Supporting the development of young children's metacognition through the use of Video Stimulated Reflective Dialogue.

Helen Lewis

Faculty of Education and Communities, University of Wales Trinity Saint David, Wales, UK.

UWTSD, Townhill Road, Swansea SA2 0UT

Dr Helen Lewis is the director of the Primary PGCE at the University of Wales Trinity Saint David. Her main research interests include early years education, thinking skills, metacognition and reflective practice.

Acknowl wiserd ed and participants

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Abstract

Encouraging children to take responsibility for their own learning is recommended in many educational curricula. The aim of this paper is to report on a study exploring metacognition in young children. Developing metacognitive skills helps children become responsible and 'thoughtful about their learning process' (Chatzipanteli et al, 2014:1223), and can improve educational outcomes (Hattie, 2012). This paper explores whether involving young children in video-stimulated reflective dialogues about their thinking supported their metacognitive and cognitive development. Performance on a number of standardised tests was compared to that of a control group of children. Results indicated that the intervention group made more progress than the control group, they became better at discussing their thinking and demonstrated an increase in metacognitive behaviours during classroom activities. The results suggest that using VSRD with young children is valuable – as a participatory research tool, but also as a pedagogical strategy to support the development of metacognition and reflection in young children.

Keywords: metacognition; reflection; dialogue; thinking; Video Stimulated Reflective Dialogue; early childhood

1 Introduction

This study considered the nature and extent of metacognition in young children, whether it could be developed through a specific intervention, and what the impact of this would be on the children's performance in standardised tests. This was part of a

larger project, which also explored the teaching of thinking and how VSRD could support the reflective processes and classroom pedagogies of early years teachers.

1.1 Metacognition

Metacognition has been broadly defined as 'knowledge and cognition about cognitive phenomena' (Flavell, 1979:906). However, within the research literature a number of definitions of metacognition exist, and Brown (1987 in Georgihades 2004:367) warns that 'metacognition is not only a monster of obscure parentage, but a many-headed monster at that'. For the purposes of this study, metacognition refers to:

- the awareness individuals have of their own knowledge, their strengths and areas to develop, and their beliefs about themselves as learners;
- their ability to regulate their own actions in the application of that knowledge (Tanner et al, 2011).

A focus on metacognition is important given that there has been a shift in emphasis in the curricula of many countries towards promoting critical and creative thinking (eg Trickey and Topping, 2004; CCEA, 2007; Ministry of Education, NZ, 2011; Donaldson, 2015; OECD, 2015). Metacognition is perceived to lie at the heart of the thinking process (DECLLS, 2008), and Robson (2006) suggests 'good thinkers' need a repertoire of thinking strategies, confident attitudes towards thinking, a willingness to have a go at thinking, and the ability to reflect on their own thinking.

Metacognition is generally viewed as an important factor in improving educational outcomes (eg Flavell, 1979; Higgins et al, 2014; Hattie, 2012). Behaving metacognitively involves conscious monitoring and control of thoughts, as well as the ability to articulate thinking (eg McGuinness, 1999). Reflective, or metacognitive learners will recognise strengths as well as flaws in their thinking, and will review and amend their thinking strategies appropriately.

Characteristics of children who are showing metacognitive behaviours will therefore include demonstrating an awareness of the processes that they are using in order to learn; the effectiveness of these processes and awareness of what they need to do to improve.

However, the age with which children are able to think metacognitively is contestable. Early studies, often influenced by Piagetian frameworks, tended to conclude that metacognition is a late developing skill (Flavell, 1979; Schraw & Moshman, 1995). More recent research has reported that certain metacognitive behaviours occur in children as young as three years old (Whitebread et al, 2009). Metacognitive skills appear to be age-related and developmental (eg Kuhn & Dean, 2004; Schneider, 2008). This is an area needing further research, Larkin (2015:189) suggests that 'the terms metacognitive experience and early years education fit uneasily together' and there is limited evidence relating to the educational impact (eg on early mathematics or literacy skills) of metacognitive approaches in the early years (Higgins et al, 2015).

Therefore, one question this study explored was whether metacognitive behaviours can be observed in children under eight-years-old.

1.2 Video Stimulated Reflective Dialogue (VSRD)

Sociocultural and social constructivist theories of cognitive development propose that social interaction is a mediating factor in learning and development (Siegler and Alibali, 2005). Social interaction in the form of collaboration is recognised in the literature as a way to encourage development of metacognitive skills (eg Kuhn & Dean, 2004; Martinez, 2006; Schraw et al, 2006). Siraj-Blatchford (2009:84) suggests that

metacognition can develop within interactional situations, as a child is required to 'describe, explain and justify their thinking… to others'.

