PREFERENCES AND EVALUATION CRITERIA OF PRESCHOOL CHILDREN RELATED TO DIFFERENT TYPES OF PLAY MATERIALS

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ABSTRACT

PREFERENCES AND EVALUATION CRITERIA OF PRESCHOOL CHILDREN
RELATED TO
DIFFERENT TYPES OF PLAY MATERIALS

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In this study, semi-structured interviews adopted from repertory grid studies are conducted with ten 5-year-old preschool children, during which children are asked to evaluate four types of construction play materials and four types of metallophones.In the study, the important design attributes of these two types of play materials preferred by preschool children are analyzed by gathering their own evaluation criteria. Based on the interview data, children's preferences, evaluation criteria and the reasons behind their preferences are tried to be identified.

The results of the study show that, children evaluated construction play materials considering method of construction, form of the pieces, color, size, types of pieces, types of constructions, ease of construction and material. Children evaluated metallophones considering color, placement of the keys, sound, being in the open-being closed, form, size, storage of the mallets, weight, size of the mallets, form of the keys, coding, number of mallets, number of keys, height and material. The study also includes the analysis of the relationships between children's evaluation criteria for each product group and comparison of the evaluation criteria related to construction play materials and metallophones.

Keywords: Toy Design, Preschool Education, Play Materials, Toys, Personal Constructs

ÖZ

OKUL ÖNCESİ ÇOCUKLARIN FARKLI OYUN MATERYALLERİNE İLİŞKİN TERCİH VE DEĞERLENDİRME KRİTERLERİ

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Bu çalışmada, kişisel kurguya dayalı yarı yapılandırılmış röportajlarla, beş yaşındaki on okul öncesi çocuktan, dört yapı oyun materyali ve dört metalofonun değerlendirilmesi istenmiştir. Çalışmada, söz konusu iki oyun materyalinin, okul öncesi çocuklar tarafından tercih edilen önemli tasarım özellikleri, çocukların kendi değerlendirme kriterleri toplanarak analiz edilmektedir. Elde edilen verilere dayanılarak çocukların tercihleri, değerlendirme kriterleri ve tercihlerinin ardındaki nedenler belirlenmeye çalışılmıştır.

Çalışmanın sonuçları, çocukların yapı oyun materyallerini değerlendirirken, yapım metodu, parçaların formu, renk, büyüklük, parça türleri, yapı türleri, yapım kolaylığı ve malzemeyi göz önünde bulundurduklarını göstermiştir. Çocuklar metalofonları değerlendirirken, renk, tuşların yerleşimi, ses, açıkta olma-kapalı olma, form, büyüklük, vurma çubuklarının depolanması, ağırlık, vurma çubuklarının büyüklüğü, tuşların formu, kodlama, vurma çubuğu sayısı, yükseklik ve malzemeyi göz ününde bulundurmuştur. Çalışma ayrıca, çocukların her iki farklı ürün grubuyla ilgili değerlendirme kriterlerinin kendi aralarındaki ilişkinin analizini ve yapı oyun materyalleri ile metalofonlara ilişkin değerlendirme kriterlerinin karşılaştırılmasını içermektedir.

Anahtar Kelimeler: Oyuncak Tasarımı, Okul Öncesi Eğitim, Oyun Materyalleri, Oyuncaklar, Kişisel kurgular

To Children

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CHAPTER 1

INTRODUCTION

1.1. Background of the Problem

In preschool years, 3-6 years of age, children acquire important motor, cognitive, language and social skills and play is the essential tool for this development during these years. Berger and Thompson (1996) define preschool years as *the play years*. During these play years, play materials become important tools for the play activities of children and these materials are commonly used in preschool education.

Since the use of play materials in preschool education aims to promote specific skills of children, design of such products becomes important in order to meet the requirements related to education and entertainment. Chiasson and Gutwin (2005) state that, for the products, which have education and entertainment purposes, user motivation and engagement is important besides task efficiency. Achieving these goals depends on the duration of interaction with the product and the attractiveness of the product for keeping user's attention.

Therefore, the more time a child spends with a play material, the greater skill level can be developed during the play activity. In order to understand the attributes of toys and play materials that are attractive for children, their evaluation of play materials, preferences, their play patterns and the reasoning behind them should be explored in depth. Druin (2002) indicates that, children have child-specific likes, dislikes, needs and curiosities and suggests the exploration of these needs by including children in the design process.

Children's toy preferences are important to gather and analyse, especially for the early phases of design projects by providing opportunities for the improved design specifications. Ideally, children's own evaluation criteria should be taken into account.

1.2. Aim of the Study

This study aims to find out the attributes of different groups of play materials that have primary importance for pre-school children and to analyze these attributes in terms of the relationships between each other, by gathering children's own evaluation criteria.

1.3. Research Questions

During the study, the main focus will be on children's own evaluation criteria and preferences related to different types of play materials. The research questions of this study are:

1-While interacting with different types of play materials, which products are preferred by children and what are the primary attributes that affect children's preferences?

2-What are the evaluation criteria of children related to different types of play materials and what are the preferences of children related to their own evaluation criteria?

3-Are there any relationships between children's evaluation criteria related to different types of play materials?

4-Are there any similarities between children's evaluation criteria related to different types of products?

5-How can design of play materials be improved by considering children's preferences and evaluation criteria?

1.4. Expected Outcomes of the Study

The evaluation criteria, preferences and the reasons of the preferences of children derived from the tests are anticipated to have reflections on the identification of important design attributes of specific play materials and on the understanding of the user profile. In addition, the similarities and the differences between the evaluation criteria of children related to different product groups may give information about the main attributes that a product should have and

the varying attributes from one type of product to the other, according to children. To conclude, the study is directed towards providing data to the designers of this field related to the formation of design specifications of this type of products.

1.5. Structure of the Thesis

In Chapter 2, developmental levels and capabilities of preschool children in different developmental domains will be reviewed for identifying the characteristics of the user profile. The relationship between the play activity and child development will be mentioned. Play behaviour of preschool children will be investigated focusing on the definitions, theories, characteristics, developmental stages and types of play for understanding the play context. Preschool education and its aims will be defined and educational models and the toys and materials used in preschool education will take place in order to understand how play materials serve for the aims of preschool education.

In Chapter 3, main focus will be on the evaluation of methods used for understanding the user's perceptions and preferences for the appropriateness for preschool children and for the aim of the study. The selected method, interviews adopted from repertory grid technique, its application to preschool children and general guidelines for conducting tests with children will be investigated in depth based on the studies in the literature.

In Chapter 4, the structure of the study conducted with children in Ekin Kreş, will be explained. Four construction play materials and four metallophones selected for the test will be introduced. Children's preferences, the reasons behind them and the relationships between the evaluation criteria of children related to the two groups of play materials will be explored through the analysis of the data. Observational data will be included in the analysis.

Finally, in Chapter 5, based on the research questions, the study will be evaluated and concluded. Preferences of children related to two types of play materials, evaluation criteria of children and preferences related to them, primarily important attributes of the products and the relationships between children's evaluation criteria will be explained based on the findings of the study Finally, methodology will be evaluated and suggestions for further study will be included.

CHAPTER 2

THE DEVELOPMENT OF THE PRESCHOOL CHILD, PLAY, PRESCHOOL EDUCATION AND TOYS

In this chapter, developmental levels and abilities of preschool children, play and play behaviour of children, preschool education and toys and materials used for preschool play were reviewed in order to become familiar with the user profile and play context. The insights gained were also useful for evaluating data collection tools that are appropriate for preschool children.

2.1. Developmental Levels of Children of Preschool Age

During preschool years, children continue to grow and acquire new skills. Berger and Thompson (1996) define the years between the age of two and six as *play years*. Development of the preschool child takes place in physical, cognitive, language, social and emotional domains (Sluss, 2005).

2.1.1. Physical Development

During preschool years, children develop their motor skills, which are categorized as fine-motor and gross-motor skills. Fine-motor skills include hand and finger movements, whereas gross-motor skills include the movements which make the child capable of becoming mobile and being involved in skills necessitating body movement (Frost *et al*., 2001).

Through motor activities involving the whole body, preschoolers develop their mobility skills. Gross-motor development involves locomotor dexterity, which include balance and movement, and upper-body and arm skills. Jumping, hopping, running and climbing are activities that require locomotor dexterity (Frost *et al*., 2001). According to Jambor (1990; cited in Frost *et al*., 2001) types of locomotion include rolling, creeping, crawling, climbing, stepping up and down, jumping, bouncing, hurdling, hopping, pumping a swing, and pushing or pulling

an object. Children develop their upper-body and arm skills by activities such as throwing and catching a ball, during preschool years (Johnson, 1998; cited in Frost *et al*., 2001).

Preschoolers practice the use of hands and fingers and are able to use small materials that require grasping and control. Children gain the skills of working with puzzles, cutting with scissors, using brushes, pencils, and manipulating small blocks, counters, and modeling clay (Frost *et al*., 2001). By learning to button, use zippers and snaps, and tie shoelaces, they also develop self-help skills necessary in dressing themselves (Johnson, 1998; Wortham, 1996; cited in Frost *et al*., 2001).

Perceptual-motor development is the development of skills for interacting with the environment through the use of the senses and motor skills. Body awereness, spatial awareness, directional awareness, and temporal awareness are the skills, which characterize the perceptual-motor skills. Body awareness is the child's ability to recognize the body parts, their functions and to understand how to use body more efficiently. Spatial awareness is the child's ability to use body in space. Directional awareness is related to location and direction of the body in space. Temporal awareness is the knowledge of movement and time, which involves rhythmic behaviours in an activity (Frost *et al*., 2001).

According to Gallahue (1993), motor skills of children develop in a progressive way. The steps of this progression are the reflexive movement phase, the rudimentary movement phase, the fundamental movement phase, and the specialized movement phase. These phases appear in this sequence universally, however the rate of gain of motor skills differs from child to child.

From birth to about 1 year of age, reflexive movement phase is seen, including reflexive movements in child's actions.

The rudimentary movement phase involves the acquisition of basic motor skills during the first two years, such as reaching, grasping and releasing objects, sitting, standing and walking.

From the age of 2-3 to 6-7, the fundamental movement phase exists, which involves the superior acquisition of gross and fine motor skills. In this phase, children first develop each skill separately, and then combine them with other skills.

At about the age of 7, the specialized movement phase begins and this phase proceeds with teenage years and adulthood (Gallahue, 1993). During this phase, most of the children have interest in sports; they acquire new skills and apply them to their sport activities (Gallahue, 2003).

In terms of large motor skills, by the end of three years, children can run smoothly, turn sharp corners and stop suddenly, climb stairs by alternating feet, balance on one foot for a few seconds, throw balls overhand, catch a ball with arms fully extended, jump off one step, jump in place and pedal tricycle. In terms of fine-motor skills, they can dress and undress self, wash hands, feed self, recognize and draw circle, draw a crude cross, scribble, begin to use scissors, string large beads, do many puzzles by trial and error and build tower of nine to ten blocks (University of New Hampshire, 2008).

By the end of four years, children can walk heel-to-toe, skip clumsily, run easily, walk downstairs by alternating feet; hop on one foot, balance on one foot for five or more seconds, catch ball, climb a small jungle gym. At four years of age fine-motor skills also develop and children can dress and undress self but cannot close zippers or put on boots, they can button clothes, lace shoes but cannot tie bows, brush teeth alone, recognize and draw a crude square, trace a cross and a diamond, use scissors to cut a line, look at puzzle before placing the pieces, build block structures which extend both vertically and horizontally (University of New Hampshire, 2008).

At the age of five, children can walk backward with heel-toe pattern, hop, balance on alternate feet with eyes closed, use hands more than arms to catch a ball, jump down three or four steps and jump rope. Fine motor abilities include tying shoe laces, copying a triangle, printing a few letters or numbers crudely, drawing a person with six parts, printing first name, using hammer to hit a nail, using scissors and some tools such as a screwdriver, folding paper diagonally, doing simple puzzles quickly and smoothly and building structures out of large boxes (University of New Hampshire, 2008).

2.1.2. Cognitive Development

During the preschool years, children develop their cognitive skills dramatically, by the exploration of environment and acquisition of new information (Frost *et al.*, 2001).

In Piaget's theory of pre-operational reasoning, from the age of 2,5 to 6 years, children are in pre-operational stage and during this period, children behave relying on their senses instead of logic (Sluss, 2005). This period is followed by the concrete operational stage, during which conservation problems of preschool years are solved, and children rely on logic rather than perception (Butterworth and Harris, 1998). During pre-operational period, the child is interested in her individual thoughts and cannot think that, others have different points of view. Due to this, preschool children are *egocentric*. Preoperational period progresses in two stages: the symbolic function substage and the intuitive thought substage (Frost *et al.*, 2001).

Between the ages of 2 and 4, children are in the symbolic function substage, during which they develop the ability of thinking symbolically, which allows the child to imagine things mentally that are not available (Frost *et al.*, 2001).

Piaget describes pre-operational thinking as animistic, because young children may imagine objects are alive and can move on their own (Frost *et al.*, 2001).

From the age of 4 to 7, child is in the intuitive thought substage, during which the child's thinking process changes from symbolic to intuitive. The child is able to arrange objects primitively but cannot group them appropriately. This type of arrangement is described as centration, which is the child's tendency to focus on only one attribute (Frost *et al.*, 2001).

After the child passes through centering, the concrete operational stage, which involves classification and conservation, appears (Piaget, 1951). Conservation is defined as the capability of the child to understand that physical features of an object remain the same, even when reorganized or reshaped. Classification is defined as, the ability to recognize the attributes of objects and arrange them by

groups considering different attributes. Child can organize objects by color, ignoring their shapes or by shape, ignoring the color attributes (Frost *et al*., 2001).

As a critique of Piaget, Margaret Donaldson (1978) states that, Piaget underestimates the abilities of the preschool child, because of the abstract testing situations of Piaget, which are not related to the social experiences of the child. Donaldson suggests that children should be tested with terms that are familiar to them in everyday life, rather than in a way that is abstract for them.

During the conservation tasks, Light (1988; cited in Butterworth and Harris, 1998) suggests that children may respond correctly for the wrong reasons. A child may give the right answer by observing the adult's behaviours, interpreting the questions and making a guess.

At the end of three years children can make mechanical toys work, match an object in her hand or room to a picture in a book, play make-believe with dolls, animals and people, sort objects by shape and color, complete puzzles with three or four pieces and understand concept of 'two' (Centers for Disease Control and Prevention, 2008).

By the age of four, children can correctly name some colors, understand the concept of counting and may know a few numbers, try to solve problems from a single point of view, begin to have a clearer sense of time, follow three-part commands, recall part of a story, understand the concepts of same and different and engage in fantasy play (Centers for Disease Control and Prevention, 2008).

At the age of five children can count ten or more objects, correctly name at least four colors, better understand the concept of time, know about things used in everyday in the home (money, food, appliances) (Centers for Disease Control and Prevention, 2008).

2.1.3. Language Development

Preschool years have important role in children's language development. Children learn about 10000 words, from the age of 2 to 6 (Frost *et al*., 2001).

Piaget (1951) argues that language in early years is egocentric and conversations of children are generally monologues rather than dialogues. Language development depends on cognitive development.

On the contrary, Vygotsky claims that, language and thought develop together and affect each other mutually. He suggests that, language progression begins with the relations between the adult and child, continues with inner dialogue, and then with verbal thought (Butterworth and Harris, 1998).

In preschool years, children gain the knowledge of morphology rules, syntax rules and semantic rules. Morphology and syntax rules refer to the acquisition of knowledge related to the sounds and grammar, whereas semantic rules refer to development in vocabulary and meaning (Frost *et al*., 2001). Berk (1999) characterizes language development as development of vocabulary, grammar and pragmatics.

By the end of three years, children can name the pictures of everyday activities (drinking, opening, closing, sleeping), bring the objects, features of which are specified, follow two part commands and commands including two different objects, identify and name the common objects, understand about 900 words although they cannot pronounce, speak with sentences including five words, express themselves with pronouns, modulate their voices while speaking, explain the pictures they make, talk to themselves and often ask questions, develop and tell stories, repeat a sentence with six words, interconnect the events and explain them (Okul Öncesi Çocuk Gelişim Sitesi,2008).

By the end of four years, children can show the body parts when explained, can follow commands including three parts or objects, explain the pictures logically, sing songs with 3-4 lines, make sentences correctly including seven words, can use past, continuous and future tenses correctly, tell address and age, ask why, when, how questions frequently, ask the meanings of words and tell stories combining reality and fantasy (Okul Öncesi Çocuk Gelişim Sitesi,2008).

