Should we teach thinking skills to deaf children?

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Contextualisation

There are many negative reports about the 'failings' of deaf children but little has been done to develop new teaching approaches that address these issues. This paper acknowledges these reports but suggests that it is not deafness, nor the deaf children themselves, that are failing. Rather it is how the education system responds to their needs that is the issue. What can be done? This paper puts forward the notion that teaching thinking skills to deaf children may be a key to unlocking their potential.

Abstract: *This pilot study aimed to identify the benefits of developing thinking skills with KS1 deaf children who used British Sign Language (BSL). It arose as a response to the findings of a variety of researches who had reported a number of 'failings' apparent in the educational and learning activity of deaf children. It used a case study approach involving five profoundly deaf Key stage 1 children and explored the extent to which, using materials grounded in the Somerset Thinking Skills Course, the teaching of thinking skills in a supportive environment could remediate some of these issues. The strongly visual nature of the material supported pupil exchanges mediated by the use of sign language. Analysis of video film was used to plot individual pupil development of scanning skills, their use of nouns versus adjectives, micro-skills and macro-abilities. Pupil reasoning skills, how they were supported, their ownership and role of the facilitator were also examined. The results showed that within eight weeks (equivalent to four hours in total) the children were more able to express their perceptions. They watched other children in order to access their signed information and appeared to use this to develop, elaborate, extend and provide reasons when it was their turn to present. There was also evidence of enhanced creativity and originality in their contributions. This pilot study urges the need for further research and suggests that a priority should be given to developing this approach in the teaching of deaf children. Due to the complexity of thinking skills it further recommends that this area should be taught as a separate topic that can inform other subjects.*

Introduction

This study queries recent research that tends to report the 'failings' of deaf children in many different areas. These areas include, cognitive deficits (Firth 1966), poor language development (van den Berg, 1971; Tomlinson-Keasey and Kelly, 1978), and suggestions of poorer underlying intelligence (Pinter, Eisenson and Stantoni, 1941; Markschark, 1993). In addition, other areas, such as lower empathy (Meadow-Orlans, 1990), reduced self-esteem (Moss, 1987; Sussman, 1966) and disruptive behaviour (Cowan, Pederson and Babigon, 1973) have been reported. Both cognitive aspects, such as a shorter memory span (Koh, Vernon and Bailey, 1971) and broader issues concerning inflexible personality types have also been noted (Liben, 1979).

The first part of this paper takes each of these reports in turn and suggests the likely reasons why deaf children may demonstrate these 'failings'. With each finding, what is identified is that it is largely due to the limited nature of the interactions involved, and a lack of understanding and match between the deaf child and their surrounding environment that lies at the root of these apparent 'failings'. Therefore, if it is the environmental context that

informs the findings of these reports it would be logical to suggest that by changing aspects of the environment in a specific way, changes in outcome might result. One way of facilitating this might be through the implementation of a thinking skills programme that combats each of the failings and facilitates the development of a more appropriate learning environment.

The second part of this paper briefly reviews the different thinking skills programmes currently available focusing on the Somerset Thinking Skills Programme (Blagg, *et al.,* 1995a). This program adopts a specific philosophy and teaching style. This emphasis on visual materials was viewed as particularly appropriate for work with deaf children where speech based activities would have been inaccessible: it breaks down and develops skills using a visual format that deaf children require.

In the third part of this paper results from a series of six case studies are drawn upon to illustrate the view that the teaching of thinking skills, using a visually informed format, offers a way forward for the development of thinking skills for deaf pupils. This in turn would have benefits for their general learning.

Theoretical context

This paper adopts a psychological standpoint on the development of thinking skills informed by Fisher's (1995) general thinking theory and Sternberg's (1994) three component elements theory. It is further underpinned by Barlett's (1958) suggestion that thinking process and styles can be altered by the surrounding environment and changes that occur within it. These authors further suggest that the result of changing the environment in which thinking is occurring in would depend, to a large extent, on the nature of the task at hand, its difficulty and familiarity. It would also depend on the child's underlying psychological environment and training. This may relate to their age. However, Werner (1965) has suggested that we may not be able to identify stages of reasoning simply in terms of chronological ages. Rather we may need to examine how thought develops and is created by the use of appropriate environments. This implies that the earlier such a process begins (through interventions making it possible) the more likely thinking is to progress. However, we need first to understand the current situation the deaf child finds itself in and how this may have informed the reports of 'failings' mentioned earlier.

Deaf children's 'failings'?