However, Valkanova (2004:44) suggests that although reflection is a 'crucial issue in learning', motivating children to reflect is challenging. Engaging in episodes of reflective dialogue may provide opportunities to engage learners and support them to focus not just on recall of events in a lesson, but also on what they were thinking about during the activities (eg Pramling, 1988; Forman, 1999). Indeed, allowing children time and space to engage in reflective dialogue with an adult may provide the conditions needed for more effective reflection (Wood and Attfield, 2005). Robson (2016) suggests that the type of talk taking place during reflective dialogue is particularly supportive of young children's metacognition.

There is increasing recognition that children are experts in their own lives (Clark and Moss, 2001; UN General Assembly, 2009), and that they are able to undertake the role of researchers into their own learning (Kellet, 2005; Tisdall et al, 2009). VSRD involves young children watching and talking about videos of activities from their own classrooms, thus providing an authentic and meaningful stimulus for discussion. Yet many previous studies using VSRD have not involved young children (Moyles et al, 2003; Tanner and Jones, 2007). Furthermore, in the few that used VSRD with children under 8 year olds, the researcher has made the video and selected the extract. The children have not selected what they were asked to reflect upon (eg Rumenapp at al, 2015; Robson, 2016). There is no way of knowing if the selected clips were the ones of most interest to the children, or whether they illustrated the learning that they wanted to reflect upon. Although Morgan (2007) used VSRD with children aged 3-7 years and noted its potential, challenges were also identified in the research design. The VSRD was conducted with 4 children at a time and this was too large a group to elicit

reflective dialogue from some individuals, and the time between recording and VSRD was up to 12 weeks. Many children had forgotten the activities by the time reflective sessions were held. Further research with an adapted VSRD research design is therefore warranted (Morgan, ibid).

Thus the second area that this study explored was whether an adapted VSRD process could support the development of young children's metacognition and how this might happen. To gain further insight, children were assessed at the start and end of the study to see whether involvement had an impact on their performance in standardised tests.

1.3 Curriculum context

This study explored the nature and development of thinking skills and metacognition in children in schools in Wales, where since 2008, the primary curriculum has been divided into the Foundation Phase (for 3- 7 year olds) and Key Stage 2 (7 – 11 year olds). The FP is intended to give all young children in Wales a 'flying start in life' (Davidson, 2001:8), and aims to promote young children's all-round development, largely through playful and experiential learning (DCELLS, 2008). This study is of relevance to early years educators beyond Wales since the FP curriculum draws upon a well-established tradition of child-centred, play-based practice (Gray and MacBlain, 2012). Emphasis is placed on individual children's interests, first-hand experience and practical, engaging learning.

Many of the underpinning principles of FP practice are evidence based and known to have an impact on the quality of provision, and the FP rationale acknowledges that early experiences lay the foundation for all learning (eg Sylva et al, 2004). Pedagogical approaches such as co-construction, use of the outdoor provision and adult-child interaction are seen as important. However, reflection has been identified as the only

area of Foundation Phase pedagogy that happens most frequently with the oldest year groups (ie 6-7 year olds) rather than with the youngest learners (Waldron et al, 2014). Perhaps this is because teachers assume older children are better able to review their learning experiences.

Therefore this study set out to investigate the impact of using VSRD to support young children's reflections on their learning and performance in standardised tests.

2. Method

Three research questions were explored:

1. What metacognitive awareness and behaviours can children under the age of eight years old demonstrate?
2. What is the impact of VSRD on young children's metacognitive development, and why might this be the case?
3. What impact does this process have on young children's performance on standardised tests?

The research design took a mixed-methods approach, underpinned by a pragmatic philosophy (eg Burke Johnson et al, 2007), and used a quasi-experimental, pre- and post-test research design. Progress in outcomes on a limited number of standardised tests in an intervention group and control group were assessed in order to ascertain whether the study had an effect on educational outcomes (beyond that expected as part of normal cognitive development). Qualitative data was gathered through semi-structured interviews and observations. The insights gained were expected to indicate what potential is offered by VSRD as a process to support the development of young children's metacognitive and cognitive development, and how it could therefore be used in the context of early years education.

Study Design

2.1 Study Location and Participants

The study took place in six Foundation Phase classes, each in a different school in south Wales. Schools varied in terms of size, location and demographics as illustrated in the following table, in which all numbers are approximate to maintain anonymity. Eligibility for free school meals is taken as a broad indicator of social economic circumstances (Hobbs and Vignoles, 2010).

