat a line or section of text. Direct the child to the correct part of the text by pointing to the next word that should be read. Do not count this as an error, but do make a note as it may provide important diagnostic information.

Figure 2.1: Example of classification and recording of reading errors

It was Poppy's first day at school and she was feeling a bit worried. The (om) (ref)

school bell rang and she went inside. Poppy's teacher, Miss Frost, was watching (sub) waiting at the door. Poppy hung her hat on her peg and went into the here (sub) here (sub) pants (sub) classroom. There were red, green and yellow paints on the tables. She saw so (sub) her friend Mark and began to feel better. friend (mis)

						PASSAGE TOTALS	
						Reading accuracy	Reading rate
Mispronunciations	Substitutions	Refusals	Additions	Omissions	Reversals	Number of errors	Time taken (seconds)
1	|||	1			8	167sec

63 words

Figure 38: Coding system for YARC

(Snowling et al 2009, 2011).

Appendix 3: Ethics Approval Notice

University of Hertfordshire UH

SOCIAL SCIENCES, ARTS AND HUMANITIES ECDA

ETHICS APPROVAL NOTIFICATION

TO	**Beth Elaine Welstead**
CC	**Helen Nelson**
FROM	**Dr Ian Willcock, Social Sciences, Arts and Humanities ECDA Chairman**
DATE	**08/11/2021**

Protocol number:	cEDU/PGT/UH/05288
Title of study:	Using thinking maps, hats, and keys to promote engagement with reading in children who are Deaf

Your application for ethics approval has been accepted and approved with the following conditions by the ECDA for your School and includes work undertaken for this study by the named additional workers below:

Figure 39: Ethics approval notice

no additional workers named

General conditions of approval:

Ethics approval has been granted subject to the standard conditions below:

Permissions: Any necessary permissions for the use of premises/location and accessing participants for your study must be obtained in writing prior to any data collection commencing. Failure to obtain adequate permissions may be considered a breach of this protocol.

External communications: Ensure you quote the UH protocol number and the name of the approving Committee on all paperwork, including recruitment advertisements/online requests, for this study.

Invasive procedures: If your research involves invasive procedures you are required to complete and submit an EC7 Protocol Monitoring Form, and copies of your completed consent paperwork to this ECDA once your study is complete.

Submission: Students must include this Approval Notification with their submission.

Validity:

This approval is valid:

From: 01/01/2022

To: 30/05/2022

Please note:

Failure to comply with the conditions of approval will be considered a breach of protocol and may result in disciplinary action which could include academic penalties.
Additional documentation requested as a condition of this approval protocol may be submitted via your supervisor to the Ethics Clerks as it becomes available. All documentation relating to this study, including the information/documents noted in the conditions above, must be available for your supervisor at the time of submitting your work so that they are able to confirm that you have complied with this protocol.

Should you amend any aspect of your research or wish to apply for an extension to your study you will need your supervisor's approval (if you are a student) and must complete and submit form EC2.
Approval applies specifically to the research study/methodology and timings as detailed in your Form EC1A. In cases where the amendments to the original study are deemed to be substantial, a new Form EC1A may need to be completed prior to the study being undertaken.

Failure to report adverse circumstance/s may be considered misconduct.
Should adverse circumstances arise during this study such as physical reaction/harm, mental/emotional harm, intrusion of privacy or breach of confidentiality this must be reported to the approving Committee immediately.

Appendix 4: Permission to use the data

Employer Permission Form

This form must be signed by the researcher's employer prior to commencement of the study. The form should be signed by the Head Teacher/Head of Service or relevant member of the Senior Management of the school/service.

- I give permission for (Beth Welstead) to undertake their study entitled 'Using thinking maps, hats and keys to promote engagement with reading in children who are Deaf.' within their workplace (All Faiths Children's Academy).
- I understand that the student will need to access historic data related to an intervention which they undertook as a usual part of their role as a Qualified Teacher of the Deaf within the school.
- I understand that this study has ethical approval from the University of Herts Ethics Committee.
- I confirm that all data will be accessed and stored in compliance with the GDPR arrangements in place within the workplace (All Faiths Children's Academy).
- I confirm that the student will be working within the current workplace-based risk assessments which relate to their role.

Signed: 

Name: Mrs Marion Browning

Role: Headteacher

Figure 40: Permission to use the data

Appendix 5: Pupil voice

As part of our normal collection of pupil's voice to develop the provision of reading across the Treetops and the wider school.

Pupil A

'Guided reading is quite hard, and you can learn, it is a challenge for ourselves.

There is speech and language in guided reading.

We get more ideas and know what is in the book

When you do the tests, I know how to answer them.

Sometimes I make a mistake and I just need to learn more

The hats help so you can think about how to feel about something sometimes it's how a character feels and you can look for evidence in the text. We know what the answer is we can learn how they feel.