The 'failings' referred to in the introduction are each discussed in turn. Underlying each of the following 'failings', it is argued, are the level and impact these factors have on self-esteem. Measuring self-esteem is difficult and the impact of each of the issues raised below, on a person's self esteem (either as a child or, later in life, as an adult) is currently unclear.

Poorer language development?

Van den Berg (1971) studied 104 children aged between seven and fifteen years of age who were in a bilingual setting[1], and suggested that deaf children/students have poor language development. However, more recent research such as that of Kyle (1988), Petitto (1987), and Bonvillian and Orlansky (1983), has suggested that Deaf[2] children within a Deaf family acquire sign language at the same rate as hearing children acquire spoken language in the first year of life. Although this would only account for 5-8% of Deaf children (Lane, Hoffmeister and Bahan, 1996) this suggests that deaf children using a natural visual

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[1]   In New Zealand

[2]   A capital D is used to represent culturally deaf persons.

language (British Sign Language) have the capability to develop language skills. If this is so, why then are deaf children held back by focusing on a spoken phonetical language (English) that they cannot hear? This suggests a need to look briefly at the very early stages of deaf children's development. Gurney (1973) suggested four conditions that are needed before language (sign or spoken) develops. These were: good interpersonal relationships, self-esteem, perceptual and motor maturation, and an adequate level of intelligence. However, 90-95% of deaf children are born into 'deaf-unaware' hearing families. As a result aspects of Gurney's four conditions (1973) may not develop and their development may be impeded. This may explain the reported poorer language development.

Poorer IQ?

IQ tests, initially devised by Alfred Binet (Kite, 1916), were underpinned by a view that intelligence, as an inherited quality could be measured quantitatively. IQ tests were originally designed to distinguish between groups in society, for educational provision purposes and to place the less able in separate classes. Pinter, Eisenson and Stanton (1941) concluded that deafness itself exercised a 'permanent, crippling effect on intellectual function' and that, on average, a deaf child had a score ten points lower, than that of a hearing child. However, this conclusion ignored the effect of test administration and the premise of the test (Braden, 1994). Sternberg (1977), advanced a different view of the nature of 'intelligence' seeing intelligence as the cognitive ability of an individual to learn from experience, to reason well, to remember important information, and to cope with the demands of daily living. Sternberg (1994, p 395) also linked intelligence with three different interrelated abilities. The first ability addressed the internal world of information processing. This involved metacognition[3], performance components[4] and knowledge-acquisition components[5]). The second ability was to take into account experience and past learning which involved dealing with novelty[6] and automatizing information processing[7]). Finally, the third ability invoked the external world, in adapting to, shaping and selecting real world environments. Clearly, on this view, a move toward the ability to think, develop, apply and select is apparent. Although plausible, the model is probably too complex for application to classroom assessment.

Nevertheless this model does provide support for, and suggests likely answers to, questions raised by the research of Braden (1985, 1987), Vernon and Koh (1970), and Sisco and Anderson (1980). They found that Deaf children of Deaf parents, and deaf children who had deaf siblings and hearing parents, consistently showed mean IQ's above those of deaf children with hearing parents. Importantly, the former groups were not likely to be held back by restricted or delayed language as shown in the previous section. These groups were likely to interact and discuss at length, different topics, perceptions, and view points.

Communication/relationships and disruptive behaviour?

Bronfenbrenner (1979) suggested a model that involved four levels of interactional organisation that could influence students' achievement and behaviour patterns in the context of the working classroom. First was the microsystem, such as the school, classrooms, home and neighbourhood; second was the mesosystem that linked two or more microsystems; third was the exosystem, where the outside demands/influences affecting adult lives could affect young learners by affecting the adults with whom they worked; and

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[3] Higher order mental processes used in planning, monitoring and evaluating performance of a task
[4] Probably best measured by current intelligence tests
[5] Mental processes used in learning
[6] The ability to learn and think within new conceptual systems building upon existing knowledge
[7] Automized operations needed for, ie, complex verbal, mathematical tasks to be completed.

finally, the fourth level was the macrosystem that included the cultural beliefs/patterns, or institutional policies, that contextualised and thus affected individuals' behaviour.

At an early age, the microsystem is arguably the most influential for the deaf child. However, it might be assumed that, within bilingual schools, children have opportunities to develop relationships and free communication through their first language. Nonetheless researchers such as Myklebust (1964) have reported apparently inferior social development among deaf children when compared to hearing children. This suggests a need, therefore, to look at both the style of communication and type of experiences they are having; not only within school but also outside of the school setting. This is important as children only spend about thirty hours per week, for about thirty-seven weeks of the year in school; the rest of their time is spent as part of the their family unit.