School	School information
1	Semi-rural 220 children on roll 30% eligible for free school meals (e-FSM) 30% Special Educational Needs (SEN) Catchment area described as an area of significant economic and social deprivation 10 full time teachers
2	Urban 250 children on roll 50% e-FSM 50% SEN Catchment area has a considerable percentage of children who come from disadvantaged backgrounds 10 full time teachers
3	Semi-rural 120 children on roll 12% e-FSM 20% SEN Catchment described as neither socially advantaged or disadvantaged 6 full time teachers

4	Urban 600 children on roll 35% e-FSM 30% SEN Catchment described as an area of socio and economic disadvantage 28 full time teachers
5	Urban 260 children on roll 30% e-FSM 40% SEN Catchment ranges from relatively prosperous to economically disadvantaged 8 full time teachers
6	Urban 400 on roll 40% e-FSM 50% SEN Catchment described as one of the most deprived areas in the city 18 teachers

Table 1: Contextual information about the schools involved in the study

The study ran for one academic year, and involved one class and teacher in each of the schools. The researcher visited each class on four separate occasions, roughly every eight weeks (excluding holiday periods). 72 children took part in the study in total. They aged between 4 years and 7 months, to 6 years and 6 months at the beginning of the study. In each school six children were selected to take part in the VSRD aspects of the study, these are referred to as the 'intervention group'. Teachers selected the children for varied reasons, typically choosing those whom they felt would benefit in terms of developing self-confidence, social skills or academic outcome.

An additional six children from each class were selected by the teachers and assigned to a control group. These children did not undertake VSRD or interviews with the researcher. The non-random nature of the sample was controlled for in the research design. Given the age of participants, consent was sought from parents/ carers and children, and was negotiated and regularly affirmed throughout (Dockett et al, 2012). The researcher remained aware of verbal and non-verbal signals of consent, and BERA (2011) ethical guidance was followed.

2.2 Measuring performance on standardised tests

Data about the participants' cognitive and language skills was collected at the start and end of the study using the British Ability Scale II (BASII; Elliott et al, 1996), and comparisons in standardised scores of progress between the intervention and control groups of children were made. The BASII was chosen because of its reliability and validity, and suitability for use with young children (Sammons et al, 2005). Four batteries of tests from the BASII were selected as relevant to the focus of the study – Naming Vocabulary, Early Number Concepts, Reasoning (Picture Similarities) and Verbal Comprehension. Appropriate age-related starting points were used, as were associated decision points to ensure that the tests were terminated as appropriate. Data was gathered as a raw score, an ability score and the standardised score (which takes into account chronological age and ability score), and analysed using a statistical package. Planned comparisons were made between intervention and control groups.

In addition, qualitative data regarding children's attitudes and beliefs about thinking, and their metacognitive behaviour in lessons before and after the intervention was collected. This was examined to see whether an explicit focus on thinking, and the chance to reflect on this during VSRD had an impact on children's awareness of thinking and their metacognition.

2.3 Semi-structured interviews

Semi-structured group interviews were held with the intervention children at the start and end of the study to find out their views regarding the nature of thinking before and after the intervention. This replicated typical day-to-day classroom experiences, and supported deeper responses than individual interviews would with children of this age (Clark, 2003). The interviews were conducted in a quiet room, and typically lasted for 15-20 minutes. The children were asked their views on what they thought thinking was, what they did when they had tricky things to think about, and what helped them to think best. Given possible limitations of interviewing young children (MacNaughton et al, 2006), a projection technique was also used (Cohen et al, 2011). Children were asked to look at photographs of people engaged in different activities and identify those in which they thought thinking was taking place. These included a photograph of a child reading a book in class, a photograph of children writing, and a photograph of children reading books outdoors. Responses to these photographs were compared at the start and end of the study. On the initial visit, children were also offered the opportunity to draw 'what you look like when you are thinking', to gain additional insight (Mitchell, 2006; Coates and Coates, 2015). On the final visit, children were shown their original drawings and asked to comment on them.

2.4 Lesson observation

In order to see if there was an impact of the intervention on observable metacognitive behaviour in lessons, non-participant observations were made by the researcher during focused tasks where the teacher worked with the intervention children. These took place on four separate occasions during the year as part of normal classroom practices, and

typically lasted for 20-30 minutes. Contemporaneous field notes were made and the session was videoed, analysed and coded using a framework of metacognitive behavior derived from the literature review. This framework supported the systematic identification of a range of indicators of metacognitive behaviour, and is summarised below:

Component of metacognition	**Type of behaviour**	**Terminology commonly associated**	**Citations include**	**Example**
Cognitive knowledge	Knowledge of oneself / others as a learner and factors affecting cognition	Person and task knowledge Self-appraisal Declarative knowledge	Flavell (1979) Kuhn and Dean (2004)	'I know what to do' 'She doesn't know how to do it'
	Awareness and management of cognition including knowledge of strategies	Procedural knowledge Strategy knowledge	Kuhn and Dean (2004) Flavell (1979)	'We've got to solve a problem' 'I think that's right but is it?'
	Knowledge of when/ where/ why to use a strategy	Conditional knowledge	Schraw et al (2006)	'Something is missing' 'This is like the one we did last week'
Cognitive regulation	Identification and selection of appropriate strategies	Plan	Whitebread *et al* (2009) Schraw *et al* (2006)	'We need to know which way to go'
	Attend to and awareness of task performance and understanding	Monitor/ regulate Cognitive experience	Whitebread *et al* (2009) Flavell (1979)	'this is so hard to do'