The maps help so we can remember.

I act out the story with my dolls, it was quite fun, and I remember the story, and the order of the story.

Acting and dressing up helps you; it helps me to know how the character is feeling and what they are doing.

The shape code word interesting words and good words in there.

Participant B:

I like to read new books at home, but sometimes don't know them very much, but I do want to learn things I don't know. The debug helps me know things, like what the word means. Before that I didn't know it and since I did it in guided reading I recognise it. And I sometimes want to tell my mum, and I can go to the same place, and I can tell them what it is now. Guided reading just makes me smarter.

Guided reading helps me get better at spelling. The Blue Hat and Green Hats (used in this study for inference) are difficult to me, and White Hats (retrieval) are easy, sometimes, and I write them, and then I get a bit stuck the Green Hat, it's a bit hard (Thinking Hats, De Bono, 1999, 2000).

Well there are big quizzes! Child D helps a lot, and we do a lot, and it makes me happy, but I feel bad for the others. The quizzes help me to remember the story. The flow maps we practice, it helps me remember the story. The acting is really fun. Sometimes if I do a very fun acting it makes me more happy, and I want to do it again. I do get a bit nervous, because people watch me, the story, the show, I have to be brave. I think people should do it like us.

If the last answer is draw something, it makes me happy, because my talent is drawing, and it makes go shorew (their sound for whizzing through something) through it. The Friday retrieval I am improving a lot. I like it when I improve and get smarter.'

Participant C:

'I feel very proud. I've made 17 points progress in reading. It's different to my old school. The debugs help me to learn more words than I used to know and I know what they mean. The hats help because they like tell you if the bit's in the book or if you have to think on your own. The acting helps me remember what the book is about for the big quiz, it can help me. There is a challenge and it is quite hard to do, but at the end of a book we have a quiz and it gives you hard questions, you have to remember what the answer is. Using the story flow map it describes what the story is in a quicker way rather than the whole story, so you can quickly know what the story is about. It makes me feel more confident to answer the questions. The retrieval is hard on a Friday but I am improving.'


My parents/carers comments.

[redacted] is very good at reading now & we are very impressed with how many steps she has achieved especially in reading & maths.

11. Anything else ...

I feel [redacted] is doing really well at school, is really catching up and enjoys it.

Figure 41: Child C reported in the family and child's Views in their Person-Centred Annual Review

Participant D:

> *'I think the debug helps me learn new words and what they are. I think the hats help me, about the feelings, it helps me know how to answer the question. If it is a white hat it is a fact and it is in the book. The acting normally helps me to know what it feels like to be in the book it's like someone's writing you it's like you are famous. It's pretty fun when we dress up it's like we are the people we do the movements.*
>
> *(Quiz) It was super fun, each time me and Child B and Child A used to win. It feels like you win different games (rounds) it really helps me to get ready for the next test, and the next test, so I know what to do. They are both things; challenging and fun. I like doing quizzes with Child B if* [pronoun] *remembers something I don't know, and then* [pronoun] *helps me, and If I remember something [pronoun] don't know, then I help* [pronoun].
>
> *I like the books we choose, I remember them. I make really good links in guided reading. The bubble map helps me to know what is the same and what is different.*
>
> *The retrieval on Friday I am getting better.'*

Child D Reported in their Person-Centred Annual Review:

What I like about school/college: '*I like using my drawing to help me come up with ideas and to remember what my plan is for my writing. I like the books we have read in guided reading; Theseus and the Minotaur, Beowulf, The Paper Bag Princess, Alice's Adventures in Wonderland.* ***I like*** *using the hats* [Thinking Hats, De Bono, 2000] *to think about the questions in guided reading. We think about questions in guided reading and we have a challenge to answer it. I like it when we link what we are reading with things at home'.*

What you need to know about how I like to be supported, and what I find difficult:

'I think guided reading and writing is challenging. But I think I like being challenged.'

But what do you like about yourself…

Child D 'I think what I like about myself is when we are doing acting I can make pretty good funny faces and I like that.'

Child D: 'The acting normally helps me to know what it feels like to be in the book it's like someone's writing you it's like you are famous. It's pretty fun when we dress up it's like we are the people we do the movements.'

Child D: 'The retrieval on Friday I am getting better'.

Participant E

'I like the maps in guided reading. I feel excited and interested, when I see story maps, I understand the story.

I like drawing what things mean, it helps me to find the word again, and when I read it again in a book, I feel a little bit more confident. I lots of acting, I like acting in the book. The words we learn are in the shape on the wall and it helps with English and retrieval (pointed to the retrieval sticker). I know, the nouns the naming words, the verbs 'what doing' words, 'How feel' and 'what like' they are adjectives, 'where' words prepositions, 'how' are adverbs,

Determiners; the. a, an. Conjunctions; for, and, nor, Pronouns; she, he, her, these, this.

