As ‘schema theory’ becomes better known, inevitably more challenges and questions arise about its validity and usefulness to those of us involved in aiming to provide high-quality experiences for young children.

Recently, Professor Usha Goswami’s research paper for the Cambridge Primary Review Trust argued that the evidence no longer supports Jean Piaget’s ‘stage theory’, meaning that an important part of the theory behind schemas – that the repetition of certain actions will support development from the sensory-motor stage to abstract thought – is not supported.

It is the questions and challenges (or ‘perturbations’) that enable us to refine the theory, taking into account research unavailable during Piaget’s, or even Chris Athey’s lifetime.

Athey, who trained and supported staff at Pen Green to reflect on video sequences using ‘schemas’ as a framework, used to remind us frequently that ‘all knowledge is partial’. I agree with this and write this article in the spirit of reflecting on what I know of schemas up to now based on a great number of observational studies.

Pen Green, as an organisation, has shared ideas with parents about schemas since the mid 1980s. We, and the parents, have found this knowledge sharing to be highly significant to our relationships and to the view children hold of themselves as learners.

Ernst Von Glasersfeld (writing about ‘constructivism’, the overarching theory Piaget was using) says that ‘all knowledge is subjective’. This seems logical in that we all experience things slightly differently and only in dialogue, as Lev Vygotsky pointed out, can we come to some sort of shared understanding. I find I can hold both ideas in mind – that I learn from others (Vygotsky) but my learning is individual and not just a replication of what others know (constructivism).

Many researchers and early childhood educators have moved away from the idea that knowledge (some sort of universal truth or reality) is out there in the world, just waiting to be discovered by each individual learner, like a package ready to be opened. It seems much more likely that each individual engages in a process of learning that is lifelong.

Von Glasersfeld describes ‘constructivism’ as a ‘theory of knowing’ rather than a theory of knowledge. Each of us constructs (or more accurately construes) our knowledge or knowing from our experiences.

We know from a great many research studies (both experimental and observational) that as humans we are information-seeking organisms that explore systematically in order to find out about and adapt to our world. This is where identifying the patterns in children’s explorations helps us to provide experiences for them that they are motivated to engage with. We can’t ‘teach’ or ‘introduce’ schemas to children. The motivation to explore certain patterns comes from them. We can, however, enrich their experiences.

WHAT ARE SCHEMAS?

Athey’s idea of children ‘fitting’ ideas together, rather than ‘flitting’ from one thing to another, helps us see the continuity in their explorations.

In schemas, ‘content’ is what children are playing with, such as a train or train track, and ‘form’ is what they do with it.
As repeated patterns of action, schemas sometimes have effects that can be seen – for example, lines or circles drawn in the sand as a result of a particular action with a finger, stick or foot. It seems complex, as both the repeated action and its effect are part of the schema.

This would explain why a child interested in ‘rotating’ or ‘circularity’ would also notice round shapes in their environment, which could be anything from a biscuit to a full moon.

Matthews (2003), drawing on brain research, explains that, as humans, we pay attention to ‘movement’ and ‘shape’ and that offering the word to describe what we are doing, acts as a ‘pivot’ around which similar instances can cluster.

For example, when Gabriella (see box) aged about 11 months, noticed objects in the garden and house that rotated, I offered the explanation that ‘It’s going round and round’. Her parents played Round and Round the Garden with her. Her sister played Ring a Ring o’ Rosies with her.

When she was faced with a water wheel rotating for the first time, she spontaneously said ‘Ra ra’, meaning ‘round and round’. This shows that she could link those instances together with a phrase. She was beginning to link the word with the action and to conceptualise what ‘round’ means.

Fundamental to understanding schemas is understanding the difference between the ‘content’ children are using and the ‘form’. The ‘content’ is what children are playing with (for example, a train track) and the ‘form’ is what children are doing with what they are playing with (for example, connecting the track). Both offer scope for enriching play, but the ‘form’ allows adults to think more widely and more conceptually and to use related language.

**Frequently observed schemas**

You may find that different authors use slightly different names or give more emphasis to certain patterns.

- **Trajectory**: moving oneself or objects in straight lines, arcs or curves.
- **Lines**: representing lines by lining up objects or making marks.
- **Transporting**: carrying objects or being carried from one place to another. Frequently involves gathering and distributing.
- **Enclosing**: enclosing oneself, an object or space.
- **Enveloping**: enveloping or covering oneself, an object or space.
- **Containing**: putting materials or oneself inside containers.
- **Going through a boundary**: causing oneself or some material to go through a boundary and emerge at the other side.
- **Rotating**: turning, twisting or rolling oneself or objects in the environment around.

