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# Observing Repeated Patterns of Behavior in Three-Year-Olds

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## Observing Repeated Patterns of Behavior in Three-Year-Olds

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The purpose of the study was to find out how children apply repeated patterns of behavior, known as ‘schemas’, to organize their thinking. This entails linking knowledge gained from the past to the present and future in order to tackle cognitive challenges.

The research method was qualitative. Narrative observation, writing down exactly what the child says and does, was used to collect data. The target group was five three-year-olds in the Finnish American Kindergarten. Every child was observed by two observers simultaneously and notes were compared to find similarities after which conclusions were made. Data was analyzed through content analysis, more specifically thematic and narrative analysis.

The findings show that children spend their time repeating the same action again and again. Through these actions they are able to make sense of their past experiences, by testing their knowledge as they confirm and organize what they already know and understand. By this they are extending their growing ability to think logically.

In conclusion, schemas as one concept of cognitive development, should be understood by early childhood practitioners in order to facilitate children’s learning. The first step is to identify children’s schemas through observations. Then, based on the observations, practitioners and parents can provide an environment where children can explore their schemas through free play. Observations can also be used to plan interesting activities for children. Furthermore, adult-child interaction and a parent-teacher partnership are important in supporting and extending children’s learning and development. Working together in a holistic way for the best interest of the child will prepare a child for a healthy future as an adult.

Key words: Early childhood education, Schemas, Observation

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## 1 Introduction

Many children spend more time with other caregivers than their own parents. These caregivers are the teachers and nursery nurses in the absence of parents. The amount of knowledge gained by children will depend on how engaged the early childhood practitioners are with the children. Children today will be professionals tomorrow; this means whatever knowledge gained from childhood will develop as it is passed onto adulthood.

In this study five three-year-olds were observed during their free play at the Finnish American Kindergarten in Helsinki. The aim was to pick out repeated patterns of behavior. While doing the observations it was important to write down what was seen and heard, and not what we think. This way the children's true actions were documented instead of interpretations of them. Over the years we have gained some experience in working with children in other daycares. We were, therefore, aware of repeated patterns of behavior in children. Still, as for many others before us, the term 'schemas', which defines such behavior, was unfamiliar to us. It sparked our interest as we came across it in one of our early childhood education books and our thirst for more knowledge about the topic would not be quenched until a full blown study was undertaken. It was our wish to, firstly, gain more understanding personally and, secondly, to raise awareness about schemas among those who work with children.

In our study we found that children need to experience situations repeatedly to be able to apply knowledge to new circumstances. Also, many researchers affirm that schemas do not disappear after childhood but, rather, they develop into concepts in later life. (Athey 2007; Bruce 1997; Meade & Cubey 2008) It is, therefore, important for adults and early childhood practitioners to give children plenty of opportunities to explore various schematic behaviors and a chance to test their thoughts against adult knowledge. It is important for adults to engage in children's thinking and to support their schemas, as they are integral parts in concept formation.

This study supports the view that early childhood practitioners and researchers can use their observations of schemas to facilitate children's learning and cognitive development. It is important to combine materials, the environment, adult-child interaction and a parent-teacher partnership to work in a holistic way for the benefit of the child. Parents and teachers can combine their knowledge and observations to support and extend children's schema explorations. Moreover, giving children ample opportunities to explore and gain experience is what feeds and extends their schemas.

## 2 Background information

“Hannah aged four is playing with cardboard tubes, she is interested in the way some tubes fit inside each other, some disappearing completely. She plays for some time this way before making the tubes into a telescope and playing I-Spy.” The enveloping schema (Louis et al 2008, 32)

Most childhood practitioners often wonder when they are told about the meaning of schemas, exclaiming “we are aware of this already but have never known the terminology to express it.” (Bruce 1997, 66) Simply put, schemas are organized patterns of behavior. They are part of human development, from birth to death, and are not in a constant state but always changing with new experiences (Bruce 1997, 68). Some of the most common schemas in children include trajectory, envelopment, enclosure, rotation, transporting and connection. Sometimes children may do things which seem crazy to an adult, such as carrying sand around in paper bags, or pushing a pram with nothing in it, or post things in a video recorder (<http://www.jitterbugs-nursery.co.uk/children/schemabookletforparents.htm>). By studying and observing schematic patterns in children’s behavior it will be easier for adults to understand and relate to children better. These patterned ways in which children act are influenced by their biological make-up interacting with socio-cultural influences.

Children have repeated patterns of behavior from a very early age, such as sucking their thumb or throwing objects from a high chair or cot. According to Louis et al (2008, 11), “this repeated action helps the child to establish internal cognitive structures (schemas) in the brain” which will help them construct meaning in what they are doing. Furthermore, by observing schemas in children practitioners will gain more understanding as to what concepts children are exploring currently. This, in turn, will allow the practitioners and educators to plan activities that are interesting to a particular child. It is believed that we can use our knowledge of schemas to help children to develop their skills and competence and gain a higher self-esteem. Louis et al (2008, 96) maintain that “focusing on schemas makes planning more appropriate to the needs of the individuals and to refine personalized learning” and, therefore, instead of concentrating on what the child cannot do there will be a more ‘I can’ approach to the targets through which the child will gain a sense of achievement. Moreover, Meade & Cubey (2008, 10) go on to say that the role of the educator is to facilitate learning, not to instruct.

This study was conducted over a period of one month in the Finnish American Kindergarten, based in Helsinki. There we observed five three-year-olds on 2-3 mornings a week doing naturalistic observation using the written record (Hobart & Frankel 1999, 27), simply writing down everything the child does for a period of time. We were careful not to interfere with

the children's behavior. Both of us have in the past done a practical training in the Finnish American Kindergarten, so the day care as such was familiar to us. It has, however, recently expanded and now has kindergarten facilities both in Arkadiankatu and Itämerenkatu in Helsinki. The new kindergarten in Itämerenkatu only opened its doors in mid August so everything was new there: the facilities, the teachers and the children. The daycare centre in Arkadiankatu has been running for over 30 years. Our research was conducted in the new kindergarten in Itämerenkatu.

### 3 Purpose of the study and research question

The main purpose of the study is to find how children use schemas to link the past, present and future to tackle cognitive challenges.

The main research question is:

How do children apply different schemas to organize their thinking?

### 4 Theoretical background

In the following sections we will go through some important theories that guided us in this thesis process. Firstly, early childhood education will be discussed as it has an essential role in daycare life. The importance of a high quality curriculum will be examined as well as some core principles that guide early childhood education. Secondly, cognitive development will be considered as the term "schemas" is a concept within it. Other important points within cognitive development will be examined as well. Thirdly, the concept of schemas will be discussed in detail. The most common types will be considered with definitions and practical examples. Thereafter we will move onto discuss why schemas should be observed in the first place. We will also look at the occurrence of multiple schemas and discuss the importance of schemas to parents and early childhood practitioners. Furthermore, we will discuss how schemas can be supported in children's play.

#### 4.1 Early Childhood Education

According to Pucket and Diffily (2004), Early Childhood Education is the formal teaching and care of young children by people other than their family or in settings outside of the home. The needs of young children in this period are different from those of older school children because early childhood sees the greatest growth and development. During this time the brain develops most rapidly, almost at its fullest. It is also a period when walking, talking, self-esteem, vision of the world and moral foundations are established.

The early years of life are critical to the development of intelligence, personality and social behavior. Research on brain development attests to the importance of key mental, physical and social capabilities. If these fundamental capabilities are not well established from the start, and especially if neurological damage occurs, a child's learning potential could be adversely affected. That is why education in early childhood must have its own specific practices and issues.

Curricula in early childhood education, according to Bruce (1997), are concerned with three main aspects. These are namely the child, the context in which the child learns, and the content i.e. knowledge and understanding the child gains. It is important that these aspects are integrated and in synchrony to be able to reach a high quality curriculum. To begin with, understanding child development is part of reaching a good early childhood curriculum. Workers need to know who they are helping to learn. They must have knowledge and understanding about the development of children's language(s), their play, and symbolic life, their spiritual and moral development, their physical development, their feelings, ideas and relationships (Bruce 1997, 58).

In addition, the context in which a child learns is important. Socio-cultural aspects are good to consider as children are part of the culture in which they grow up. Moreover, material provision, ranging from indoor to outdoor objects, in an early years setting is crucial as it gives children first-hand experiences. What the workers must consider, according to Bruce (1997), is how will the provision be used to serve the child, and how will it help the adult to help children develop further their ideas, feelings, or relationships. It is advisable that equipment is readily available for children in an early years setting for them to be able to practice newly acquired skills. Places and events are part of the cultural context. So, for example, visiting parks and shops, or museums and theatres are all encouraged.

The last point, the content of the curriculum, cannot be separated from the two other points mentioned. What is considered worthwhile for children to know about is culturally defined. Also, what the child already knows, what he/she needs to know, and wants to know are all part of a high quality curriculum.

So, a quality curriculum sees adults and children as active learners. It is also one that engages children both broadly and deeply with the content. It has high expectations of what children do and high expectations of the learning opportunities adults provide for children. It is based on narrative observation of children, the importance of which will become apparent later in this thesis. It emphasizes the importance for adults to know and understand how children develop and learn, as well as being informed about the subject to be studied (the content). Furthermore, adults need to be informed also about the context in which learning takes place

so that children's learning is both supported and extended. This will also become apparent throughout the thesis. Lastly, in a high quality curriculum informed observation (assessment and evaluation) is used for planning the curriculum. Observation is the first step for adults. The next is moving to support and consolidate what the children learn, and extend that learning into less familiar aspects of knowledge and understanding (Bruce 1997).

At this point it is good to refer to some core principles that guide high quality curricula. Bruce (1997), an expert in early years education and play, goes through the ten main principles in early childhood education influenced by Froebel, Montessori and Steiner. These ten core principles form the core of early education in many countries, and will briefly be gone through in the following paragraphs.

Firstly, the best way to prepare children for their adult life is to give them what they need as children. Children and adults learn from each other, and they enrich and complement each other's lives. Bruce maintains that "children are not seen as being in need of instruction on how to achieve an all-knowing childhood" (1997, 18). Rather, they have their own specific needs and rights.

Secondly, children are whole people who have feelings, ideas and relationships with others. They also need to be physically, mentally, morally and spiritually healthy. Bruce stresses the importance of play and asserts that it is a means by which the child maintains the wholeness of his/her experiences. Thirdly, subjects such as art and mathematics cannot be separated; young children learn in an integrated way and not in neat, tidy compartments. Fourthly, children learn best when they are given appropriate responsibility, allowed to make errors, decisions and choices, and respected as autonomous learners.

The fifth principle put forth by Bruce is that self-discipline is emphasized, which is the only kind of discipline worth having. She goes on to say that reward systems are very short-term and do not work in the long run. Self-discipline needs to be promoted with children being allowed to make mistakes and learn from them. Also, their sincere efforts need to be valued. The sixth principle states that there are times when children are especially able to learn particular things. Moreover, the seventh principle, what children can do, rather than what they cannot, is the starting point of a child's education. This is also agreed on by Louis et al (2008, 96).

Bruce's eighth principle is that imagination, creativity and all kinds of symbolic behavior (reading, writing, drawing, dancing, music, mathematical numbers, algebra, role play and talking) develop and emerge when conditions are favorable. Ninthly, relationships with other people - both adults and children - are of central importance in a child's life. And lastly,

quality education is about three things: the child, the context in which learning takes place and the knowledge and understanding which the child develops and learns (Bruce 1997, 17-33).

With these ten core principles of early childhood education in mind let us move on to finding out more about children's cognitive development.

#### 4.2 Cognitive development

Cognitive development is one aspect of child growth and development and it deals with perception, attention, thinking, memory, problem solving, creativity, and language (Puckett & Diffily 2004, 102). Cognitive development influences and is influenced by other areas of human growth and development - neurological, physical/motor, emotional, social, moral, language, and literacy. From infancy onward cognitive abilities change and are influenced by, firstly, increasingly more complex interactions between an individual and the environment. Secondly, greater language facility influences cognitive abilities and, thirdly, the acquisition of knowledge through literate behaviors (Bruce & Meggitt, 2006).

Let us go through aspects of cognitive, or intellectual, development. First of all, it is about the development of thinking and ideas. Ideas can be emotionally or physically experienced and can be shared with other people. Thinking is social, emotional, physical and cultural, and involves the moral and spiritual aspects of development. Cognitive development is deeply linked with communication and language, and how symbolic behaviors of all kind develop, for example, art, music, mathematics and dance (Bruce & Meggitt 2006, 262).

Secondly, Bruce and Meggitt (2006) refer to Piaget's theory and state that intelligence is not something people are born with or without. This theory suggests that intelligence is not fixed and unchangeable. Rather, it is like a plastic that stretches, grows and increases. Children can increase their intelligence in several ways. One way is by mixing with adults and other children who help them develop their intelligence. Another way is by experiencing a stimulating environment which encourages thinking and ideas, and emotional intelligence. When children find things that are interesting they concentrate best. This can be apparent when they choose activities for themselves, have an adult to help them do things, and are enjoying what they do. If the child doesn't concentrate at all it could be due to several reasons. S/he could be under stress or be unwell, or it could be due to learning difficulties or disabilities. Or, quite simply, the child could be tired or poorly nourished. Whatever the reason, adults should avoid jumping to conclusions.

A third aspect in cognitive development - imagination - is the ability to rearrange your past experience and put them together to make new ideas, like art, architecture, music dance drama, scientific research and mathematics (Bruce & Meggitt, 2006). People who do this are termed as creative thinkers because they are able to gather many different ideas and organize them into a single interesting idea. Bruce & Meggitt define creativity as taking an imaginative idea and turning it into an act of creation (2006, 258).