I like the books. I like reading more now. I like to read a new book.'

Participant F

'I like drawing lots

Writing lots its hard lots of fish and sharks its good and fun we learnt about dolphins.

The verbs

I love the story map you can practice it and then you know the story.

You can look at the walls and it helps you and there are other words (synonyms) ways to say words and you can put it in your writing and practise thinking the teacher helps.'

Participant G:

In a session with a Deaf artist and Deaf actor from 'Big D Live' Child G was observed responding to a question, 'Do you like reading?' They leant forward gaining eye contact with other children nodding and signing to them, 'You know, remember,' and listed books we had read and explained to the course facilitators how much they liked reading and began to explain the strategies pointing to the story maps.

Participant H:

'Guided reading it helps me to read a story book. It's easy to find the word, the guided reading is quite hard. I like reading. I like doing the plays, they help me do acting, what the story is about, the name and the title.

The map shows you what the story is. You can draw and then write it.'

Child H recorded themselves independently reading a story written by themselves, on our online homework platform. Child H added a Thinking Hat to reflect on their feelings about the story, and included one for me, to reflect on how I felt about the story. Child H also included a Likert scale where they added

their thought, about how I would feel. Saying I would feel ‘very big numbers’ about their story.

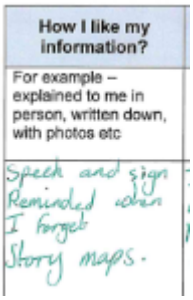


Figure 42: Child H Reported in their Person-Centred Annual Review

Pupil I

> *‘I like reading books. I liked the Dragon Machine story. I like the book we are reading now ‘The Jungle Book’. Having fun. When we are learning and reading a book and we are signing altogether and doing the red word, and the blue word and the shape coding then it makes me happy too.’*

Appendix 6: Exert from the advanced thinking accreditation form Exeter University

Exert about this study from Dr Kleine Staarman's (2022) report by on the application from 'All Faiths Children's Academy for re-accreditation as an Advanced Thinking School' by Thinking Schools @Exete'r, University of Exeter. Director, Thinking Schools @Exeter Graduate School of Education College of Social Sciences and International Studies University of Exeter.

> *'A member of the Drive Team (Beth Welstead) has undertaken systematic qualitative research, aimed at using thinking maps and thinking hats in order to promote reading and language engagement with severely and profound Deaf students. This is a key area in which the school has developed specific and sound knowledge and understanding, and I would strongly encourage the further dissemination of this important and interesting work; something we would, as a university-based organisation, be happy and well-placed to support.'*

Appendix 7: Enlarged table

Table 48: Enlarged copy of Participant's information

Participants	Age in Oct 2020 Years and months	Year group	Time in provision hours per day, hours and minutes	Primary mode of communication	Type and degree of loss	Current form of amplification Cochlear Implants (C.I) Hearing Aids (H.A)	Aetiology	Additional SEND	Home language
A	6yr 4mth	2	3 hr 40 mins	TC	Bilateral profound sensorineural	CI Cochlear Nucleus7	Unknown congenital with progressive element	Glasses	Lithuanian and English
B	6yr 9mth	2	3 hr 40 mins	Aural/Oral	Bilateral severe mixed with microtia and atresia	BAHA Oticon Ponto 3 SP	BOR Syndrome	Glasses	English
C	7yr 1mth	3	3 hr 40 mins	TC	Bilateral profound sensorineural	CI Medel synchrony +Flex 24	Unknown		English
D	7yr 5mth	3	3 hr 40 mins	TC	Bilateral profound sensorineural	HA PHONAK, 1-SKY V UP	Family history of progressive hearing loss	Glasses	English
E	7yr 8mth	3	3 hr 40 mins	BSL	Bilateral profound sensorineural	CI AB Naida Q90	Family history of hearing loss	SEMH	English
F	9yr 0mth	4	3 hr 40 mins	BSL	Bilateral profound sensorineural	HA PHONAK, 1-SKY V 70 UP	Family history of Hearing loss	Glasses	BSL
G	9yr 10mth	5	3 hr 40 mins	BSL	Bilateral Profound mixed with microtia and atresia	CI Advanced Bionics Neptune	Atypical Treacher-Collins Syndrome	Core Autism ADHD Glasses	
H	9yr 6mth	5	3 hr 40 mins	TC	Bilateral profound sensorineural	CI Naida AB	Connexion 26	SEMH	Punjabi
I	10yr 7mth	6	3 hr 40 mins	TC	Bilateral severe sensorineural	HA PHONAK SKY Q 70 SP	Family history of hearing loss	Glasses	Slovak Roma
J	10yr 2mth	6	0	TC	Bilateral severe mixed	HA PHONAK 1-SKY V 70-UP	Family history of progressive hearing loss	Glasses	English

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