Globally, children are exploring with shaving foam and cornflour and water; exploring with shaving foam and playdough; exploring with the tea towels and napkins in home situations. Gabriella has been exploring several schemas since we began keeping a record when she was a few months old (Arnold, 2015). She has been attending the Nest (one of the nursery spaces) at Pen Green since she was two years three months. She is now two years ten months. Her parents and her family worker, Sam, are tuned into her interests and schemas. One ‘thread of thinking’ played out recently at home and enriched at nursery is ‘enveloping’ or covering:

- **At home**, playing the ‘tea towel game’.
- **At nursery**, exploring with cornflour and water; exploring with shaving foam; playing with the tea towels and napkins in home situations to cover areas, possibly exploring shape and space.

At nursery, she was offered some materials, with different properties, so that she could discover for herself a different experience of ‘covering’.

In addition, the adults offered language that matched conceptually, which several researchers have shown to be important (Athey, 2007; Atherton and Nutbrown, 2013). Language that might be introduced includes: ‘cover’, ‘conceal’, ‘hide’, ‘envelop’, ‘spread’. Gabriella’s obvious pleasure and involvement show that she is being offered worthwhile experiences.
She frequently practised the ‘disconnecting’ action as fresh content to ‘assimilate’. However, it took four months of practice for her to ‘accommodate’ to the idea of placing her name on the Velcro to ‘connect’. She often tried but did not fully understand the concept of where and how to place it for it ‘to connect’.

**HOW SCHEMAS ARE EXPLORED**

Schemas are explored through our actions when we are exploring and finding out about something, often for the first few times; through symbolic play when we pretend or use marks or language to stand for an idea or object; through functional dependency relationships when we become aware of the effect of our actions (a bit like ‘cause and effect’); and through thinking.

It can be quite tricky to work out when children are thinking, and all too often our observational evidence depends on their use of language, which means that younger children are often underestimated. These ways of exploring schemas do not ‘replace’ but ‘augment’ each other, as Goswami suggests (2015). I now tend to think of these ways as equally valid ways of exploring a pattern.

Obviously, as our experience increases, we are more likely to be able to think in a more abstract way but, as a mature adult, I frequently use my senses and action to discover how something works. Although we are not now thinking in the way that Piaget was, about children moving from one stage to the next, learning does always build on earlier learning.

**NEW CHALLENGES**

So why is the ‘progression’ of schematic behaviour into abstract thought being challenged?

Piaget’s ‘big idea’ was that our actions become our thoughts. This is and always has been notoriously difficult to demonstrate or prove (Athey, 2007). At the time of the Plowden Report (1967), the rationale for this idea was rooted in Piaget's extensive research, including the existence of ‘different developmental stages’ partly according to age. In translation, this was received as a fairly strict hierarchy whereby we move from one stage to the next always in the same order.

During the 1970s, Margaret Donaldson demonstrated that many of the experiments carried out by Piaget to show the validity of ‘stage theory’ did not make ‘human sense’ to the children being tested and, therefore, the children often performed well below their capability. Her research and that of others called into question the validity and usefulness of stage theory, although remnants remain in our education and health systems.

However, although stage theory has been challenged and we now know that children are a lot more capable at birth than previously thought, Piaget’s big idea that our actions become our thinking (which I prefer to ‘thought’ as it is more active) draws support from another quarter – the study of ‘metaphor’ by George Lakoff and Mark Johnson and Mark Turner, among others. Mark Turner (1996) points out that much of our language, as adults, links right back to our early ‘action schemas’. In normal conversation as well as in literature, we regularly use conceptual ideas connected to:

- ‘up/down’ (trajectory), for example ‘She went up in my estimation’
- ‘connecting’, for example ‘He’s well connected’ (socially)
- ‘containing’ or ‘inside’, for example ‘We welcomed her into our family with open arms’
- ‘transporting’, for example ‘She carried the worries of the world on her shoulders’

**IMPLICATIONS FOR PRACTICE**

- Supporting and enriching schemas with fresh content to assimilate builds on children’s intrinsic motivation to learn and supports their identities as learners
- We can tune in conceptually and make appropriate comments (rather than ‘What colour is it?’ or ‘How many are there?’; which may not interest a child at that point)
- Knowing about schemas can improve adult/child relationships as workers and parents become interested in actions from the child’s perspective

**MORE INFORMATION**

- ‘Cambridge Primary Review Trust – challenging aspects of EY practice’ by Julian Grenier, Nursery World 6–19 April 2015
- Cambridge Primary Review Trust
- ‘Schemas: a way into a child’s world’ by C Arnold in Early Child Development and Care (2015)

- ‘enveloping’, for example ‘Our news reporter is covering the story’.

I think it is fair to say that the wider our experience of a concept, the more expertise we build, and the more able we are to use ideas in our language.

**SCHEMAS AND EMOTIONS**

Over the years many parents have questioned whether there is a link between schemas their children are exploring extensively and emotional events in their lives. My hunch (and theirs) was that the repeated actions might be prompted by the event.

In a longitudinal study of eight children, I found that the children studied used schemas for ‘comfort, to give form to and to work through’ painful events. I did not find that the emergence of the schema was prompted by the event (Arnold and the Pen Green Team, 2010).