	Assess processes and products of learning	Evaluate	Whitebread et al (2009)	'we should build boxes – that would be quicker' 'this one is good isn't it'

Table 2: Components of metacognition, associated behaviours and literature

2.5 The intervention: Video Stimulated Reflective Dialogue

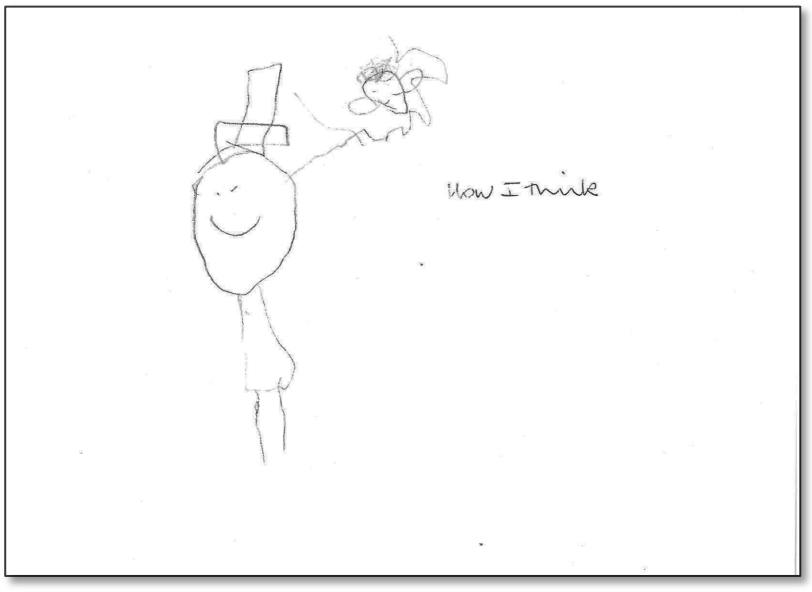
This study adapted the VSRD process, which has been shown to support metacognition in older children and adults, for use with children aged four to seven years. In each school, the researcher made an initial visit in order to meet the children and teach them how to use the digital camera. Intervention children were grouped in pairs and once they were able to use cameras confidently each pair was asked to make videos in their classes when they saw 'good thinking.' They were encouraged to make short film clips – no more than 2-3 minutes in length and were allowed to use the cameras in the indoor and outdoor provision. The resulting video clips were not used as raw data to be analysed by the researcher. Instead, the pairs of children uploaded their films to computers, reviewed them together (but independently of the researcher) and together selected parts that they wanted to talk to the researcher about. Ownership of every step of this process was placed firmly in the children's hands. The episodes that were selected formed the stimulus for the dialogue between the researcher and the children. This was structured around some broad questions (eg Why did you choose this clip to watch? What do you think is happening in this clip? Did you both agree that this was showing good thinking?). Although the focus of the discussion was on the children's views about thinking, the researcher remained sensitive to the direction of discussion that the children wanted to take. This dialogue typically lasted for 15 – 20 minutes, and took place in a quiet room, immediately after the lesson, and the dialogue was recorded, analysed and coded for emerging themes.

3 Results

3.1 Children's initial thinking about thinking

At the start of the study, the children's prevalent view of thinking was that it was something that happened in quiet classroom contexts. Photographs showing children playing, laughing or outside were not selected as examples which showed thinking. Responses given as to why included a belief amongst more than half of the children that you cannot talk and think at the same time – because talking '*might disturb you'* thinking.

Children's drawings of thinking conformed to typical images, and were characterised by common symbols. For example, a common symbol used by all the children was that of thoughts drawn as a bubble coming from the head, replicating a socially accepted representation of thinking.

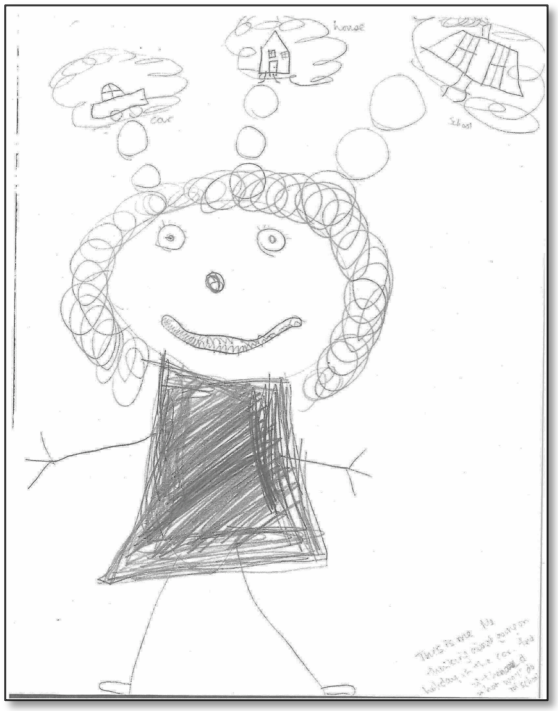


Drawing 1 Child's drawing of 'How I think'

