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Observing young children's creative thinking: engagement, involvement and persistence

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This paper looks at young children's creative thinking as inferred through observations of their activities. A total of 52 episodes of child-initiated and adult-initiated activities in 3- to 4-year-olds in an English Children's Centre were analysed using the Analysing Children's Creative Thinking (ACCT) Framework. Results showed that activities such as gardening and construction were as valuable for supporting creative thinking as ones traditionally associated with creativity, for example, music and painting. Outdoor play of all kinds and socio-dramatic play were particularly effective contexts. All adults played a significant role in facilitating children's initial engagement in activities, and at supporting their speculative thinking and use of prior knowledge. Teachers were often more successful than other adults in supporting the acquisition of new knowledge. Child-initiated activities featured the highest levels of involvement, and were associated with trying out and analysing ideas, flexibility and originality, imagining and hypothesising. This was particularly evident in group or pair play. Children were also more persistent in child-initiated activities. Evidence of risk-taking behaviour was low, although more apparent in child-initiated activities than adult-initiated activities, or activities in which adults were present.

Keywords: creative thinking; creativity; observation; child-initiated; engagement; involvement; persistence

Introduction

There is increasing recognition of the importance of supporting creativity and creative thinking at all phases of education (Siraj-Blatchford 2007).This paper presents data produced as part of the Froebel Research Fellowship Project, 'The Voice of the Child: Ownership and Autonomy in Early Learning', at the University of Roehampton. In particular, it looks at young children's creative thinking, as inferred through observations of their everyday behaviour whilst they engage in child-initiated, adult-directed and adult-led activities in an early childhood setting.

Creative thinking and creativity

Creativity, as an overarching concept, has often been seen as the preserve of arts-based activities, such as art and music, a conception which may be damaging to children's creative development (Prentice 2000). However, in recent years more emphasis has been placed upon creativity as a 'universal capability'

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(Siraj-Blatchford 2007, 7), along with the idea that everyone has creative potential (Runco 2003). Looked at in this way, creativity can be an everyday event (Richards 2006), visible across the broadest range of everyday contexts in daily life. Often referred to as 'little c creativity' (Craft 2003; Kaufmann 2003), this approach views creativity as 'a capacity of human intelligence, rather than a subject or event' (Prentice 2000, 150).

What, though, is the relationship of creative thinking to creativity? The National Advisory Committee on Creative and Cultural Education (NACCCE) defines *creativity* as 'imaginative activity fashioned so as to produce outcomes that are both original and of value' (1999, 29), whilst Sternberg defines *creative thinking* as 'thinking that is novel and that produces ideas that are of value' (2003, 325–6). They share ideas of imagination, and originality or novelty – features of most standard definitions of creativity (Kaufmann 2003) – but differ chiefly in outcomes, with the NACCCE focusing on something tangible, and Sternberg identifying ideas. Sternberg's use of 'novelty' rather than 'originality' highlights that, to count as creative, someone's idea does not have to embody thinking that has never occurred before in anyone. Rather, creative thinking is thinking which is new for *that individual.*

The second key idea in both Sternberg's (2003) and the NACCCE's (1999) definitions is the notion of value. This has two implications. First, it implies that creativity is inherently social. Amabile suggests that 'A product or response is creative to the extent that appropriate observers independently agree it is creative' (1996, 33). The second implication links creative thinking to so-called critical thinking. Choices and critical evaluations are made by both participants and observers as part of any creative process. The NACCCE suggests that 'creative thinking always involves some critical thinking' (1999, 31).

Sternberg identifies some key 'decisions', discernible in children's behaviour, that, in his view, underlie creative thinking, including redefining problems, analysing ideas, taking sensible risks, tolerating ambiguity and allowing time and mistakes, inter alia (Sternberg 2003, 333–5). These 'decisions' may be helpful indicators of creative thinking. Similarly, in her analysis of creative thinkers, Meadows (2006) identifies some characteristic attributes. Amongst these are choosing challenges rather than avoiding them, valuing appropriateness, tolerating risk and displaying the ability to both confront uncertainty and enjoy complexity. These attributes imply a role for qualities such as self-efficacy and self-esteem. Hypothesising, and making leaps of the imagination require confidence on the thinker's part, and a willingness to take risks, suggesting a key role for motivation, particularly intrinsic motivation (Amabile 1996). Amabile's 'intrinsic motivation hypothesis' of creativity suggests that 'the intrinsically motivated state is conducive to creativity, whereas the extrinsically motivated state is detrimental' (1996, 107).