Due to the imbalance of time spent in each context, the 'effects' of this more extensive 'outside-the-school' experience are likely to be greater than those that occur 'in-school'. This may have a large bearing on the deaf child's development and progress[8]. With this in mind, deaf children need to develop skills to interpret, understand and apply, with reason, the world around them in these two environmental contexts.

However, an underlying restriction in their first language communication at home, could have an effect on their flexibility in working in different environments. It may also have more explicit effects on their cognitive development such as in the development of memory. This will be examined next.

Memory and flexibility?

Koh, Vernon and Bailey (1971) found that deaf students had poorer recall than their hearing counterparts with both related and unrelated word lists. Although it can be argued that using words in investigations provide an unfair advantage for the hearing students, even with recall of line drawings (Liben, 1979), deaf students recall performance was poorer than that of the hearing students.

However, Liben's (*ibid.*) study also found that training[9] improved the memory performance of the deaf students (though not as much as the hearing students). Liben (1979) surmised that the apparent imbalance in performance between hearing and deaf students were due to two possible reasons: (1) they did not have sufficient categorical knowledge; (2) they evidenced a lack of flexibility in item classification.

There is a range of possible reasons why poorer recall, associations and responses, might occur for deaf children with hearing parents. These include those that suggest that younger children and deaf children rely on concrete visual cues when learning, rather than the abstract world. Also, deaf children do not have the opportunity within the family environment to explore open ended or undirected responses (Bonvillian and Orlansky, 1983) due to their restricted communication with hearing parents. In addition, deaf children, both at home (Bonvillian, Charrow and Nelson, 1973) and at school (Wood, 1982), experience limited conversational contexts. These are either teacher/parent initiated conversations that are often in the form of concrete direct questions or task information questions that requires only a brief response from the child. Therefore, as Arnold and Walter (1979) found, it is no wonder that deaf students were significantly inferior to hearing students on tests of abstract,

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[8] Though it must be noted that this affect would be arguably greater, and more substantial, if the deaf child was part of a mainstream, predominantly, oral school.

[9] The training involved developing semantic clustering strategies.

mechanical and verbal reasoning as deaf children would not have been given the opportunity to extend or explore responses in their past learning experience whether at home or school.

Flexibility, associations and language (Darbyshire, 1977; Schrimer, 1989) are often developed through play and stories during the early developmental stages (Sheridan, 1993; Calderon, Greenberg and Kusche, 1991). These stages of play development suggest that from birth a number of things are happening that are informed by the perception of sounds. First, that children may rely on sound to make sense of events, through imitating a developing sequence of events such as what happens when an object is thrown out of the pram. Second, in reacting to actions made by themselves, or others, including those that are directed at them. Third, through an awareness of their surroundings and a focus on events not in their immediate line of view, such as when a kettle is boiling, or a door slamming, and finally through balance, when walking and the feedback given to this mechanism by the sounds of contact between feet and the ground, are missing. Unlike a Deaf child with Deaf parents (who are likely to be sensitive to the child's needs and desire to explore using visual clues) a deaf child in a hearing family does not have initial access to these opportunities or to the language used. They are therefore likely to miss opportunities to explore their environment in this way.

These considerations highlight the need to give deaf children the opportunity to explore and apply their knowledge within different systems[10]. As shown by Liben (1979) in context of memory training, deaf children can learn appropriate strategies, if given the opportunity. Poorer memory and application might therefore be remediated by the methodology employed by teachers; where this is not done the experiences of deaf children could be contributing to their inflexibility and poor memory performance. A priority for working with a deaf child has to be an emphasis on extending and carrying forward information previously learnt.

Poor self-esteem?

In addition to the above 'failings', there is a need to reflect on the issue of self-esteem. Where individuals experience differences in their ability to access and experience their environments, as suggested above, it might be anticipated that this would lead to lowered self-esteem. One way of developing self-esteem is by giving children ownership of their learning. Developing children to be inquisitive, questioning, reflective and able to engage with different points of view before concluding (at that point), requires confidence and self-belief. However for this to occur they need to be in an environment that is secure and supportive. It needs to be one where mistakes can be made without ridicule and views are valued on an equitable basis. This is unlikely to occur in a top-down, one-way, behaviourist-type methodology (Thorndike, 1932; Skinner, 1957). A move towards an andragogy and socially constructive, Plowden-type, teaching approach, as suggested by Bennett, Desforges, Cockburn and Wilkinson (1984), where the teacher acts as a facilitator and puts the deaf child at the centre of the learning process, is more likely to support development of self-esteem. The reduced formality of such an environment may lead to more productive learning. In such an environment a facilitative approach to teaching might be more realisable. It would, in the current context of working with deaf children, need to be one that could address the 'failings already identified, that used visual cues and materials and could support enhanced self-esteem. Identifying such an approach proved harder than it first appeared.