Drawing 1 shows a typical response - the picture shows a person who has a cloud/ bubble coming from their head.

When asked what was happening, the child said that *'This is me thinking about things. That's my thinking coming out'* (pointing to cloud). The children were able to indicate thinking using the symbol of a bubble or a cloud, but not elaborate on what happens when they think. In 86% of the pictures the children drew a single thought coming from their head, and reported that they could only think about one thing at a time.

In the following drawing, the child drew a picture that indicated that thinking could be about various things. The child also used a familiar representation of thinking – bubbles coming from the head, but these showed thinking 'about school, home and the car'. This child could not explain in any more detail what happened when she thought, or tell me any of the strategies that she might use when thinking. Thinking about multiple thoughts was only seen in two pictures.



Drawing 2 Child's drawing of 'What I think about'

Common across all six schools was the fact that in their drawings, the children associated thinking as something happening in their heads.

When asked to talk about what their drawings showed, nearly all of the children made very general comments and typically said that they had drawn pictures of them thinking about being 'good', 'kind' or 'nice' – ie they focused on behavioural features. Most said that they were good at thinking. Three noted that sometimes it made them tired. When asked to explain why that might be the case, two children said that it was because it is hard. The third, said it was because thinking is '*complicated*', and suggested that it was tricky to think – and also tricky to talk about what it was like to think. This child said '*I just don't know what thinking is so I have drawn a muddle*'.

Drawing 3 Child's representation of thinking as 'a muddle'

This was the only drawing to show thinking as complex, with many ideas (shown as squares and bubbles) with connecting lines and boxes all around the page. These join things that the child thinks they want ('I Fig I Wot') to what they think about – which is what they will play with ('wil paj wils'), which also connect to other bubbles and ideas.

This view of thinking processes involving the making connections is in line with the work of researchers such as McGuinness (no date), who suggest that a crucial thinking skill involves being able to make connections.

When children were asked to describe 'good' thinking, and what they did when they were thinking, responses often included the statement '*We put our thinking caps on'*, however the children were unable to elaborate on what this meant in terms of what they would actually do. Whilst the 'extent to which children can articulate their thinking about thinking is clearly dependent upon their language development' (Tanner et al, 2011:76), these children could not begin to explain about their thinking beyond this standard phrase. Yet they could elaborate on other questions asked, which suggests that the idea of 'putting on a thinking cap' was a routine response rather than a metacognitive strategy. When asked what they would do when they were stuck with their work, most of the thirty-six children responded by saying they would ask the teacher, two said they could ask a friend and one said they would '*think about it'*. They did not demonstrate any deeper awareness of the metacognitive strategies they could use in tricky situations – or at least they did not verbalise these.

When making videos and in the initial VSRD that followed, common themes emerged across schools. These themes demonstrated that children were equating thinking to certain behaviours – and to tasks connected to perceptions of 'work' rather than 'play', or in several cases because they wanted to make a film of their friend. Children identified 'good thinkers' to make films of as children who were:

- doing good work / hard work
- colouring neatly
- listening to the teacher
- being good.

- best friends/ friends of the children and/or
- perceived as 'clever'

VSRD with the children also indicated that certain tasks such as writing were was seen as thinking well, but the children found articulating reasons why difficult, as illustrated in the following transcript:

R: Can you tell me why you made a film of these children?

Child C: Josh was writing.

R: So when he was writing he was doing good thinking? I wonder what about?

Child C: ummm thinking about ….umm just thinking.

Transcript 1: Thinking and writing

There was only one example in the initial VSRD dialogues where children made a connection to a particular strategy relating to thinking. The children had selected to discuss a clip that showed a child colouring in, but there was some debate between the pair about whether they were thinking or 'just colouring'. To explore this further the clip was watched again, and from the resulting dialogue Child D was able to demonstrate some metacognition in the form of Strategy Knowledge:

Researcher: Let's watch him again, how did we know he was thinking? (We watch the clip). Do you agree with (child C) – if you colour in you do think?

Child D: Yes. But if you don't want to think you can just colour.

R: You both have very interesting ideas. I am still wondering how I can find out how you know someone is thinking.