Moreover, memory and imitation are closely linked together. After observing adults for a while babies and young children remember things and imitate their actions. Bruce and Meggitt say that, instead of rushing to try out new things, children between 2 and 3 years pause in unfamiliar situations until they have an idea of what they would like to do. This is one way they organize their thinking. "They remember what they have done before with similar or different objects and people, and they use this memory to help them plan their ideas for this new situation" (2006, 262). This simply means that children can think before they do.

Furthermore, perception means being aware of things. Children and adults perceive and understand the world around them through their many senses. The senses are used to construct an idea of anything that is received through them. All the senses - touch, smell, taste, hearing and sight, along with movement - are important in a child. It is important to introduce new experiences to newborn babies by, firstly, choosing the right moment to introduce them and, secondly, allowing them to experience their environment through their senses, which will help them develop ideas. The third point is being aware of how the different parts of your body work together through which a sense of self develops.

Bruce and Meggitt (2006) assert that, according to previous research, concepts develop early in babies. These early concepts connect the past, present and future around a certain idea, meaning that children can predict and plan ahead (Bruce & Meggitt 2006, 263). This will help their memory development. Concepts that stem from past, present and future experiences enable children to, firstly, organize their thinking. Secondly, children will be able to organize previous experiences and perception (which Piaget termed assimilation). Thirdly, they will be able to predict things about the future and have ideas. Furthermore, they will be able to take in new knowledge and understand it (which Piaget termed accommodation). (Bruce & Meggitt, 2006, 263)

In our research we focused on one of the early concepts of cognitive development, known as schemas, which are the repeatable patterns of behavior that children apply in different situations.

### 4.3 Schemas

Jean Piaget, a Swiss professor of psychology, sociology and philosophy, was one of the first people to identify organized behavior patterns in children, specifically under the age of five years. Puckett and Diffily (2004) refer to his theory as they explain how mental schemata, or schemas, are constructed as individuals interact with the environment and objects in their environment.

Piaget's main ideas include equilibrium, assimilation and accommodation. Pound states that "when we take in new information - through the feel of something, sounds, sights or smells - in Piaget's terms we assimilate the information" (2006, 37). According to her, we are aware of the experience but simply store away the information alongside our existing ideas. Later something happens during which we question our new concept and "we experience some discomfort or disequilibrium which causes us to rethink the idea we assimilated" (37). This rethinking is what Piaget would term accommodation. Louis et al state that "the new experience either fits easily into the child's cognitive structures so he/she maintains 'equilibrium' or if the experience is different or new the child alters their cognitive structures to accommodate the experience" (2008, 16). For example, a young child picks up a piece of paper with a toy wrapped around inside and it falls onto the floor making a clunking sound. The baby will first assimilate the idea that paper makes a clunking noise every time it falls onto the floor. But later he/she will accommodate the view that paper will make such a noise only in certain circumstances (Pound 2006, 37). So:

*Assimilation* refers to the process whereby a new object or idea is understood in terms of concepts or actions (schemata) a child already possesses.

*Accommodation* is a complementary process which enables all individuals to modify concepts and actions to fit new situations, objects or information (Birch 1997, 67).

Let's take another example: As a child learns the word for dog s/he will call all furry animals dogs. This is assimilation. The child will sometimes hear "no that's not a dog, it's a cat" so his/her schema for dog will soon be modified to suit only certain furry animals. This is accommodation.

In addition to Piaget, Chris Athey and Tina Bruce have been major influences in the study of schemas. Athey applied the theory to the practical observation and analysis of young children's learning (Pound 2006, 50). Bruce, now a professor in early childhood studies, together with Athey observed about 20 children for two years, after which both of them wrote books and accounts about schemas in children. According to Bruce (1997), schemas are one of the concepts of cognitive development and they function at different levels in early

childhood. Examples of the four developmental stages which Piaget termed as ‘stage level theory’ are as follows:

**Level 1: *the sensori-motor stage***- when babies and young children explore and experience the world through their senses, interactions and movement.

**Level 2:** It is divided into two:

*Symbolic development:* where young children use one thing to stand for another, for instance, a box becomes a house or car.

*Language development;* Children will continue to use familiar sounds and words and they will start to structure language and make language work for them, using appropriate vocabulary to support their thinking and actions.

**Level 3: *Functional dependency:*** Understanding cause and effect, for example- ‘what will happen if I jump in the puddle?’

**Level 4: *The development of thought:*** Children use logic, reasoning and prior knowledge in their interaction with people, experiences and materials.

These four levels will become more useful in the Findings section. The most common types of schemas will now be considered.

#### 4.3.1 Types of schemas

In the following paragraphs the most common schemas displayed by children will be considered with descriptions and examples. The trajectory, enveloping and enclosing, rotation, transporting, connecting and disconnecting, positioning and orientation schemas will be looked at. The original list was compiled by Jitterbugs Day Nursery in England. (<http://www.jitterbugsnursery.co.uk/children/schemabookletforparents.html>)

To begin with, children exploring the trajectory schema are interested in how objects and people move and how they can affect that movement. They may be seen, for example, playing with running tap water, drawing or painting lines, pushing cars along the floor, bouncing balls up and down or wanting to help with mopping, cleaning and dusting. Secondly, covering or wrapping things or themselves and putting objects inside things is showing an interest in the enveloping schema. Children exploring this particular schema may wrap “presents” up in toilet roll, wrap dolls or teddies in blankets, cover themselves or dress up.

Furthermore, creating enclosed spaces in which children enclose themselves or objects is called the enclosing schema. Examples of what children may do include building fencing

enclosures for animals or enclosures out of blocks. In addition, children showing an interest in things that turn like watching air conditioning fans, or being fascinated by washing machines, and with anything with wheels that turn, are said to explore the rotation schema.

Additionally, the transporting schema, as the name implies, is about moving things around from one place to another and moving themselves around. Children often like to carry sand around in bags or even their pockets, or they like to be the “train driver” to take everyone to the park.

Moreover, sometimes children are observed doing unconventional things like tying table legs with string, or tying door knobs together. This is called the connecting and disconnecting schema which is an interest in fastening and joining things together and in taking them apart. Joining train tracks and other construction toys, connecting buckles on shoes or straps on pushchairs, and building towers of blocks before demolishing them are all fun to children who are exploring this particular schema.

Also, carefully placing objects or themselves in patterns or rows is an interest in the positioning schema. Children love to line up toys on top of, under, and next to each other. They may also enjoy painting and collages and sticking scraps in sequences. Finally, the orientation schema is an interest in seeing things from different angles. Children exploring this schema may be seen hanging upside down from climbing frames or turning toys upside down as they look at them.

At this point it is good to mention that researches have been done according to which there are direct links between young children’s schemas and their talk, action, representation and thinking. In their book Louis et al (2008) refer to Cathy Nutbrown as she defines schemas as early patterns of behavior seen in babies, becoming more complex and more numerous, and eventually becoming grouped together so that babies and young children do not perform single isolated behaviors, but coordinate their actions. Toddlers work hard, collecting piles of objects in the lap of their carer, walking to and fro, backwards and forwards, bringing one object at a time. According to Louis et al, they are working on a pattern of behavior which has a consistent thread running through it (2008, 22).

Schemas don’t disappear after childhood but, rather, develop into concepts later in life. For instance, the transporting schema leads towards a concept of quantity, and the vertical trajectory schema towards a concept of height. It is important to support children’s schematic behavior once recognized and give them ample opportunity to explore their schemas and schema clusters, for in doing so one is contributing to a child’s preparation for adult life (78). However, it is equally important not to support unacceptable behavior as it

will not help the child, but will make the child dislikeable and rejected by others. When acceptable behavior is supported the child's self-esteem rises like in the following example:

“Kevin at three years loved to climb. He climbed furniture and was reprimanded constantly for doing so, but he had no access to climbing frames or gymnastic equipment, except 20 minutes a week in school from the age of five years. By the age of nine years he was scaling walls and stealing from houses to flats. He loved the danger and the thrill of heights.

By the age of 13 he was sent to an experimental unit where he was closely observed, assessed and given appropriate therapy and education. It was decided, amongst a variety of measures, that he should be taught to rock climb. He loved it, quickly learning the techniques.

During the years 13 to 16 he slowly began to change from delinquent to ordinary citizen, and remained so until adult life. He spoke of the importance of being set clear boundaries in the unit, not stealing other people's property. He was taught to think about the cause and effect of this and the implications of his actions. To steal was not acceptable.

Later, as an adult he spoke of his experiences in the unit, of being able to find an acceptable way to fulfil his joy of climbing heights, of being valued in his own right and having his needs specially thought about, being nurtured and feeling that he mattered. His vertical trajectory schema and the thrill of the danger of climbing remained important from childhood, through adolescence and into adulthood. It became an important access tool or mechanism which took him from childhood 'naughtiness' (climbing furniture) to adolescence (delinquency) into ordinary adult life (with a passionate hobby of rock climbing).” Case Study (Bruce 1997, 94)

#### 4.3.2 Observation of schemas

Chris Athey, a schema researcher, inspired nursery schools to build on the theories of Piaget and Vygotsky. Piaget first identified schemas, but Athey was the first to lay the ground work for observations of schemas in the nursery setting.

Now we will go through the six reasons Hobart and Frankel (1999) give of why children are generally observed. The first reason is to establish normal child development and growth. This development includes physical, intellectual/cognitive, language, emotional, social and

moral development. Secondly, adults and practitioners need to understand children's needs. Once the needs are established the adults and practitioners need to become sensitive to meeting these needs. The third reason why children are observed is to support and promote social interaction with children and adults. "By closely observing the interactions taking place you will gain more understanding of children's needs and be able to help them establish good relationships" (Hobert & Frankel 1999, 13).

Fourthly, one needs to be aware of behavior patterns and changes in a child. Having systematic observations will enable adults to establish whether a child's change in behavior has a physical cause, like becoming ill, or an emotional reaction to family problems. One needs to be careful in these observations. The fifth reason is health and safety. Observations will make you more aware of potential risks like stairs. Finally, observations should be used for future planning. Meeting children's needs, establishing meaningful relationships, understanding changes in behavior, and ensuring a safe environment all tie into future planning (14). As such, practitioners are required to assess and undertake possible actions individually or as a team.

Now, having first mentioned general reasons for observing children, let us now consider why schemas in particular should be observed. As already previously stated, studying and observing schemas in children will allow adults and early childhood practitioners to relate to children better. Bruce states that narrative observations will help us understand schemas and learn how to observe them (1997, 67). When observing schematic behavior the practitioner should describe what the children are doing and saying, an observation technique which Sharman et al term "narrative/ free description" (2007, 4). It is important to note what the child can do rather than what they cannot. The observer needs to concentrate observations on spontaneous play as then they will be able to see what schemas the children are currently exploring. According to Sheridan, the child provides his/her own motivation to play and act without prompting or intervention by an adult (2008, 4). Observations can then be used to interpret and analyze what is happening using available theory and in planning the next steps in children's learning.

Once a specific schema or cluster of schemas is observed and identified, the adults can use the information to plan interesting and appropriate activities for the children. Still, Bruce stresses that schemas should not be viewed in isolation from other aspects of observation or good practice (1997, 67). Using schematic and other observations together with theory need to be for the benefit of the child, so these and a high quality curriculum are to be used in a holistic way in order to be useful for a child or group of children.

Furthermore, Louis et al (2008) mention five ways in which observations of schemas will facilitate practitioners to work better with children. First of all, practitioners will learn to understand young children's learning and development. Secondly, awareness and respect for children's unique differences will arise. Also, the practitioners will be able to build on what the children already know, and extend their interest in language and thinking. Fourthly, planning dynamic, challenging and interactive play experiences will sustain and extend the children's thinking. And lastly, observations will enable the practitioner to work together with parents, other carers and professionals for the benefit of the child.

Fraser et al point out that "research with young children which is carried out in an environment that is familiar to them may be of greater value in terms of the validity of the findings than studying the children in an unfamiliar setting" (2004, 153). The new Finnish American Kindergarten, where the observations were conducted, had only been running for three weeks upon our first observation. It is, therefore, possible that some of our results are not as valid as they could be since the children were still getting used to the environment.

#### 4.3.3 Multiple schemas displayed by children

Children can display more than one schema but one may dominate the other. "Children and adults move in and out of the different schematic levels but cannot go beyond their biological capabilities at any time. As always, the biological and socio-cultural aspects of development interact, co-ordinate and integrate with each other." (Bruce 1997, 70) Research shows that schemas often work in pairs and groups to form a network of clusters, rising and falling, grouping and re-grouping as the child's learning and interests change.

"Schema clusters seem at times to rise and dominate what the child does, and at other times it is as if they have gone into hibernation." Tina Bruce  
(Louis et al 2008, 75)

Clusters of schemas also occur when children begin to link their ideas and thinking into longer chains of brain connections. This includes combining different schematic behaviors like, core and radial graphic, trajectory and connecting, transporting and infilling, transforming and infilling, enveloping and infilling, transforming and enclosing, rotation and orientation and many others. The following schema cluster includes the rotation and orientation schemas:

"Adam, aged three, is playing inside a big cardboard box in the nursery garden. He rotates himself round and round inside the box, saying, 'I go round and round'. Then he fetches a broom, gets back in his box and holding it by the

brush end, turns it round and says ‘I’m coming to get you out’”. (Louis et al 2008, 75)

As children develop, instead of applying individual schemas, children may apply more than one schema to enable them to think and act at much higher levels than they would with just one schema. It has already been established that human interactions, both social and cultural aspects, contribute to the development and coordination of children’s schemas.