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[10]   Ideally this would also apply for the family unit.

Thinking skills programmes

There are many different programmes designed to develop thinking skills; some being very general, based on developing teachers questioning techniques within the classroom such as Tactics for Thinking (Marzano, Brandt, Hughes, Jones, Presseisin, Rankin and Sunor, 1988) and Project THISTLE (Oxman and Michelli, 1984). Others, such as SIATS (Armstrong, 1995) and PATHS (1998), focused on developing and controlling emotional, behavioural and interpersonal skills so that the students could better interact with others.

Lipman (1991) used short stories that the children had to discuss using four main steps. These involved the use of: (1) leading ideas; (2) self knowledge requiring depth; (3) thinking skills to develop understanding; and (4) follow-ups that required transfer and application of ideas to other contexts. Lipman concentrated on the study of critical thinking through analysis of argument and the application of logic. His objective was to get children to think for themselves instead of learning by rote or accepting the authority of the teacher. This method was triggered by his observations whilst an educator at university. He found that his students had 'low level' thinking skills and this prompted him to find a way of developing these skills through text. Although this has potential as a methodology (and can open discussions), for young deaf children, it would require experience, and language sequencing skills unavailable to them and would not be suitable.

Another approach was adopted by Feuerstein (1980) who built his theory upon the notion of 'structural cognitive modifiability'. This viewed intelligence as something that could be developed through mediation[11] and exposure to appropriate stimuli[12]. In this, Feuerstein echoed Vygotsky's emphasis on social interaction and language as an important part of the learning experience.

Feuerstein initially focused on developing the education potential of young Jewish immigrants in the (then) new Israeli state. These immigrants had experiences different from 'normal' children, and he found that these children, with low IQ, were in fact suffering from 'cognitive deficiencies'. He concluded that it was this that impeded their learning and suggested that these children had 'blocks' (The Guardian, 1983). These blocks resulted in impulsivity, an inability to make comparisons between different objects and events (particularly over any period of time), poor spatial orientation to materials, an inability to follow or give directions (whether in a classroom exercise or in the outside world), and a complete failure to link with any degree of sophistication, cause and effect. Significantly, these 'blocks' (with the exception of spatial orientation) are very similar to 'failings' associated with the educational performance of Deaf children previously discussed.

Feuerstein (1989) further linked the underdevelopment of cognitive functioning with family background. He suggested that, because the parents (mediators) were unable to appreciate or give meaning (or order) to their experiences, the foundations, rules and values that children need to make sense of the world were missing. Again, these observations might be applied to the deaf child within a hearing family. With the previously highlighted restricted, concrete based mediation, from parents (and further the school), similar links and conclusions could be made.

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[11] Mediation ie from the facilitator/educator

[12] in this case through tasks created by Feuerstein.

Feuerstein then compiled 14 instruments13 of content-free, pen and paper tasks that required the use of specific cognitive functions. This 'Instrumental Enrichment (IE)' programme was based upon abstract concepts that were repeated with increasing difficulty and application. The tasks involved were designed without a reliance on, or a presumption of, previous knowledge and thus could be used (if adequately modified) for any age and ability of child. Feuerstein, Rand, Hoffman and Miller (1980), found the tasks significantly improved both cognitive performance14 and academic achievements15. Studies carried out on the IE students16 two years after the completion of the programme by Rand, *et al*. (1981) showed that they continued to produce enhanced performance in verbal and nonverbal cognitive tests.

However, there have been several subsequent investigations on the effectiveness of the IE programme. These have showed that a significant improvement in non-verbal reasoning could be identified but other effects, such as self-esteem, improved classroom behaviour and attainment test performance, were inconsistent (Wilson, 2000).

This approach was taken further in the work of Blagg, Ballenger and Gardner (1996), who created the Somerset Thinking Skills Course (STSC). This group was heavily influenced by Feuerstein's methodology, but developed it further by using more naturalistic and pictorial tasks in order to enhance meaning-making and conceptualisation of the activities. McGuinness (1999) has reported that no large-scale evaluation of the effects of the STSC has been made. However, Blagg, *et al.* (1996) showed that in 12 of the 14 studies using the materials, significant benefits in terms of the ability to recognise complex problems, plan and review work and demonstrate greater self confidence could be identified.