The project

Theoretical constructs

The project is underpinned by some guiding theoretical constructs, in particular sociocultural theory and the social context of early learning, drawing on the work of Vygotsky (1978, 1986) and Rogoff (2003), and the views of Fleer (2006) and Kağitçibaşi (2007) with regard to the cultural diversity of children's learning

experiences. The influence of Amabile's (1983, 1996) 'componential framework' model of creativity reflects a 'Social-personality' approach, drawn from the field of social psychology.

Research question

The findings of earlier stages of the 'Voice of the Child: Ownership and Autonomy in Early Learning' project (see for example, Fumoto and Robson 2006; Robson and Fumoto 2009; Robson and Hargreaves 2005) indicated the value of looking at young children's creative thinking both at home and in early childhood settings. Whilst the project has considered both contexts, the emphasis in this paper is on young children's experiences in the latter: data on home perspectives are available in the study of Greenfield (2012). Accordingly, this paper addresses the research question: How do children express their creativity and creative thinking in early childhood settings?

Method

Participants

The research took place in Westbrook (name changed) Nursery School Centre for Children and Families. Staff from the Early Childhood team at the University of Roehampton have a long history of collaborative work with the Centre (involvement of centre staff in student sessions, practitioner training, professional development and joint research), and the Centre had identified children's creative thinking as a priority for development. The setting caters to the needs of approximately 85 children and families. Approximately two-thirds of children come from a wide range of minority ethnic backgrounds, with approximately 25% speaking first languages other than English and approximately 20% of the children having a range of special educational needs and/or disabilities.

Participants were 30 children aged 3–4 years, their key persons (teachers and nursery officers) and other professionals, including a speech, language and communication therapist, music, play and movement therapists, an Autistic Spectrum Disorder specialist teacher, an artist, family workers and a Forest School Leader, parents and carers and two researchers.

Procedures and research tools

In this short-term longitudinal case study, data were produced over a period of five months, with a researcher attached to each of the two home bases, facilitating more in-depth focus on a smaller group of children and practitioners.

Episodes of child-initiated and adult-directed or adult-led play activities were video recorded in all areas and analysed and coded using the Analysing Children's Creative Thinking (ACCT) Framework (Fumoto et al. 2012), set out in Figure 1. This framework, which draws particularly on the work of Sternberg (2003), Claxton (1999), Craft (2003), Meadows (2006) and NACCCE (1999), is underpinned by the view that young children's creative thinking can be inferred by observing a range of aspects of their everyday behaviour, as they engage in activities that have meaning and purpose for them (For much fuller information on its development see Robson

CATEGORY	OPERATIONAL DEFINITION	EXAMPLE
E: EXPLORATION		
E1: Exploring	Child is keen to explore, and/or shows interest in the potential of a material or activity.	J is trying out buttons on the keyboard, causing a rhythm to play. He plays individual notes with alternate hands, smiling and watching carefully as he makes a note pattern.
E2: Engaging in new activity	Child is interested in becoming involved in an activity and taking an idea forward. The activity could be of his/her own choice or suggested by another child or adult.	A approaches a Table covered in paint, where previous children have been working. She picks up a piece of paper from a pile and lays it on the Table. Turning it over she spreads the paint that is now printed on it with her fingers.
E3: Knowing what you want to do	Child shows enjoyment or curiosity when choosing to engage in an activity.	K and adult A are standing at the woodwork bench. K has chosen a piece of wood, which he holds. He points to the back of the bench: 'In there.'
I: INVOLVEMENT &ENJOYMENT		
I1: Trying out ideas	Child shows evidence of novel ways of looking and planning: uses prior knowledge or acquires new knowledge to imagine and/or hypothesise, or to show flexibility and originality in his/her thinking.	A is in the block area. She picks up 3 semi-circular blocks and lays two of them on the floor to form a circle, which she later calls a 'cheese'. She then puts one foot on each block and 'skates' across the carpet on them.
I2: Analysing ideas	Child shows either verbal or behavioural evidence of weighing up his/her idea, and deciding whether or not to pursue it.	R, N and K are building a tunnel from construction pieces. R watches as N and K build a cuboid, N puts a piece in front of the open end. R: 'No, they won't be able to get out.'
I3: Speculating	Child makes a speculative statement or asks a question of him/herself, or of other children or adults, relating to the activity.	H is outside, looking at herbs in the garden with adult J. H points to a herb and says 'Yes, but why is this spiky?'
I4: Involving others	Child engages with one or more children or adults to develop an idea or activity: may articulate an idea, seek to persuade others, or show receptivity to the ideas of others.	A, J and C are playing a 'Father Christmas' game in the block area. A: 'I'm Rudolph.' J: 'And he's Rudolph too….No, he…you can be… C: (to A) 'You Comet, you be.' A: (to C) 'Why don't you be Comet? C: 'No, I'm Donner.'
P: PERSISTENCE		
P1: Persisting	Child shows resilience, and maintains involvement in an activity in the face of difficulty, challenge or uncertainty. He/she tolerates ambiguity.	In the sandpit E has been filling a large tube with dry sand. He picks up the tube and goes to fill the hopper on a nearby toy lorry, but the sand runs out of the end of the tube. He looks up, smiles, but does not break his concentration, but instead uses his hands to fill the hopper.
P2: Risk taking	Child displays a willingness to take risks, and to learn from mistakes.	M is at the clay. She tries to fill a bottle by inverting it in to a full cup of water, but this causes the water to flow out on to the Table. She abandons this and pours water straight from the cup onto the clay.
P3: Completing challenges	Child shows a sense of self-efficacy, self-belief and pleasure in achievement: shows conscious awareness of his/her own thinking.	M has been at the mark-making Table, using felt tip pens and paper. He finishes his drawing. M: 'I've finished' (smiling). Adult: Mm. M pats the paper and nods, then picks up the pen and makes a large 'M' in the bottom right corner. 'That's my Muh.' (He continues to write the other letter of his name.) 'I did it, I writ may name myself.'