Observing schemas in clusters may sometimes be difficult for practitioners. In order to be effective, they need to plan and provide for children to extend their developing interests. There should be an ongoing observation and assessment of babies and young children’s actions, interests and development which forms an integral part of the practitioner’s role. Louis et al refer to Roden in that:

“Close observation of young children at play suggests that they find out about the world in the same way scientists explore new phenomena and test new ideas forming in their heads. Young children may not be able to verbalize new ideas forming in their heads, but may still apply similar processes to objects and events through simple, if crude scientific investigation.” (2008, 76)

#### 4.3.4 Importance of schemas

Children are able to apply their pre-existing schemas in order to understand more about the world. Therefore, there is much need to understand the meaning of schemas and how to observe children in order to help them in their mental development.

“Mark, three years, began spitting at people. He could target someone’s eye with unerring accuracy. The schema was a targeting ‘trajectory’ with ‘dab’ (the spit was the dab schema).

His mother bought a pea shooter and suggested he could target cereal boxes on the kitchen table. He played happily for hours. He had a straw and newspaper pellets as objects. He willingly picked them up when he had finished and helped throw them in a rubbish bin (targeting the rubbish bin by throwing things into it).

In the bath he blew water at floating objects. The pleasure of these pursuits and his enjoyment of the company of his mother and other friends far outweighed the frustration of people’s reaction when he spat in their eye. This

was a better use of his targeting trajectories. He stopped spitting in people's eyes.

The learning possibilities of targeting trajectories have given him autonomy of learning about forces in physics, but he needed an adult's help to do so in an acceptable and worthwhile way." Case study (Bruce 1997, 92-93)

According to Bruce, adults can support children's schemas with appropriate language (1997, 85). For example, in the above case study the mother vocalized to the child what was not acceptable behavior and helped him to channel his particular schema in an acceptable way. The next case study will show another scenario.

"In an early years setting, a teacher helped children to extend their mathematical learning. She rigged up a pulley with a bucket and hung it above the paddling pool. Four year-old Nayam and three year-old Shazia worked with this most of the morning. Nayam was concerned with filling the bucket before it was released. He focused on fullness, sometimes with water, sometimes with the toys he had collected. Shazia, on the other hand, was concerned with holding the rope right until the bucket reached the top and then releasing it. Her interest lay in the splash, which she enjoyed enormously. She and Nayam tended to argue, as their concerns were different." Case Study (Bruce 1997, 85)

In the above case the children were able to reach a compromise with the help of the teacher. The teacher's role was to establish each child's concern "in order that the mathematics in the situation could be developed" (Bruce 1997, 85). The teacher taught various linguistic terms such as 'full' and 'empty', 'half full' and 'nearly full' for Nayam. Thanks to the teacher, who vocalized each child's concern to each other with a compromise that satisfied the both of them, the situation was resolved without a fight erupting between the children. Furthermore, Nayam learned appropriate vocabulary to describe his own actions. Louis et al quote Lev Vygotsky, a Russian psychologist, in that "a child's speech is as important as the role of actions in attaining goals. Children not only speak about what they are doing; their speech and action are part of the same complex psychological function, directed towards the solution of the problem at hand" (2008, 17).

So, through these two case studies we have seen that schemas are important both to children and to adults and early childhood practitioners. Schemas are a way for children to explore the world around them. According to Bruce, it is important that adults do not feel obligated to support unacceptable schema behavior (1997, 95). It is not beneficial for the child or the people around. Schemas allow children to make mistakes and learn from them, also

encouraging autonomous behavior in order to become successful learners who are not always reliant on adults controlling them.

Furthermore, like stated in the previous section, schemas are an aid to adults and practitioners in planning interesting activities. In one of the above case studies, Mark's mother used her observations to plan an interesting and socially acceptable activity for the boy. Bruce states that children who develop self-discipline have high self-esteem and behave "better" (1997, 93).

#### 4.3.5 Supporting children's schemas in play

Children who do not play are not exercising their schema clusters. They are, therefore, not firing and wiring their brains optimally, which means that they are learning less (Bruce 1997, 84). Children are born to learn. We, as adults, only need to help them, but don't always know exactly what is needed. If we observe and support children's schema clusters and see what they are interested in, we can begin to extend their learning as we are aware of the direction they are taking.

A good learning atmosphere is one in which the adults support and extend the development and learning of children. Children need adults who provide a safe and predictable learning environment indoors and outdoors. This means that the staff must work together as a team to create consistent boundaries and ways of doing things so that children feel secure and safe. This enables children to become explorers and problem solvers, and encourages reasoning and enquiring minds (Bruce & Meggit 2006, 456).

Children learn through play, especially free play, which is significant to the development and coordination of schemas (Louis et al 2008, 20). There should be a rich and varied environment for children to explore their schemas in and practitioners should be aware of this. A rich environment will enable practitioners to notice schematic play, which should be valued and given time.

"Provide materials that support particular schemas, for example, things to throw for a child who is exploring trajectory." EYFS (Louis et al 2008, 39)

The findings of the Peers Early Education Partnership on Children's Developmental Progress (PEEP) project in Oxfordshire stated that "children often have favorite ways of playing. Sometimes they seem to need to do things in the same way again and again. Underlying the ways in which they play, are their schemas ... the 'mental framework' of children's thinking." (Louis et al 2008, 23). So, more support should be given to them in order to expand

their thinking. Also, through repeating their actions children are able to learn more and more.

The Early Years Foundation Stage (EYFS) 2008 highlights four themes: a unique child, positive relationships, enabling environments, and learning and development. Active learning, play and exploration, creativity and critical thinking are as central to EYFS as they are to the development of schemas as actions or schemas as thought.

“When children have opportunities to play with ideas in different situations and with a variety of resources, they discover connections and come to a new and better understanding and a way of doing things. Adult support in this process enhances their ability to think critically and ask questions.” EYFS  
(Louis et al 2008, 26)

## 5 Methodology

In the following sections we will consider our method of research, namely narrative observation under the qualitative approach. Thereafter we will move onto describing our target group. Finally, we will examine our data collection and data analysis in more detail.

### 5.1 Qualitative research

Qualitative research tries to find out how people behave and why. Bell (2005, 8) states that “the approach adopted and the methods of data collection selected will depend on the nature of inquiry and the type of information required”. So, because our research deals with human behavior the qualitative research approach is a good method to use. Bell (2005, 7) continues that, “researchers adopting a qualitative perspective are more concerned about understanding individuals’ perceptions of the world”. Perception is one of the concepts of cognitive development. Therefore, by observing children’s schemas we are able to see how they perceive the world by coordinating their ideas to gain knowledge and understanding of how things work.

Silverman states that “qualitative researchers stress the socially constructed nature of reality, the intimate relationship between the researcher and what is studied, and the situational constraints that shape inquiry” (2005, 10). He affirms that these researchers seek answers to questions that stress how social experiences are created and given meaning. Schemas help children to develop meaning in their actions which is why this study aimed to identify their schemas and see how they apply them in everyday situations. The study will focus on the most common schemas which are trajectory, enveloping and enclosure, rotation, transporting, connecting and disconnecting, positioning and orientation.

Moreover, Miles and Huberman (1994) believe that with qualitative data one can preserve chronological flow, see precisely which events led to which consequences, and derive fruitful explanations. This is particularly true when observing schematic behavior in children as narrative observation is the best tool to use. In our case, writing down the observations was in itself hard work so we always categorized the schemas after the sessions. Once we had finished observing the children we would sit down in a quiet room and go over the observations spotting the schematic behavior from our notes. Findings from qualitative studies, especially words organized into incidents or stories, have a concrete, vivid, meaningful flavor that often proves far more convincing to a reader - another researcher, a policymaker, or a practitioner- than pages of summarized numbers (Miles & Huberman 1994, 1).

Narrative observation is our method of collecting data in the Finnish American Kindergarten. Observation is the best tool in finding out information about children, especially three-year-olds, as they are too young to be interviewed. The children in this study were observed in a natural kindergarten setting, for a certain period of time, without interfering with their actions. Through this we were able to appreciate their actions as genuine as the notes were taken. Silverman quotes Emerson in his book saying that “field researchers seek to get close to others in order to understand their way of life. To preserve and convey that closeness, they must describe situations and events of interest in detail” (2005, 174).

In addition, Hobart & Frankel define narrative observation as the “commonest type of observation technique used to record a naturally occurring event, where a specific task is set appropriate to the age and stage of development of the child.” They continue to say that, “it is a description of an event unfolding in front of you, written in the present tense so that your reader can appreciate what is happening more easily.” (2004, 37)

We simply wrote down what we saw and heard from the children, and then later on we made conclusions on our data. Bruce maintains that understanding schemas and learning how to observe them has emerged out of a “time-honored tradition which uses narrative observation to describe what the children are doing and saying, interpreting and analyzing what is happening using currently available theory, and planning the next steps in a child’s learning” (1997, 67).

## 5.2 Target group

This research was done targeting a group of three-year-olds in the Finnish American Kindergarten. This age group was chosen because they are already quite independent socially,

physically, linguistically and emotionally. They don't need much help in getting dressed, using the toilet, communicating their needs verbally, and eating (Sheridan 2009, 39-42). We set out to identify what schemas, and concepts, children of three years are exploring as they have recently moved onto greater independence from being toddlers.

We picked five children, four boys and one girl, to observe over a period of four weeks. Most of them had already turned three a few months ago, but two were still on the brink of turning three. There were several criteria we wanted to be met in selecting the children. Firstly, the children should be from different countries and, secondly, the group should include both genders. The teacher in charge of the three-year-olds helped us select children that met these criteria. As both the children and the teachers were new to the facilities the research would help the teacher to get to know the children more and plan suitable activities. So, an inquiry into the five specific three-year-olds would be useful and interesting (Strauss & Corbin 1998, 37).

### 5.3 Data collection

As we wanted to find out what kind of schematic behavior the children were exhibiting, the best way to go about the research was to use observational methods (Silverman 2005, 113), more specifically the narrative observation or naturalistic observation. So, the main tools for observation were a paper sheet and a pen. We wrote the details of the situation onto a sheet, but the observation itself was a written record of what the child did. The observation sheet consisted of the basic information of the child: the age, name, starting and finishing time of the observation, number of adults and children present, the setting, the main aim and objectives of our observation, and finally the record of the observation.

The observations were done on 2-3 mornings a week for a period of four weeks. On each session two children were observed by both students during free play for about 45 minutes per child, amounting to four observations per child during the four weeks. Both group members observed the same child at the same time in order to get valid, i.e. true results. This way we were able to compare our results and complement each other's findings.

Our aim was to observe the children in a natural setting far from pretense. We also wanted to observe the children while they had play time. Fraser et al (2004) maintain that "real-life" research is more valid than laboratory-based researches where the child is taken out of his/her natural setting. This is because it "has less validity when making deductions about human behavior or ideas" as the child may alter his/her behavior (Fraser et al 2004, 149). Therefore, while doing our observations we tried to be as invisible as possible, sometimes deliberately avoiding eye contact. The children were not told exactly what we were doing,

but that we were doing our own paper work. On a number of occasions we took a few photographs of a child's drawing or other work which seemed to distract them a bit. Instead of continuing with whatever they were doing the child would pose in front of the camera, and after a few minutes resume playing. After a couple of incidents of this sort we decided to take the pictures after the child had finished playing with the game in question. Sometimes this meant trying to replicate the result afterwards as the child had perhaps put away the game.

According to Louis et al, it is important that researchers write down what they see and hear, not what they think (2008, 77). We took care describing non-verbal communication and made a record of relevant spoken words. Strauss and Corbin point out that "complete objectivity is impossible and that in every piece of research there is an element of subjectivity. What is important is to recognize that subjectivity is an issue and that researchers should take appropriate measures to minimize its intrusion into their analyses".

#### 5.4 Data analysis

To analyse the data we decided to use two types of analyses. Firstly, thematic content analysis was used to pick out themes i.e. schemas from our narrations. According to Hardy and Bryman, thematic analysis is "where the coding scheme is based on categories designed to capture the dominant themes present in a text" (2004, 550). Secondly, when the schemas were identified we moved onto analyzing the narrations through narrative analysis. This is because, in order to answer the research question, we needed detailed observations to base our findings on.

The table below shows how we identified the themes, or schemas, from our narrations. The left hand column has the exact narration from our field notes. It is then summarized in the center column into a shorter form, by which it is easy to identify the schema in question. The right hand column has the theme(s), or schemas, that were derived from the notes.

Table 1

Exact narration	Summary	Derived theme(s)
"The child goes to the car mat and takes a blue car. He pushes it along the road"	Pushes car along in straight line	Trajectory schema
"He looks intently at the car wheels"	Interest in wheels	Rotation schema
"The child takes out a truck and starts loading little cars"	Filling the truck	Enveloping schema

onto it. He connects the trailer to the truck and pushes it along the floor"	Connecting trailer Pushing truck along	Connecting schema Trajectory schema
"The child is pushing the pram back and forth with a dolly in it. He pushes it around the room. He takes the baby cot out, and places it onto a surface in the kitchen corner. Then he puts it back into the pram"	Transporting dolly around room	Transporting schema
"The child goes into the playhouse and turns the oven knobs. He opens the oven and opens a bag. He takes food items out of the oven and puts them into the bag. He throws the non-edible items out of the house" "He places plates neatly in a pile"	Turns oven knobs Fills in bag Throws items out  Positions item neatly	Rotation schema Enveloping schema Trajectory schema  Positioning schema
"The child looks through a colored plastic sheet"	Seeing the world differently	Orientation schema
"The child draws lines on a paper. She draws circles and even intense spirals"	Drawing enclosures Circularity	Enclosing schema Rotation schema

Also, the observation sheets amounted to a lot of text describing in detail what the children did. Instead of writing up all the narrative observations in this thesis, it was prudent to pick out the schematic behavior from the notes and write them up in tables per child. The following tables are a summary of each child's schematic behavior. Five tables were drawn up, one table for each child. By grouping the actions and schemas the observations are summarized into more understandable terms for the reader. We did not want to conclude particular behavior as schematic if it was seen only once but, rather, if it was observed repeatedly. The left column shows the repeated actions of the child with the identified schema in the right column.