The Somerset Thinking Skills Course – overview

The opening statement of the Somerset course summarises its structure:

> 'The Somerset Thinking Skills Course (STSC) consists of a series of modules designed to teach, discuss and generalise specific concepts, skills and strategies involved in problem solving.' (Blagg, *et al.,* 1996, p 1).

Eight specific course aims are involved:

- To enhance self-esteem;
- To promote positive attitudes and beliefs about being able to learn;
- To heighten awareness of learning styles and the need to adjust them according to differing demands;
- To develop awareness and control over the use of problem-solving processes;
- To enhance ability to communicate ideas accurately and clearly;
- To teach basic cognitive resources underpinning problem-solving processes;
- To facilitate the ability to transfer and generalise ideas across many different contexts;
- To transform passive recipients of information to active searchers and generators of ideas. (Blagg, *et al.,* 1996, p 35).

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[13] The 14 instruments: organisation of dots, comparisons, orientation in space 1, analytic perception, illustrations, family relations, categorization, numerical progressions, temporal relations, instructions, orientation in space 2, syllogism, transitive relations and representational stencil design.

[14] spatial relations, figure grouping, numbers and addition sub tests

[15] geometry and bible studies

[16] IE students are students that have undergone Feuerstein Instrumental Enrichment programme.

There were seven modules17 in the complete course (though for this study only the first module was used). These focus on two teachable aspects; cognitive resources18 and cognitive strategies19 (Blagg, *et al.,* 1996). Through these, with the additional categories of communication and generalisation, the Somerset Thinking Skills Course uses a 'problem strategy loop'. This loop consists of eight different stages that support a logical sequence of events needed to analyse, develop and check problems. As a loop, it allows for the process to continue many times over depending on the complexity of the problem. Through using this loop it is intended that children develop awareness and logic in their thinking; in this way they can develop their ability to apply knowledge and understanding in different contexts.

The tasks within the different modules were one of three types: First, stimulus activities that establish a meaningful context; second, artificial tasks that are abstract and, third, naturalistic tasks that require transfer of cognitive resources from the source to real life situations. All tasks however, revisit and advance the strategies used in previous modules and specific tasks such as one involving aspects of a' living room' and the use of 'thinking keys'.

The course was designed for a target age group in the range of 10-16 year olds in mainstream schools. However, the strongly visual content of the modules, which hade been 'designed to enable differentiation by outcome' (Blagg, *et al.,* 1996, p 58) whereby it was the children who advanced the discussion and development within each session, were particularly accessible to the deaf children in the current study.

The role of the teacher/facilitator is vital in the STSC. The course requires teachers to provide an environment that is full of questions and 'free from embarrassment and in which pupils' ideas and viewpoints are listened to and explored' (Blagg, *et al.,* 1996, p 64), thus matching the criteria established earlier for an approach that might support deaf children's learning and self-esteem. Interaction, justification, challenge, sharing, significance and meaning are key areas and skills that the course requires pupils to develop within the classroom, without rote learning. These also supported the criteria just referred to. Alongside this, the teacher was advised not be seen to lead, but rather to share and facilitate discussions by sitting beside the children, following the same rules and respecting the opinions of all of the children.

This programme encompassed the majority of the criteria and thus was used in the study.

Methodology

The aim was to examine the benefits of developing thinking skills with KS1 deaf children who used British Sign Language (BSL). The Somerset Thinking Skills Course (Blagg, *et al.,* 1996) was used to investigate deaf children's potential.

The stimuli pictures used in the tasks were pictures taken from the Somerset Thinking Skills course (Blagg, *et al.,* 1995a, pp 10, 15, 19, 20, 34) Module 1: Foundations for problem solving. Each picture was enlarged to A3 size and placed on a central white board. The comparison / assessment activity was taken from Module 2: Analysing and synthesising (Blagg, *et al.,* 1995b, p 14).

Video cameras were used to record the participants who were viewing the picture as well as the child standing at the central white board who was sharing their thoughts with the other

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17   That come in a form of a book

18   This consists of: (1) conceptual understanding; (2) skills and procedures; (3) knowledge and experience; (4) verbal tools.