Between the ages of five and six, children can say name and surname, the names of family members, telephone number and address, make sentences using 6-8 words and repeat sentences, describe physical objects in detail, ask the meanings of abstract concepts, articulate antonyms, explain daily life, describe location and movement and answer why questions in detail (Okul Öncesi Çocuk Gelişim Sitesi, 2008).

2.1.4. Social Development

In preschool years, children recognize themselves as individuals and also as a part of society. Elements of social development are self-concept, self-esteem, and self-regulation of emotions. In paralel with the development of empathy and social competence, children form relationships with others (Frost *et al*. 2001).

By the end of three years, children can imitate adults, spontaneously show affection for familiar playmates, take turns in games, understand concept of his/hers and mine. Emotionally, they can express affection openly, express a wide range of emotions, separate easily from parents, object to major changes in routine (Centers for Disease Control and Prevention, 2008).

By the end of four years, children are interested in new experiences, they cooperate with other children, become inventive in fantasy play, negotiates solutions to conflicts and they become more independent. Emotionally, they may imagine the unfamiliar images as monsters; they view self as a whole person including body, mind and feelings and they may not tell the difference between fantasy and reality (Centers for Disease Control and Prevention, 2008).

By the end of five years, children become enthusiastic to please their friends and be like them, they are more likely to agree to rules, they like to sing, act and dance, they become more independent. Emotionally, they become aware of gender, they are able to distinguish fantasy and reality and they sometimes become demanding, sometimes eagerly coperative (Centers for Disease Control and Prevention, 2008).

2.1.5. Musical Development

Zimmerman (1984; cited in Miyamoto, 2007) states that music concepts develop in the following order: volume, timbre, tempo, duration, pitch and harmony.

Children begin to give physiological responses to music in infancy and as the children grow up, these movements decrease and motor control and coordinated movements appear. By the age of 3, more complex and dance-like movements appear and by the age of 4, synchronized movements and dances can be performed. At the age of 5, children are able to perform choreographed movements and they associate music symbols with sounds (Moog, 1976; cited in Miyomoto, 2007).

Flowers and Dunne-Sousa (1990; cited in Miyomoto, 2007) state that, between the age of 3 and 5, echoing pitch patterns and maintaining a tonality during singing a song seem to be seperate skills. Between the ages of 4 and 5, singing becomes more accurate, unstable tonality through phrases sometimes occur and spontaneous singing decreases (Moog, 1976; cited in Miyamoto, 2007).

In several studies it is indicated that children at preschool age cannot discriminate the events in music which occur simultaneously (Bertrand, 1997; Costa Giorni, 1994; Serafine, 1981, 1988; Sims, 1991, 1995; cited in Miyamoto, 2007), they can focus on one aspect of a musical stimulus (Hargreaves, 1986; Petzold, 1981; Shuter-Dyson and Gabriel, 1981; Sims, 1988; Young, 1982; Zimmerman, 1986; cited in Miyamoto, 2007) and they tend to attend to the upper line of a melody more than the lower line in two-part music (Imberty, 1969; Serafine, 1988; Zimmerman, 1971; cited in Miyamoto, 2007).

Pitch and melodic direction discrimination concepts are difficult to be understood by children between the ages of 3 and 6 (Hair, 1977; Van Zee, 1976; Webster and Schlentrich, 1982; White *et al*., 1990; cited in Miyamoto, 2007). Discrimination of timbre is more developed in 5-year-olds more than 4-year-olds (Loucks, 1974; cited in Miyamoto, 2007) and preschool children are able to distinguish different types of instruments (Fullard, 1967). In the study of Miller (1986), it is indicated that 5 year olds are more capable of discriminating between the pitches, order the direction of sounds and associating directions on musical instruments than 3 and 4 year old children. In the study of Miller, it is observed that 5 year olds played sequential diatonic and chromatic tones of the xylophone with an understanding of pitch and melodic contour, whereas 4-year-olds played the xylophone randomly.

In the same study, it is indicated that, during singing, 4 and 5 year olds accompanied with the xylophone, resonator bells or autoharp whereas 3 year olds accompanied with rhythm sticks, cymbals and other nonmelodic instruments.

It is stated that young children, generally, cannot make accurate verbalizations about pitch (Costa-Giorni and Descombes, 1996; Funk, 1977; Hair, 1981, 1987; McMahon, 1982; Van Zee, 1976; cited in Miyamoto, 2007) and terms related to pitch and loudness are often confused (Van Zee, 1976; cited in Miyamoto, 2007). Scott (1977; cited in Miyamoto, 2007) suggests that nonverbal expression of register, contour and intervals can be made by children as young as 3. Nonverbal expressions involve the use of pictures, sorting devices, gestures, playing up and down on an instrument and clapping. Verbal modes of expression include the verbal expressions of *going up* and *going down*.

Smithrim (1997; cited in Berger and Cooper, 2003) claims that in free-play environment, children are more involved in music making including activities such as musical abilities, sound exploration, long periods of absorbed activity, unconventional use of instruments, teaching peers and spontaneous games.

Use of musical instruments not only promotes music development but also develops hand-eye coordination, two handed coordination and social skills (Balat and Artan, 2003).

2.2. Play and Play Behaviour of Children

During preschool years children spend most of their time playing and acquiring basic skills. Understanding play and play behaviour of children is important for the study in order to understand the play process during the interaction of children with play materials used in the tests.

2.2.1. Definitions of Play

Play is defined various times from different perspectives.

Froebel (1887; cited in Sluss, 2005, p: 7), founder of kindergarten, defines play as: "(…) the purest, most spiritual activity of man at this stage, and at the same time, typical of human life as a whole—of the inner hidden natural life in man and all things."

Freud (1961; cited in Sluss, 2005; p: 7) describes play as follows: "Children repeat everything that has made a great impression on them in real life, and that in so doing, they recreate the strength of the impressions and (…) make themselves masters of the situation."

Play definition of Erikson (1977; cited in Sluss, 2005, p: 7) is: "The growing child's play (…) is the training ground for the experience of a leeway of imaginative choices within an existence governed and guided by roles and visions."

The viewpoint of Vygotsky (1978; cited in Sluss, 2005, p: 7) is: "Play creates a zone of proximal development. In play a child always behaves beyond his average age, above his daily behaviour; in play it is as though he were a head taller than himself".

Play is defined as exploratory and includes variety of activities involving movement and manipulation in relation to the environment (Sutton-Smith, 1967; Robinson, 1977; cited in Stagnitti, 2005).

Caplan and Caplan (1973; cited in Sluss 2005, p: 7) define play as "the highest form of research".

Bredekamp and Copple (1997; cited in Sluss, 2005, p: 7) state that, "(…) in addition to its role in cognitive development, play also serves important functions in children's physical, emotional, and social development (…). Therefore, child initiated, child directed, teacher-supported play is an essential component of developmentally appropriate practice".

Klugman (1995; cited in Sluss, 2005) defines play as an interactive process during which children learn about themselves, their environment, the other people in that environment, and the interrelationships between all these elements.

Ablon's (2001; cited in Sluss, 2005, p: 7) play definition is "a free-ranging voluntary activity that occurs within certain time and place limits, according to accepted rules. Play is accompanied by feelings of tension and joy and an awareness that it differs from ordinary life".

John Huizinga (1955; cited in Sluss, 2005: 8) and the work developed further by Rubin, Fein and Vandenberg (1983; cited in Sluss, 2005: 8) define play as a "behavioral disposition, as observable behaviors and as context".

Bundy (2001; cited in Stagnitti, 2005) defines play as an activity, which is a transaction between the individual and the environment including intrinsic motivation, internal control and independent from the constraints of objective reality.

In Sutton-Smith (1997; cited in Sluss, 2005) it is stated that child players define play as having fun, being outdoors, being with friends, choosing freely, not working, pretending, enacting fantasy, drama and playing games, which does not resemble the definitions of adults including emphasis on growth.

2.2.2. Theories of Play

Scholars from different disciplines contribute to the understanding of play, bringing out different perspectives related to biological, emotional, cognitive, communicational and social aspects of play.

Classical Theories of Play

Originated in the nineteenth century, classical theories of play explain motivational aspects and existence of children's play and emphasize the physical, biological and instinctive nature of it (Mellou, 1994; cited in Stagnitti, 2004; Verenikina *et al.*, 2003; Sluss, 2005).

Surplus Energy Theory

The earliest classical theory, surplus energy theory of Schiller and Spencer (1875; cited in Johnson, 1999), explains human play as a way of expending excessive energy, which is not expended through work and survival activity, in order to balance the amount of energy in human body.

Schiller (1875; cited in Verenikina *et al*., 2003) defines play as *the aimless expenditure of exuberant energy*. However, this theory has lost its validity today, since it is not supported with further research. It evaluates children and animals in the same category and since children continue to play even if they are exhausted, it cannot fully explain play behaviour of children (Sluss, 2005).

Recreation/Relaxation Theory

As an opposite of surplus energy theory, recreation or relaxation play theory explains play as restoring energy that is expended in work (Lazarus, 1883; cited in Verenikina *et al*., 2003). This theory also has lost its validity today, since it is not supported with further research and it cannot explain why people, who spend energy in physical labor also play (Sluss, 2005).

Practice Theory

An alternative classical theory, Practice Theory, proposed by Groos (1898; cited in Verenikina *et al*., 2003), who is interested in the future and not with the past of the child, explains play as the tool for preparing the child for adulthood. According to Groos (1901; cited in Sluss, 2005), play gives children the opportunity of practicing adult activities. Gross emphasizes not only the physical play, but also the cognitive aspects of it, by interpreting the enactment of adult roles by a child in pretend play (Verenikina *et al*., 2003). Sluss (2005) argues that, if children played for practicing roles of adulthood, they would be psychic, as children cannot see into the future. However, some modern play scholars still associate play with practising certain roles (Bruner, Jolly and Sylvia, 1976; cited in Sluss, 2005).

Recapitulation Theory

From a different perspective, Hall (1906; cited in Verenikina *et al*., 2003) states that, play is the way of reliving our evolutionary past and serves for expressing instincts and weakening them. According to Hall (1906; cited in Johnson, 1999), stages of play are similar with the evolutionary stages of human. As an example, theory explains the children's baseball play as a way of getting rid of primitive hunting instincts. Hall (1916; cited in Sluss, 2005) categorizes animal/human development stages as: animal stage (climbing), savage (hunting), nomad stage (keeping pets), agricultural or patriarchical stage (sand play) and tribal stage (team games).

His hierarchical approach of play and ideas on the need for play outdoors has influenced play practice and scholarship. However, lack of supporting evidence and the fact that all children do not experience all these stages, this theory remains insufficient for understanding play (Sluss, 2005).

Contemporary Theories of Play

Developed after 1920, contemporary theories of play focus on the cognitive, social and emotional aspects of play. These theories are still taken into consideration in early childhood programmes (Mellou, 1994; cited in Stagnitti, 2005; Verenikina *et al*., 2003).

Psychoanalytical Theory

Psychoanalytical theory explains play in terms of its social and emotional aspects. Freud (1959; cited in Sluss, 2005), focusing on cathartic benefits of play, explains play as an activity, which fullfills the wishes of the child by the creation and control of the environment. Freud argues that, the main motivation for play is pleasure.

Play gives the child the opportunity of obtaining his desires, which are out of his control, in the world of fantasy. During play, children can obtain everything that they cannot do in reality. According to Freud, play is the source of information about a child's unique experiences, a way to resolve his problems and a drive for shaping self-concept (Freud, 1964; cited in Frost *et al*., 2001). Similar to Freud, Mead (1934; cited in Verenikina *et al*., 2003) states that, children develop their self-concept through role-play.

Erikson (1963; cited in Frost *et al*., 2001), a student of Freud, extends Freud's ideas and states that play is the primary feature of early socialization. According to Erikson, play reflects a child's past, musings about the present, or exploration of the future.

Erikson (2000; cited in Sluss, 2005) views play as ego mastery for emotional development, social and a life-long phenomenon. Play as ego mastery refers to the cathartic nature of play, which provides a context for the reduction of anxiety and expression of emotions. Social quality of play refers to the social force of play on the development of ego and sense of identity.

Erikson categorizes levels of development of play as autocosmic, microsphere and macrosphere. Autocosmic play is the child's exploration of his own body and realization of being separate from the others, during the first year of life. As the child develops, he includes objects and toys in the microsphere and gains mastery over the world through mastery over the toys. Play is solitary in this stage. As the child begins to interact with others, he enters the macrosphere, which includes sociodramatic play and games. The lifelong nature of play is explained as, the continuance of play experience by adults after experiencing other stages.

Peller (1954; cited in Frost *et al*., 2001) argues that, play reflects the child's wishes on how the reality would be rather than the child's experiences. For instance, a child hugging a doll may be wishing to be hugged by an adult.

Communication Theory

An anthropologist, Bateson (1976; cited in Frost *et al*., 2001; Sluss, 2005), in his theory of play and fantasy, argues that all organisms (human or not) that play have adapted signals that give information about the intention of action, whether it is play or real. In order to play, signals and communicational skills are needed. Bateson's theory focuses on the communicational nature of children's play. He names the common perceptions, which are developed during play by children as *play frames*, indications of which can be communicational signals or text.

Supporting the predictions of Bateson in her studies with preschoolers in pretend play, Garvey (1993; cited in Frost *et al*., 2001) proposes a framework, which explains the sorts of play language signals used by children (Table 2.1). Garvey's studies prove that children give signals about the play frames and through these signals, children shift between their pretend roles and their real identity continuously during the play activity (Johnson, 1999).

Extending Garvey's work, Corsaro (1986; cited in Frost *et al*., 2001; Sluss, 2005) and other social status researchers claim that children develop hierarchical relations during play activity and play is a context in which children create communicative strategies and social status (Table 2.2). Corsaro states that during play, children's use of language leads to hierarchical group construction.

Farver (1992; cited in Sluss, 2005), extending Corsaro's work in her study with Mexican children, states that, children use strategies for communication including basic communication (describe actions) and less complex communication (tags).

Table 2. 1 Garvey's Language Tools for Social Play
(Garvey, 1993; cited in Frost et al., 2001: 44)

Preparatory Talk	*("Let's play"; "These dolls are mine")*
Explicit Directions for Pretend	Transformation of self *("Pretend I'm a doctor")* Transformation of other *("You be a patient")* Transformation of joint rules *("Let's be nurses")* Transformation of action for self *("We need to make some medicine")* Transformation of action for other *("Pretend you broke your leg")* Transformation of joint actions *("Let's pretend we're saving lives")* Transformation of object *("This clay can be our medicine")* Transformation of environment *("Under the table can be our hospital")* Transformation of nothing to something *("Child holds up empty hand while approaching another child and says, "This is a needle so I can give you a shot")*
Within Pretend Talk (enactment talk)	*("Take all your medicine.")* *("Let the nurse give you your shot.")*
Negation of Pretend	*("I don't want a shot. I'm leaving.")* *("I don't want to play anymore.")*
Play Signals	Altered tone of voice (e.g., high-pitched when speaking like a baby) Giggles while acting or speaking Winks

Table 2. 2 Corsaro on Social Play Talk
(Frost et al., 2001: 55)

Imperatives	Commands, warnings (makes play happen; common from superordinate player to subordinate)
Informative statements	Acknowledge or provide information (clarifies what is going on; common with all players, but more so for subordinate to superordinate and from one superordinate to another)
Request for permission	Asking to engage (from subordinate to superordinate)
Request for joint action	Refer to another speaker's suggestion (from superordinate to superordinate)
Answers	Responses to a directive (more common from subordinates)
Information requests	Asks for clarification (more common from superordinates)
Directive questions	Gives indirect orders
Tag questions	Make statement with "OK?" or "Right?" (from superordinate to superordinate)
Greetings	Saying "Hi!" (most common among children of the same status)
Baby talk	Human or animal forms (more subordinate)

Cognitive Developmental Theory

Cognitive developmental theory views play as a context providing intellectual growth and development (Sluss, 2005).

The most influential theorist in this area, Piaget (1962; cited in Verenikina *et al*., 2003; Frost *et al*., 2001; Sluss, 2005), puts forward two processes, *assimilation* and *accommodation*, through which a child constructs knowledge during play.

Assimilation is the action of the child on environment, while accommodation, is the action of the environment (objects) on the child. Imitation of reality brings out accommodation. Equilibrium between assimilation and accommodation is adaptation. "Play is essentially assimilation (action on objects) or the primacy of assimilation over accommodation" (Piaget, 1966; cited in Frost *et al*., 2001: 46).