Table 2  
Child A

What the child did	Identified schema
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<ul style="list-style-type: none"> <li>- Restless body movements (swinging feet, clapping hands, tapping fingers, twisting head from side to side)</li> <li>- Rolls marbles in his hands</li> <li>- Pushes cars along train track</li> <li>- Rocks in rocking chair</li> <li>- Pushes pram back and forth</li> <li>- Opens and closes drawers in kitchen corner</li> <li>- Climbs up and down a hill</li> <li>- Slides down slide</li> </ul>	Trajectory
<ul style="list-style-type: none"> <li>- Loads cars onto truck</li> <li>- Fits screws and bolts into holes</li> <li>- Holds paper tightly in fist</li> <li>- Goes inside play house</li> <li>- Puts toys inside house, and inside a bag</li> </ul>	Enveloping & Enclosure
<ul style="list-style-type: none"> <li>- Rolls marbles in his hands, and on surfaces</li> <li>- Rolls crayon on table</li> <li>- Pushes cars along train track</li> <li>- Fits screws into holes</li> <li>- Twists head around</li> <li>- Turns oven knobs</li> <li>- Watches pram wheels turn around</li> </ul>	Rotation
<ul style="list-style-type: none"> <li>-Pushes pram with baby in it</li> </ul>	Transporting
<ul style="list-style-type: none"> <li>- Connects screws to pieces of wood</li> <li>- Connects truck to trailer</li> <li>- Connects tubes</li> </ul>	Connecting & Disconnecting
<ul style="list-style-type: none"> <li>- Lies on the ground on his tummy, bottom and back</li> <li>- Piles plates vertically</li> <li>- Places plates against the wall in the playhouse</li> <li>- Piles red containers</li> </ul>	Positioning
<ul style="list-style-type: none"> <li>- Lies on his tummy, and rolls over to other side</li> <li>- Gazes up onto ceiling</li> </ul>	Orientation

Table 2 above shows that child A explored all the common schemas, but some more than others. During our observations we noted that child A moved from one schematic behavior to another, making it appear like he couldn't concentrate on one action for long. The trajectory schema seemed to be of most interest to him at the time of our observations. As the table shows, he explored movement in different forms and how he can affect that movement. He also showed an interest in mathematical concepts like infilling i.e. containment as he

explored enveloping and enclosing. Rotation and circularity were explored too, as well as transporting in various forms. Further explorations of connecting and disconnecting, positioning and orientation were observed on numerous occasions.

Table 3

Child B

What the child did	Identified schema
<ul style="list-style-type: none"> <li>- Makes lines with finger onto surfaces</li> <li>- Walks around</li> <li>- Rolls marble down marble run</li> <li>- Puts cars in car tower</li> <li>- Rolls cars on floor</li> <li>- Pushes car to an adult</li> <li>- Motions car movement on toilet floor</li> </ul>	Trajectory
<ul style="list-style-type: none"> <li>- Fits pieces into puzzle</li> <li>- Puts hand inside a cup</li> <li>- Squeezes play-dough between hands</li> <li>- Holds a baby doll against her chest</li> <li>- Puts car inside a case</li> <li>- Puts game pieces into box</li> <li>- Puts teddy in cubby hole</li> <li>- Holds marbles in her hand clenching fist</li> <li>- Puts marbles inside plastic sheet</li> <li>- Puts marbles into a box</li> <li>- Draws an enclosed space</li> <li>- Goes inside playhouse in home corner, comes out through window</li> <li>- Puts toys inside a box</li> </ul>	Enveloping & Enclosure
<ul style="list-style-type: none"> <li>- Interest in round marbles</li> <li>- Rubs car wheels against each other</li> <li>- Turns car wheel with finger</li> <li>- Rolls marble down marble run</li> <li>- Draws spirals</li> <li>- Moulds play-dough into round ball</li> </ul>	Rotation
<ul style="list-style-type: none"> <li>- Carries toy saw around room</li> </ul>	Transporting

<ul style="list-style-type: none"> <li>- Connects and disconnects magnets</li> <li>- Connects puzzle pieces together</li> <li>- Connects and disconnects stickle bricks</li> <li>- Connects tubes</li> </ul>	Connecting & Disconnecting
<ul style="list-style-type: none"> <li>- Lies down on floor, reaches for toys under shelf</li> <li>- Places game pieces into groups according to colours</li> </ul>	Positioning
<ul style="list-style-type: none"> <li>- Climbing up the climbing frame</li> </ul>	Orientation

As table 3 shows, child B seemed to explore all the schemas except the orientation schema during our observations. The most dominant schemas which the child explored are enveloping and enclosure. She also explored a lot of the trajectory and rotation schemas, showing an interest in circularity and movement. According to our observations, out of the most common schematic behaviors, at the time the child seemed to show most interest in putting things inside other objects and making enclosed spaces.

Table 4

Child C

What the child did	Identified schema
<ul style="list-style-type: none"> <li>- Walks around the rooms a lot</li> <li>- Hops on one foot</li> <li>- Puts plastic boards on top of each other</li> <li>- Runs around</li> <li>- Motions food into bowl</li> <li>- Moves on his bottom, lifts feet in air</li> <li>- Moves hands like guns/bats</li> <li>- Throws toys onto floor</li> <li>- Thrusts himself onto the floor, quickly getting up</li> <li>- Moves car up and down a tower</li> </ul>	Trajectory
<ul style="list-style-type: none"> <li>- Puts fork into bowl</li> <li>- Tries to cram rolling pin into bowl</li> <li>- Puts train into a wooden case</li> <li>- Puts train, cars, animals into their rightful boxes</li> <li>- Fills in a cupboard with toys in the kitchen corner</li> <li>- Puts pegs inside board with holes</li> </ul>	Enveloping & Enclosure

<ul style="list-style-type: none"> <li>- Runs around in circles</li> <li>- Mixes bowl with fork in a circular motion</li> <li>- Motions finger in hair in circular movement</li> <li>- Turns around repeatedly</li> </ul>	Rotation
	Transporting
<ul style="list-style-type: none"> <li>- Demolishes tower of blocks</li> <li>- Connects and disconnects train tracks</li> </ul>	Connecting & Disconnecting
<ul style="list-style-type: none"> <li>- Puts plastic boards on top of each other</li> <li>- Lines pegs in a straight line on a board</li> <li>- Sits on a bench in the cloakroom</li> <li>- Puts bowl on his head</li> <li>- Stands on a chair, gets down</li> <li>- Moves on his bottom, lifting feet</li> <li>- Puts bowl onto another bowl</li> <li>- Puts apple onto a pan</li> <li>- Builds tower of blocks</li> </ul>	Positioning
<ul style="list-style-type: none"> <li>- Looks through a colored plastic sheet</li> <li>- Stands on a chair, gets down</li> <li>- Looks through hole in a block</li> <li>- Looks through window in playhouse, in home corner</li> </ul>	Orientation

Table 4 above shows that child C explored all of the schemas except for the transporting schema which was not recorded at all during our observations. He displayed a lot of the trajectory and positioning schemas. The child showed an interest in his own bodily movement and also how objects move. He was also interested in placing objects and himself in patterns or in different positions through which a new view of the world opens up to him, for example, when standing on the chair. This also shows an interest in the orientation schema. According to the above table the most dominant schemas for this child are trajectory and positioning which the child was observed exploring constantly.

Table 5

Child D

What the child did	Identified schema
<ul style="list-style-type: none"> <li>- Pushes car along mat, back and forth</li> </ul>	

<ul style="list-style-type: none"> <li>- Pushes trains along tracks</li> <li>- Pretends to move around like an aeroplane</li> <li>- Pushes legos on car mat</li> <li>- Opens and closes drawers</li> <li>- Bangs the top of a drawer</li> </ul>	Trajectory
<ul style="list-style-type: none"> <li>- Goes inside playhouse, covers himself under a blanket</li> <li>- Puts cars inside a tunnel</li> <li>- Puts screws and pegs inside holes</li> <li>- Fills in and empties a dishwasher in home corner</li> <li>- Creates a circle of pegs to create an enclosed space</li> <li>- Closes oven door in home corner</li> <li>- Fills in and empties puzzle</li> </ul>	Enveloping & Enclosure
<ul style="list-style-type: none"> <li>- Creates a circle of pegs</li> <li>- Turns knobs and screws</li> <li>- Pushes car along mat</li> <li>- Takes out a stickle brick with wheels, pushes it along</li> <li>- Draws spirals</li> <li>- Watches wheels turn</li> <li>- Moves around in circular movements on his bottom</li> </ul>	Rotation
	Transporting
<ul style="list-style-type: none"> <li>- Connects little legos to bigger lego</li> <li>- Connects and disconnects train tracks</li> <li>- Connects and disconnects stickle bricks</li> </ul>	Connecting & Disconnecting
<ul style="list-style-type: none"> <li>- Makes a straight line of colored pegs</li> <li>- Places his car next to another child's car</li> <li>- Lies down on his side, knees, tummy</li> <li>- Pushes chair under table</li> <li>- Sits on his bottom</li> <li>- Lines up screws in a straight line</li> <li>- Bows down onto floor</li> </ul>	Positioning
<ul style="list-style-type: none"> <li>- Leaps around on his knees</li> <li>- Looks through holes</li> <li>- Crouches down and looks around</li> <li>- Lies down inside the playhouse</li> </ul>	Orientation

From table 5 above we can see that child D explored all other schemas except for the transportation schema. The child seems to be at a stage where he is interested in almost all

the most common schemas, some more than others. He also shows an interest in movement and circularity, as well as positioning and orientation. Moreover, he was observed exploring connecting in various forms and concepts of enveloping and enclosure.

Table 6

Child E

What the child did	Identified schema
<ul style="list-style-type: none"> <li>- Swings his leg under table</li> <li>- Drags his leg along while walking</li> <li>- Walks around the room a lot</li> <li>- Turns around</li> <li>- Opens and closes drawers</li> <li>- Drops toys onto the floor</li> <li>- Bangs carrot against floor</li> <li>- Crawls on the floor</li> <li>- Tiptoes</li> <li>- Swings hands around as he walks</li> </ul>	Trajectory
<ul style="list-style-type: none"> <li>- Sits on a toy bread</li> <li>- Encloses a toy banana between his knees</li> <li>- Goes inside playhouse in home corner</li> <li>- Puts toys inside sink in kitchen corner</li> <li>- Holds puzzle piece in clenched fist</li> <li>- Fills in a puzzle</li> <li>- Creates an enclosed space out of play-dough</li> </ul>	Enveloping & Enclosure
<ul style="list-style-type: none"> <li>- Twists and turns around in a circular motion repeatedly</li> <li>- Twists hands in a circular motion</li> <li>- Walks around a round pillar</li> </ul>	Rotation
	Transporting
<ul style="list-style-type: none"> <li>- Connects puzzle pieces</li> <li>- Connects camels together by their tails</li> </ul>	Connecting & Disconnecting
<ul style="list-style-type: none"> <li>- Places puzzle pieces on table</li> <li>- Sits on the floor</li> <li>- Puts a toy against his forehead</li> <li>- Places a toy on the table</li> </ul>	Positioning

<ul style="list-style-type: none"> <li>- Positions himself in different places</li> <li>- Arranges tins on top of each other</li> <li>- Places stethoscope in different positions</li> </ul>	
<ul style="list-style-type: none"> <li>- Crawls to home corner</li> <li>- Looks up at the ceiling</li> <li>- Looks around different places</li> <li>- Looks at himself in a mirror</li> </ul>	Orientation

Table 6 above shows that child E explored all the schemas except for the transporting schema. He displayed more of trajectory, positioning, and enveloping and enclosing. Orientation, rotation and connecting and disconnecting were not as frequent during the time we observed him. What was especially interesting about this child was that he was constantly observed rotating himself, twisting and turning around in circles around the room. This is a combination of trajectory and rotation, as he shows an interest in his own bodily movement and circularity. He was not observed exploring circularity in fine motor movements. But, then again, our observations were very limited timewise which, in turn, limits our right to draw conclusions. The child showed an interest in the most common schemas.

In summary, tables 2, 3, 4, 5 and 6 show that all five children explored the trajectory schema more than other schemas during our observations. The schema that seemed to have been explored the least was the transporting schema. However, the positioning, enclosing and enveloping schemas were explored by all the children almost equally. Also, the connecting and disconnecting schemas were explored by all but one on fewer occasions. The orientation schema was explored by all but one child. It seems that children at the age of three are quite interested in trying out different things and are active in exploring the world around them. Had we been able to observe the children more, it is very likely that we would have spotted all the common schemas in all five children on more occasions. As our observations started soon after the kindergarten opened its doors in August, it is likely that the children had not become that acquainted with the materials and toys yet. Therefore, a potential learning experience could have been hidden on a shelf without the child knowing about it.

## 6 Findings

This section will discuss the findings in more detail and will look at the seven main groups of schemas. These are the trajectory, enveloping and enclosure, rotation, transporting, connecting and disconnecting, positioning, and orientation schemas. We will refer to excerpts of our narrations and examine how each schema was applied by the children. This is because researchers believe that schemas are better analyzed and interpreted through exact narrations. Thereafter the findings are related to theory. Krippendorff states: "Validating evidence, it is the ultimate justification of the content analysis" (2004, 30). Furthermore,

this section will discuss and aim to answer the research question of “How do children apply schemas to organize their thinking?” The Discussion section will discuss and explain in more detail how children’s schemas can be supported and extended.