Figure 1. The Analysing Children's Creative Thinking (ACCT) Framework.

2012a). The episodes were event driven, as it was hoped to capture more of the development of creative thinking by observing complete events, however, long or short in duration. This was supplemented by data from a number of reflective dialogues (RDs) between children and their key persons (for further discussion of the

use of RDs see Robson 2010, 2012b). The time period of data collection included a 'Creative Week', during which the Centre was visited by various creative artists who led the children in a range of 2D and 3D art and craft and music activities.

Ethical guidelines of the University of Roehampton were adhered to. Consent for video recording was obtained from the centre head teacher, practitioners, parents and children. Children were reminded of their rights to participate or withdraw at all times, and researchers were sensitive to children's implicit consent or dissent to participate (as expressed by gesture, action or verbally) throughout. At no time were camcorders taken into areas regarded as private or confidential, or where children's personal care was being attended to.

Coding strategy

The ACCT Framework (Fumoto et al. 2012), developed during a previous phase of the project, was used to code children's behaviour. A copy, with operational definitions and examples, is shown in Figure 1.

Data analysis and discussion

Fifty-two recordings were analysed and coded. A total of 15% of observations (10% initially, followed by a further 5% after discussion) were double coded by two researchers independently, and outcomes compared, to support consistency and inter-coder reliability.

The recorded episodes were of differing lengths ranging between 1 minute 30 seconds and 43 minutes, with an average length of between 7 and 8 minutes. Using the Early Years Foundation Stage (DfES 2007) definitions of child-initiated, adult-directed or adult-led activity, the relative balance of activities, including whether occurring indoors or outside, is shown in Table 1. The predominance of child-initiated activity reflects the Centre's emphasis on organisation and planning to promote children's opportunities for choice and self-direction.

The data show that all participant children displayed evidence of creative thinking, although in some this was more frequent than others (further details appear below). The occurrence of examples of creative thinking (an action, gesture or talk of some kind) varied across the children from about every 11 seconds to every 72 seconds, across all of the activities and all of the children. (Throughout this paper 'high' frequency of examples of creative thinking is defined as anything up to every 30 seconds, 'medium' is defined as frequencies of between every 31 and 50 seconds and 'low' frequency is defined as less than every 50 seconds.)

Table 1. Recorded episodes, divided into child-initiated, adult-directed and adult-led groups, and indoor/outdoor contexts.

	Child-initiated	Adult-directed	Adult-led	Total
Indoors	26	8	6	40
Outdoors	8	3	1	12
Total	34	11	7	52

In addressing the research question: 'How do children express their creativity and creative thinking in early childhood settings?' the data are considered from three perspectives:

(1) Responsibility for choice of activity (child-initiated, adult-directed or adult-led),
(2) Type of activity,
(3) Type of creative thinking behaviour.