According to Piaget, during play, children do not gain new skills, but practice the skills acquired before (Johnson, 1999). Development is facilitated and followed by play. Piaget associates play stages with stages of cognitive development and explains levels of play as practice or functional play (repeated actions), symbolic play (building with blocks, modeling clay) and games with rules (marbles, board games) (Sluss, 2005; Frost *et al*., 2001).
However, according to many theorists, Piaget's stages of play remain weak for two reasons. Firstly, he proposes that children cannot reach an upper level while operating in one stage (Frost *et al*., 2001). The other weakness of Piaget is the context in which he analyzed children's play. He analyzes children in individual play, whereas play is social most of the time and needs to be analyzed also in group context (Reifel and Yeatman, 1993; cited in Frost *et al*., 2001).

Sociocultural Theory

Sociocultural theory of Vygotsky explains children's construction of knowledge through interactions with society and culture (Sluss, 2005).

According to Vygotsky, play is the most important *leading* activity for development in the preschool years (Vygotsky, 1966; cited in Frost *et al*., 2001). He focuses on the effect of socio-cultural and historical forces on the development of the child and claims that interactions with competent peers and adults lead learning (Sluss, 2005).

Vygotsky (1966; cited in Frost *et al*., 2001: 50) proposes the concept of *zone of proximal development*, which refers to "a range of tasks between those the child can handle independently and those at the highest level she can master through play or with the help of adults or more competent peers". Vygotsky (1978) claims that play broadens this zone of proximal development cognitively and socio-emotionally.

While Piaget argues that play follows development, Vygotsky claims that learning occurs during play, by the creation of zone of proximal development in play (Sluss, 2005). Piaget claims that rules come out after the preschool years, in organized games or games with rules, Vygotsky, in contrast, states that all games with rules involve imaginary situations (play), just as all imaginary play contains rules (Frost *et al*., 2001).

According to Vygotsky, play promotes language development, memory, reasoning and social skills (Sluss, 2005).

Arousal Modulation Theory

Arousal Modulation Theory of Berlyne (1960) explains play as a way of balancing the level of stimulation in solitary play or during
exploration. Lack of stimulation causes stimulus-seeking behaviour or play. In the same way, excessive stimulation causes play to cease (Sluss, 2005).

Refining this theory, Ellis (1973), Fein (1981; cited in Sluss, 2005) and Shultz (1979; cited in Sluss, 2005) believe that, this theory provides implications for understanding and facilitating play.

Singer (1973) emphasizes both emotional and cognitive aspects of play and states that, by the help of play, child can balance the external and internal stimulations and through this way creates enjoyment.

Cognitive Adaptation Theory

Bruner (1972; cited in Sluss, 2005) asserts that through symbols, children construct knowledge and play is a tool for cognitive adaptation. According to Bruner (1972; cited in Johnson, 1999), during play activity, children's concern is not achieving goals and they try different possibilities of solutions that they do not do while they are under pressure. After the exploration of different behaviors, they can adapt their solutions to real life problems. According to this theory, play improves creativity and flexibility, which provide new opportunities for exploring different possibilities.

Similarly, Sutton-Smith's theory (1997; cited in Johnson, 1999) claims that through symbolic transformations, children improve their mental flexibility. Sutten-Smith's *adaptive potantiation* refers to the enactment of possibilities, which develops child's capacity of considering different alternatives and gain control over them.

Theory of Mind

Leslie's theory of mind (1987; cited in Sluss, 2005; Frost *et al*., 2001) suggests that, during social pretend play and the mental representations children begin to realize that others' view is different from his views.

2.2.3. Characteristics of Play

The characteristics of play are defined as spontaneous, self-initiated and self-regulated. Motivation for play is intrinsic and play requires active involvement of the child (Garvey, 1977; cited in Verenikina, 2003). An important characteristic of children's play is the symbolic use of objects in an *as if* situation, involving some rules, that is pretend play (Leontiev, 1981; Nikolopolou, 1993; cited in Verenikina *et al*., 2003).

Smith *et al*. (1985; cited in Stagnitti, 2005) and Pellegrini and Galda (1993; cited in Stagnitti, 2005) propose five criteria to rate children's play. These are, intrinsic motivation, positive affect, non-literal, means/ends and flexibility.

In the same way, Sluss (2005: 8) describes the characteristics of play as follows.

1. Play is voluntary (Intrinsically motivated).
2. Play requires active involvement.

3. Play is symbolic (Involves symolism or pretend play).
4. Play is free of external rules (Rules are established by the children).
5. Play focuses on action rather than outcomes (Process is more important than the outcomes).
6. Play is pleasurable (Play produces a positive affect).

2.2.4. Developmental Stages of Play

As children grow and become experienced, their play gets more complex and integrated (Verenikina *et al*., 2003). Theoreticians propose different stages of play in order to understand the role of it. Piaget (1951) claims that, play progresses in three stages. These are functional or practice play, symbolic, pretend, or make-believe play, and games with rules.

Functional play begins with play with objects in infancy. In preschool years object play becomes more complicated and goal oriented. By the age of 5-6, preschoolers are able to use complex constructions with the help of social development (Johnson, 1998; Rubin *et al*., 1983; cited in Frost *et al*., 2001).

Representational or symbolic play appears prior to early childhood (Frost *et al*., 2001) and when children are in the preoperational stage of thought (Piaget, 1962; cited in Verenikina, 2003). Symbolic play initiates when the child substitutes an object for another (Vygotsky, 1976; cited in Frost *et al*., 2001; Piaget, 1951) and in dramatic play; it becomes more complex involving imitating, imagining and role-play during the early childhood years. Vygotsky (1978) states that this stage progresses in two steps, which are play with objects and symbolic role-play. Table 2.3 displays the progress of symbolic pretend play in the first eight years based on the studies of Piaget.

Defining pretend play as “the projecting of a supposed situation onto an actual one, in the spirit of fun rather than survival”, Lillard (1993: 349) states that, there are three skills used in pretend play. These are “the ability to think of one object as two things at once, the ability to think of one object as representing another and the ability to represent mental representations”.

Lillard declares five characteristics of pretend play as “a pretender, a reality, a mental representation different from the reality, a layering of the representation over the reality, such that they exist within the same space and time, and awareness on the part of the pretender of the reality, mental representation and layering of it”. Lillard adds a sixth element, activity, which is parallel with pretend play.

According to Vygotsky (1976; cited in Frost *et al*., 2001) games with rules initiate in the early childhood years, whereas Piaget and Smilansky claim that this stage begins in the school-age years. (Frost *et al*., 2001) This type of play can be in group setting or individual (Verenikina *et al*., 2003).

Parten (1932, 1933; cited in Verenikina, 2003) associates the levels of play with social development and explains the social categories of play. These categories are:

- Onlooker- observer of play of others;
- Solitary play- playing alone;
- Parallel play- playing together but with little interactions and
- Group play- playing together.

Group play is divided into two levels by Rubin, Watson and Jambor (1978; cited in Verenikina *et al*., 2003), which are associative and cooperative; they both higher levels of interaction among players such as coordination of actions and doing similar things.

Rubin *et al.* (1978; cited in Verenikina *et al*., 2003) put forward a two dimensional matrix, known as Parten-Piaget Scale, which combines Piaget’s cognitive categories with Parten’s social play categories. This scale involves Piaget’s functional, constructive, dramatic and games with rules categories in cognitive axis, and Parten’s unoccupied, solitary, onlooker, parallel and group categories in social axis, which provides an in depth framework to understand children’s play (e.g. solitary functional, solitary-constructive).

Table 2. 3 Progress of Symbolic Pretend Play in the First Eight Years
(Frost et al., 2001 : 48)

Single pretend transformation toward self	With toys that resemble real objects; e.g., the child hugs a toy doll or toy animal; the child pretends to eat toy food.
Other object is pretend agent	Object is treated as if it acts, with toys that resemble real objects; e.g., the child has a toy doll or toy animal act as if it is eating toy food.
Single pretend transformation	With toys that have no resemblance to real objects; e.g., the child creates a bed out of building blocks; the child forms a pancake from Play-Doh.
Pretend role	With toys associated wit a role that resemble real objects; e.g., a child pretends to be a cook with toy food; a child pretends to be a firefighter with toy fire hat and toy truck.
Multiple pretend role transformations	With toys that resemble real-world objects; e.g., a child takes roles such as doctor, patient, and nurse while playing with dolls or toy animals.
Pretend role	Without the support of toys that resemble real objects; with blocks or Play-Doh, a child creates a pretend setting by constructing the objects needed; e.g., children pretending to be farmers by building a farm from blocks and forming animals with Play- Doh.
Multiple pretend roles	With toys that resemble real-worl objects; a group of children negotiate roles such a doctor, patient, and nurse in the presence of doctor's office toys.
Multiple pretend roles	Without toys that resemble real objects; e.g., children create a pretend setting with blocks or Play-Doh and designate pretend roles to enact.

2.2.5. Child Development and Play

Play promotes the development of physical, social, emotional and cognitive skills, which is essential for children.

2.2.5.1. Play and Physical Development

Through activities such as throwing, running, climbing, children acquire new skills and recognize their bodies. Physical play is important since it promotes the development of muscle strength, muscle endurance, improved coordination, agility, flexibility and balance, cardio-respiratory endurance, gross and fine motor skills, specific motor skills such as kicking and catching, team work and cooperation, body awareness and body language (PSCWA Childcare Support Services, 2008).

2.2.5.2. Play and Cognitive Development

Children's play experiences affect their cognitive development, which involves creativity, discovery, verbal judgement and reasoning, symbolic thinking, problem-solving skills, and the ability to focus and control behavior (U.S. Consumer Product Safety Commision, 2002).

Symbolic abilities can be developed during certain types of adult-guided social-pretense play (Johnson, 1999). Smilansky (1968; cited in Johnson, 1999) states that during sociodramatic play, children establish relations between unrelated experiences. Concepts such as time, space, probability and causality become clearer during play. For example in activities involving turn-taking and in pretend play sessions including expressions these concepts are understood (Athey, 1988; cited in Johnson, 1999).

According to Vygotsky, symbols used in make-believe play promote abstract thinking. Piaget states that, play gives children the opportunity of practicing the mental skills acquired previously (Johnson, 1999). In addition Johnson, Ershler and Lawton's studies (1982; cited in Johnson, 1999) reveal that there is a positive correllation between IQ scores and sociodramatic play and constructive play.

Studies indicate that play helps children to develop their problem solving skills (Simon & Smith, 1983; Sylva *et al.*, 1976; cited in Johnson, 1999) by providing a context for variations of solutions to use in real-life. Several studies reveal that play

promotes creativity (Lieberman, 1977; Dansky and Silverman, 1975; Fisher, 1992; cited in Johnson, 1999).

2.2.5.3. Play and Language Development

According to Garvey (1974; cited in Johnson, 1999), make-believe play helps children to develop their language skills, because children follow rules of a conversation, plan a story and use language to elaborate this story. Bruner (1983; cited in Johnson, 1999) states that the first appearance of complicated grammatical and pragmatical forms of language is during play activity. Correlational studies of Wolfgang (1974; cited in Johnson, 1999) and Pellegrini (1980; cited in Johnson, 1999) reveal that sociodramatic play affects reading and writing ability positively. According to Dickinson (1994; cited in Johnson, 1999), pretend play in preschool years has influence on language and literacy skills in elementary school.

2.2.5.4. Play and Social Development

During play interactions, children improve their social abilities, by becoming a member of a group and learning certain rules and behaviours of being a part of a group (U.S. Consumer Product Safety Commision, 2002). Play has an important role in the acquisition of skills such as turn taking, sharing and cooperation and understanding others' thoughts and emotions (Johnson, 1999). Pellegrini (1995; cited in Johnson, 1999) reveals that there is a positive relationship between rough and tumble play and social cognitive skills. In addition, parallel constructive play also has positive influence on social competence (Rubin, 1982).

Researchers indicate that object play promotes social play, facilitating the interactions between peers (Mueller and Lucas, 1975; cited in Johnson, 1999).

2.2.6. Types of Play

U.S. Consumer Product Safety Commision (2002) in the Age Determination Guidelines, presents seven categories of play. These are: Early exploratory/practice play, construction play, pretend and role play, game and activity play, sports and recreational play, media play, and educational and academic play.

Sluss (2005) categorizes the types of preschool play according to developmental domains. According to Sluss, the play types that occur in cognitive domain are constructive play, symbolic play, sociodramatic play, superhero play and war play.

These types of play can also be included in the social and language domains. The play types that occur in physical domain are chase and rough-and-tumble play.

2.2.6.1. Constructive Play

During constructive play, children use materials in order to create things (Forman and Hill, 1984; cited in Sluss, 2005; Isenberg and Jalongo, 2001). The aim of constructing may be creating an object or only creating (Sluss, 2005). Constructive play encloses the children's activities such as playing with play-dough, building with blocks or painting a picture. Most scholars see constructive play as a transition stage between practice and symbolic play. While children are constructing things, they are involved in constructive play, exploration, practice play and then symbolic play (Sluss, 2005).

2.2.6.2. Symbolic Play

During symbolic play, the child uses an object as if it is another object or an idea. As the child grows, it becomes more complex. Dramatic play is the imitation of reality (Piaget, 1951) and requires children's engagement in complex pretend play. Sociodramatic play, the most complex pretend play, appears as the child reaches a more mature level (four to five years) and the child begins role taking and imitating people (Sluss, 2005).

2.2.6.3. Superhero Play

Superhero play includes the combination of pretend play and rough-and-tumble play. Children develop empathy and symbolism during superhero play. Unless superhero play does not involve violent themes and turns up war play, it can be encouraged (Sluss, 2005). Particularly, boys engage in superhero play because this type of play enables them to run, wrestle, jump and shout. In addition, superhero play provides children to feel strong and powerful and they always prefer to be good characters (Bauer and Dettore, 1997).

2.2.6.4. War Play

Today, altough many education centers do not allow the use of war play materials such as guns and weapons, children are promoted to play with these materials because of the advertisements. Teachers and parents should be sensitive in guiding this kind of play (Sluss, 2005).

2.2.6.5. Chase

Chase is a sporadic activity, during which one child runs after another (Sluss, 2005). Chase includes physical skills, strategy, tagging and hiding (Clark, 1999; cited in Frost *et al*., 2001). Although boys engage in more, both genders are involved in chase games (Thorne, 1995; cited in Frost *et al*., 2001).

2.2.6.6. Rough-and-Tumble Play

Berk (1999) defines rough-and-tumble play as friendly chasing and playfighting. During rough-and-tumble play, children laugh and smile, which differs this play from real fighting (Frost *et al*., 2001). Preschool children engage in rough-and-tumble play for %5 of their free play durations. This amount increases in primary grade years (Johnson, 1998; cited in Frost *et al*., 2001).

2.2.7. Gender Differences in Play and Play Materials

Play behaviour of preschoolers can differ, as well as resemble, notably in terms of gender and play preferences (Sluss, 2005). Dunn and Herming (1992; cited in Dhingra *et al*., 2005) focus on the relationships between gender and play characteristics of young children and state that, boys engage more in functional/ solitary functional play than girls, who engage more in constructive play (play with concrete objects).

In the study of Blakemore and Centers (2005), it is revealed that, toys, which promote artistic, musical, physical skills and creativity are generally neutral toys. In addition, toys that have educational value and that are supporting cognitive or intellectual abilities are rated as neutral.

In various studies (Diamond et al., 1993; Maccoby, 1990; Ramsey, 1995; cited in Sluss, 2005), it is stated that, children prefer the same-gendered groups during play activities.

2.2.7.1. Play and Play Material Preferences of Boys

By the age of 4-5, boys become more active and clamorous than girls (Sluss, 2005). In the study of Smith and Inder (1993; cited in Sluss, 2005), it is revealed that, boys engage in physical contact and boisterous play. They prefer to play in outdoor environments rather than indoors.

Boys appear to be involved in rough-and-tumble play more than girls (Carlsson-Paige and Levin, 1987; Goldstein, 1992; Humphreys and Smith, 1984; Smith, 1997; cited in Sluss, 2005). Generally, boys' aggression is found to be instrumental such as hitting, grabbing, pushing, using physical force in order to obtain something (Sluss, 2005). Black (1989; cited in Sluss, 2005) states that boys suggest their own ideas during group play, which causes fragmentation of play. It is found that boys are more dominant during play activities.

Wardle (1991; cited in Sluss, 2005) states that, boys prefer the activities like pushing and pulling toys, blocks or wheeled toys on the floor. Boys tend to be engaged in functional play, including pushing a vehicle, blowing bubbles or cranking a mechanical toy (Johnson and Roopnarine, 1983; cited in Sluss, 2005). Boys engage in large-group play activities (Maltz and Borker, 1982; Sutton-Smith, 1979; Tarullo, 1994; cited in Sluss, 2005) and focus on the activity itself (Sluss, 2005).