Child D: Actually not Tom – see Kade is the best thinker. He is reading and it's a new book and if he gets stuck he has to sound it out.

R: Can you tell me what you mean?

Child D: You know. You go 'a-n-d' and say the letters to make the word if it's hard. That's really a lot of thinking.

Transcript 2: Demonstrating awareness of strategy knowledge.

3.2 Children's thinking about thinking at the end of the study

At the end of the study, children's views on the types of activity that involved thinking showed a marked difference from the initial visit. They selected a wider range of photographs, including those in non-classroom contexts compared to the initial visit as showing thinking. This may indicate that the children had become aware of the complexity of thinking and better aware of its varied nature as the study progressed.

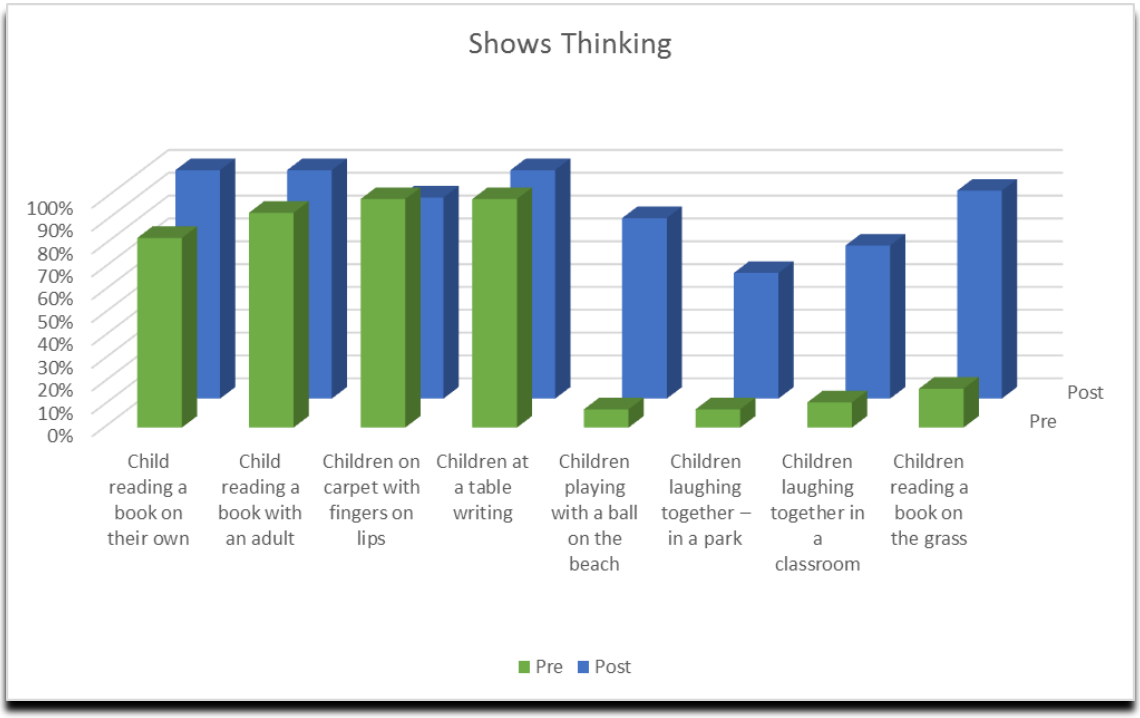


Figure 1: Children's views of whether an activity shows thinking pre- and post-intervention

The graph shows that the number of children who thought that the photograph 'sitting with fingers on lips' was an image of thinking was the only one that had fewer responses post-intervention compared to pre-intervention.

When asked why it might not show thinking, one child responded by saying '*You might just be waiting. You know. To find out what you are going to do.'* Another said *'Well, you know. You might not be thinking 'cos you are just going to be told what to do.*' They seemed to be associating thinking with a more active type of involvement, and sitting with fingers on lips was perceived to be a passive activity where they were just waiting.

In final VSRD episodes, the children in all schools demonstrated a move to use more specific vocabulary relating to thinking when they explained who and what they had chosen to film. For example, reasons included good thinkers being those who '*make good connections'*, or children who were '*saying about what they think'*. Because a child was a 'friend' was not given as a reason, and although in one class there remained a tendency to film children who were quiet and well-behaved, this was less frequently cited as a reason than on the initial visit.

The idea of thinking involving keeping pictures and images in your head as an effective strategy was a commonly held view. For example, one child explained that if you get stuck reading: '*you have to sound out the word – it's like having the letters in your head and putting them together – and that really is a lot of thinking. You need to look to remind you what to do'*. Peers demonstrating such strategies were frequently selected for filming. The following transcript provides an example of how children were able to demonstrate metacognition in the form of strategy knowledge, but also conditional knowledge of when and where to use this strategy.