### 6.1 Trajectory Schema

The trajectory schema is about movement and lines, both horizontal and vertical. All the children were observed exploring this particular schema repeatedly (see tables 2, 3, 4, 5 and 6). Even what may seem like a mundane action, like rocking back and forth on a rocking chair, indicates an interest in lines as the chair is moving in straight lines. Arnold quotes Athey in that “young children become interested in lines before circles” (Arnold 2003, 5). Arnold also points out that “when we are learning to move, we are also learning to think” (2003, 40). Moreover, she says that we often highly value a certain action done by a child but rarely give notice to the thoughts preceding the action. Davies states that “information concerning cognitive development appears in movement” (Arnold 2003, 40). So, there are links between the physical action seen and the cognition behind the action. For instance, when the child is rocking back and forth he is learning about the concept of direction.

#### Observation 1:

##### Exploring the trajectory schema

“Child A goes to the car mat and takes a blue car. He pushes it along the road on the mat. He leaves it for a second and looks around, then continues. He places his hand gently on the car and moves it slightly. He stops again for a moment. Then he pushes it slowly again, along the road and around the traffic circle. He goes away for a minute then comes back. He pushes the car a little faster and says in Finnish ‘the car comes to the police station’ (= auto pääsee poliisiasemalle perille). Then he goes to another play corner. “

In the above mentioned example the child is furthering his learning about direction in straight lines. He pushes the car along the mat first in lines, taking his time exploring the relationship between the movement of the wheels and the action of his hand doing the pushing. Let it be added that the child is showing an interest in circular motion, as well, since he is intently observing the wheels, indicating an interest in the rotational schema. After some time of pushing it along the mat he comes to a stop point and decides it is the car’s destination. Carr, as cited in Arnold (2003, 51), names “‘persisting with difficulty or challenge’ as one ‘domain of disposition’. She goes on to describe ‘three parts’ of the domain”. The three parts are: being ready, being willing and being able.

Firstly, “being ready” is about “enthusiasm for persisting with difficulty” (Arnold 2003, 51). The child is probably not having a major difficulty in this example, but still shows a level of enthusiasm and persistence in pushing the car along. He may be relating the activity to a personal experience in driving through town with his family, having seen straight strips of road as well as roundabouts. Secondly, “being willing” indicates a “sensitivity to places and occasions in which it is worthwhile to tackle difficulty or uncertainty and to resist the routine” (52). The car mat is currently the child’s workshop in which to explore the trajectory (and rotational) schema and he does not finish the game before arriving at some sort of cognitive solution, namely that of the car’s arrival at a destination in town.

Lastly, “being able” is “problem-solving and problem-finding knowledge and skills; experience of making mistakes as part of solving a problem” (Arnold 2003, 52). The child is clearly going through a cognitive experience in his head. This exploration with the car is self-initiated and the child seems to be intrigued by the car mat environment, creating situations in which he can explore and discover things for himself, like places in town, and roads in different shapes, both straight and circular. It could be that the problem-solving in this experience is about finding a particular location in town through taking a few wrong turns and finally arriving at the desired destination. He wraps up his experience of exploring lines (i.e. pictures of roads on the mat) by declaring that the car has arrived at the desired location.

Child A was often seen playing with cars, pushing them both along the road lines on the car mat and along train tracks. He was also seen playing on the slide in the park continuously. Table 2 shows that he explored trajectories a lot during our observations. As schemas in childhood develop into later concepts (Bruce 1997, 78) we can say, based on our observations, that child A is exploring and learning about mathematical concepts like length and speed through his actions. By repeating these actions again and again, and by coming back to the same activities, the child is organizing his thoughts and interests. It could be that in the above example child A experienced some sort of discomfort - or disequilibrium - in pushing the car along the lines for a minute, reaching a point where he had to take a cognitive break before coming back and declaring the car has reached its destination. As he seems satisfied with this declaration and happy to move onto another play area, we can conclude that he reached equilibrium in his thoughts. Now, let us look at another example.

#### Observation 2:

##### Exploring the trajectory schema

“Child A is up the slide and positions himself on his tummy, ready to slide down head first. He uses his feet to push himself forward and slides down on his tummy. He climbs up again and repeats several times, then smiles at some

other children and says in Finnish 'I slid down very fast' (= otin kovat vauhdit)“.

This same child, A, was observed using the slide in the park repeatedly, during which he is also exploring trajectories and more specifically the up/down motions (however, seeing the world differently up the slide and on the ground also relates to an interest in the orientation schema). In section 4.3 we noted that there are four stages in development. Athey (2007) argues that there is a continuity from stage to stage. This means that child A, firstly, explores up/down movements on a *motor level*. According to Bruce, children reflect through acting out past experiences (1997, 23). Therefore, physical experiences are essential as children begin to organize their thinking.

Arnold (2003, 42) states that he receives feedback through his senses as he goes through the physical effort of struggling up the hill to the slide, and how good it feels to slide down fast again, perhaps faster than the previous time thus feeling a sense of achievement. He is clearly showing satisfaction and pleasure in this experience. This feeling motivates him to repeat the action. Also, the child may be exploring his *symbolic* knowledge through this trajectory experience. He may be, for instance, relating the speed of sliding down the slide with the speed of a car zooming by on the highway. The child is clearly exploring the relationship between movement and speed - as we can deduce from noting him push the car along the mat, first slowly and then faster, and repeating the sliding action outside. Moreover, he seems to understand the cause and effect of his actions - which is the *functional dependency level* - as he slides down, taking up speed in the process to which he affirms “I slid down fast”. Sliding down the slide is functionally dependent on the child positioning himself up the slide first. Also, the child is using the concept of speed at a *thought level* as he uses familiar *language* and terminology to explain how he himself was able to take up speed and slide down.

So, through his actions child A is showing an interest in a number of schemas. However, the most apparent during our observations was perhaps the trajectory, as we explained above. Still, his actions show an interest, firstly, in the rotation schema as he observes the car wheels intently in one play corner. His actions also have characteristics of the positioning and orientation schema as he positions himself up the slide where his view of the world is different from when he is on the ground. Adults, both parents and practitioners, can support his schemas and extend his learning by providing him with ample opportunities to explore these various schemas through freely chosen play. Children exploring the trajectory schema may enjoy blowing feathers or chiffon scarves, making simple folded paper planes, chasing and catching bubbles, exploring objects that bounce, playing with simple yo-yos or running

with kites and streamers. Key words for adults to teach include fly, spin, twirl, high/low and heavy/light.

## 6.2 Enveloping and Enclosure Schemas

The enveloping schema is about an interest in covering and filling objects. The enclosing schema is similar where children often show an interest in creating boundaries or enclosures. All five children were observed exploring these schemas during our observations.

### Observation 3:

#### Exploring the enveloping schema

“Child A goes inside the playhouse in the home corner. He opens the oven and a little bag. He takes all the food item toys from the oven and starts putting them into the bag. Then he tries closing the bag, but the zipper won’t close. Then he takes all the stuff out again. Another child tries to come inside the house, but child A won’t let him. He piles some plates neatly against the wall, and then he comes out of the house when several children barge in. Then child A takes any toys he can find, like a doctor’s kit, more food items from the kitchen corner, containers and plates, and starts throwing them into the house with all the rest of the kids. He throws them in both through the door and the window. He also piles several red cans on top of each other, then throws them into the house. When he has finished throwing the toys in he goes to another play area.”

In the above example child A is exhibiting several schemas in his behavior, but in this section we are concentrating on the enveloping and enclosure schemas, both of which have characteristics here. When he goes inside the playhouse he is showing an interest in the enveloping schema as the house hedges him all around, leaving a little doorway. He explores this schema further as he loads items into a bag - a sort of wrapping up or enveloping - and later into the whole house, as if trying to fill in the entire space (also called the infilling schema, Bruce 1997, 79).

We noted the child first filled in the bag with food items. He quickly noticed that the zipper wouldn’t close and poured all the things out. But before he was able to try again, it seems he was interrupted by the children barging in and taking over his space. It could be that he was slightly annoyed at the other children invading his play and, therefore, decided to mess up their play area by throwing all the items he could find into the house, as if to get back at them for their behavior. He is not fluent in the English language and does not have a common language with the children barging in. So, it could be that the only way he is able to get his

thoughts organized, in relation to the other children, is by using his enveloping schema to deal with his reactions towards them. Still, he seems to be getting pleasure out of the process in any case. Bruce refers to Piaget's theory when she says movement, thinking, feelings and relationships cannot be separated. "They involve the physical and spiritual development of the child as well as ideas, feelings and relationships" (Bruce 1997, 80). Also, Arnold points out that another way to explore length is by throwing objects (2003, 102). It could be that child A is subconsciously using the opportunity of messing up the other children's play as a new opportunity to explore the mathematical concept of length and containment.

#### Observation 4:

Exploring a cluster of schemas: the enclosing, trajectory and rotational

"Child D takes out a peg board and starts putting pegs through the holes. First he makes a straight line of colored pegs from top to bottom and says "this is a train". He adds more pegs to create a circle connected to the line (looks like the lower case for letter B, only the wrong way round). He declares "Look, it's going to be like this" (= katoppas, tästä tulee tällöinen). He takes out a few pegs and puts more in. Then he says "Nobody's going to steal this, it's Linnanmäki" (Linnanmäki is an amusement park in Finland). He has a discussion with his friend, who's playing with his own peg board. Child E changes the places of two pegs and a circle forms. He leaves one peg inside the formation and goes to another play corner." (to see photo refer to Illustrations, photo 1)

In this example the child is exploring a cluster of schemas. First, he explores trajectories, both vertical and horizontal lines. Then he extends this schema by adding a circular side to the line of pegs. He ends his play by changing the places of some of the pegs and creating a circle, i.e. an enclosed space, and leaving a peg inside. Moreover, placing the pegs in a pattern has characteristics of the positioning schema.

As we mentioned earlier, Athey believes there are links between the motor level, symbolic representation level, functional dependency level and thought level. Let's look at the above mentioned example in relation to these levels.

Previously, this child was observed on numerous occasions playing with cars and trains, which indicates an interest in lines and rotational movements as the vehicles move along in lines with the wheels turning around. Therefore, it is fascinating to note that now the child is exploring these schemas further. He uses his *fine motor skills* to create lines and circles from the colored pegs. He places *symbolic representations* to his creations by using appropriate *language*. Furthermore, his work of pegs not being stolen by another child or adult is

*functionally dependent* on its symbolic representation of being Linnanmäki. He is clearly showing a development in his *thoughts* as he knows an amusement park cannot be stolen, and he is able to give objects symbolic representations.

Child D has also been observed to cover himself under a blanket inside the playhouse in the home corner, exploring the enveloping schema in doing so. He has also been observed to connect blocks and train tracks and forming enclosed spaces out of them. Now, in the above example, he applies his knowledge gained from the earlier experiences to create a similar enclosed space with the pegs. It is interesting also that he tops the experience off by showing characteristics of yet another schema, that of enveloping or infilling, by leaving one peg inside the enclosed space.

Child A and child D are exhibiting an interest in both the enveloping and enclosure schemas. Louis et al point out that many experts believe that schema play in most children occur in multiples (2008, 73). This is quite apparent in both these children. Not only is child A showing an interest in enveloping as he fills in the bag and the house, but he is displaying characteristics of the trajectory schema as he throws the toys into the house. Also, child D displays elements of the trajectory, enveloping and enclosure schemas as he makes the peg formation. Some ideas how adults can support enveloping schemas include building pass the parcels, wrapping pretend gifts, making sock and glove puppets, stuffing old socks to make snakes and filling in containers with sand, water or jelly. Key words for adults to teach include under, over, in/on, full/empty and size words. Children exploring enclosure schemas may enjoy making bracelets or bangles, making borders or picture frames, making cloaks, hats and masks, playing with zoo and farm animals, and creating burrows and tunnels in very wet sand. Key words include positioning and size words.

### 6.3 Rotation Schema

The rotation schema is about showing an interest in things that turn or roll like wheels, knobs and marbles. Children who exhibit the rotation schema often incorporate this aspect into their drawings in the form of circles and spirals. Again, all the children were observed exploring the rotation schema in one way or another.

Observation 5:

Exploring the rotation schema

“Child E is walking around the room in circles. He turns and twists around and around repeatedly. He hops toward another side of the room, turning around as he hops, combining the two movements. He goes back to the middle of the

room and turns around there, looking around at different play corners. He walks to a round pillar in the middle, twisting his hands in the air as he goes, and leans against the pillar. He starts walking around the pillar dragging his palms against it. A teacher motions him to a game table.”

Child E in the above example shows a repeated interest in circular movements, i.e. the rotation schema. He has been observed to apply his whole body whenever he shows an interest in circular motion, as opposed to child B, who, we will note later on, explored circularity in the form of wheels, marbles and knobs. Child E was observed exploring a lot of different things, and sometimes it looked like he was lost between what to do and where to go. It was then that he would spin his body around and around. Arnold refers to Pound when she says that a child “needs to experience the physical sensation of rotating his own body and objects in his environment to understand shape and angles” (2003, 108).

Child E has been observed to explore containment and filling, just like child A, and also connecting. These actions involve him in estimating capacity and in exploring size and fit (Arnold 2003, 94). His explorations also help him to understand the properties of the various objects he uses. According to Athey, providing containers with “a specific capacity” can help children to develop their ideas about volume and capacity (Meade and Cubey 2008, 95). Arnold makes it clear that understanding rotation and circularity are important aspects of mathematical development (2003, 108). This child showed an interest in rotation every time he was observed, and a good way to extend his interests would be to provide more things that rotate for him to explore.