In terms of play themes and roles, boys include adventure themes in their pretend play and take roles such as superheroes, which make them become more active (Levin and Carlsson-Paige, 1994; Paley, 1984; cited in Sluss, 2005). They also include unfamiliar and fantasy themes in their pretend play (Sluss, 2005).

In terms of toy preferences, boys like to play with blocks and wheeled vehicles (Sluss, 2005). They usually play with boy toys and are beware of playing with girl toys (Liss, 1981; cited in Sluss, 2005). Miller (1987; cited in Cherney *et al.*, 2003) states that toys, which are seen for boys are identified as competitive, aggressive, constructive, conducive to handling, encouraging sociability, and reality based.

2.2.7.2. Play and Play Material Preferences of Girls

In the study of Smith and Inder (1993; cited in Sluss, 2005), girls appear to be passive and more quiet and they prefer to play in indoor environments. In the study of Black (1989; cited in Sluss, 2005), it is observed that, girls' turn taking tends to be smooth and their play activities last long and is more coherent than boys.

In terms of play themes and roles, girls take roles such as family characters and include themes related to everyday experiences in their pretend play (Levin and Carlsson-Paige, 1994; Paley, 1984; cited in Sluss, 2005). Girls tend to include more familiar and realistic themes, while pretending (Sluss, 2005).
In terms of toy preferences, girls like to play with dolls and art materials (Sluss, 2005). They prefer to play both boy toys and girl toys (Liss, 1981; cited in Sluss, 2005). Miller (1987; cited in Cherney *et al*., 2003) states that toys, which are seen for girls are identified as attractive, creative, nurturing, and manipulable. Wardle (1991; cited in Sluss, 2005) indicates that, girls like activities such as coloring, doing puzzles or playing with dolls on a table top.

Girls engage in small-group play or as best friend dyads (Maltz and Borker, 1982; Sutton-Smith, 1979; Tarullo, 1994; cited in Sluss, 2005) and they are more subjective than boys, focusing on social relations (Sluss, 2005). Girls' aggression is found to be relational such as breaking contact, gossiping and ostracism (Sluss, 2005).

2.3. Preschool Education

Preschool education encloses the education of children at the age between the ages three and six years (Gol-Guven, 2007; Yaşar, 1998).

A preschool education program should have the aim of developing self-awareness, social skills, awareness of cultural values and other cultures, communication skills, perceptual and motor skills, analytic thinking and problem solving skills, creativity and aesthetic skills (Curtis, 1991; cited in Genç and Senemoğlu, 2001).

Curriculum models vary according to different learning activities, which have primary importance and flexibility in application for teachers (Goffin, 2001).

The choice of educational model influences the type of play. Using a model has positive effect on education, since it provides children a consistent approach (Sluss, 2005).

2.3.1. High/Scope Education Model

Developed by David Weikart and his colleagues in 1960s, High/Scope education model is based on active learning (Schweinhart, 2003). The other elements of High/Scope model are positive adult-child interaction, learning environment, a consistent daily program and evaluation. The model is influenced by Piaget's intellectual development theory. High/Scope model daily program includes plan-do-review sequence, small and large group activities and outside activities. Children plan what they will do, and then perform the planned activities and finally review their own activities. This daily routine in the model provides children an active learning environment (Schweinhart, 2003). The five stages of active learning are large number of diversified materials, children's material choices, use of the materials, language and support (Poyraz and Dere, 2003). The 58 key experiences determine the content of the program, which are grouped into 10 areas. These are social relations, initiative, creative representation, music and movement, language and literacy, logic, mathematics and science (Schwinhart and Weikart, 1999; Poyraz and Dere, 2003).

Teachers are actively involved in the activities and their planning in order to expand children's ideas and to encourage children to think about the tasks they do (Schweinhart, 2003). In this approach, child-adult interaction is accepted to be the core of knowledge construction in children (Sluss, 2005).

The High/Scope environment is divided into well-defined working areas including large amount of materials, which are placed in a logical way (Figure 2.1). The children can move independently and they have control over the environment (Weikard, 1990; cited in Poyraz and Dere, 2003; Morrison, 2007).

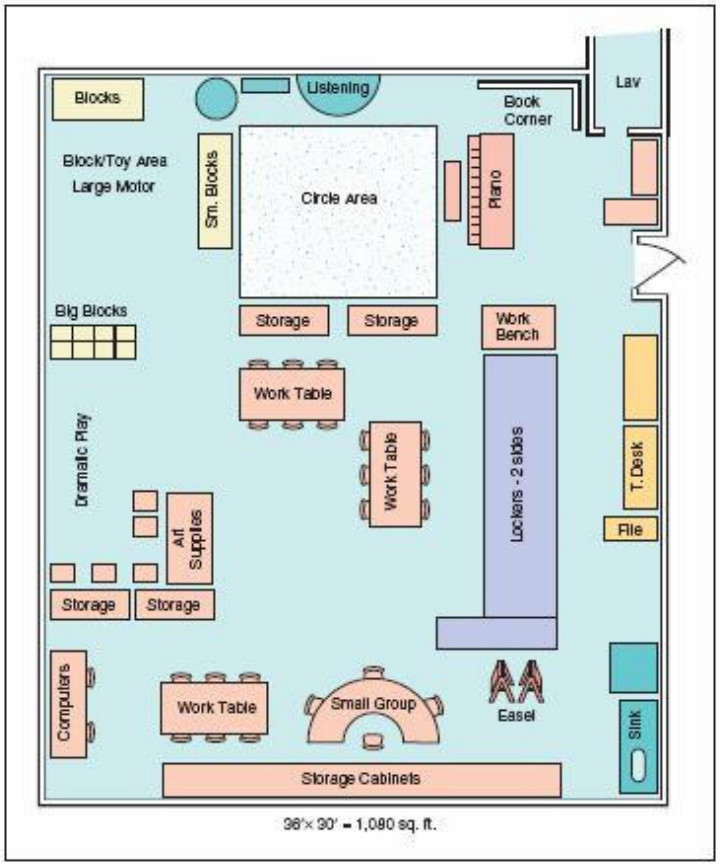


Figure 2. 1 A High/Scope Kindergarten Arrangement (Morrison, 2007:18)

2.3.2. Developmental Interaction Approach

Developmental interaction approach, also known as Bank Street, started in 1916 by Lucy Sprague Mitchell (Sluss, 2005). In this approach, children's construction of knowledge is believed to be the result of the interactions with the world, and progressivism and emotional health is the main emphasis of the program. Bank Street approach aims to educate the child in all aspects, including physical, social, cognitive, emotional and aesthetic skills. The curriculum includes daily living activities, which involve sensory experience such as sand, water, playdough play, etc., gross motor activities and blocks. Social studies and literacy are emphasized in the curriculum. Developmental interaction approach has an unstructured curriculum. It is important that teacher understands the aims and does necessary preperation (Sluss, 2005).

2.3.3. Reggio Emilia

After World War II, in Reggio Emilia, which is a city in Italy, a system of preschools and infant-toddler centers are formed with the leadership of Louis Malaguzzi (New, 2000). Malaguzzi, influenced by Dewey and Vygotsky, believes that children construct knowledge through many ways and he named this *The Hundred Languages of Children* (Edwards *et al*., 1998; cited in Sluss, 2005). The curriculum has an emphasis on aesthetic and play has an important role. Children's interests determine the activities each day and centers include block center, home area, pretend play area, computer area, book area, group meeting area, gross motor area, and art and music area (Sluss, 2005). Two teachers are responsible for each room. In schools, an atelier (a workshop), and atelierista exist for the visual art education. Environment is individualized and the placement of objects and structures support the development of problem solving and decision-making skills and exploration. Project work is the most important component of Reggio Emilia preschools. These projects aim learning by doing. The program is criticized because of the fact that it does not guarantee the acquisition of necessary academic skills (Morrison, 2007).

2.3.4. Creative Curriculum

Developed by Amy Dombro, Laura Colker, and Diane Twister Dodge (1999; cited in Sluss, 2005), creative curriculum is a framework, which guides program developers. The framework includes two areas, curriculum framework and interest areas. Curriculum framework includes how children develop and learn, the learning environment, what children learn, the teacher's role and the family's role. Interest areas are blocks, dramatic play, toys, games, art, library, discovery, sand and water, music and movement, cooking, computers and outdoors (Dodge *et al*., 2002; cited in Sluss, 2005).

2.3.5. Waldorf Education

Founded by Rudolf Steiner (1861-1925) in Germany, schools of Waldorf give importance to education of the whole child; head, hands and heart. Holistic approach of Steiner has four basic principles: anthroposophy, respect for development, eurythmy, nurturing imagination. Anthroposophy is what Steiner called the study of the wisdom of man.

Teachers in Waldorf schools provoke children to respect beauty and knowledge. Respect for development refers to the respect for child development process and stages. Curriculum topics are determined according to children's individual development. Eurythmy refers to visibility of speech and music through movements and gestures in order to make children develop balance and harmony. Nurturing imagination is related to the exploration of different cultures through fairy tales, fables and legends to improve children's free thinking and creativity (Morrison, 2007). The education is focused on exploration of body, constructive and creative play, and oral (never written) language, story, and song. In the mornings children are free for uninterrupted imaginary play (Edwards, 2002).

2.3.6. Montessori Method

Montessori approach is based on the natural development of children in an organized environment. Principles of Montessori method include respect for the child, absorbent mind, sensitive periods, prepared environment and auto-education. Respect for the child refers to the positive attitude towards children in order to let them make choices for the development of self-esteem and effective learning. Absorbent mind refers to Montessori's belief of children's absorption of knowledge through living experiences. According to Montessori, in certain periods, children are more sensitive to learn specific skills. Teachers have to observe children in order to benefit from these sensitive periods. Presentation of learning materials in an order and freedom for children to explore materials are important in Montessori classrooms. Autoeducation is the ability of the children to educate themselves. In a prepared environment, children's engagement can lead to autoeducation (Morrison, 2007). The six year periods of child development is divided into 2 three-year periods, birth to age 3 and 3 to 6 years of age. Multiaged groups of children exist in the classrooms. There is a scope and sequence in the curriculum but at the same time it is highly individualized (Edwards, 2002). Materials and activities include motor education materials, sensory materials (Table 2.4) and academic materials.

Leone (2004) reviews the design characteristics of Montessori materials, which are isolation of attributes, pairing like objects, variable sequencing, successive isolation, variable pairing, observation before analysis, known to unknown, indirect preparation and control of error.

In the design of Montessori materials, it is important that children can understand the error during playing (control of error). It is also important that other attributes remain constant and only the important attribute changes (isolated attributes) (Morrison, 2007). In the design of any Montessori sensory materials, isolation of attributes is considered (Leone, 2004). Making one attribute identical within pair of objects but contrasting between different pairs is a way of helping child to recognize a specific attribute, which is ubiquitous. In the design of color tablets, this pairing like objects is considered. If two attributes may be confounded by the child, it is designed as making four sets of objects that are graded sequentially. In the design of knobless cylinders, this characteristic, variable sequencing, is considered. In order to make the child set a relationship between more than one set of ordered objects, variable pairing, pairing the objects between the two sets is suggested. While introducing the child something new, presenting experiences from the most familiar to the least familiar ones, is suggested as a design solution (known to unknown) (Leone, 2004). In addition, the colors and proportions of Montessori materials are designed attractively to catch children's attention. Writing activities become first in the use of academic materials and reading occurs as an outgrowth of writing (Morrison, 2007).

Table 2.4 Montessori Sensory Materials (Morrison, 2007: 9)

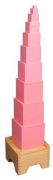
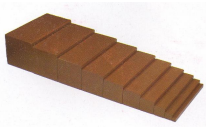
Material	Illustration	Description and Learning Purposes
Pink tower		**Visual discrimination of dimension** Ten wooden cubes of the same shape and texture, all pink, the largest of which is ten centimeters. Each succeeding block is one centimeter smaller. Children build a tower beginning with the largest block.
Brown stairs		**Visual discrimination of width and height** Ten wooden blocks, all brown, differing in height and width. Children arrange the blocks next to each other from thickest to thinnest so the blocks resemble a staircase.
Red rods		**Visual discrimination of length** Ten rod-shaped pieces of wood, all red, of identical thickness but differing in length from ten centimeters to one meter. The child arranges the rods next to each other from largest to smallest.
Cylinder blocks		**Visual discrimination of size** Four individual wooden blocks that have holes of various sizes and matching cylinders; one block deals with height, one with diameter, and two with the relationship of both variables. Children remove the cylinders in random order, then match each cylinder to the correct hole.
Smelling jars		**Olfactory discrimination** Two identical sets of white opaque glass jars with removable tops through which the child cannot see but through which odors can pass. The teacher places various substances, such as herbs, in the jars, and the child matches the jars according to the smells.
Baric tablets		**Discrimination of weight** Sets of rectangular pieces of wood that vary according to weight. There are three sets—light, medium, and heavy—which children match according to the weight of the tablets.
Color tablets		**Discrimination of color and education of the chromatic sense** Two identical sets of small rectangular pieces of wood used for matching color or shading.
Cloth swatches		**Sense of touch** Two identical swatches of cloth. Children identify them according to touch, first without a blindfold but later using a blindfold.

Table 2.4 (Continued)

Tonal bells		**Sound and pitch** Two sets of eight bells, alike in shape and size but different in color; one set is white, the other brown. The child matches the bells by tone.
Sound boxes		**Auditory discrimination** Two identical sets of cylinders filled with various materials, such as salt and rice. Children match the cylinders according to the sound the fillings make.
Tempera-ture jugs of thermic bottles		**Thermic sense and ability to distinguish between temperatures** Small metal jugs filled with water of varying temperatures. Children match jugs of the same temperature.

Examples of academic materials of Montessori include ten geometric forms and colored pencils, sandpaper letters, movable alphabet with individual letters and command cards (Morrison, 2007).

2.4. Toys and Materials for Preschool Play

According to Johnson (1999) there is a mutual relationship between play materials and child development. By influencing the type and content of the play, play materials indirectly effect development. The direct affect of play materials is their ability to provide educational opportunities. Children gain knowledge on important concepts during playing with toys and play materials. Sutten-Smith (1986; cited in Johnson, 1999) reveals that, interaction with various types of toys promotes learning. Frost *et al*. (2001) suggest that, toy selection affects the play value and in order to promote imagination, dramatic play and creativity, toys, which are unstructured, diverse in playability and simple in design, should be selected.

In the Age Determination Guidelines of U.S. Consumer Prosuct Safety Commission (CPSC) (2002), toy categorization is made according to the types of play and each toy category is explained with the examples of toys (Table 2.5).

Table 2.5 Play Categories and Toys (CPSC, 2002:6)

Play Category	**Toy Subcategory**	**Examples of Toys**
Early Exploratory/ Practice Play	Mirrors, Mobiles and Manipulatives	Rattles, squeeze toys
	Push and Pull Toys	Mounted/hand held
Construction Play	Blocks	Wood/foam/cardboard blocks
	Interlocking Building Materials	Brick-connecting blocks, model kits
Pretend & Role Play	Dolls and Stuffed Toys	Dolls, stuffed animals, action figures
	Play Scenes and Puppets	Doll houses, pop-up tents
	Dress-Up Materials	Costumes, jewelry
	Small Vehicle Toys	Cars, trucks, trains, planes
	Tools and Props	Cell phones, kitchen sets
Game & Activity Play	Puzzles	Outline, jigsaw, 3-D
	Card, Floor, Board and Table Games	Wood, cardboard
	Computer and Video Games	Hand-held, desktop, laptop
Sports & Recreational Play	Ride-On Toys	Tricycles, wagons, bicycles, scooters, motorized cars, skates
	Recreational Equipment	Hoops, tents
	Sports Equipment	Football, baseball, tennis, golf
Media Play	Arts and Crafts	Paints, paper, glitter, scissors
	Audiovisual Equipment Musical Instruments	Tapes, CDs, VHS, DVDs Keyboards, tambourines, drums
Educational & Academic Play	Books	Paper, hard, coloring, vinyl
	Learning Toys	Press & guess
	Smart Toys & Educational Software	Computer-chip based

Johnson (1999) classify the types of play materials as replica toys, educational toys, construction toys, gross-motor toys, games and real materials.

Another classification of toys and types of play for preschool age is suggested by Frost *et al*. (2001), which include toys for gross-motor play, fine motor play, language and literacy, cognitive play and sociodramatic play. Toys for gross-motor play include large blocks, transportation toys, climbing equipment, tricycles, wagons, big wheels, etc., woodworking equipment and materials (child-sized hammers, workbench, etc.). Toys that promote fine motor development include clay, puzzles, art supplies, beads for stringing and construction materials. Language and literacy equipment include books, writing materials and thematic props such as puppets and teddy bears. Cognitive play materials consist of materials for water play, simple board and card games, materials for science experiments and objects from nature. Toys for socio dramatic play include dolls and stuffed animals, props for dramatic play such as hats, neckties, lensless eye glasses, etc., miniature life figures and housekeeping equipment and props such as dishware, table and chairs, etc.