19   This is the higher-level general control processes concerned with the selection and co ordination of specific cognitive resources for particular purposes.

children. This was so that behaviour, reactions and answers by the audience could be analysed alongside the signer. Analysis of the video was conducted after each session; any signs not understood were clarified either by the child or other adults familiar with the child. Analysis of the video film was used to plot individual pupil development of scanning skills, their use of noun versus adjective, micro-skills and macro-abilities. Pupil reasoning skills, how they were supported, their ownership and role of the facilitator were also examined.

Five profoundly deaf KS1 children who were assessed as below level one (P7/8 level) in both Maths and English were involved in the study. The pupils and facilitator sat on chairs in three quarters of a circle around and facing the white board at the front. The A3 picture acted as a focus for the group of pupils and facilitator and was stuck to the centre of the board, making sure that the child who was signing had enough room to stand beside the picture without obstructing it. At the start of the session each child had his/her own A4 copy to examine and the group reviewed the events of the previous session. In addition, the facilitator had information / objectives to infiltrate into the discussions. This A4 copy was subsequently placed under the chair. The video cameras were switched on before the sessions started.

Each of the sessions was of half an hours duration, carried out once a week. Although this study aimed to stay true to the Somerset Thinking Skills Course procedure, alterations in time and language level had to be made so that the children could access the information.

Five activities were designed to introduce and develop thinking skills in steps, thus breaking down each process, focusing on one aspect of the thinking skills (Appendix 1: Table 1). The first week was designed so that there was little input, after the initial introduction, from the facilitator. It was therefore used to determine each child's starting point. Sessions over the following weeks encouraged discussion, analysis, comparison, transfer of knowledge, synthesis and deduction strategies, all of which were assessed in turn. During the last week, all the skills learnt were assessed by carrying out a different pictorial task and comparing the results with assessments carried out in the first week.

Results

Development of skills

The following section summarises the results of the study by dividing the account into the five different areas that the children developed within the eight weeks (equivalent to four hours in total) of the sessions.

Scanning

The children started activity one, randomly selecting and stating points, without any apparent cognitive pattern. They did not select, nor share features, from the whole of the picture. It can be argued that features not highlighted in a picture cannot then be elaborated. However, the purpose of this programme was to improve this situation so that more efficient and effective thinking could take place. Indeed, by using the (in activity three) 'question mark frame', the children were then able to apply and carry this forward in the subsequent activities. However, there was one child 'B' who did not analyse the whole of the picture using the question mark frame. (Appendix 1: Figure 1) He was the last child to explain what he could see. Child 'B' took an area that had not been closely examined by the other children and thus took an original stance only made possible by taking in what the other children had signed.

Names versus description

For the purpose of this study, as a way of analysing what was signed, a comparison between signs that stated the name or labelled the object were made with the additional information given about the object (description). This was on the basis that descriptions might reveal a deeper level of thinking (abstract and creative). Almost all the pupils showed a decrease in the number of names compared with an increase in descriptions as the sessions progressed.

Further these results suggested that the points of reference being highlighted were elaborated with information that was not shown within the black and white picture or given by the facilitator.

In week 1, one-word name responses such as 'FLOWER' were given, mirroring the explicit and concrete information presented in the picture. However, in week 8 the concrete evidence such as pram or paint pot were given additional, descriptive, elements, for example, colour [PINK, PURPLE]; who it belonged to [DADDY NEWSPAPER, PAINT HOME] and a concept of time [LONG-AGO, OLD]. These were additional aspects that informed the child's account of the picture and drew on aspects of their child previous experience.

Micro-skills and Macro-abilities

The children began the programme listing and labelling features in the pictures (evidencing the use of their micro-skills). As they progressed through the activity they began developing their descriptions, linking different aspects of the picture and giving reasons why (suggesting the use of macro-abilities). One child responded by signing, in activity 3, [SAME KEY LOTS OPEN DOORS BAD GIRL THROW KEY-IN-AIR, BOY SAD LOTS (keys) EVERYWHERE]. This statement linked three different aspects of the picture, namely the keys, the character at the base of the picture and the 'boy' drawn on the key. The child had used these three aspects and linked them together to create an explanation, and thus a meaning, for what was happening in the picture. It should be noted that it also provides a good example of the use of support statements at each stage of the response. For example keys: OPEN DOORS, BAD GIRL: because she has THROWN THE KEYS IN THE AIR, the BOY is SAD: because there are LOTS OF KEY EVERYWHERE (making it difficult to find the key he wants). Parallel to this development, the children increasingly engaged with, elaborated upon, and extended ideas from other members of the group, thus becoming more active learners.