Responsibility for choice of activity

The balance of child-initiated and adult-directed activity given in Table 1 reflects the Centre's emphasis on child-initiated activity. However, the boundaries between these definitions are often difficult to sustain, and may also change in the course of an activity. For example, in 11 of the 'child-initiated' activities, an adult was nearby at times, but in the role of co-player or companion, rather than providing input or instructions.

The total frequencies of coding categories, which show the relative distribution of creative thinking behaviour according to whether the activity was child-initiated, adult-directed or adult-led, given in Table 2. Some behaviours fell into more than one category and were, therefore, coded more than once.

In order to investigate the extent to which the distribution of these activities might differ between child-initiated and adult-organised events, and since some of the frequencies in the second and third columns of Table 2 were quite small, the frequencies in these two columns were aggregated and a 10×2 chi-square test was performed on the resulting overall frequency table. This indicated that there was a significant association between the frequency distributions of the 10 categories for the two types of activity ($\chi^2 = 34.21$, df $= 9$, $p < 0.05$). Further inspection of the data suggests that there are some interesting differences in creative thinking behaviour according to whether or not children or adults were responsible for initiating an activity. It is evident that some aspects of young children's creative thinking behaviour occur more frequently than others (in particular 'Trying out ideas', 'Analysing ideas' and 'Involving others') and also that these may also occur more frequently in activities initiated by the children. Other aspects, such as engaging in

Table 2. Observed behaviours in the three ACCT categories of exploration, involvement and enjoyment and persistence.

	Child-initiated	Adult-directed	Adult-led	Total
E1: Exploring	4	0	3	7
E2: Engaging in new activity	4	5	6	15
E3: Knowing what you want to do	17	9	7	33
I1: Trying out ideas	200	31	33	264
I2: Analysing ideas	66	13	14	93
I3: Speculating	15	6	5	26
I4: Involving others	106	43	17	166
P1: Persisting	34	5	3	42
P2: Risk taking	8	1	0	9
P3: Completing challenges	27	7	4	38
Total	481	120	92	693

Note: 34 child-initiated, 11 adult-directed and 7 adult-led activities.

new activity, are associated more strongly with adult direction and involvement. These differences are further explored below.

Type of activity

Categorising young children's activities can be challenging, especially given the free-flowing nature of their play. Accordingly, activities were categorised using the dominant form of activity in an episode. They comprise 2D activities such as mark-making, painting and printing (11 episodes), 3D activities with clay, dough, paper construction and woodwork (8), construction (4), gardening (5), pretend play (8), sand and water (4), music (4) and mathematics, puzzles and a category of 'free play' (total 8), such as a child finding some sticks outdoors and using these in various ways, or a group of boys exploring a box of magnets and toy cars.

It is not our intention here to compare different types of activity for their creative potential (the data are too small to support any such comparison), but it is worth noting that activities often designated as 'creative' (for example, as in the Early Years Foundation Stage, DfES 2007, category of 'Creative Development') were no better at supporting and developing young children's creative thinking than any other type of activity. Indeed, other types of activity were often more successful. Overall about half of the 'creative' episodes led to the medium and higher frequencies of creative thinking. In the case of 'non-creative' activities, this figure rose to nearly three quarters. Two possible factors accounting for this are that the 'creative' activities in this sample were often associated with adult direction (a number of them having taken place during a 'Creative Week', including activities led by adults from outside the Centre), and more likely to take place indoors. In the case of the first factor, the data here endorse the view that child-initiated play may be more supportive of creative thinking (Craft et al. 2008). In the case of the second factor, the differences between indoors and outdoors as contexts for creative thinking may be significant. The vast majority of outdoor play we recorded showed high levels of creative thinking behaviour in the participants, whether alone or with others, and regardless of adult presence or absence. Some of these episodes involved activities unique to outdoors – digging and gardening, for example, whilst others were activities that also occurred inside, such as mark-making and construction. It may be that outdoors affords children time and space to think creatively (Robson and Hargreaves 2005), and facilitates a greater range of creative responses (Compton et al. 2010). The episode here with Asher exemplifies this sense of time and space, and freedom outdoors:

> Asher finds 2 short sticks. He first uses them in a 'bow and arrow' shooting pose, aiming in different directions and frowning. Running back to the covered area he notices the wind chimes high above his head. He uses the sticks with alternate hands to strike the chimes, stretching and jumping up high. He looks at adult A, who says 'Lovely'. He looks pleased. He hits the chimes again, and then taps the two sticks together. He calls 'Tidy up time' eight times, striking the chimes between each call. He alternates between this and 'bow and arrow' poses, then walks over to a table and taps out a rhythm on the edge. He then adds a big jump to his striking routine, and repeats this four times . . . He later picks up a set of jingles he spots nearby, jingling and jumping to hit the chimes simultaneously. He sees this does not work well, and abandons the jingles.