In order to determine appropriateness of a toy to a certain age group, toy characteristics are classified in the guidelines. CPSC (2002) classifies toy characteristics as size, shape, number of parts, interlocking versus loose parts, materials, motor skills required, color/contrast, cause and effect, sensory elements, level of realism/detail, licensing, classic, robotic/smart features, and educational.

2.4.1. Construction Play Materials

Construction play involves the representation of real objects such as towers, bridges and castles, by the use of blocks and other types of construction materials such as interlocking building materials. As the child develops, constructed structures become more complex. According to the motor skills required, number of parts, size of parts, materials, cause and effect, sensory elements and shape of the parts, age range of these types of toys vary (CPSC, 2002).

Construction play materials are open-ended materials, which can be completed any time the child decides. Blocks can be divided into two categories, which are small building blocks and large hollow blocks.

Small building blocks can be categorized as unit blocks and table blocks. Unit blocks are the blocks, which have a standard unit and different shapes with sizes of the multiples of the unit. In general the blocks are very safe and durable play materials, made of kiln-dried maple or birch and they have beveled edges and sanded surfaces. Table blocks are smaller than the unit blocks and their sizes and shapes may vary from manufacturer to manufacturer. They may include additional wooden objects, such as toy-houses, which promotes dramatic play (Johnson, 1999). Large hollow blocks include large wooden, plastic and cardboard blocks, which can be carried by children, using both hands. They enable children to build collaboratively and to construct life size structures for dramatic play. The wooden ones, in general, are made of pine, maple or both and they have beveled edges and sanded and waterproofed surfaces. Another type of construction materials are building sets like tinkertoys and Legos. Their pieces can be joined in different ways and they are very flexible and versatile play materials, which are approppriate for almost any age (Johnson, 1999).

Around 3 years of age, children begin to analyze the parts of construction materials, and relationships between them. Wooden blocks are now appropriate with a basic unit and its double and quadruple sizes of it and the sets may involve up to 60-80 units including wedges, triangles, cylinders, half rounds, and others. However, use of triangles and half round arches is not suitable for this age group. Three-year-old children have the necessary fine-motor skills such as snapping, screwing, pressing together or pulling apart, and nesting, to connect interlocking materials but they cannot follow assembly instructions. For this reason, open-ended play materials with simple joints such as rods and spool-like connectors are more appropriate, instead of very small parts with detailed joints (CPSC, 2002).

From the age of 4 through 5 years construction play becomes more complex and richer and children begin to add loose parts into their structures, such as addition of animals to farm construction. Plastic and wooden materials with different sizes, lengths, shapes, and forms other than just squares or rectangles are added and the number of block units increase up to 80-100. Children at this age group can use most of the interlocking systems, such as notched logs, interlocking cogs, snapping or pressing plastic bricks together, inserting flat pieces into slots, using nuts and bolts, connecting straws, and popping tubes together.

Most of the children at this age group, cannot hook up or use battery-powered construction sets (CPSC, 2002).

2.4.2. Pretend and Role Play Materials

Rudimentary pretend and role-play with toys begin around nineteen months of age, continues into preschool years and begins to fade through the elementary years of children (CPSC, 2002). Dolls and stuffed toys, small vehicle toys, play scenes and puppets, dress-up materials and tools and props serve for pretend and role play activities.

Three year olds like to play dolls with cause and effect attributes and they like dolls with sound and realistic attributes such as crying, walking, moving eyes and body parts with realistic proportions (CPSC, 2002). Similarly, they like to play with puppets and play scenes with realistic features. They also enjoy playing with telephones, as they are more enthusiastic to be social and cooperative and development of language skills promote this. Three and four year olds include small vehicles to their pretend play activities. They enjoy small vehicles with sounds, lights or remote control. They like vibrant colors or bright pastel colors. As the vehicle becomes complicated, and children enjoy bringing parts together, intensity and duration of the play increase. Materials like die-cast metal or plastics attract children as they carry more realistic details (CPSC, 2002).

Four-five year old children like to play dolls with highly detailed features and these kinds of toys improve children's pretending ability, enrich the play activity and extend duration of play (CPSC, 2002). The children of this age group prefer to play with dolls and stuffed toys which are large or oversized, detailed in facial attributes and multi-functional. They also attracted by toys in different types of media (tv, books, etc.) and robotic toys. They like to place small objects in small areas and enjoy playhouses which gives the opportunity of playing in a private space for pretend play. Four and five year olds play with tools and props for role-play purposes in order to enact different stories (CPSC, 2002).

2.4.3. Educational Toys

Educational toys are designed to develop specific skills and concepts and they are didactic, structured and outcome oriented play materials (Johnson, 1999). Children gain knowledge on skills such as, part-to-whole relation, self-help skills, recognition of colors, arranging objects by size and one-to-one correspondence. Educational toys include puzzles, stacking toys, stringing toys, nesting objects and pegboards (Johnson, 1999).

CPSC (2002) states that, educational play materials can improve children's cognitive skills and include also books, smart toys and educational software.
Learning and smart toys and educational software have specific objectives for gaining different kinds of knowledge.

Puzzles

In puzzle games, children need three major skills, which are fine-motor skills to pick and place the parts, visual discrimination to understand if the pieces are in right place, and cognitive skills for organizing the complete puzzle. Puzzles promote problem-solving skills and persistence of children, as they require strategies and solution (CPSC, 2002). Puzzles help the development of one-to-one correspondence and part-to-whole relations. They can be categorized as formboard puzzles and jigsaw puzzles (Johnson, 1999).

The characteristics of formboard puzzles for different ages are classified as:

- 2-year-olds: Knobbed ouzzles with a complete figure
- 3-year-olds: Knobbed puzzles with 5 to 8 pieces
- 4-year-olds: Puzzles (knobless) with 12 to 18 pieces
- 5-year-olds: puzzles with 18 to 35 pieces
- 6-year-olds: puzzles with 35 to 62 pieces (Maldonado, 1996; cited in Johnson, 1999: 288)

Jigsaw puzzles have smaller pieces than the formboard puzzles and are designed for older children. Advanced fine-motor skills and higher conceptual development are necessary for this type of puzzles (Johnson, 1999).

Stacking Toys

These types of toys promote the development of skills such as ordering objects by size or color, seriation and hand-eye coordination (Johnson, 1999).

Stringing Toys

These toys include a waxed cord and wood, plastic or metal pieces with their centers drilled out. Children pass the cord through the pieces and gain skills such as hand-eye coordination and sequencing (Johnson, 1999).

Nesting Materials

These materials include four or more pieces, which can be nested and develop children's sequencing and size recognition skills. They can be in shapes such as eggs, matrushka dolls, kangoroos, etc (Johnson, 1999).

Pegboard Sets

Pegboards include pegs and a board to insert the pegs, which can develop children's abilities such as shape recognition and hand-eye coordination. Children can copy the patterns or create their own patterns on the board.

Educational toys also include sorting games, templates, locking games, button boards, shoelace boards and zippering boards (Johnson, 1999).

2.4.4. Gross-Motor Play Materials

This type of play materials promotes large-muscle development and coordination (Johnson, 1999).

Ride-on Toys

Ride-on toys are toys that can be moved by child's own power or by motor, such as sit-on riders, motorized vehicles, bicycles, skateboards, scooters, tricycles and rocker toys. They improve the sense of balance, physical fitness, and coordination and provide children the opportunity to pretend real-life situations (CPSC, 2002). At the age of three, children are able to use tricycles, pedals, steering wheel, handlebars, three wheeled scooters and four wheeled vehicles, as they cannot control two wheeled vehicles due to lack of balance (CPSC, 2002).

By the age of Four-five, children enjoy riding bicycles, scooters and skateboards. Most of the children at the age of five develop balance and coordination to use two wheeled vehicles (CPSC, 2002).

Recreational Equipment

Recreational equipment, which is used for leisure activities, involves playground equipment, water play equipment, winter sports equipment, creative movement equipment and games like beach balls and marbles. In order to use such equipment, children need to develop necessary cognitive and physical skills (CPSC, 2002).

By the age of three, children enjoy playground equipment such as climbers, open swings and slides. At the age of four-five, they can pump a swing, climb a rope ladder, and climb up an inclined board. They are also engaged in water sport activities depending on the experience with water (CPSC, 2002).

Sports Equipment

At the age of three, children develop basic motor skills such as kicking, throwing and catching. They enjoy engaging activities, which have few rules and are non-directive. By the age of four-five, children are able to take part in organized sports activities, but the rules of the activities should be modified because of the limited attention span of children (CPSC, 2002).

2.4.5. Game and Activity Play

By the age of two, children become more engaged in games and puzzles. Card, floor, board and table games, computer and video games are materials included in this type of play.

Card, Floor, Board and Table Games

During the preschool years, children's attention span increases and their abilities such as learning to take turns and following simple rules are developed (Johnson, 1999). Bronson (1995; cited in Johnson, 1999) states that, games designed for preschool children should include few rules and simple scoring systems and they should be based on chance rather than being goal directed.

For three year olds, games should be simple and include few rules with not more than five or six pieces. In addition, they should progress quickly and time intervals between turns should be short. Due to the lack of skills necessary for developing strategies, they should be based on chance and should not be goal directed (CPSC, 2002).

Four and five year olds still cannot fully understand complex rules and strategies of games properly. Number and letter recognition games, games with physical components are suitable for this age group. As the children of this age group are egocentric, they cannot presume the opponent's actions and enjoy games based on randomness (CPSC, 2002).

Computer and Video Games

Computer games attract three year olds and children like following the actions on the screen. Limited use of mouse is performable and children enjoy games, which are not goal directed. Games including painting, drawing, reading and matching items are also suitable for this age group (CPSC, 2002).

By the age of four and five, children gain basic skills necessary for the use of mouse and identifying the navigation tools on the screen. They also like painting and drawing, book reading programs. However the children of this age group cannot fully coordinate two hands together and use one hand and focus on one attribute at a time (CPSC, 2002).

2.4.6. Media Play

Media play is the use of all types of media in order to create art or music. Media play equipment involves arts and crafts equipment, musical instruments and audiovisual equipment. Activities including the use of artistic media and materials improve creative thinking and problem solving skills of children (CPSC, 2002).

Children are quite attracted by musical instruments and become more excited with these instruments, if they create their own music during preschool years (Bal and Artan, 1995; cited in Balat and Artan, 2003).

Balat and Artan (2003) define the characteristics of the musical instruments used in preschool period as rhythm-oriented and easy to learn since they do not require tuning. A preschool should provide drums, rhythm sticks, triangles, xylophones, metallophones, wrist bells, tambourines, maracas, cymbals and sand blocks, tape recorders and CD players. Eliason and Jenkins (1994; cited in Balat and Arhan, 2003) state that body can become a musical instrument, with the movements such as clapping, finger snapping, whispering, etc.

3-year-old children, as their fine-motor skills develop, can use scissors and large crayons. Materials with interesting effects attract children and they like painting on easels. They can differentiate different sizes of shapes and draw the same shapes repeatedly for exploration of artwork. They like rhythm and they can shake and tap instruments. Appropriate instruments should be easy to handle, have round edges and be sturdy. Shakers, bells, drums, blocks, triangles and rhythm sticks are appropriate for this age group.

Around the age of four and five, children's drawings become more realistic and detailed and their drawings may express reality or fantasy. Children, at the age of four, can play simple songs with musical instruments. At the age of five, children can use instruments creatively and enjoy playing instruments with adult quality. Shakers, maracas, bells, drums, blocks, rhythm sticks, xylophones, keyboards are appropriate instruments for this age group (CPSC, 2002).

CHAPTER 3

TOOLS AND TECHNIQUES FOR PRODUCT EVALUATION WITH CHILDREN

Products for children should also be tried out by children in order to understand their own ideas, interactions and preferences. In addition, since adults cannot fully predict children's expectations, abilities and media context, it is important to get opinions of children in order to create user-friendly and enjoyable products for them (Hanna *et al.*, 1997; Druin *et al.*, 1999; Bruckmann and Bandlow, 2003; cited in Zaman, 2008). There is a growing interest in including children as test participants, particularly in human computer interaction studies (Markopoulos and Bekker, 2003). Based on his experiences, Vries (1997) states that, the reasons of liking of a particular product are almost completely different for adults and for children.

3.1. Methods for Understanding Perceptions and Preferences of User

The aim of the study conducted for this thesis is to gather information related to user's own evaluation criteria and priorities, which may provide meaningful data for further design activity. For this reason, the methods, which will be used to obtain this kind of information, should provide data related to personal values, preferences of users, important product attributes. Furthermore, the application of the method should be appropriate for the early stages of product development for understanding user.

According to Stanton and Baber (1996a; cited in Stanton, 1998: 23), method selection can be done considering four factors:

- The stage of the design process;
- The form that the product takes;
- Access to end-users;
- Pressure of time (and other resources).

In this section, various methods of product evaluation will be briefly explained in order to discuss those that are suitable to be conducted with children of preschool age.

3.1.1. Interviews

Interviews can be conducted for a wide variety of purposes such as perceptions and experiences of users, usability problems, cognitive components of a task, etc. Interviews are classified as structured, semi-structured and unstructured. In general, the required information is gathered by asking pre-determined questions to participants (Stanton *et al*., 2005).

The format is very important when conducting interviews with children. A researcher should choose the questions sensitively, in order not to guide the answers of children. Explaining the aim of the research and making an introduction is important for relaxing children (Lewis and Lindsay, 2000).

3.1.2. Questionnaires

Questionnaires help to collect large amount of data from large populations. They can be used for a wide range of purposes such as usability, user satisfaction, opinions and attitudes. They can be used in different stages of the design process in order to evaluate concepts, prototypes, existing products or systems and usability. There are previously prepared questionnaires such as SUMI (Software Usability Measurement Inventory), SAQ (System Acceptance Questionnaire) and QUIS (Questionnaire for User Interface Satisfaction) (Stanton *et al*., 2005).

Lewis and Lindsay (2000) indicate that, questionnaires may not provide reliable results, because, the child may lack the recalling skills necessary or the child may not understand the questions or may have difficulty in written skills to explain his response clearly.

3.1.3. Semantic Differential

Semantic differential method (Osgood *et al*., 1957) is used for obtaining data related to perceptual dimensions of user preferences. The method is based on the feelings of user about a product and translation of these feelings into product specifications. A list of product attributes, *image words*, pre-defined as pairs of opposing adjectives are listed such as traditional-modern, large-compact, hard-soft, etc., and participants

evaluate the products according to these attributes in a qualitative scale (Chuang *et al.*, 1999).

This method may be difficult to conduct with children, because what the test conductor means may not be what the child perceives. Vries (1997) states that, it is difficult to understand the perception of stimuli by children and it requires further discussion of topics with them.

3.1.4. Category Appraisal

Category appraisal is a product-driven method, consisting of a set of procedures used for understanding and visualizing the positions of products in the user's mind (Kleef *et al.*, 2005). It provides information about the product attributes, which lead to product choice. The method includes internal preference analysis, external preference analysis and Moskowitz' category appraisal. Participants rate, rank or sort multiple products in terms of sensory, preference or perceptual attributes or their perceived (dis)similarity. Factor analysis or multi-dimensional scaling is used to display the obtained data. Final map can provide information related to competition between products, user perceptions of products related to each attribute, relationships between attributes and desirable segments for the user (Kleef *et al.*, 2005).

Since rating, ranking or sorting of products according to specific attributes or preferences require a high-degree of cognitive skills, this method may be inappropriate for preschool children.

3.1.5. Conjoint Analysis

Conjoint analysis is based on the evaluation of products or product concepts, which are described with a number of attributes. These attributes are broken down into alternative levels. The aim of the method is to find out the preferences of user related to the attribute and attribute levels and the value they carry for the user. Hypothetical and therefore unfamiliar products are used in conjoint analysis (Kleef *et al.*, 2005).

Since this method is based on the hypothetical products, which are constructed according to variations in attribute levels and requires high-level of cognitive skills, it

may be difficult for children to evaluate non-existing, abstract and unfamiliar products.

3.1.6. Free (Direct) Elicitation

Free elicitation is a technique based on interviews during which the participant points out the attributes that she/he percieves as relevant for a product set. The method is used to obtain information about participant's existing knowledge structures of a particular product set and to generate product attributes through recall (Kleef *et al*., 2005).

Steenkamp and Van Trijp (1997; cited in Kleef *et al*., 2005), in their comparative study of three techniques including RGT and free elicitation, state that free elicitation technique generates greater number of attributes and more abstract attributes.