Reasoning skills

The children, as previously stated, appeared to list the names of the features in activity 1. Within activity 1 the children were asked 'why' throughout the activity. However, none of the children were able to reply at this stage. This raised a very important issue, and one that had to be worked on outside the programme.

The ages of the children, and their previous experiences, meant they had relied on concrete information and direct questioning to structure their responses. They initially found giving extended answers (beyond labelling) difficult. However, very quickly the children were independently relying on past experience and knowledge to develop ideas and create information beyond what was in the picture. Activity 7 (a picture of a desert island) pulled in information about stories (and films) that they had previously seen. All of the children signed about a boat that was in fact not present in the stimulus picture.

Extending this work, through interaction with the signer, the children developed and created a pirate scene. Within this activity, the children had to conclude and state where they thought the gold and silver was.

Each child was able to give a reason, whether it was under the rock because it was hot, at the bottom of the sea because the ship had sunk and the money was heavy, or under the rocks in the mountain with frightening snakes nearby. Again these reasons relied on imagination and creativity (and originality) as this information was not drawn or seen in the picture. By the final activity 8, the children were using their own experiences by linking the contents of the dustbin featured in the picture being discussed with different 'happenings and people' that had occurred in their own homes that might be apparent in the waste putout in their dustbins. These links were explained with reasons and the stories they involved used to expand upon their discussion of the stimulus picture.

There was considerable progress in giving explanations from the first to the last activity; the children were increasingly associating aspects of the picture with their own personal experiences, necessarily drawing upon their own experience as recorded in their memory.

Support, ownership and the role of the facilitator

All of the children required diminishing amounts of support and encouragement as the activities progressed. On the other hand, one child required a lot of support especially up until activity 4. Nevertheless, it needs to be highlighted that, just because a child did not sign, discuss or use correct procedures (up until activity 4), it did not mean that the child was not thinking, but it is likely to be that she was not able to communicate her thoughts. Activity 2 highlighted this point; the same child openly rejected the facilitators' claim. However, it must be noted that the positive response by the facilitator reinforced the concept that everyone was right to have an opinion and that the facilitator could be challenged.

One explanation for this difference of opinion between facilitator and pupil might relate to the issue of whether the child in the picture being discussed, who appeared ill in bed, was a girl or a boy. Highlighting the change of opinion, questioning and then supporting the children by confirming that everyone was right, may have prompted the child to openly suggest an alternative link with the 'thinking character'. Furthermore, after that discussion, there was more creativity and originality within the discussions, with the raising of additional features increasing. In the instance just referred to the child had questioned and rejected the facilitator's suggestion, initiated communication, created an original suggestion and accepted the facilitator as a person who can be challenged. The statement was praised and the child responded warmly to it.

Conclusions

The aim of this study was to discover whether the application of the Somerset Thinking Skills Course with deaf children aged between 5 and 7 who use sign language, produced beneficial and measurable results in the children. A particular focus was pupil confidence and the extent of their discussion of picture materials. Considering that deaf children have the same 'cognitive potential' as their hearing peers (MacSweeney, 1998), it was important to determine how well they could express themselves and work out the consequential aspects and relations in the pictures.

It was suggested that deaf children (within hearing families) are more likely to have less opportunity to explore open ended or undirected responses due to restricted communication;

flexibility, language, and associations are less likely to be developed as well. However, it was also surmised that these areas could be developed at school.

The results showed that within eight weeks (equivalent to four hours in total) of the sessions the children were more able to express these perceptions. It was as if the children became proactive and interactive learners and learned from each other; this could be seen in the transcripts and observations of the lessons. The children watched others for signed information and appeared to use this to develop, elaborate, extend and provide reasons when it was their turn to present. There were also examples of creativity and originality in their own thought.

During the first session, the children looked for guidance from the facilitator, but gradually realised that 'there was not a right answer' and so their own views could be expressed. This created the appropriate safe environment for exploration and explanation of their own perceptions, so much so, by activity 2 one child disagreed with the facilitator. The said child was met with a positive reinforcement from the facilitator that showed that they were equal and inadvertently showed that all had the right to their own view, although they did need to give a reason why.

The children were then able to develop a more systematic way to analyse the evidence. They could also use both micro-skills and macro-abilities, for example, when they followed the 'question mark' border of one of the tasks. This highlighted the features (micro-skills) and provided individual conclusions about where the gold and silver, buried on the Treasure Island (see discussion above) had been hidden (task activity 7). Further, they could identify who, through the rubbish they produced and that appeared in their dustbin, lived at House number 52 (activity 8).