One type of activity which may particularly afford young children opportunities for displaying and developing their creative thinking is pretend play, emphasised by Singer (1973) and Vygotsky (2004) as valuable for creative and flexible thinking. Pretend play, particularly socio-dramatic play, was the most likely activity to lead to high levels of creative thinking. A comparison of episodes of pretence and episodes of 'creative' activities showed similar frequencies of 'trying out ideas', particularly imagining and hypothesising, but the activities involving shared pretence had much higher incidences of 'involving others', particularly in articulating ideas and persuading others, as in the following episode of Sapphire and Amanda, as they play with dolls:

> Sapphire: This is for baby, bibs are for babies (she has difficulty fitting it on the doll's neck, and takes it off and puts it on the floor). That doesn't work, that one (Amanda bends down, picks it up and holds it out). No, that is for babies.
> Amanda: This one?
> Sapphire: That's your bib and this one is a baby's bib.
> Amanda: You know what, I don't have a baby.
> Sapphire: No, you are the little baby and I am your mummy and this is your little sister. You are the big baby and this is your little sister.
> Amanda: (crouching down) Pretend I'm the little two year old baby. (Sapphire nods and Amanda puts her hand on Sapphire's arm.)
> Sapphire: (smiling) No, you say goo goo.
> Amanda: But I say baby words.
> Sapphire: This is your little sister (folds bib and puts it in box, beside doll).

Much pretend play, particularly in this age group, is collaborative, providing a context for children to engage with others, hypothesising about their wishes and intentions, as they negotiate story lines, and imagine how co-players will feel, think and act.

Types of creative thinking behaviour

The data are considered using the three ACCT categories of exploration, involvement and enjoyment and persistence.

Exploration

The nature of recording children's spontaneous involvement in activities (even when these were adult-led/directed) meant that a child was sometimes already engaged in an activity before being noticed by one of the researchers, and recording started. This may have contributed to the relatively low number of behaviours in this category. At the same time, however, it was evident that children's exploratory play with materials and resources of all kinds proved a very strong context for their creative thinking. For example, Ella spent much of one afternoon using a digital camera. She explored what the camera could do, pressing buttons and observing the lens extend, taking pictures and looking at them on the camera screen. She also focused on seeing what she could do with the camera, as she held it out in front of her, watching the image change on the screen as she walked across the nursery with it, or as she used it to 'see' underneath the climbing frame, pointing it upwards. She involved others as she took their photographs, and showed them the results on screen. In talking later

about this, Ella told her key person that she had wanted to take pictures of her friend Charlene's eyes.

In another activity, Karl was outside. He had got himself a bucket and a pair of gloves, and gone over to a practitioner sitting nearby. She was already talking to another child, so he put down the bucket and stood in front of her, holding his gloves out. He then put them on her knees, and waited. It was clear that he was interested in becoming involved in an activity (E2) – gardening. He knew that he needed gloves for this so he had found some and waited for some help in putting them on, before he could take his idea forward.

The third aspect of exploration, 'knowing what you want to do' (E3) was often evident at different times throughout an activity, as in Maya's play with clay:

> Maya uses a rolling pin as a hammer, then makes dents in the clay, smiles at friend, lifts rolling pin off in triumph: 'yes!', several times.
>
> Maya shows great delight in this activity, which she repeats several times.

An interesting element of the data is the impact of adults on children's initial engagement and exploration. In discussion in the RDs, children often talked about making their own choices to enter an activity, with the presence of friends frequently cited as a reason for becoming engaged. Interestingly, though, the observations suggest that a significant phenomenon was the impact of adults on children's initial engagement and exploration. The data in Table 2 show that children's initial engagement in an activity was often the result of adult direction. 'Engaging in new activity' (E2) and 'Knowing what you want to do' (E3) are shown to be strongly associated with adult direction or leading. In the case of E2 this is particularly marked, with an (estimated) comparison of equal numbers of child- and adult-initiated activities showing adult-initiated activities as four times more likely to provide evidence of children engaging in new activity. The small size of the sample here means that such data are, at best, inconclusive, but it does suggest the value of further attention to this aspect of children's creative thinking.