Since recalling and eliciting ideas directly without being asked specific questions, may be difficult tasks for preschool children, this method may remain inapproppriate for this study.

3.1.7. Rank Ordering Elicitation

In rank ordering, subjects rank-order the products according to their preferences and then, explain the reasons of their ordering (why product a is preferred to product b, why product b is preffered to product c, etc.). The aim is to understand the evaluative attributes of products from the user's perspective (Breivik and Supphellen, 2001).

Rank ordering technique may be an easier task than rating and sorting for preschool children if there are not too many products that will be ranked. This method may provide data related to preferences of children and the reasons behind them.

3.1.8. Q-Sort Techniques

Q-sort techniques involve the techniques for eliciting perceptual attributes, during which subjects sort products and then explain the criteria of sorting (Breivik and Supphellen, 2001). Without specifying any criteria, preschool children may have difficulty in sorting objects, since they have limited knowledge on concepts for sorting.

3.1.9. Ideal Descriptions

This technique is used for eliciting evaluative product attributes during which, subjects explain the characteristics of their ideal product, related to a product set (Breivik and Supphellen, 2001).

Although this method may provide data related to primarily important product attributes for user, it may be a difficult task to consider a hypothetical product and describe it for preschool age children.

3.1.10. Laddering

Based on means-end theory, laddering is an interview-based method and its aim is to find out the knowledge structure of a person related to a particular product (category). Means-end theory explains people's categorizations of stimuli as a hierarchical structure, which involves attributes, consequences and values (Subramony, 2002; Gutman, 1982; cited in Zaman, 2008). In a laddering interview, the participant evaluates multiple products and researcher obtains needs of participant directly or posing 'why' questions. First preference and similarity information is gathered from the participant and then laddering interview begins (Kleef *et al*., 2005).

Elicitation of distinctions can be in three ways:

1. Kelly's triadic sorting technique,
2. Preference-consumption differences; participants put the products in order according to their preferences,
3. Differences by occasion; participants put the products in order according to their preferences within a personally meaningful context (Raynolds and Guttman, 1988; cited in Kleef *et al*., 2005).

Zaman (2008: 113) states that, laddering interview can be conducted in two ways, which are positive laddering and negative laddering. Positive laddering begins with a positive statement such as "Please tell me something that you liked about the game". On the other hand, negative laddering begins with a negative statement such as " Please tell me what didn't you like about the game". Reynolds and Gutman (2001; cited in Zaman, 2008) suggest the use of negative laddering when the subject cannot provide an answer for the positive laddering question.

This technique may provide information related to primarily important product attributes, children's preferences and the reasons behind them. However, it may be difficult for preschool children to give clear answers in the second or third stage of laddering interview.

3.1.11. Focus Groups

In a focus group, a group of 8-12 person discuss on previously determined topics. The technique can be used to determine the important factors in consumer choice for a product or discuss the new product concepts. The primary focus is on product characteristics and consumer benefits but any topic can be discussed (Kleef *et al.*, 2005). Vries (1997) states that, conducting focus groups with children is a promising approach, during which design team members and children collaborate and in this way, the interests, interactions, leisure activities and preferences of children can be understood.

However, controlling the group and making every child talk on their preferences may be a difficult task for the test conductor, since children have different capabilities, and social skills.

3.1.12. Repertory Grid Technique

Based on Kelly's (1955; cited in Caputi and Reddy, 1999) theory of personal constructs, repertory grid technique (RGT) offers an insight into psychological space of a person. According to Kelly, we understand and organize our world through personal constructs, which are bipolar in nature. Through constructs such as tall-short, light-heavy, handsome-ugly, we make judgements about things, events, people, etc. A construct is defined as a single dimension of meaning, which provides a basis for viewing two phenomena as similar and different from a third (Bannister and Fransella, 1977).

3.1.12.1. RGT Procedure

RGT is a structured method for creating a repertoire of personal constructs and their relationships (Fallman and Waterworth, 2005). Constructs explain the criteria that the participants consider, in order to describe elements in participant's own terms (Fransella and Bannister, 1977).

A repertory grid is a matrix, consisting of rows including *constructs* and of columns including *elements* (products, people, events, etc.). In addition, the grid includes a rating system for establishing a quantitative relationship between constructs and elements. In an RGT study, a personal grid is used for each participant (Fallman and Waterworth, 2005).

In general, constructs are elicited using triadic method, during which a participant is asked to evaluate three elements by considering the way the two elements are similar to each other and different from the third (Caputi and Reddy, 1999). This process is repeated until the participant finds no more constructs (Wilson and Corlett, 2005). In some studies, participant expresses his/her preference related to construct poles (Hassenzahl, 2002). Fransella and Bannister (1977) state that constructs can be elicited by triads of elements, by dyads of elements, by laddering (eliciting superordinate constructs), by constructing pyramids (eliciting subordinate constructs) or by self-characterisation. In dyadic sorting technique proposed by Landfield (1971; cited in Neimeyer and Hagans, 2002), participants consider a difference or similarity between two elements. If the two elements are alike, then participant is asked to find an element, which is different from the two, in order to form the contrast pole. If the two elements are different, this difference forms the bipolar constructs.

There are different methods for eliciting bipolar constructs, which are difference, opposite and contrast methods (Neimeyer *et al*., 2005). In Kelly's difference method, subjects are asked to think of the way two elements are alike and different from the third (Neimeyer and Hagans, 2002). Epting *et al*. (1971; cited in Neimeyer and Hagans, 2002) suggests another method for elicitation of constructs, during which participant defines the contrast pole by giving the opposite of the initially elicited construct. In the study of Epting *et al.* (1971; cited in Caputi and Reddy, 1999), opposite and difference method are compared and opposite method is found to produce more bipolar constructs. In the contrast method of construct elicitation suggested by Neimeyer *et al.* (2005: 244), first one pole of constructs are elicited for different triads and then subjects are directed back to the first construct and they are asked "To you, being (emergent pole) would contrast someone who is _____?"

After elicitation of the constructs, the participant rates each element in a binary or Likert-type scale, in order to establish a quantitative relationship between elements and constructs (Fallman and Waterworth, 2005). Fransella and Bannister (1977) suggest variations in grid use including the use of rank order grid, rating grid, implications grids, resistance-to-change grid and dependency grid.

3.1.12.2. Analysis of Repertory Grid

Repertory grid data can be analyzed using factor analysis, multidimensionsl scaling, and analysis of variance (Stanton, 1998). There are statistical packages used for analysing grids, which help clustering of constructs and establishing relationships between elements and constructs (Butler and Green, 2006).

In general, firstly, a display matrix is generated in order to present the repertory grid data, with constructs, elements and numerical results (Björklund, 2005; Fallman and Waterworth, 2005). In Figure 3.1, each element is rated on a 9-point scale according to the constructs that are elicited.

Secondly, a focus graph, also called hierarchical clustering, is generated for each participant (Figure 3.2). In this process, elements and constructs are sorted and rearranged in order to group the similar elements and similar constructs (Björklund, 2005). Closely matching elements and consructs are brought together. The similarity scores of adjacent constructs or elements are displayed numeriacally and also in a tree structure called dendrogram. The actual score of similarity between elements or constructs can be seen, when the apex of the lines are followed on the scale. For example, in Figure 3.2, there is a strong resemblance, 96% between good craftmanship and beautiful.

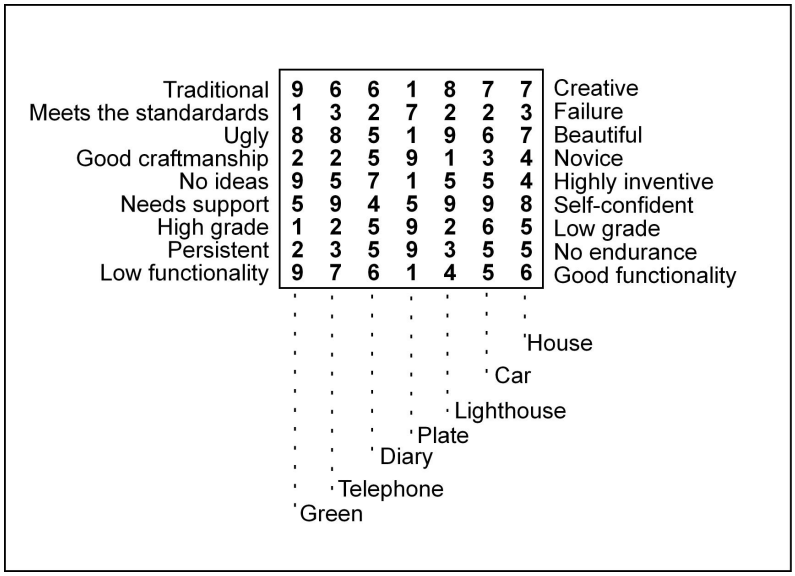


Figure 3. 1 Display Matrix Showing the RGT Data (Björklund, 2005:9)

Thirdly, principal component analysis is used in order to display the map of the grid in vector space, displaying the extent to which the ratings in the rows are similar to each other (Figure 3.3). The first principal component is placed as a horizontal dotted line with the percentage of variance. The second component is placed on the y axis. The lines of constructs that are placed with angle with respect to each principal component displays the extent to which they are represented by the component. The length of the lines show the amount of variance in the ratings related to a construct. The distances between the elements display the ratings according the constructs (Björklund, 2005; Fallman and Waterworth, 2005).

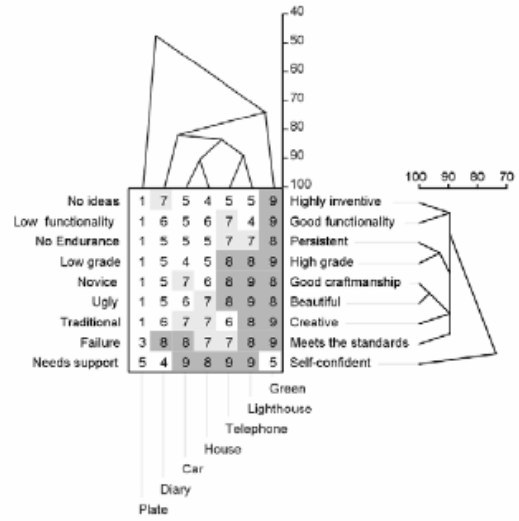


Figure 3. 2 Focus Graph (Björklund, 2005:9)

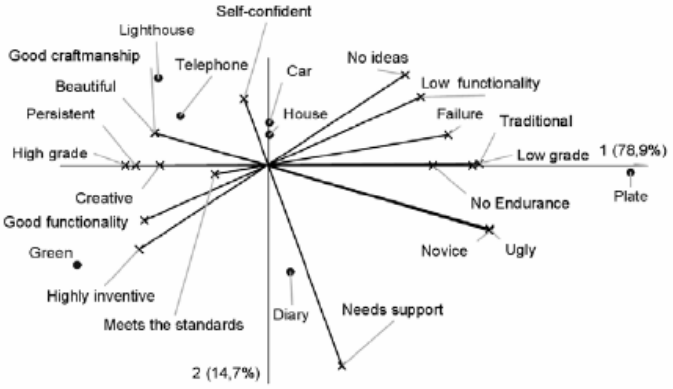


Figure 3. 3 Principal Component Analysis (Björklund, 2005: 11)

According to Kelly (1955; cited in Frances, 2004) a construct should have the tendency of forcing one or the other two elements; otherwise the construct does not mean anything. However, when the participant is asked to make a preference between bipolar constructs, it may be difficult for the participant to make a choice between two poles, since some constructs may be ambigous and complex to be evaluated as preferred (Frances, 2004). To solve this conflict, Frances proposes a *preference axis,* which can be used for exploring the meanings behind the

preferences related to a construct pair (Figure 3.4). This system may help to understand the relationship between the constructs of a person (Frances 2004).

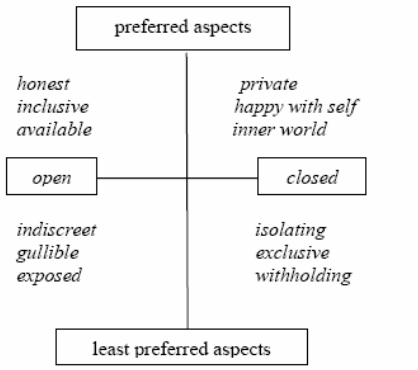


Figure 3. 4 Preference Axis Related to Being Open-Being Closed Construct Pairs (Frances, 2004: 106)

Apart from the analysis of RGT data with computer software programs, there are stuides including manual analysis of RGT data based on qualitative information. Butler and Green (2006) state that, analysis can be made without a computer software program, since the aim is to understand what children think and say.

During the RGT application to 8-year-old children, Baxter *et al.*, (1998) use generalized procrustes analysis, in order to eliminate the variations in different terms explaining the same stimuli and the differentiation in the scoring, when using scales.

3.1.12.3. Application of Repertory Grid Technique to Preschool Children

RGT is not restricted with a particular age-range and unless the elements and the constructs are inapproppriate, very young children can also complete a grid task (Fransella and Bannister, 1977).

Fransella and Bannister (1977) state that the triadic method of construct elicitation developed by Kelly is too complex for children under the age of 10-12. Ravenette (1964; cited in Fransella and Bannister, 1977) suggests asking children for essays related to the topic under research. Salmon (1976; cited in Fransella and Bannister,

1977) indicates that, a shy child who cannot verbalize his thoughts easily, can be asked for grouping the elements and naming each group.

Ravanette (1977; cited in Johnson, 2003) argues that, the elicitation process should be eased for children to respond. As a simplification, Salmon (1976; cited in Caputi and Reddy, 1999) suggests the use of dyadic elicitation of constructs in order to make the process easy for children. Similarly, Klion and Leitner (1985; cited in Butler and Green, 2006) state that, dyadic comparison of elements is highly effective in receiving constructs of children as young as five. Klion and Leitner (1985; cited in Butler and Green, 2006) also suggest the use of only one element for construct elicitation from children, which is called free response.

Salmon (1976; cited in Fransella and Bannister, 1977) suggests that children over 6 years of age can rate the elements in terms of constructs, emphasizing that the rating categories should consist of 5 or even 3 numbers (for under 12) and should be defined by words such as *very*, *a little bit* etc. For younger children, they can be asked to rank the elements by placing them on a marked table between the construct poles (Fransella and Bannister, 1977).

In the study of Johnson (2003), RGT is conducted as a semi-structured interview with 11-year-old children in order to elicit their ideas. Children give responses related to how the pairs of elements are different or similar, which element they prefer and why. In order to identify the important features for children, Johnson considers the frequency of mention during interviews.

Butler and Green (2006) state that, when children are confronted with a 'why…?' question, their response may be a mumbled 'Don't know'. Instead of asking 'why' questions, the authors suggest using questions like 'How come…?' or 'Can you tell me…' in order to receive an answer.

In order to understand a ten-year-old boy's construing of himself, Butler and Green (2006) ask the child the three ways that best describe him. After the child suggests emergent poles of three constructs, 'active, arty and helpful', he is asked to explain the contrasting poles by thinking how someone not active, arty and helpful is.

The contrasting pole is asked in order to understand the meaning of the emergent construct. His responses, 'boring, writing and sit around doing nothing' are then elaborated through asking him the preference related to each construct pairs and asking for three things that he does/people do, when he is/they are active.

This process is called pyramiding, which is used for understanding behaviours and actions that the construct is based on and for elaborating subordinate constructs. Developed by Hinkle (1965; cited in Butler and Green, 2006), pyramiding is based on 'what' and reveals what a construct means in practice. The examples of questions for pyramiding is below:

- 'What sort of person do you think makes mistakes when talking in a large group?'
- 'Give me an example of a time when you felt you made a fool of yourself' (Butler and Green, 2006:65)

In contrast, laddering (Hinkle, 1965; cited in Butler and Green, 2006) is a way of elaborating superordinate constructs during which the child is repeatedly asked 'how come' he prefers one pole of the construct until he cannot find any responses. This process helps understanding of core constructs of the child, since young children may have difficulty in producing psychological constructs and their responses may remain concrete and in the level of physical descriptions (Butler and Green, 2006). Butler and Green (2006: 65) examplify the elaboration of a physical construct through laddering as below:

Enquirer 'Is it important that some children have freckles?'
Child ' Yea.'
Enquirer 'How come it's important?'
Child 'Well, kids with freckles are always telling jokes.'

Butler and Green (2006) state that in this way more psychological constructs are acquired, in this case, telling jokes and more superordinate or core constructs can be with further laddering.