#### Observation 6:

##### Exploring the rotation schema

“Child B is standing by a table watching children of the same age practice drawing letters A and B onto paper with a teacher. She points at a sheet of paper and the teacher gives her one. The teacher asks her to try and write the letters. She draws straight lines and circular lines, even intense spirals. She stays by the table, still drawing, even after all the other kids are done. When she is done she goes to another play area.” (to see photo refer to Illustrations, photo 2)

Not only is the child exhibiting the trajectory schema in drawing lines, but also an interest in the rotation schema as she draws the spirals. She has been observed previously to show an interest in wheels turning, marbles rolling and turning knobs, and now she is extending her concept of rotation and turning by drawing spirals. Meade and Cubey state that there is often

no clear-cut distinction between figurative and action schemas, especially in drawings, as a child may be dealing with both the static and dynamic aspects of an idea; such as a circle and wheels turning simultaneously (2008, 48).

As this child has developed fine motor skills, and is interested in making marks on paper, it is likely that she will learn to write properly not many years from now, provided she is given lots of opportunities to practice. Arnold states that “learning to write is not simply learning to copy symbols” and quotes Kress in that “the drawing of a line is an intensely physical, bodily activity, just as much as it is an intellectual cognitive one” (Arnold 2003, 77). The child is exploring the world of writing and with a little help from an adult she could probably produce an “A” or a “B”. Vygotsky would use the child’s strengths to help her learn more. Rather than focusing on what the child cannot do, according to Arnold, Vygotsky focuses on what the child can nearly do alone, which he termed “the zone of proximal development” (2003, 27).

Child E and child B show an interest in circularity in various forms. As it was mentioned before, schemas often occur in multiples, and often schemas cannot be separated. For instance, child E uses his body to explore circularity but he is also displaying elements of the trajectory schema as he hops around the room. Child B, on the other hand, often showed an interest in circularity by exploring marbles and cars. Rolling marbles down a marble run was one of her frequent objects of interest, which also has elements of the trajectory schema as the marbles move in lines as well as spirals. Children exploring the rotation schema may enjoy playing with locks and keys, wind-up toys, kaleidoscopes of all sorts, and mixing and stirring foods. Key words include fly, spin, twirl, circle and spiral.

#### 6.4 Transporting Schema

Children who are interested in the transporting schema are continuously observed moving objects around from place to place. During our observations two out of three children were observed exploring the transporting schema in one form or another (see tables 2, 3, 4, 5, and 6).

##### Observation 7:

##### Exploring the transporting schema

“Child A is pushing a pram with a dolly in it back and forth. He pushes it around the room. He takes out the baby in the cot and places it onto a surface in the kitchen corner. Then he puts it back into the pram and starts pushing it around again. He sits down in the rocking chair and pushes the pram back and forth as

he rocks on the chair. He repeats this a few times. Then he sits himself at a table and pushes the pram back and forth before getting up again and walking around pushing the pram. He takes the cot out again and puts it back. Another child puts a toy into the pram but child A promptly throws it out. The pram falls over and child A tries to put the hat back onto the dolly. He sits onto the rocking chair again, this time sitting on his knees, then gets up and puts the cot back into the pram. Then he goes into the playhouse in the home corner.”

Child A is, firstly, exhibiting aspects of the trajectory schema here as he pushes the pram back and forth in straight lines. Secondly, he is exploring transportation in pushing the dolly around in the pram. According to Arnold, the transportation schema is about exploring mathematical concepts like length (2003, 101). Also, the child learns about starting points and points of arrival during his transportation behavior (101). Moreover, Arnold points out that, according to Piaget, during such behavior the child is presumably experiencing physically early equivalence of distance, length and speed (Arnold 2003, 101).

Children with the transporting schema often like building waterways with guttering and sail twigs and sticks on them. Using wheelbarrows, carts and trolleys of different sizes for transporting are also very popular. Key words include in, on and under, and empty and full.

#### 6.5 Connecting and Disconnecting Schema

This is an interest in fastening and joining things together and in taking them apart. The schema can be seen in children’s actions when they join train tracks, attach ropes to climbing frames, are fascinated with string and even tie their own legs together. All five of the observed three-year-olds were observed exploring this schema repeatedly.

##### Observation 8:

##### Exploring the connecting schema

“Child D takes out a stickle brick with wheels attached to it and pushes it along the floor. Then he pulls out the wheels and puts them on another stickle brick. Together with another child, he walks to the train set. Child D picks out some train tracks and starts to connect them. He takes two pieces and tries to connect them. He goes to the car box, takes out a car and puts it on a train junction. He picks out more trains, connects them and then disconnects. He pushes the train along the track.”

The observation shows that child D is interested in joining things and taking them apart. The child applies this schema in different situations as he connects wheels to a stickle brick, then to train tracks and he goes further to connect disconnect trains. He understands that the wheels stick to stickle bricks, so he uses this knowledge to solve his problem of making the wheels stick in the first place. He then extends the knowledge to other objects that can stick to each other. So, as the child repeats the same process he is able to develop cognitively. Louis et al state, “this repeated action helps the child to establish internal cognitive structures (schemas) in the brain” (2008, 11).

Louis et al continue to say that connecting schemas often help children to think symbolically (2008, 61). In a previous section child D was noted connecting pegs to a peg board and giving meaning to his picture created i.e. a train and later on Linnanmäki. Unfortunately the above example is limited in its content as we were not able to hear much talking during it.

Applying the connecting schema in constructing train tracks was frequent during our observations. Also, demolishing or taking apart constructed items was common with children exploring this schema. According to Louis et al, “as the connection schema evolves, disconnection sometimes becomes as important as connection, untying as important as tying and, as children begin to explore the idea of separating things they often demolish items they have previously constructed, or take toys apart” (2008, 34).

If children do not have access to building, woodwork and creative materials with a variety of joining materials, they do not have the possibility to extend their knowledge of the physics of connecting. Furthermore, unrestricted play often proves especially valuable as children have freedom to explore in their own way. In the above mentioned example the child is making sense of his past experience and applying it to the available resources. Through these activities the child is learning about the concept of connecting, which may later develop into mathematical problem solving, like drawing graphs and coordinates or joinery in woodcraft (Bruce 1997, 79).

Children with the connecting and disconnecting schema often enjoy constructing with hammers, nails, cards and twines. Building bridges with building bricks, string, tape and magnets are also very popular, and creating train tracks and complex roadways. Key words include heavy/light, tie, knot and stitch.

## 6.6 Positioning Schema

This is an interest in carefully placing objects or themselves in patterns or rows. The schema may be seen when children line up toys, books or other objects and position them either on

top, under, around the edge of, behind and next to each other. This particular schema was explored by all the observed three-year-olds.

Observation 9:

Exploring positioning

“Child C is sitting down on his bottom and holding a car in his hand. He changes position and lies on one side. He pretends to wake up and fly around after which he throws himself to the ground and lies on his back for a little while. He repeats this over and over again. Then he picks up a wooden box from the mat and throws it. He picks it up again and runs around with it. He pushes a circular block from inside another block and lets it fall to the ground. Another child snatches the other piece of wood from him and runs away. Child C runs after him, the teacher tells them to come back to the mat area.”

In this observation child C is interested in positioning himself differently, like sitting down, lying on his side and, finally, throwing himself on the ground again and again. He is exploring gross motor positioning, as opposed to fine motor positioning which can be seen in drawings when children draw figures in different positions. Again, our observations are limited, so it could be that the child explored fine motor positioning but not during our observations.

Louis et al (2008) mention that this schema is often incorrectly regarded as having elements of an Obsessive Compulsive Disorder. For example, some children do not want particular foods mixed together on the same plate, and some line their toys in order of shape and size in unconventional places. They continue to state that “the positioning schema, like all schemas, is part of learning, and is how children make sense of their experiences, testing their knowledge again and again as they confirm and organise what they know and understand, extending their growing ability to think logically and apply order in and through their play” (2008, 35).

This child explored other schemas, too, together with the positioning schema. For example, he moves a lot in lines showing characteristics of the trajectory schema. Bruce (2008) believes that schemas do not work in isolation but, rather, with other schemas to create a coordination of actions in children.

Observation 10:

Exploring positioning

“Child C is walking to the home corner. He turns around and then goes to join some other children with a teacher. He observes what they are doing. He turns around once, and puts his hands on top of the table. He walks to another play area, observing children who are painting at a table with the help of the teacher. He puts one leg on a chair and leans on the table. Then he sits on the chair and folds one leg. As the children finish painting child C walks away. For a minute he joins another group that is working with a teacher near the home corner. He leans against a kitchen cupboard. Then he goes to a table and plays with mushroom shaped game pieces. He starts piling rectangular shaped boards on top of each other. He takes them apart and inserts the game pieces into the holes, after which he fills the holes with different patterns. Then he takes them away one by one and lines up the smaller and bigger ones in separate lines. He goes away to another table and watches the children play. He sits down on the floor and tries to talk to another child. After this he walks to the home corner and takes one item and plays with it. Then he joins his brother in lining up cards.”

In the above example child C observes what other children are doing, perhaps trying to learn something from them. Sometimes children need help from other children or practitioners to learn a new skill, and sometimes through observing intently for a long time and then trying it out. Vygotsky would say that what the child can do with assistance today he can do by himself tomorrow. Still, once again, we came into the daycare to observe the children for a limited period of time, and we can not say for sure what the child is doing as he walks around from table to table. He could simply be bored or hungry and, therefore, not engaging in play.

Child C places the plastic boards on top of each other, which is a form of positioning that children often explore. This observation tells us that the child is trying to see what will happen if he places one plastic board on top of each other. He is, therefore, exploring *functional dependency* which is about understanding the cause and effect of actions. Will it come tumbling down? Or will he be able to build a tall tower without it falling to pieces?

This child was also observed playing with construction blocks placing them on top of each other, and building a tower. As we mentioned earlier, schemas often work together. For instance, placing blocks on top of each other in a straight line vertically or side by side horizontally have elements of the trajectory schema. Also, before demolishing it, child C pushed a car along the tower and back down again (as the car wheels rotate let the rotation schema be added to his interests). It seems that he was exploring functional dependency, first, in using his hand to elevate the car up the tower and further in demolishing it.

Children often try to modify their schemas to fit into new situations. When they manage to do so they reach *equilibrium*, a balance between assimilation and accommodation, mentioned in section 4.3. Assimilation was stated to occur when new information is taken in.

Accommodation, on the other hand, is applying that knowledge to new situations. Child C, for example, is using his knowledge of a combination of schemas - positioning, trajectory and rotation - to fit many situations. He positions his body and objects in different ways to create new constructions and explore new circumstances. He moves from one action to another testing his pre-existing experience in order to solve the current situation. Once he is able to rethink an idea he originally assimilated into fitting naturally into a new situation, he has reached a state of equilibrium.

Piaget as cited by Bruce (1997) states that schemas develop into later concepts in life. Positioning, for example, develops into a concept of end points, exact length and exact height. Child C is currently exploring these concepts through his positioning schemas. Adults, both practitioners and parents, can support and extend the child's learning through his schemas in several ways. Firstly, after identifying his schema interests, it is important to provide the child with more opportunities to explore a particular schema further and gain more knowledge. Moreover, engaging with his actions and asking him challenging questions and supporting his play through appropriate language is a vital role for adults. Children exploring positioning may enjoy stacking objects, lining up toys, creating layers in paint and collages, sorting small objects, and using peg boards to create patterns and shapes. Key words include on top, under, behind, between, next to and in front.

### 6.7 Orientation Schema

This is an interest in seeing things from different angles. Children hang upside down from the slide or climbing frame and may turn their toys and objects upside down as they look at them. All the children were observed exploring this schema on several occasions.

#### Observation 11:

#### Exploring the orientation schema

“Child C takes a coloured plastic sheet with a hole in it and looks through it. He then walks away to the home corner. He takes a plastic cup, puts a fork in it and promptly takes it out leaving it on the table. He picks up a bowl off the floor and places it onto his head like a hat. Then he leaves the bowl on a table and climbs up onto a chair. He stands there for a bit, then gets down.”

In this observation we see that child C is interested in seeing both objects and himself from different angles. He seems to be combining positioning and orientation to explore his surroundings from a new angle. Earlier we indicated that child C is interested in positioning himself differently. Now he is climbing up onto a chair showing an interest in the orientation schema. He is seeing the room and the other children from a different angle when he places himself higher than they are. Furthermore, by looking through the coloured plastic sheet he is seeing everything differently, even in a different colour. It is also interesting how child C briefly tries on the bowl on his head like a hat, as if exploring how different people look with something on their head. Too bad there was no mirror around for him. It is likely that he may be testing a new idea in his head, or learning a new concept through his explorations. Referring to Piaget's theory Bruce maintains that a child takes in new information and changes it in his mind to fit his ideas (1997, 77).

According to Louis et al, often children exploring this schema find it difficult to sit still during group times (2008, 36) needing a physical object such as a finger puppet, some playdough or a beanbag to help them concentrate. Moreover, practitioners need to offer plenty of opportunities through freely chosen play to support children in developing and coordinating their physical movements.

Furthermore, Louis et al go on to say that "a pattern may emerge in children's actions that links orientation with angles, slopes and shapes as children explore how different objects and their own bodies move on various surfaces" (2008, 36). Child C was often seen imitating something like action man or spider man, as he thrust himself on the floor doing what resembled break dance movements. We did not hear any speech during such observations so we cannot say for sure what he was imitating or playing. However, in a further study it could be wise to ask parents to observe the children at home to see what meaning the children place on their actions in a more familiar environment.