In addition, this evidence may be very important for practice. Exploration, having an interest in taking an idea forward, and knowing what you want to do are aspects of behaviour which, by their nature, often occur at the beginning of children's engagement in an activity. They serve as conditions, even as 'gatekeepers' for children's ongoing involvement and persistence. Previous research by Hutt et al. (1989) found that gender was an important aspect here, with girls in their study more frequently opting for an activity where an adult was present. In this study we did not find this, and both boys and girls equally showed their keenness to explore and engage when adults were present at an activity.

Involvement and enjoyment

The majority of observations fell into this category. In particular, 'Trying out ideas' (I1), 'Analysing ideas' (I2) and 'Involving others' (I4) between them accounted for just over 75% of examples recorded. In the context of choice, our observations showed that child-initiated activities were much more likely to feature the highest levels of children's involvement, particularly in comparison to activities led by adults, or even where adults were present but not directing or leading. Laevers

believes that a key factor of support for higher levels of involvement (seen by him as an indicator of children's 'intense mental activity') is the opportunities children have for choice: 'the more children can choose their own activities, the higher will be their level of involvement' (Laevers 2000, 26). Siraj-Blatchford et al. suggest that 'freely chosen play activities often provide the best opportunities to extend children's thinking' (2002, 12). In child-initiated activities, children were over twice as likely to try out ideas, and to display more flexibility and originality, imagining and hypothesising, and also significantly more likely to analyse ideas and to involve others. In I3 (speculating), the likelihood of creative thinking behaviour was roughly equal between child- and adult-initiated activity.

One factor which seems to be important is the presence of play companions. High levels of involvement in the children were observed in over three quarters of the episodes of group play. Pair play between friends was also a strong context for supporting the children's involvement, with approximately 60% of pair play episodes having high levels of involvement, in contrast to solitary play, where only half of the episodes supported such high levels. In RDs, children often referred to the presence of friends as important, and friends have been shown to be more likely to succeed in problem solving activities than non-friends (Smith et al. 2011). Some children also talked about *not* wanting to play with children that they did not count as friends, and the impact this had on their choices of activity.

Looking at I1 ('Trying out ideas' – using prior knowledge/gaining new knowledge), one interesting aspect of the data is the role of adults in supporting young children in developing their knowledge. All adults in our study were skilful in encouraging children to make use of prior knowledge, such as reminding them of how to use resources, or ways of doing things. However, whilst using prior knowledge is important, Vygotsky's famous statement, 'What a child can do with assistance today she will be able to do by herself tomorrow' (1978, 1986), emphasises the value of the acquisition of new knowledge and insights, gained through joint thinking. We found that, of all adults, teachers were most successful in supporting children in gaining new knowledge. This is reflected in the excerpts below, showing teacher Anna and artist Catherine, engaged in the same activity. Whilst Anna models thinking, and engages in speculation and prediction with Jake, Catherine focuses on instruction and demonstration with Mimi:

Jake and teacher Anna:
Jake is holding the hammer with the ball end facing the nail, not the flat end.
Anna: 'I wonder if it works on that side?'
Jake turns hammer over.
Jake hits the nail with the hammer, whilst Anna holds nail in position. Jake pulls Anna's hand away.
Anna (moving her hand away): 'Oh! If I let go it's going to fall over!'

Mimi and artist Catherine:
Mimi picks up hammer and goes to hit nail with ball end.
Catherine (pointing to flat end of hammerhead): 'Bash it with this end' (turns hammerhead over) 'Bash the nail in there'.
Mimi is turning screwdriver anticlockwise on screw head.
Catherine: 'Turn it the other way, look, this way' (demonstrating).

It is interesting to speculate about why this might be the case. It may reflect the findings of both the Researching Effective Practice in the Early Years

(Siraj-Blatchford et al. 2002) and Effective Pre-school and Primary Education Project (Sylva et al. 2010) studies. Both studies conclude that adults with higher-level qualifications, particularly qualified teacher status (QTS), were most likely to encourage young children to engage in activities with higher cognitive challenge. Supporting children in the acquisition of new knowledge can be seen as embodying a higher level of cognitive challenge than asking them to recall or rehearse already acquired knowledge and skills. In addition, both studies found that the adult's knowledge of subject matter and the curriculum was central to this. Requirements for QTS in England place considerable emphasis on trainees' subject knowledge and teaching of the statutory curriculum, more so than other relevant early years qualifications such as the Level 3 Diploma for the Children and Young People's Workforce (CACHE 2012), and clearly more so than what may be required of other adults such as artists. As a result, teachers as a group (though not necessarily individually) may be more likely to be attuned to looking for potential opportunities to develop children's existing subject knowledge. It is, however, important to emphasise that it was only in this aspect, that of gaining new knowledge versus rehearsal of the known, that we found a difference in adult behaviours.