Similarly, Zaman (2008: 116) suggests the use of 'what' questions instead of 'why', such as " what did you (dis) like about the product". Berry (2002; cited in Zaman, 2008) states that, 'why' questions may provide different possible answers related to reason or causality and decrease reliability of the responses, since they are abstract in nature. 'What' questions, on the other hand, provide more concrete and specific responses.

Zaman (2008) suggests using clear, open-ended and short laddering questions for children. Reynolds and Gutman (2001; cited in Zaman, 2008) suggest using *communication checks* such as ' so you think, …' in order to provide children time for thinking and for them to explain the responses that they had given before.

3.2. Guidelines for Conducting Tests with Children

Hanna *et al*. (1997) state that, including children in critical phases of design process is important in terms of the creation of child-friendly and child-approved products. Conducting product tests with children can help resolving design debates, improving user interface and gathering quantitative information related to effectiveness of educational approaches.

3.2.1. Guidelines for Observing Play

By observing children's play, their play activities can be understood in depth and this may give information about their play, play space and toy preferences, their relationship with peers and adults and their developmental levels (Johnson, 1999). In addition, what children mean may not always be what they say and for this reason, designers should observe what children do as well as listening to them (Yawitz, 1997).

It is recommended that, observation may provide more information, if it is made in a setting where children can perform the full range of their play abilities. Adequacy of play materials in this setting and of time is also important for gathering information (Johnson, 1999). Observation that is carried out in both indoor and outdoor settings may provide different information, since some children display more complicated play behaviours in outdoor environment than indoor (Henniger, 1985; Tizard *et al*., 1976; cited in Johnson, 1999).

Johnson (1999) classify the observation procedures in three categories, which are chekcklists, rating scales and anectodal records. Checklists and rating scales are structured and quick methods, whereas anectodal records are unstructured and time consuming but they provide in depth information about children's play. The authors include video recording as a tool for observing play, which provides a complete record of play behaviour in different aspects.

3.2.2. Guidelines for Testing with Children

Although the design process of children and adult products are basically similar, the main difference is how children evaluate products and the role of designer during the evaluation. It is important that children feel comfortable with the evaluation procedures (Vries, 1997).

It is stated that, tests should be adapted for preschool children extensively, because it is difficult to attract their attention for long periods and children have varying ability to adapt to different environments and people (Hanna *et al*., 1997; Markopoulos and Bekker, 2003). Instead of performing specified tasks, children should be permitted to explore products independently. During the evaluation of appeal and engagement, their behaviours and expressions should be carefully observed.

In the same guidelines it is stated that, testing environment should be child friendly and cameras and furniture should be placed accordingly in order not to distract children's attention. The reason of using microphones and cameras should be explained.

In terms of duration, Hanna *et al*. (1999) state that, preschool children can concentrate on the tasks for about 30 minutes but they may also need additional time for exploration and familiarization. If test takes more than 45 minutes, child may need a short break. In order to make children do something instantly, tester can pretend as if he/she needs help. Markopoulos and Bekker (2003) state that the number and the duration of the tasks should be less for young children.
The aim and the importance of the test should be explained to children accordingly, so that they do not feel as if they are being tested (Hanna *et al*., 1999). It is especially important to conduct tests in the school environment, where children usually taking tests and exams (Vries, 1997).

Since the age group of 4-5 years prefer more realistic objects, it is better to use real products rather than paper prototypes (Hanna *et al*., 1999).

During test, preschool children may need tester with them, since they may need encouragement and also for decreasing teacher or parent interference (Hanna *et al*., 1999).

Positive feedback to children's performances motivates them. It is also stated that, instead of asking children whether they want to do something or not, using phrases such as "Let's do this..." or "I need you to..." would be more appropriate. After testing, their work should be appreciated (Hanna *et al*., 1999).

Since the interests and capabilities of children vary according to age, characteristics of children such as ability to verbalize thoughts, may affect the selection of appropriate tests for children. Children under the age of seven may have difficulties during tests requiring reading instructions or filling in questionnaires (Markopoulos and Bekker, 2003). Children may have different preferences on expressing themselves such as, talking, writing, drawing. During tests, these preferences should also be considered (Vries, 1997; Butler and Green, 2006).

The characteristics of children that may influence usability tests are listed as verbalization and extroversion skills, ability to concentrate, motivation, ability to adapt to different environments, trustworthiness of self-report, cognitive skills such as abstract and logical thinking, ability to conduct goal-directed tasks, gender differences, language skills, knowledge and experiences Markopoulos and Bekker, 2002; 2003).

In the tests during which children give direct responses about their knowledge or beliefs, open-ended questions can be asked to help children to structure their responses. It is better not to ask questions directing yes/no or exact answers (Lewis and Lindsay, 2000).

CHAPTER 4

EMPIRICAL STUDY SET-UP AND DATA COLLECTION

In this study toy preferences of preschool children are analyzed based on their play behaviour and comments on specific products, focusing on the important product attributes mentioned by children. In this study, children evaluate products (metallophone and construction play materials) made for them, which is important since children have less opportunity to choose what they actually want than their parents and educators. The study is carried out in Ekin Kreş, a private institution, which has an education programme for children between 0-6 years of age.

4.1. Aim of the Study

This study aims to find out the attributes of different play materials that are primarily important for 5-year-old preschool children and to analyze these attributes in terms of the relationships between each other, by gathering children's own evaluation criteria.

4.2. Expected Results

The results of the study may provide information about play material preferences of preschool children, which may help to understand the design attributes that have primary importance for children and the reasoning behind their product choices. If the results indicate that, there are similarities between the evaluation criteria of children for one group or all groups, this may give meaningful information related to design of products for preschool children. In addition, problems in the use of the products and user profile can be understood for the formation of design specifications for this type of products.

4.3. Methodology

Based on the personal constructs, two sets of tests are conducted, comprising of semi-structured interviews, carried out two times with each child, one for evaluating

one product group and one for the other product group. Each product group contains four products.

In each interview, children are asked for the similarities and differences between the dyads of four products, their preferences related to construct poles and the reasons of their preferences. After construct elicitation, children are asked to rank the products according to their preferences. Before conducting the study, a pilot test was carried out in order to identify the problems related to data collection method, age-appropriateness of the method, products, duration and test equipment.

During all of the tests, an introduction is made in order to familiarize the children with the test conductor. In addition, the aim of the study is explained to children and it is stated that all of their responses are right and they are free to play whatever they like. The reason of using a video camera is also explained in an informal way. After completing each test, a small present is given to the children and they are thanked for their help.

4.4. Pilot Study

The pilot study was carried out in ID 704 Usability Testing and User Centered Design course (Fall 2007). The aim of the study was to find out the product features that have primary importance for preschool children and the reasons behind their product choices by eliciting constructs with interviews based on personal constructs. Application of the technique to preschool children was also tested during the study.

4.4.1. Participant

The participant was a male 5-year-old child attending preschool. He had previous experience in playing with xylophone; however the xylophone he owned was not appropppriate for his age, since it was very simple and designed for younger children.

4.4.2. Test Environment

The test was conducted at home, in the child's room. The child did not have to adapt to an unfamiliar environment but this caused extra comfort and unexpected behaviours such as running in the room, answering questions while laying down in bed, etc.

4.4.3. Test Equipment

A video camera was used to record the child's behaviours during the test and a pre-formatted chart was used to note the responses of the child.

4.4.4. Duration of the Pilot Study

The test lasted one hour, which was a long period for a 5-year-old child. By the end of the first half hour, the child's attention was distracted and he started to show interest in other objects in the room.

4.4.5. Methodology of the Pilot Study

In the pilot study, semi-structured interviews adopted from repertory grid technique was used to elicit constructs. The child was expected to compare four xylophones with each other by making dyadic comparisons. Since the products were new for the child, 10 minutes of familiarization with products was provided. During this process, the child was observed and his activities were recorded. After familiarization, construct elicitation process began. While the child elicited a construct, the opposite of it was asked and his preferences for each construct were noted to place it in the negative or positive side of the chart. After elicitation, the child was expected to rank the products according to each attribute that he had previously produced. This process progressed as an interview and questions like " which one of these attributes is more important for you?", "which one has/is the most… among these four products, and which one is the second, third…?" and "which product would you like to play with most?" were asked.

4.4.6. Products Used in the Pilot Study

Figure 4.1 displays the products used in the pilot study.

Product 1 is a small metallophone, consisting of eight metal tubes. It has a tuned sound and sounds the eight notes clearly (C, D, E, F, G, A, B, C). The product includes a songbook, displaying songs and their notes, with color-coding, which is also used under each metal tube. Each color represents a different note. Under the notes of the songs, notes are coded with colors, so that the child can form a relationship between the notes and the tubes. The product has one wooden mallet with a spherical head and opens up like a book. The songbook, which is combined with the metallophone part, can stand. This metallophone needs a flat surface to be used on.

Figure 4. 1 Products Used in the Pilot Study

Product 2 has a bright green plastic frame with 12 metal tubes inside. It has a handle to carry easily and the shape of the frame gets narrower as the notes become high-pitched. There is no relationship with the color-coding and the notes, since some of the same colors are used for different notes. The sound of the metallophone is tuneless. The notes are coded with the numbers on the frame. The same numbers indicate the same notes. There is also a graphical colorful sticker on the frame. The product has two plastic purple mallets with spherical heads. It can be used both on lap and on a flat surface. Since the frame cannot hold the tubes appropraitely, and there is space between tubes and the frame, tubes can be removed easily.

Product 3 is a xylophone with 12 wooden keys. Each key is coded with a color and the same notes are coded with the same colors. The product's height increases, as the notes get high-pitched. The sound is not very tuned and it is deep because of the material. The xylophone has two wooden mallets with spherical heads and can be used on a flat surface or can be used on lap by reducing the height with a foldable stand.

Product 4 has a wooden base and 15 metal flat keys. The keys are metallic gray and are coded with note names (C, D, E, F, G, A, B) on them. The product produces loud and sonorous sound. The sound is tuned and gives the exact notes. The xylophone has two black, plastic mallets and they have spherical heads. This product also can be used both on lap and on a flat surface.

4.4.7. Findings of the pilot study

Three groups of constructs are gathered, which are related to physical characteristics, sound and ease in playing (Table 4.1 and Table 4.2).

Table 4.1 Constructs related to physical attributes

+	-
Big	Small
Colorful	Colorless
Attractive	Uninviting
Small mallet	Big mallet
Has lots of keys	Few number of keys
Durable	Fragile
Large keys	Narrow keys
Thin tubes	Thick tubes
Sharp-edged keys	Round-edged keys
Shiny	Pale
Keys are attached	Removable keys
Heavy	Light
Adjustable height	No height adjustment

Table 4.2 Constructs related to sound and ease in playing

+	-
Comfort in use	Uncomfortable to use
Ease in hitting with the mallet	Difficult to hit with the mallet
Easy to hit the keys	Hard to hit the keys
Too much sound	Weak sound
Good sound	Bad sound

4.4.7.1. Main observations related to the products

- During the familiarization process, the child had the opportunity to explore all the products. In this process, he preferred to play with Product 4 mostly.
- He did not care about the direction of use of the products.
- While playing the xylophones, the most striking behaviour of the child was his hitting the keys from one end to the other.
- Only with the preferred product (Product 4), he used both of the mallets and played the notes in a proper manner. In the other products, the hits were random.
- The child defined Product 3 and 4 as durable, since their keys were fixed to the bodies.
- He tried to create a musical instrument by combining the two toys with different sound qualities (Product 3 and 4).
- Because Product 3 had a stand, he tried to sit on it. But he associated the stand with storage purposes.
- The child also played the products' bottom sides except Product 1, since its bottom side was covered with cardboard.
- The child associated the differentiation of sound and color with materials of the products.
- The child associated the differentiation of size of the keys with the letters, numbers (for Product 1 and 2) and scratches (for Product 4).
- The second product reminded him of a saw, due to its shape on the wide edge, and he was not interested in it. He expressed that he did not like the product. He tried to play it vertically by holding from its handle.

- Before using the mallets, the child liked the biggest one (Product 4) and after playing, he preferred the smallest one (Product 1).
- He could find the high-pitched and low pitched notes of the products easily, since he may have thought that there is a relationship between the size of the keys and the sounds they produce.
- He could not form a relationship between the notes and the coding but he expressed that he liked the colorful coding.
- The child changed the places of the keys of the products with movable keys (Product 1 and 2).
- He could hit the keys with large surfaces more easily (Product 3 and 4).
- The child's preference was Product 4 and the attributes that attracted him were firstly its sound and secondly its size and material, although most of the attributes the child mentioned were related to physical characteristics.

4.4.7.2. Findings related to the conducting of the test

- When a child compares two of the four products, the other two products should be removed in order to make him to concentrate on the products that are chosen for comparison.
- Cameras should be placed accordingly to prevent the child to face directly towards the camera.
- Test should be conducted in an environment with an optimum familiarity for children. Carrying out the test in a familiar environment caused extra comfort and affected the duration and efficiency of the test.
- Test should be kept short, because after a period of time, child cannot concentrate on the activity.
- Ranking process was time-consuming and child had difficulty while ranking the products according to specified attributes.
- Gender-related factors may have influence on the child's preferences.

4.4.8. Evaluation of the Pilot Study

Since the child was not familiar with the products, 10-15 minutes of familiarization was necessary and this process provided clues related to his preferences. Before the familiarization process and using the products, the child can be asked the most preferred/liked product. This may give information about the evaluation criteria of the child at first glance, when the products are unfamiliar.

The child broke the third product by sitting on it. Since in the main study more children will test the product, it may be broken again and affect the preferences of the children; therefore this product is removed from the study.

The testing environment was too comfortable and conducting the test in a preschool classroom is preferred.

Since the ranking process was time-consuming and the child had difficulty while ranking the products according to specified attributes, this process is removed. Instead of ranking, children will be asked for similarities, differences and their preferences and after that children will be asked to rank the products according to their overall liking rather than individual attributes.

Five years of age can be more appropppriate for conducting this kind of study, if it is carried out by building up a game or playing together with the child. Instead of asking questions and waiting for answers, it may be more effective to be involved in the play with the child and acquire the necessary information. Otherwise, it seems the child feels uncomfortable and thinks that his response may be wrong. In this way, the child may feel more comfortable and become familiarized with the test conductor, which may help the child to become more communicative.

4.5. Main Study

Based on the findings of the pilot study, the structure of the main study is constructed and the study is carried out in Ekin Kreş in May 2008. The main study is comprised of two sets of tests, carried out with two different product groups.

4.5.1. User Profile

To understand the values and requirements of children at preschool age while interacting with different product groups, observational methods remain inadequate and verbalization of these evaluation criteria and the reasoning behind them are necessary. Because of this, children should have reached an adequate cognitive, social, physical and linguistic level in order to evaluate the products that are used during the test. Literature review reveals that, 5-year-old children can meet the requirements of the test to conduct it in an appropppriate way (Chapter 2, Section 2.1).

The tests of the main study are conducted with ten 5-year-old children, five of them male and five of them female (Table 4.3). However one of the children could not take part in the second test due to health problems.

Table 4.3 Information about the Subjects

Subject	**Gender**	**Age**	**Duration of Education**
Subject A	Male	5 years	2 years 10 months
Subject B	Female	4 years 11 months	1 year 9 months
Subject C	Male	4 years 10 months	8 months
Subject D	Male	5 years 1 month	3 years 9 months
Subject E	Male	4 years 5 months	4 years 8 months
Subject F	Female	4 years 11 months	1 year 9 months
Subject G	Female	4 years 7 monhs	1 year 8 months
Subject H	Female	4 years 11 months	3 years 8 months
Subject I	Male	4 years 3 months	1 year 8 months
Subject J	Female	4 years 8 months	3 months

4.5.2. Selection of the Products for the Tests

Gender-typed toys, objects and characters have important influence on children's toy preferences (Carter and Levy, 1988; cited in Cherney *et al.*, 2003) and exploration (Bradbard & Endsley, 1983; Bradbard *et al.*, 1986; cited in Cherney *et al.*, 2003). Therefore, in order to prevent the impact of gender-typed toys on children's toy preferences, toys such as dolls, vehicles, props for pretend play and character toys are not used in the study (Chapter 2, Section 2.2.4).

Kleef *et al.* (2005) state that when stimuli are complex and unfamiliar, evaluation becomes difficult. Familiarity with test products leads to obtaining more specific user needs. The amount of experience with a product is related with the amount of information that a user can provide. Therefore, the play materials chosen for the study are toys, which children are familiar with.

During the selection of the products, age-approppriateness and common use of them in preschool classrooms is considered. It is also important that the selected materials can be used in solitary play, since the tests are conducted individually with each child. The selected materials were four types of construction play materials and four types of metallophones. Experience level of the participants is the same.