Children exploring the orientation schema may enjoy examining the underneath of objects, bending to look at the world from different directions, mirror play, kaleidoscopes, creating peep holes and posting boxes. Key words include turn, upside down, backwards, over, twist, roll and under.

## 7 Discussion

In the previous sections we talked about the most common categories of schemas in relation to children's behavior. It was also pointed out that once schematic behavior is observed in children, the information can be used to plan interesting activities for them - linked to their current interests. Educators and parents alike should be involved in children's learning in many ways. First of all, by providing a range of materials adults can extend children's schema

learning. For instance, if a child is observed to frequently explore containment and infilling - i.e. the enveloping schema - parents could involve them in everyday activities to extend their schema explorations. Meade and Cubey (2008, 18) mentioned a teacher using soup-making as an activity to extend the children's concept of infilling. The children helped in cutting the carrots and putting them inside the pot for cooking the soup. "The adult supported the schema learning by using language such as 'inside the pot' and 'inside the soup'". They go on to say that "children helping with everyday chores use their action schemas in different ways" (2008, 45). Often children who are interested in enveloping or infilling are also helpful in putting toys away. The three-year-olds in the Finnish American Kindergarten explored this schema constantly, filling in containers, bags and baskets both indoors and outdoors.

Still, according to Meade and Cubey, it is not enough simply to identify a child's interest, but "when a child appears to be paying attention to a particular pattern, he or she needs to be provided with a range of interesting and stimulating experiences which extend thinking along that particular path...Extensions to children's schemas need to provide opportunities for further learning, for children to talk and for more nourishment for children's fertile minds" (quoting Nutbrown, Meade & Cubey 2008, 46). Bearing in mind the children's current explorations, parents and practitioners at the Finnish American Kindergarten can incorporate the children's interests into activities during circle times, crafting sessions, field trips as well as free play.

However, Bruce (1997) points out that it is important adults do not feel like they should support unacceptable behavior just because it is schematic. Negative schematic behavior, like the trajectory schema of throwing or kicking, does not make a child likeable nor is the child learning good ethics. Smidt (2010) maintains that schemas help us to understand difficult behaviour, and in every schema there is a crucial learning embedded. We were pleased to find out the teacher of the three-year-olds at the Finnish American Kindergarten wanted to use our observations for her planning in order to cater for the children's needs. Often when teachers or parents are aware of schematic behavior they start seeing the children in a different light. For example, a boy's parents in Meade and Cubey's research changed their perspective about his tying chairs together, switching from seeing it as naughty behavior to seeing the boy exploring connection and the physics of tension.

Also, if a child is noted to constantly scatter objects around and empty out filled containers and bags - like many children at the Finnish American Kindergarten - parents at home and practitioners in daycare may want to have a dedicated corner where children are free to explore capacity and fit in this way. This way the children are given boundaries and adults do not get frustrated with the mess. Also, it is wise to make sure the children know in advance what they scatter around must be tidied up when they are done playing.

It is common for adults in early childhood centres in which a child-centred approach is used to think that “the children are like ‘butterflies’, flitting from area to area, from child to child” (Meade & Cubey 2008, 43). Sometimes it may be true. Still, without the knowledge of schemas it is easy to think that children move from one play area to another without a specific purpose. A lot of the time children are fitting different but appropriate content into their latest schema. For instance, Bruce (1997) gives an example of a child who, at first, was thought to be restless - always hiding inside the curtains, dressing his mother and covering her, dressing his teddy, and wrapping himself around chair legs while listening to a story. As the mother learned that the boy was exploring enveloping in different forms she stopped worrying about him. It is, therefore, important to observe children in an informed way instead of jumping to conclusions and thinking they lack purpose in their actions. Unless schematic behavior is understood as systematic learning, things like messy play or repeating the same actions again and again can be frustrating or boring to an adult.

In this context, Meade & Cubey use a metaphor of bees collecting nectar to describe integrated learning (2008, 43). This means that children develop a schema by behaving like honey bees, moving from one experience to another, trying to get further ingredients to use, and in that way gaining a fuller understanding of a schema. We observed many three-year-olds moving around from one play area to another. But we also made a note that many children stayed in one play area for a long time repeating the same action again and again - like filling in drawers and containers in the home corner for quite a long time, obviously getting pleasure out of it. Through such repetitive actions children develop their thoughts and begin to understand something better, like volume and capacity in this case. Their thinking becomes more organized as they focus their attention and fit new experiences into patterns that have already been stored in their memories. Bruce (2006) believes that children do not act randomly but in ways that are organized.

Also, Louis et al (2008) maintain that as children develop, their schemas begin to function together, forming clusters, enabling the child to think and act at much higher levels than they would with just one schema. Schemas become co-ordinated with each other and develop into systems of thought. According to Athey (2007), specific schemas have been used to show the sequential and systematic progression from motor behaviour to thought. For instance, Louis et al (2008) mention a three-year-old girl who has a fascination for anything that can be pushed, like prams and trolleys, and carrying bags filled with toys. Later, she starts to be selective about what is being pushed or carried and begins to match items to particular roles she acted out -for example, the doll is taken out by mum, or her letters are delivered by the postman. She is using her schema clusters in developing her thought on a symbolic representation level as she matches the items and roles acted out. It was interesting to note

that child D placed symbolic meaning to his creation of pegs in one of our observations (first it was a train, then Linnanmäki) which shows how his schema clusters are developing his thought on a symbolic representation level. Meade and Cubey (2008) refer to Vygotsky's theory in which he states that young children learn by putting together insights from diverse first-hand experiences. All aspects of learning are based on earlier experiences - and for young children especially they must be real-life experiences.

It is important that in these real-life experiences children hear a lot of speech. Early childhood researchers and educationists give great importance to language in relation to schema development. "As well as opening up experiences and adding equipment, opportunities for children to talk need to be extended" (Meade & Cubey 2008, 46). They state that recent research confirms that dialogue is central to children's development and young children's thinking. By naming schemas and actions, engaging in young children's forms of thought and asking challenging questions, adults and older children are extending the children's thinking. Moreover, children use narration to reconstruct experiences into a coherent, meaningful order (quoting Engel, Arnold 2003, 74). The Finnish American Kindergarten is an English language playschool and the mother tongue for most of the three-year-olds is something other than English. The teachers, therefore, face a bigger challenge when engaging in dialogue with them. Still, observing how young children pick up words very fast is always encouraging. Many of the three-year-olds were heard repeating the teachers' words constantly. The Finnish speaking ones were heard speaking a combination of Finnish and English repeatedly.

The important experiences of talking to an adult complement the variety and stimulation of exploration that children go through. By asking questions children are making sense of the world around them, and it is important to give them answers that make sense. Autocratic or flippant answers like "because it is" or "because I say so" are neither logical nor satisfactory (quoting Nutbrown, Meade & Cubey 2008, 46). They do no justice to children's capacity to think. Professionals and parents should work together in order to facilitate the necessary links between children's thought and appropriate speech. Athey (2007) also believes that one implication of the cognition for teaching is that the language used by adults must be sufficiently elaborate to support advances in children's thinking. What young children say usually relates directly to what they do and see. On one occasion child E was observed playing with another three-year-old with whom he did not have a common language. They were placing toys on their heads letting them fall onto the floor as their heads tilted, laughing hilariously as they fell. Interestingly enough, child E was heard singing the "inacey wincey spider" in Finnish as he did so. He must have been making a connection with placing the toys and making them fall to the spider that was washed out by the rain in the nursery rhyme. So,

language played a vital role here as he seemed to be placing symbolic meaning to his actions through reciting the nursery rhyme.

Another important reason for language is simply that children often don't know the words that go with their explorations. For instance, a child that is exploring the rotation schema needs to hear words like "spin" and "rotate". Meade & Cubey ask an important question: "With minimal language, how do children consolidate their thoughts about either figurative or action schemas, and progress to understanding concepts?" (2008, 80) After carrying out their research in two childcare centers in New Zealand, Meade and Cubey found that practitioners were not nourishing the children's language development as much as they could have. Rather than a higher level of staff interaction with kids, the practitioners relied more on materials enrichment to nourish children's schemas. Meade and Cubey affirm that the staff did too little to help foster a better understanding of what the children were experiencing, because they did not engage with the children's thinking (2008, 81). They feel the low percentage of time adults spent in conversations with children is of concern.

Not only is speech linked to schemas but writing is believed to originate from schemas as well (Athey 2007). Athey states that "early babbling developing into speech has been compared to early scribbling developing into drawing and writing" (2007, 168). She further argues that, from a developmental point of view, writing could be traced to originate soon after birth when the infant starts to distinguish between things that move from objects that are static.

Meade and Cubey refer to Whitehead's theory in which he states that young children's first investigations of print and first attempts to use written symbols are the earliest stages of literacy, and they do not involve real reading and real writing (2008, 105). According to this view, mark-making involves both creativity and communication. Moreover, in emergent writing children may use non-conventional marks, like scribbles, in different ways to communicate what was written. They may combine their letters, numerals and drawings, seeing no need to separate them but knowing that they are symbols for communication (Meade & Cubey 2008, 106). Referring to photo 2 in the Illustrations section we can say that child B is exploring early forms of literacy. Providing opportunities for children to practise their schemas in scribbles and drawings is one way to support their schema explorations and early forms of literacy. Moreover, helping children give words and meaning to their work is part of engaging with their experiences. Child B, for instance, needs to hear that she is drawing "spirals", "circles" and "lines".

So, engaging with children's thinking is an important role for an adult, both practitioners and parents alike. Meade and Cubey found in their research that adults were not engaging enough with the children's experiences to help foster a better understanding. For instance, a little

boy experimented with trajectories by using lassos at different speeds to catch objects. To the researchers' disappointment the teachers did not discuss these experiments with him and, therefore, did not extend his thinking and scientific concepts in his explorations. The boy was evidently capable of abstract thought but was not given opportunities to talk about his thoughts or test his theories against adult knowledge. The more involved teachers are with children's progression the more they gain in their profession. They are likely to gain more job satisfaction as they "experience the thrill of planning and facilitating children's excitement about new revolutionary cognitive discoveries" (Meade & Cubey 2008, 156).

However, sometimes the lack of supporting children's schemas may be due to a number of points. For instance, it may be difficult to spot schemas if the children are not displaying them visibly, or if practitioners are not even aware of the whole concept of schematic behavior. Some children may show one or two schemas, while others may be going through a phase where their schematic behavior is not visible at all. Sometimes during our observations it was difficult to spot schemas, and at other times the children explored their schemas quite intently. Still, schema-spotting, though fascinating it is, should not become an act of labelling children. Understanding schemas and learning to observe them are both part of professional learning. Smidt (2010) believes that identifying children's schemas is only one of the many tools at our disposal in observing and supporting children's learning. Also, there is the danger of practitioners becoming too subjective or narrow-minded. Children are not robots. Sometimes they explore many schemas at a time and sometimes they change frequently from exploring one schema to another. If practitioners have already spotted a schema in a child - or if they are not detecting a schema at all - and as a result stop observing the child they may be missing out on supporting or extending that particular child's concept formation. This happened in the case of the little boys' lasso explorations mentioned earlier.

We have noted that adult-child interaction is important in supporting children's development. However, schema researchers also stress the importance of partnership between parents and early childhood teachers. As all children are individuals and have different needs to be catered for it is important that shared understanding exists between parents and teachers. When both parties are aware of existing schematic behavior in explorations, together they can work in a way that is best for the child. According to Bruce, the "Confident Parents, Confident Children" in the Community Education Pack states: "Helping people become confident parents may be the best way to ensure that the next generation grows up to be capable and confident. There is more to parenting than just looking after a growing child. As adults we too 'grow' as we become more experienced and skilful parents" (1997, 151).

Athey points out that at the beginning of her intense five year schema research a conceptual gulf existed between the parents and professionals involved. This was due to a lack of

previous shared experiences (Athey 2008, 201). The parents were respected as experts of their own children, as they have them full-time and know them better than anyone else. The parents and professionals exchanged information concerning the children's schematic interests and explorations in an attempt to foster their cognitive development. Athey states that "one of the most important outcomes of the project was that all the adults watched and listened with ever-increasing interest to what the children were saying and doing. Nothing gets under a parent's skin more quickly and more permanently than the illumination of his or her own child's behavior. The effect of participation can be profound. " (2008, 209) Coming back to the context of our thesis, if another study were to take place it would be wise to involve the parents more.

So, adult participation is vital for children's cognitive development. But providing a nourishing environment for children both in daycare and at home is equally important. Meade and Cubey mention two observable ways in which younger children "come to know", and they are via their symbolic representation and their active exploration (2008, 44). They also point out that an effective educational provision has consistent features, "constants". These are, firstly, adults and their behavior, secondly, routines and information and, thirdly, experiences and materials. Through these constants children feel stimulated to tackle new things in their environment because they know adults will help if needed. They will also plan what to do when they arrive, like "when I get to nursery this afternoon I'm going to build a tower of blocks all the way to the ceiling". Moreover, Meade and Cubey say children will also revisit familiar materials, like rebuilding a new and bigger block structure that may have been fun the previous day. Through these constants the children will feel safe to assume responsibility in their explorations.

So far we have talked about the importance of adult participation in supporting children's development and learning. Another essential point to mention is that time to play is important for children. Mary D Sheridan points out that, "just by watching young children it is easy to see that play is often stimulating and rewarding, and that they also get a great deal of emotional satisfaction from playing" (1999, 4). She identifies four functions that play has for children which are *apprenticeship*, *research*, *occupational therapy* and *recreation*.