The children developed ways of linking and drawing information from many sources as a way of supporting and developing their observations, judgments and reasons. Within this study the children initially stated what they could see. However, through encouragement the children began linking the different parts of the picture creating order and sense of what they could see. From this linking, the children began to draw upon and include personal experiences.

In activity 8, one child pointed to a broken wheel and related it to a recent car accident he had been in and another linked the empty paint tins with her new house. The results showed that the children began to involve people that were familiar to them, stories/films that they had seen and information learnt in other areas of the curriculum. Using their experiences from a range of situations they can support what they can see. This linking develops meaning and understanding of the world around them, as the skills learnt can be applied to many different situations and topics whether familiar or not.

The children had began to think and reason beyond the concrete picture, as presented to them in the task, and started to develop a more systematic and flexible link between what they knew and what they could see. From here, the next step would be to develop their thinking so that they could take a further step away from the concrete/visual in order understand and predict situations not previously experienced.

However, it is apparent, that this linking, transfer and reasoning are even more important for deaf children whose primary and natural tool for understanding, communicating and learning is mediated by visual media.

Consideration of the interaction of language and thought in this study, suggests the need to determine the relation of written English development and sign development. This

development could support the children with understanding the processes and patterns of how the English language is build up. Predicting words, understanding the context and linking clues from the grammar and style evidenced in the communications being used could give a child an ownership of their learning and development of the second language at an earlier age.

Similarly, this programme facilitates and improves children's overt thinking and ability to share ideas with others. This communication and interaction could be seen therefore to support all areas of the curriculum and social life.

Although this curriculum focused aspect was not addressed in this pilot study it has identified a focus for further, in-depth research. This would be needed in order to show that skills learnt and developed within the Somerset Thinking Skills Course could influence and extend into learning in other curriculum areas. On reflection, additional consideration and research needs to be carried out on the benefits that could be gained by other groups of children who also show the same 'failings' as implied for deaf children.

The way forward

From here, there seems a desperate need to investigate and create a thinking skills programme that is sympathetic to the needs of deaf children. Therefore, it may be that such a programme should be taught as a separate topic that can be developed, applied and used as a tool to support deaf children's learning in other curriculum areas, rather than as an integrated subject based approach.

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Appendix 1

Session number	Activity: focal picture	Cognitive skills focus
1	The Living Room (1)	Assessment
2	The Living Room (2)	Discussion, negotiation, hypothesis testing
3	Keys (1)	Discussion, synthesis
4	Keys (2)	
5	Abstract Search (1)	Recognise and define problem. Highlight
6	Abstract Search (2)	that order can be created out of chaos
7	The Treasure Trove	Discussion, analysis and synthesis
8	Dustbin	Assessment

Table 1. Timetable of events showing the focal picture used and cognitive skills developed during the sessions.
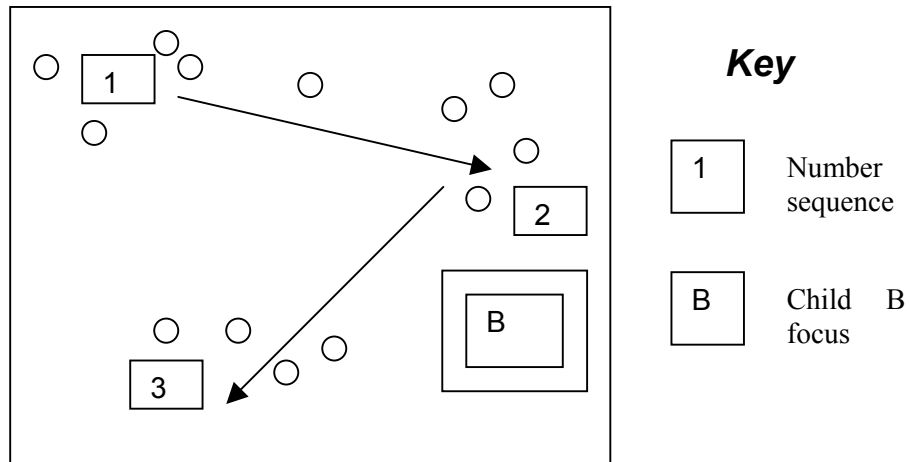
Figure 1. Direction and location of features highlighted in the analysis of the key picture (activity 3). The number direction mirrors the square question mark border shown on the focal pictures. B: denotes original stance taken by child B who was the last child to analyse the focal picture.