In 'Analysing ideas' (I2), the focus is on the ways in which a child might show some evidence of evaluating an idea to see if it works or makes sense. In the following example, Carla seems to be deciding when something is not working and then changing her strategy:

> Carla is printing. The big block she is using doesn't seem to work too well: she tests it with her fingers on the printing surface, seems to look up for help, and then discards it in favour of a different block.

Analysing ideas could also be seen when a child planned a strategy – describing how their work was going to go forward:

> Fardosa is mark-making at an easel: 'I need black for that'.
>
> She adds some tall purple lines: 'I need blue. For here, here, here, here, here'. (pointing to different parts of the picture.) 'Colour, colour in'.

'Speculating' (I3) was the least frequently observed area of involvement and enjoyment. During activities, adults were more successful at engaging children in speculative thinking than peers, but interestingly, it often emerged much more in the RDs, with children speculating about why something had or had not worked: 'He's too big and he's going to fall over me'. It may be that the adult focus on reflection in the RDs is a more powerful means of supporting these aspects of creative thinking. In practice, it was often related to 'Involving others' (I4) in that children were expressing a view or posing a question and, while it might sometimes be self-talk, in these examples another child or adult was usually being addressed. Several of the behaviours coded in this category also fitted in I4, but the following example seems clearly speculative:

> Emily is in the 'doctors' surgery' developed by a group of girls in the mark-making area. She flicks over pages in the desk diary, roughly tears out two pages from it, and looks across the Table: 'I think I need a big one. I need a big one. A big one so I can fold this . . .

'Involving others' (I4) contained a large set of observations, in which specific moves to involve others seemed to be driven by a range of intentions. All of the coded behaviours in this category were further categorised, according to responsibility for choice of activity and intention, as given in Table 3.

Dividing the observations in this way reveals some interesting features. In child-initiated activities, the chief verbal contributions were aimed at making statements or suggestions which explained what was happening, often with the purpose of moving the game forward, as in the following extract:

> Naomi (offers some of her dough): 'Who wants some birthday cake?'
> Carrie (smiles): 'Me', and pretends to take and eat some.
> This interchange also shows aspects of 'enlisting others to join in' by Naomi.

What may be significant here is that the interactions between children more often supported thinking in that they were concerned with developing an idea, instructing another child, disagreeing/persuading others, defending an idea or extending another child's idea. In such cases, children are obliged to both clarify their own thinking, and to try to 'get inside' the thinking of another person, in order to persuade them to go with your idea. These are key aspects of theory of mind and metacognition, associated with higher order thinking (Meadows 2006).

Attempts to attract attention or seek assistance were much more common in adult-directed/led activities than in child-initiated activities, and it was most frequently adult attention or assistance that was being sought. Such calls for help could be a simple gesture as from Drina:

Table 3. Involving others: typical purposes of interactions.

Involving others	Number of observations	Typical purposes of interaction, in approximate order of frequency
Child-initiated activities	106	• Informing/instructing • Developing the game • Disagreeing/persuading someone round to their opinion/controlling • Defending an idea • Picking up another child's idea and extending it • Enlisting others to join in • Seeking attention or assistance
Adult-directed activities	43	• Seeking attention or assistance • Informing/instructing • Defending an idea • Picking up an adult's idea and extending it • Picking up a peer's idea and extending it • Enlisting others to join in • Offering to help
Adult-led activities	17	• Informing/describing a process • Seeking attention or assistance • Answering adult's question • Asking permission • Controlling adult input

> Drina decides she wants a different printing block and stretches out her arm, pointing and asking for it.

Or they could be in the form of a more clearly articulated demand, or set of demands:

> Amber folds her picture to make a card (picture on the inside) and tries to get practitioner Sally's attention: 'S, S, look'.
> Sally: 'That's lovely, are you going to write your name on it?'
> Amber: 'Yes'.
> Sally continues to talk to various children.
> Amber gets a pen and writes something in the very corner of her card: 'I can't do it'.
> Sally: 'Do you want to get your name card to help you?'
> Amber: 'Where is it?'

Interestingly, children were more likely to be receptive to other ideas, and for these to have an impact on their thinking and action when these came from an adult, rather than another child.