Firstly, children develop different competencies through everyday tasks like dressing, feeding themselves or answering the telephone (Sheridan 1999, 4). Play gives them the opportunity to acquire such skills. The function that play has here is called *apprenticeship*. Secondly, children will learn more about the world around them by observing, exploring, speculating and making discoveries. For instance, they will learn about the properties of water, concepts of sinking and floating, by doing *research* through play. It seemed quite apparent that many three-year-olds in the Finnish American Kindergarten were testing gravity by throwing toys of

different weight around, thrusting themselves on the floor like action man, or using the slide or climbing frame in the park. Sheridan's third point is that of *occupational therapy*. She points out that play can have a soothing or distracting effect, like escaping boredom or coming to terms with unpleasant things like emotional or physical pain. Child A seemed to use his enveloping schema (section 6.2) to deal with his reactions towards some other children invading his play area. The fourth function of play is *recreation* i.e. simply getting enjoyment out of it. This was also very apparent during our observations of the three-year-olds!

According to Bruce (1997), through play, children can actively manipulate, rearrange, act on and reflect on their learning. She goes on to say that adults reflect through discussion, literature, writing and meditation, whereas children reflect through acting out experiences, or preparing for them. Bruce asserts that "play helps them to grasp and try out their learning in concrete ways" (1997, 23). Moreover, she places importance on free-flow play as "it enables children to apply what they know, reflect on it, use it in different ways, experiment and explore with what they know and have learnt of relationships, feelings, ideas, thought and the movement of their bodies" (2004, 167). Children who transport, scatter and heap objects everywhere need to be provided with unbreakable objects, such as baskets and other containers as well as space to move about. In doing so, practitioners and parents are preparing children for a healthy adult life. Most children during our observations did not seem to display the transporting schema while inside, but it was more common outside. This may be because the daycare has rules against scattering objects from one play area to another so as to avoid a huge mess or things from getting lost.

Another important point to mention is that of parallel play i.e. when two children are playing together. It is said to have an important role in children's cognitive development. As children engage in parallel play they will have opportunities to observe other children's actions that are useful for developing one's own understanding of schemas, and of people, places and things more generally. In our study we found that child D particularly engaged in parallel play repeatedly. In fact, he was hardly ever seen playing by himself. Through parallel play children learn from each other.

In summary to this section, we discussed adult-child interaction, the importance of engaging with children's actions, and how children can explore their schemas through free play. By allowing children to explore the world around them through free play adults are contributing to a healthy adult life. We were happy to realize that children in the Finnish American Kindergarten are provided with plenty of materials to use and play with in their free play, which also made identifying the schemas easier for us. Schemas by no means disappear after childhood, instead, they develop into later concepts in adulthood. Bruce (1997) mentions some examples of early schemas developing into later concepts. Feelings, ideas, social

relationships and object relationships are all a part of these concepts. She believes that all these contribute to why we like and dislike and are interested or not in particular things. The following table shows some examples of what concepts early schemas may later develop into as suggested by Bruce (1997).

Table 7

Early schemas	Later concepts
vertical trajectory	height
horizontal trajectory	length
lateral trajectory	angles
connecting	graphs in mathematics
enclosure	maps, geometry, regular shapes, art, figure drawing
enveloping	area in mathematics, hot air balloons and the physics of gases, concept of run-off in geography, shading in art
rotation	molecular structure in chemistry and so on
transporting	quantity and understanding numbers

Let us come back to our research question, which is: How do children apply different schemas to organize their thinking? In section 6 we presented our findings by analyzing some of our observations and picking out visible schematic behavior. We described how the most common schemas can be detected through observations. Then we related our observations to available theories influenced by early childhood theorists and practitioners like Jean Piaget, Lev Vygotsky, Chris Athey, Tina Bruce, Anne Meade and Pam Cubey, as well as Cath Arnold.

First, we can conclude that children need to explore the world around them repetitively in order to organize their thinking. They need to experience similar situations again and again to be able to apply knowledge learned from one situation to other circumstances. Sometimes breaking down observations of children and analyzing them in relation to theory helps adults see how children may be doing it. As we noted, looking at their actions through Piaget's stage-level theory, and applying Athey's ideas of continuity helps us appreciate children's actions through a cognitive lens. There are links between physical actions, symbolic representation, language, the idea of cause and effect, as well as the development of

thought. Also, relating experiences from the past to the present and future is essential for concept formation and gaining knowledge from experiences. For instance, to understand and internalize the concept of size and fit children need to fill in containers of different sizes and shapes again and again. If one bucket is bigger than another, after a few trials and errors children will realize that whatever fits into the smaller one will not fit into the bigger one. Furthermore, through exploring movement children begin to understand the laws of physics. Through their explorations of the world around them children develop physically, socially, mathematically, ethically and emotionally.

This study was very helpful to us as we learned a lot. To begin with, we learned to conduct ourselves as researchers. Even though the process needed a lot of dedication and commitment it was a good experience. Observing the children in their natural setting helped us to understand them better and appreciate purposeful learning through explorations, as opposed to thinking that “children just behave like that”. Moreover, linking their actions to theory broadened our perspective. We also learned that through informed observations adults can play a vital role in children’s learning and development. Often it is difficult to categorize schemas in an outlined way as they do not always appear clearly for all children. However, as Louis et al (2008, 36) assert, it is vital that we recognise the importance of children’s self-initiated play and the role of the sensitive adult in providing the time, place and opportunity to turn purposeful play into learning.

The topic of our study was really interesting and it motivated us a lot. As we read through different theories of schemas it was interesting to see how children can be mistaken in their actions. Unconventional behavior - like not wanting different foods mixed together or tying chair legs together - is not necessarily a sign of being naughty. Instead, children may be applying their current interests of positioning or connecting to everyday life.

As we mentioned in the beginning of this thesis, many early childhood practitioners have not heard of the concept of schemas. This was true with us as well since we did not know before our study that the word “schema” can be used to summarize children’s actions. We also learned that, as future early childhood practitioners, we should be well conversant with children’s development as it is necessary in planning ahead and extending their learning.

Furthermore, before starting our observations we thought it would be difficult to spot schematic behavior in the children. But, after reading through different theories and observing them in daycare, identifying schematic behavior became easier than expected. Even though our time was limited we managed to identify the most common types of schemas. We could have also gone further in our study and interview the parents and teachers. Sharing knowledge with them would have broadened perspectives on all sides and

would have been more beneficial for the children. Still, we believe this study can be helpful to those who are working with children and to those who wish to work with them in the future.

This study of schemas in three-year-olds was a very limited one in many ways. In a further study it would be prudent to involve the parents more. This could be done, for example, through handing out questionnaires and maybe educational leaflets to raise more awareness of schematic behavior in children. Also, it could be interesting to study another age group or even do observations of several age groups and make comparisons. One aspect to note, however, is that to reach valid results the children should be observed more often and, if possible, during longer periods. Furthermore, including more outside time in the observations broadens the perspective. Unfortunately in this study outside observations were very limited.

## 8 Ethical considerations and trustworthiness

### 8.1 Ethical considerations

In carrying out the study we took into account the ethicalities involved. Before starting letters of consent were sent out to all the parents of the three-year-olds. We were careful not to observe any children whose parents had not consented to their being observed during the four week period. This way informed consent was covered (Christensen & James 2008, 19). Moreover, we were aware of the fact that no pictures of the children could be taken.

Silverman refers to Weber's views when he states that all research is contaminated to some extent by the values of the researcher (2005, 257). He goes on to say that "only through those values do certain problems get identified and studied in particular ways" (257). Let us put this into the context of this study. There were two students, both from different cultural backgrounds and nations, who observed the children using narrative observation as the method to uncover schematic behavior. Louis et al stress that it is important for the researchers to write down what they hear and see, not what they think (2008, 77). We did this and, on some occasions, after the session it was good to notice that whatever one of us had missed during the observation the other one was able to record. By recording only what we saw and heard there was no room for interpretation i.e. for possible deception and any harm that might come out from it (Christensen & James 2008, 19).

As one of the students is Finnish speaking the observations were able to include some speech from the Finnish speaking children. However, there were occasions when the student sat a bit too far away and, therefore, could not hear what the child spoke at a specific moment. As it was important not to distract the children's play we had to avoid eye contact and

concentrate on our note taking. On one occasion an older child came and asked us what we were writing to which we responded we were doing teachers' paper work.

## 8.2 Trustworthiness

The question of validity, which is another word for truth (Silverman 2005, 210), arises in our study. It is important to note that the environment, the teachers, and the children were still relatively new in relation to each other as the kindergarten had only recently opened its doors. This means that the children might not have been that familiar with the surroundings which, therefore, could be a reason for perhaps not knowing what to explore. This in turn could have resulted in the students not noting any schematic behavior, in a situation where the child would normally be eager to explore his/her surroundings. Fortunately, in many situations the teachers were able to engage the children by suggesting activities and games for them to do. Still, based on our observations the children seemed mostly quite confident and well able to find activities to do and things to explore.

In addition, each child was observed 3-5 times, for only about 45 minutes, on different days during the four weeks. The 45 minutes used for observing each child is not a lot, so it is difficult to be sure whether our observations really show the child's true interests. Things like being tired, moody, or hungry and even the weather can affect children's behavior. Furthermore, one of the children was absent during the last session so he was observed only three times, whereas most of the other were observed four times. One child was observed five times. Also, we promptly noticed how hard it is to keep writing down the observations manually, always ending up having a tired hand after the sessions. Originally we wanted to observe all the children outside as well as inside, but it was possible only on two occasions. Our afternoons were often booked with work and family matters and sometimes the weather was too rainy.

However, we were able to spot consistencies and patterns in the children's behavior. But, nevertheless, this study lasted for a very limited amount of time and the next time a similar research is conducted it would be prudent to observe the children longer and on more occasions. Children are different and they will behave and react differently in similar situations. Also, it could be that sometimes their behavior was not based on interest but convenience. In all honesty, the research did not last long enough for us to be able to predict individual behavior and reactions to situations.

Objectivity was also an important element in our research. As one of the students had just begun working in the kindergarten part-time before the start of the study she was already a little familiar with some of the children. It was important not to influence the record keeping

by preconceived ideas (Hobart & Frankel 1999, 5). Still, as stated previously, a major aspect of our record keeping was to note exactly what the child did leaving little or no room for interpretation. Moreover, it was decided from the beginning that both students should observe the same child at the same time, so as to reach a more reliable finding (Hobart & Frankel 1999, 5).

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Illustrations

Photo 1

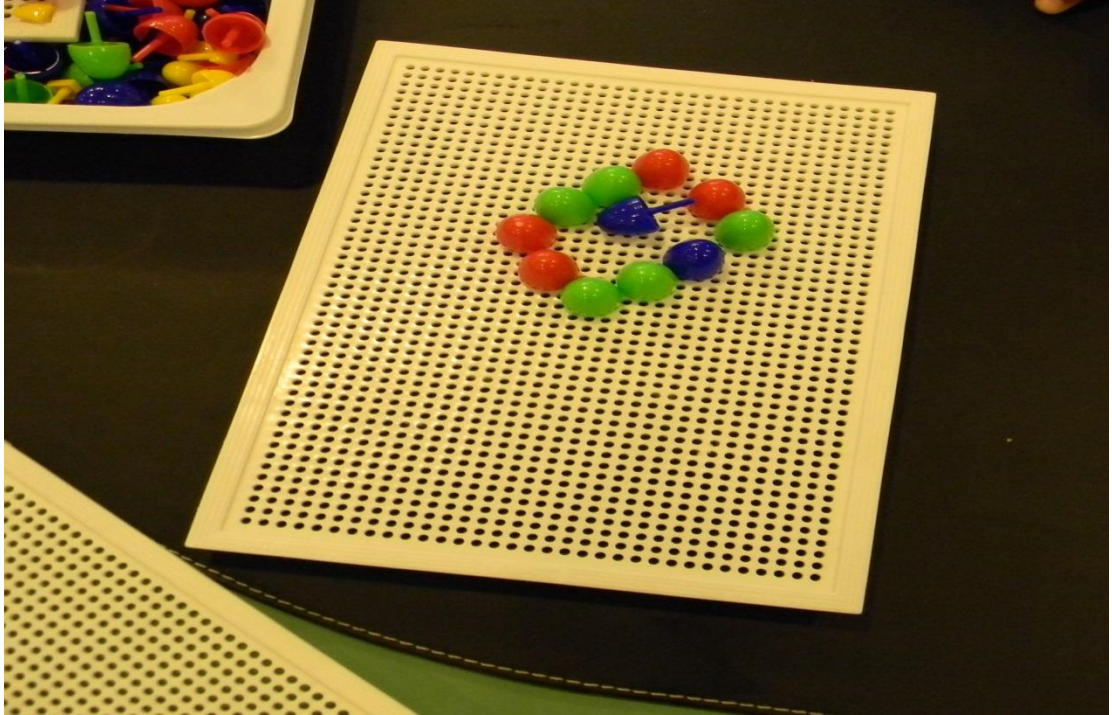


Photo 2



Appendices

APPENDIX 1 Observation Sheet

## Observation Sheet

Observation number:

Name of the child:

Age:

Number of adults present:

Number of children present:

Time commenced:

Time completed:

Date:

Setting:

Aim:

Objectives:

Record of observation:

APPENDIX 2 Letter of Consent

Dear parents,

We are students from Laurea University of Applied Sciences and we are working on our final thesis at the moment. Our research is about 'Schemas in Early Childhood' (schemas are repeated patterns of behaviour) and we plan to observe three-year-olds. We would like to ask for your permission

to observe your child during a period of four weeks. We are under an oath of confidentiality which will also be valid after the thesis is complete. We will ensure that all data collected will not be given to any outside persons. We will also take care that the thesis will bring no harm to anyone involved.

Please fill in the following:

I ..... give / do not give permission to observe my child ..... for four weeks in August-September 2011.

Kindest regards,

Hanna Pullinen & Naomy Kering