Child A: We filmed James. He didn't look at the camera, he looked at his work.

R: Why was that important?

Child A: He was really looking and concentrating. I saw him.

R: What do you think he was concentrating on?

Child A: The number line.

R: What number line – I can't see a number line?

Child A: He didn't have one, only in his brain so he was thinking hard about how to do it with the numbers in his head. He could use these 'cos when the numbers are big it is really good to use the number line in your head to help.

Transcript 3: demonstrating conditional knowledge

Furthermore, although putting on a 'thinking cap' was still something children referred to at the end of the study, their explanations of this went beyond the standard response given on the initial visit, and demonstrated further procedural and strategic metacognitive knowledge. For example, in the transcript below the child explains how the 'thinking cap' will help, showing an awareness of others as learners.

Child A: I chose Jack 'cos he was really thinking hard.

R: Oh – how do you know that?

Child A: He put on his thinking hat.

R: What's that? What's his thinking hat?

Child B: It's got batteries.

Child A: To make his thinking strong.

R: That is really interesting. But I wonder how you know he's got his thinking hat on – I can't see it, and I'm not sure how it works.

Child A: 'Cos he is looking at work. He's got numbers in his head then he is using his fingers and his head to work it out. The thinking hat helps your brain get in order.

Child B: Yep. It helps you find the ideas from your brain, and if you don't know the answer you can use something like fingers to help you work it out.

Transcript 4: explaining the 'thinking hat'

Children were enthused by being shown their original drawings again, and all said they thought their picture was funny, and that they would now improve it. Some of these reasons were because the pictures were 'babyish', but for others, it was because the picture was no longer an accurate representation of their thinking. For example, four children stated that they would now draw a picture that showed lots of ideas going round in their heads, not just one. One commented that *'I do not think my thinking is really a bubble. It's more like lots of ideas that come and go and then get inside my head for when I need them'*. Another laughed and said '*it's a bit more complicated than that*'.

3.3 What is the impact of VSRD on young children's metacognitive development?

Lesson observations revealed that there was evidence of young children displaying metacognitive behaviours in every lesson throughout the study. Analysis indicated that at the start of the study, the two most commonly occurring behaviours related to children making reference to the strategies that they would use (in four of six classes), and children showing an awareness of themselves as learners (in three classes). These behaviours were generally demonstrated after a direct question from the teacher, such as 'Why are you moving the numbers along the number line?' to which the child was able to explain the strategy that they were using. In one class there was evidence of conditional knowledge or evaluation taking place.

At the end of the study, after engaging in VSRD, lesson observations indicated that the children were able to demonstrate a wider range of metacognitive behaviours, and these occurred more frequently than on the initial visit.

For example, children were better able to evaluate their own learning '*I don't know why I bought the shark book. I should have chosen the dinosaur one 'cos that would have helped me work out the answers more better'*. They also demonstrated awareness of when and why to use strategies '*I think we should do the thing where we look at both .. find the same things. Like the packets with writing on – we could write that down*.' These behaviours did not always result from a direct question from the adult – sometimes they took place spontaneously, in child-to-child interactions. Children who had undertaken VSRD were more aware of a number of behavioural cues as indicators of thinking at the end of the study. They referred to body language cues as ways to see thinking taking place. Making a 'thinking face', tapping chin or head, looking in the air and put a finger by the forehead were also given as reasons to select certain children to film.

3.4 What is the impact on performance on standardised tests?

As to be expected in a study that took place over an academic year, children in both the intervention and control group made progress in all four cognitive tests that they were given. The following table reports on the mean scores for each group in the pre and post-intervention tests, and shows that in all but one test both control and intervention group mean standardised scores increased. This was not true for the control group in the Early Number Concepts test, where mean scores remained the same.

Test	**Naming Vocabulary**		**Early Number Concepts**		**Verbal Comprehension**		**Reasoning**	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Intervention	33	44	45	48	46	50	44	49
Control	36	41	44	44	45	48	43	45

Table 1 Mean standardised T-scores for each test item for Intervention and Control groups

The results of statistical analysis indicate that in three of the four tests (Naming Vocabulary, Early Number Concepts and Reasoning), the intervention group made significantly more progress during the course of the study than the control group did with moderate effect sizes in all cases. Naming Vocabulary: Levene's test for equality of error variances >0.05 (p=0.19), ANCOVA performed satisfies the homogeneity of variances assumption (F (1,61) = 5.062, p= .028 , p= 0.79). Early number concepts: Levene's test for equality of error variances >0.05 (p=0.782), ANCOVA satisfies the homogeneity of variances assumption (F (1,61) = 5.296, p= .025 = .082) with a medium effect size value (Cohen, 1988). Reasoning (Picture Similarities): Levene's test for equality of error variances >0.05 (p=0.121), ANCOVA satisfies the homogeneity of variances assumption. (F (1,61) = 6.162, p= .016, = .095) with a medium effect size value (Cohen, 1988).