Persistence

The focus is on children's persistence and resilience, their ability to sustain their involvement in the face of challenge, and their willingness to take risks and learn from mistakes. These dispositions will influence children's sense of self-efficacy and pleasure in completing challenges, as well as supporting deeper understanding and more complex knowledge (Lambert 2000). The data in Table 2 show that the majority of examples here occurred in child-initiated activities. Of the 10 observations with the highest levels of persistence in children, all were child-initiated, and in nine of them practitioners were absent. Practitioners may, to some extent, be victims of their own skill here: in planning adult-directed activities that are skilfully matched to the children's competences, they may present the children with fewer problems or risks with which they must deal. In child-initiated activities where adults are not present, the interventions of peers may more often result in challenges and problems which a child must overcome, without recourse to an outside arbitrator. The data from I4 (Involving others) support this idea, in showing adults as most frequently being sought out for attention or assistance.

Persistence, of course, is not just a matter of how long a child remains involved in an activity. Children's persistence in the face of difficulty and challenge, and sense of self-efficacy, was present even in short activities. Again, this was most evident in child-initiated activities where practitioners were absent, as in this example of Jagdish:

> Jagdish discovered he could pick pencils up in the open jaws of a pair of scissors, and spent considerable time transporting every pen and pencil from one side of the table to the other, and picking up stray pencils from the floor. As he did so, he tried out ideas – does a 'snipping' action with the scissors work better than keeping them still? – and analysed them – when one pencil rolled across the table he first tried moving it back with his hand, and then decided that resting it against the side of a roll of tape would keep it still whilst he manoeuvred the scissors open. He persisted until he had completed his self-set task, showing confidence and a sense of self-efficacy.

The RDs often proved to be important in revealing how children saw themselves in this respect. Cherie, for example, commented that she had chosen to draw a house

because 'I'm good at them'. Looking at her finished picture on the video, she said, 'Ah, I think it was perfect'.

An important aspect of the data is the low incidence of risk-taking behaviour in the children. Craft et al. (2012) include risk-taking as one of the seven key features of 'possibility thinking', and Tovey (2007) identifies positive links between risk-taking and key areas of children's learning. These include the assessment and management of risk as a survival skill, a sense of mastery, and emotional well-being and resilience. The greater (albeit still low) frequency of risk-taking behaviour in child-initiated activities from which adults were absent may be because children support and encourage one another more in taking risks in their play, or, in the case of solitary play, because a child feels a greater sense of freedom from adult attention. Jake, for example, decided that a more interesting use for masking tape was both winding it round himself (involving much analysis of how long a piece of tape was needed, how this could be measured around your head when you cannot see the back of your head and how to use scissors in such circumstances), and then around the legs and seat of his chair. It is children's sense of permission to use materials in different ways which may be important here, and facilitated by adults' openness to children's thinking. This emphasises the value of practitioners looking at ways to support this in their planning and interactions with children.

Conclusion

The data presented here focus on the value of inferring creative thinking from observations of young children's behaviour. Using the ACCT Framework (Fumoto et al. 2012) to identify this behaviour showed evidence of creative thinking in all areas of children's activity. Some aspects of creative thinking behaviour seem to occur more frequently than others (in particular 'Trying out ideas', 'Analysing ideas' and 'Involving others'). These were also strongly associated with child-initiated activity. At the same time, others aspects, such as 'Engaging in new activity', are associated more strongly with adult direction and involvement, and the observations point to the particularly important role of adults in supporting children's initial engagement in activities.

Children's exploratory play with materials and resources of all kinds proved a very strong context for their creative thinking. However, two particular contexts which may be supportive of creative thinking are outdoor play and pretence. Socio-dramatic play, in particular, was the activity most likely to lead to high levels of creative thinking.

The data here provide strong evidence that child-initiated activities were much more likely to feature the highest levels of children's involvement, particularly in comparison to activities led by adults, or even where adults were present but not directing the activity. One factor which seems to be important is the presence of play companions. Children showed much more involvement in an activity when they were playing in a group or pair than when they were playing alone. What is also clear, however, is that interactions between adults and children influenced the ways in which children displayed their creative thinking. Children were more likely to be receptive to other ideas and for these to have an impact on their thinking and action when these came from an adult, rather than another child, and adults were more successful at engaging children in speculative thinking than peers. However,

interactions between children more often supported higher-level thinking than interactions between adults and children.

The majority of examples of persistence-associated behaviours occurred in child-initiated activities, although adult presence at such activities was often a powerful support for the children's persistence and completion of challenges. An important aspect of the data is the comparative absence of risk-taking behaviour in the children, and this is an aspect that is particularly worthy of further investigation.

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