The only test not to show a significant difference between control and intervention groups was the Verbal comprehension test. The Levene's test for equality of error variances was >0.05 (p=0.145), so the ANCOVA performed satisfies the homogeneity of variances assumption. In this case, we cannot reject the null hypothesis that there is no difference between the intervention and control groups on post-intervention scores at the 5% level (F (1,61) = 2.330, p= 0.132)

4 Discussion

VSRD was used to support the children reveal, reflect and consider their thinking in a manner not evident at the start of the intervention. The use of the video

reflection may assist deeper reflection and assist the metacognitive development of the children.

The VSRD process allowed children the opportunity to discuss their thinking and decisions with me, and one another, and in doing so allowed reflection on what went on in each class.

The children were able to engage with the process of VSRD, identifying and filming episodes within their lessons, and then discussing these. The choice of episode to film became more closely aligned to behaviours associated with thinking in visit 2, and the children were better able to articulate their reasons for selection on the second visit.

The findings indicate that encouraging children to discuss and reflect upon their thinking using their own videos may also support their cognitive development. This supports the work of Robson (2010), who suggests that using video to support children's reflection is both a valuable research tool but also a useful stimulus for pedagogical purposes since it acts as a stimulus for discussion. Von Glaserfeld (1995) suggests that reflection on mental operations may result in the individual becoming more aware of their thoughts and changes in knowledge. Robson (2016:192) suggests why this might be the case – indicating that 'the kinds of talk that occurred in RDs (reflective dialogues), focusing on what children were thinking about rather than just recall of an activity, may be particularly supportive of young children's self –regulation and metacognition'.

However, it is also possible that the intervention children were more relaxed with me on the final test than the control group – I had formed a relationship during my school visits with the intervention children and had met them five times prior to the final testing. I had only met the intervention group once before my final visit (although

by then I was a familiar face in school), and it is possible that this had a small impact on how they performed in the tests. This is an area that could be further explored in future research projects.

Throughout the visits I adopted the role of a supportive guide and when analysing the data gathered I could see that there were times when my questioning revealed insights into the children's thinking that they may not have articulated independently. My presence may have assisted reflection on what took place. VSRD episodes with the children indicated a growing awareness of, or willingness to articulate, an understanding of thinking.

5 Conclusions

This study has all the limitations of a small-scale piece of research, but nonetheless the implications are important. The children involved in the study demonstrated development in terms of their ability to articulate an awareness of thinking, and also behaved more metacognitively in lessons at the end of the study. The results of the statistical analysis of standardised tests indicated that the children in the study outperformed a control group in three of the four tests at the end of the study.

At the start of the project, all of the children succeeded in making a short film of someone that they had identified as doing good thinking, and were able to discuss the film with the researcher. In all of the classes, the children were able to talk about the reasons that they had chosen certain children to film. They generally chose friends, or children who were conforming to perceptions of 'good' behaviour – such as sitting well or being quiet.

Discussion with the children indicated that their understanding of thinking changed over the course of the study. They recognised a greater range of behaviours as

being ‘thinking’ by the final visit, and were able to describe what ‘good thinkers’ do particularly with reference to strategy and understanding. VSRD episodes with the children indicated a growing awareness of, or willingness to articulate, an understanding of thinking.

The VSRD process allowed children the opportunity to discuss their thinking and decisions with the researcher, but also with one another, and in doing so allowed reflection on what went on in each class. The children were able to engage with the process of VSRD, identifying and filming episodes within their lessons, and then discussing these. The choice of episode to film became more closely aligned to behaviours associated with thinking in the final visit, and the children were better able to articulate their reasons for selection. The researcher’s role in the VSRD dialogue was important. Several of the transcripts illustrate how children articulated their thinking as a result of the questioning that took place, and may not have done so without the prompting that a reflective dialogue can support.

Clearly there are limitations with this study. For example, certain tasks may have lent to themselves to demonstration of metacognitive behaviours more than others, and teachers were free to select any activity that they wished when I came in to observe. Since the study took place over one academic year, development in communication skills for example is to be expected, and this might have meant children were better able to articulate their thinking at the end of the study. They may also have felt more comfortable with the researcher by the end of the study, and therefore contributed more. Further research in this area is warranted.

Nonetheless, the implications of this piece of research for teachers are important. Swanson (1990) suggests that sophisticated metacognitive ability is a precursor to sophisticated cognitive ability. Metacognitive ability is developmental, but can be

improved through practice (eg Flavell, 1987). Therefore this study, which indicates that VSRD is a strategy which allows young learners to see, discuss, explore and develop metacognition, is a useful one.

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