The children are familiar with the four types of construction play materials, as they are available in the preschool that the participants attend. The children are familiar with the product type used in the second group of products, metallophones, but were not familiar to the particular products used. Frequency of use is the same for all the participants in each group.

The reason why construction play materials are selected for the test is because, children spend most of their time, playing with these materials and they have a wide variety of forms and joining systems, which is approppriate for comparison. Secondly, both boys and girls play with these materials and this is important to prevent gender-typed preferences of children.

Metallophones are Orff instruments, which display spatial relationship between pitches visually like a piano keyboard and are played with mallets. Compared to a piano keyboard requiring more fine motor skills, metallophones can be used with larger muscle movements, which is easier for young children (Persellin, 1998). The reason why metallophones are selected as the second product group for the test is because, they are not gender-typed products and they have a wide variety of forms, which make them approppriate for comparison.

4.5.2.1 Construction Play Materials Group

The first group includes four construction play materials (Figure 4.2). The number of pieces for each group is decreased to 14 pieces, representing all the shapes existing in the product, which is enough for children to build-up structures.

Product Group C1 contains the colored wooden blocks. The set contains one blue triangular prism, one yellow triangular prism, three rectangular prisms with the same sizes in different colors, including yellow, blue and green, one yellow rectangular prism, one red rectangular prism, two green bridges, one blue semicircular piece, two red cylinders, one orange hexagonal prism and one red cube. They have different colors such as yellow, red, blue, green and orange. The children play with this block set almost every day and have experience in building up objects with these pieces.

Product Group C2 consists of big wooden blocks without color. The set includes four rectangular prisms with different sizes, one square prism, three triangular prisms with different sizes, three cylinders with different sizes, one cube, one bridge and one semicircular piece. The children also have experience in playing with this block set, however this set is rarely included in children's daily play sessions, because teachers generally introduce the colored ones.

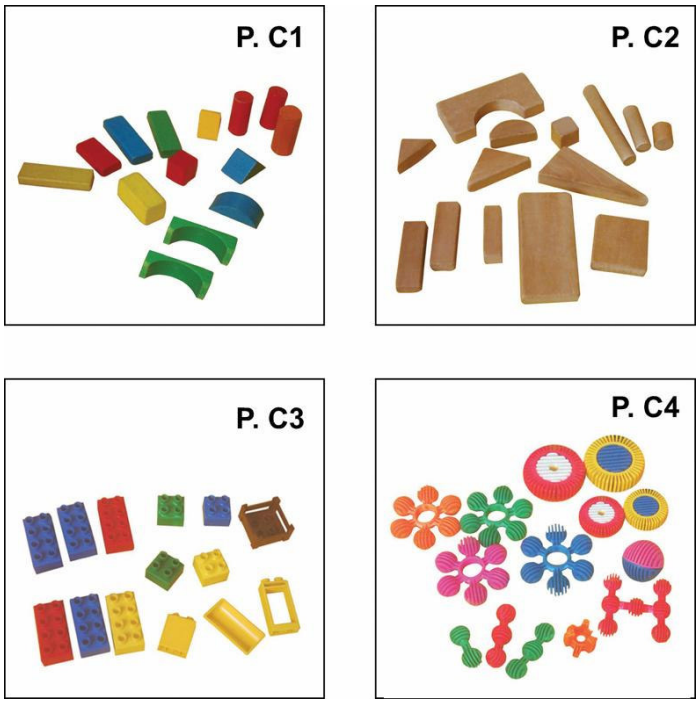


Figure 4. 2 Construction Play Materials Used in the Study

Product Group C3 includes legos consisting of three blue rectangular prisms, two red rectangular prisms, one yellow rectangular prism, two green square prisms, one yellow square prism, one blue square prism, one yellow piece with a hole in the middle, mostly used as a window, one brown piece, mostly used as a table, one yellow short rectangular prism and one yellow piece with a cavity in it. Legos are also colorful and include colors like red, blue, green, brown and yellow. The children often play with this set during their play sessions and have experience in building up objects with them.

Product Group C4 of toys are plastic interlocking building materials with bright colors including two black and pink cylinders, one small red and white cylinder, one small yellow and blue cylinder, one green flower-like shape, one pink flower-like shape, one blue flower-like shape, one orange flower-like shape, one blue and pink sphere, one small orange piece with a hole in it, one red thin piece, one green thin piece, one green and shorter thin piece and one red piece with a combination of the thin pieces. This product set is also frequently used in play sessions of the children.

4.5.2.2 Metallophone Products Group

The second product group includes four metallophones (Figure 4.3).

Metallophone 1 has a wooden base and eight bright metal keys. It has a handle and the mallet can pass through the holes of the handle in order to store, when the product is not used. Each key is coded with the letters symbolizing note names. The sound is tuned but not sonorous. The product has one wooden mallet. Among all of the products, this metallophone is the smallest one.

Metallophone 2 has a bright green plastic frame with 12 metal tubes inside. It has a handle to carry easily and the shape of the frame gets narrower as the notes become high-pitched. There is no relationship with the color-coding and the notes, since some of the same colors are used for different notes. The sound of the metallophone is tuneless. The notes are coded with the numbers on the frame. The same numbers indicate the same notes. There is also a graphical colorful sticker on the frame. The product has two plastic purple mallets with spherical heads. It can be used both on lap and on a flat surface. Since the frame cannot hold the tubes appropriately, and there is space between tubes and the frame, tubes can be removed easily.

Metallophone 3 is placed in a wooden red box. This product is the most professional one, since it has 15 major white keys and ten sharp/flat black keys. The keys are placed on wooden pieces in the box. Notes are displayed on the keys. The sound is tuned and sonorous. It has two plastic mallets with spherical heads.

Metallophone 4 has a wooden base and 15 metal flat keys. The keys are metallic gray and are coded with note names (C, D, E, F, G, A, B) on them. The product produces loud and sonorous sound. The sound is tuned and gives the exact notes. The xylophone has two black plastic mallets and they have spherical heads. This product also can be used both on lap and on a flat surface.

Figure 4. 3 Metallophones Used in the Study

4.5.3. Test Environment

The test is conducted in the playroom of the preschool that the children are attending. The children have a wide variety of toys and they play with toys in this room and in their classes during their play sessions. The room includes three armchairs for children, one small table, one big table, four chairs and different types of toys in drawers. However, during the tests, children preferred to play on the carpet, since they mostly play on the carpet in the classroom. Zaman (2007) states that, children's behaviour is more natural in a familiar environment and this helps understanding of actual use of the product by children.

4.5.4. Duration of the Test

Two interviews are conducted with each child, which lasted between 30-60 minutes. Interviews were carried out on the same days and at the same times of two consecutive weeks (Table 4.4).

Table 4.4 Test Schedule

	26.5.2008	27.5.2008	28.5.2008	2.6.2008	3.6.2008	4.6.2008
Subject A	10:00-10:45			10:00-10:50		
Subject B	10:50-12:00			11:00-12:00		
Subject C	13:30-14:15			_____		
Subject D	14:30-15:05			14:30-15:10		
Subject E		10:00-10:50			10:00-11:00	
Subject F		11:00-11:45			11:05-11:40	
Subject G		13:30-14:00			13:30-14:00	
Subject H		14:10-14:40			14:10-14:45	
Subject I			10:00-10:40			10:00-10:35
Subject J			10:50-11:30			10:45-11:25

4.5.5. Test Equipments

The interviews are recorded with a video camera, which is appropriately placed in order not to distract children. The video camera is used in order to analyze children's interactions with toys in depth and not to miss the observational data, behaviours of children and problems occurred during the interview and note taking process. Responses of each child are recorded during the interview sessions, on a previously prepared sheet (Appendix A).

4.5.6. Evaluation Measures

The primary concern related to evaluation measures was preference data rather than performance. However, the tests include the observation of participants and this provides information related to performance data.

Preference data was gathered through making comparisons between dyads of products and preference measures were:

- The attributes of the products that have primary importance for the subjects;
- The number of constructs repeated during the test by the subjects;
- The products that matched with user requirements and
- The similarities and differences between the criteria of product groups gathered through the evaluation of each product group.

4.5.7. Familiarising with the Test Materials

Thirty minutes of familiarization was provided for the second group of test materials, the metallophones, in order to make the children adapt to the materials. This process was carried out as a group activity with the help of the teacher in the classroom. Initially the teacher asked children their preferences and reasons; afterwards the children were allowed to play with the materials. The responses that they gave were also considered during the test. Later, different games were played during which children played the metallophones in turn, sung songs and danced while the teacher played the instruments. Since the subjects were unfamiliar with these materials, this process accelerated the familiarization process and affected the test positively enabling children to become more comfortable and self-confident. During this process children were observed and their behaviours were noted.

4.5.8. Process

After familiarization and informing children about the activity, the test process began. In the first three days, children evaluated the construction play materials. In the first three days of the following week children evaluated the metallophones, in the same order of participation.

The tests were conducted individually. The children participated to both tests in turns. In the beginning of the test, each child was informed about the aim of the activity in an informal way. It was emphasized that all of their responses were acceptable. At the beginning of the individual sessions, children were provided 10-15 minutes of familiarization in order to adapt to the environment and the camera.

After familiarization, each subject randomly selected two of the four construction play materials and was asked for the similarities and differences.

When a child selected two products, the others were removed, in order to prevent the child from becoming distracted. When the children specified a similarity they were asked the opposite of this specified similarity. When they specified a difference, it was noted to form the construct poles. After elicitation of each construct, children were asked for the preferred poles of construct pairs and the reasons behind them. Lastly, each child was asked to rank the four products from the most preferred to the least preferred and the reasons of the preferences related to the least preferred product and the most preferred.

The same procedure was carried out for both tests with different product groups. During the tests with the construction play materials, children were encouraged to play with the materials and were praised in order to make them more responsive. During the tests with the metallophone, children were also encouraged to play songs and sing to make them more communicative.

CHAPTER 5

EMPIRICAL STUDY DATA ANALYSIS AND RESULTS

During the analysis, firstly, two ranking tables are generated, displaying the rankings of the children related to construction play materials and metallophones. In addition, for each product group, tables are prepared, displaying the number of children who ranked the certain products as the most preferred. Primarily important attributes of the products were identified by asking children the reasons why they selected a certain product as the most preferred and as the least preferred.

Secondly, the data gathered through the comparison of four construction play materials and four metallophones is analyzed based on the responses of children related to element pairs. The constructs elicited by dyadic comparisons are counted and grouped. The reasons of the preferences of children related to each group of constructs are grouped and the relationships between children's evaluation criteria are derived.

Finally, the relationships between the constructs elicited for construction play materials and for metallophones are investigated.

5.1. Rankings and Primarily Important Attributes of Construction Play Materials

The tables below (Table 5.1 and 5.2) display the rankings of children related to construction play materials based on mode and children's primary preferences related to types of construction materials.

Table 5.1 Rankings Related to Construction Play Materials

	P. C4	P. C3	P. C1	P. C2
Subject A	3	2	4	1
Subject B	1	3	4	2
Subject C	1	2	3	4
Subject D	1	4	3	2
Subject E	2	1	3	4
Subject F	3	2	1	4
Subject G	1	2	3	4
Subject H	1	2	3	4
Subject I	3	4	2	1
Subject J	2	1	3	4
	1	**2**	**3**	**4**

Table 5.2 Children's primary preferences related to types of construction play materials

	All (n=10)
Product C4	5
Product C2	2
Product C3	2
Product C1	1

The rankings of children indicate that the most preferred construction play material is P. C4. Half of the children ranked P. C4 as the most preferred. The primarily important attributes, which made P. C4 preferable were its colors, attractive shapes such as flower-like shapes, its joints with cracks, method of construction, its joining in an inclined way, types of play and constructions created with it. None of the children ranked P. C4 as the least preferred.

The secondly preferred construction play material was P. C3. Two children ranked it as the most preferred. The primarily important attributes that made it preferable were the durable constructions that can be made with it, which do not collapse, its circular joints and the empty circles under its pieces. Two children ranked P. C3 as the least preferred because car driving and hamburger selling could not be played with it and it had no bridges.

P. C1 is ranked by one child as the most preferred. The attributes that made it preferable were the bridges it had and the houses that the child could construct (type of play). Two children ranked P. C1 as the least preferred, because it could collapse easily and its pieces were small.

P. C2 is ranked as the most preferred by two children. The attributes that made it preferable were the constructions (houses, bridges, mosques, castles) that could be built up with it and its enabling children to play car driving with it. Six children ranked P. C2 as the least preferred, because it was colorless. It is obvious that, color is one of the most important attributes that affect children's preferences related to construction play materials.

5.2. Constructs Related to Construction Play Materials

During the evaluation of construction play materials based on paired comparisons, eight types of constructs were revealed by children. These were, in order of frequency of mention, method of construction, form of the pieces, color, size, types of pieces, types of constructions, ease of construction and material. In the following sections, constructs related to construction play materials will be displayed in groups with the reasons of children's preferences. The reasons of the preferences of children are also grouped and the relationships between constructs and these reasons are investigated.

5.2.1. Method of Construction (f=30)

During paired comparisons of construction play materials, method of construction was mentioned thirty times by nine children. The constructs and the reasons of their preferences are displayed in Table 5.3. In terms of method of construction, C4 was preferred fifteen times, C3 was preferred nine times and C1 and C2 were preferred three times by children. The reasons why children mostly preferred C4 in terms of method of construction were related to types of constructions, stability of constructions, realism of the constructions, number of joining, pleasure and gender appropriateness.

To conclude, children preferred constructing things with attachable pieces instead of putting pieces side by side or on top of each other, because of the reasons related to stability, ease of construction, types of construction, order, realism of the constructions, gender appropriateness and number of joining that could be made. Stability of the constructions was the most frequently mentioned reason for the preferences of children related to method of construction.

Seven children associated method of construction with stability of the constructions. By attaching pieces with joints as in C3 and C4, more stabile constructions are built according to children.

For one child, method of construction was related to the types of constructions. According to the child, with lines of C4, movable constructions could be made.

Two children indicated that order was related to method of construction. For one child, constructions looked more orderly, when the joints were on and under the pieces. For the other child, pieces without joints were brought together more orderly.

One child indicated that pieces with circles under them attached more firmly and for this reason these pieces were preferable for him.

For one child method of construction affected realism of the constructions. He indicated that, when pieces were joined each other, more realistic hamburgers could be made.

Two children indicated that, with the pieces of C4, more joining could be made.

For two children, method of construction affected ease of construction. For one child, attaching pieces each other was easy for constructing structures whereas for the other child, putting pieces side by side or on top of each other was easier for constructing things. One child indicated that it was pleasurable for her to fix the pieces of C4. For one child, method of construction of C1 was preferable because it enabled him to play castle and the princess game. One child indicated that if the pieces were joined slowly, games lasted longer and for this reason he preferred bringing pieces together without attaching. For one child method of construction was associated with gender appropriateness. He indicated that, if the pieces attached and detached hard, the play material could be more appropriate for boys.

Table 5.3 Constructs Related to Method of Construction

C1-C2	C1-C3	C1-C4	C2-C3	C2-C4	C3-C4	+	-	Reason of Preference	Related Criteria
			+			Pieces stick eachother Parçalar yapışıyor	Pieces collapse immediately Parçalar hemen bozuluyor	Pieces stand easily on their own	Stability of Constructions
		+				Pieces combine with lines Çizgilerden birleşiyor	Have no lines Çizgileri yok	When pieces are combined, they can move and rotate	Types of Constructions
				+		No need to interlock, they are put together Takmaya gerek yok, koyulurlar	Have lines for combining Birleştirmek için çizgileri var	Pieces join more orderly	Order
	+					Have points for sticking Yapıştırmak için noktaları var	Do not have points for sticking Yapıştırmak için noktaları yok	Pieces do not scatter around	Stability of Constructions
				+		Pieces can be interlocked Parçaları takılabiliyor	Pieces cannot be joined Parçaları birleşmiyor	Difficult to be spoiled	Stability of Constructions
		+				Can be attached and detached, have cracks Takıp çıkarılabiliyor, aralıkları var	Not attachable, require adjoining or superposing Takılamıyor, üstüste yanyana koymam gerekiyor	My friends cannot spoil my game	Stability of Constructions

Table 5.3 (Continued)

C1-C2	C1-C3	C1-C4	C2-C3	C2-C4	C3-C4	+	-	**Reason of Preference**	**Related Criteria**
	+			+		Has spaces for attaching Takmak için yerleri var	No spaces for attaching Takmak için yerleri yok	Pieces stand easily on their own	Stability of Constructions
		+		+		Pieces stick each other Parçaları yapışıyor	Pieces do not stick Parçaları yapışmıyor	Even if pieces join fast, they do not fall down	Stability of Constructions
					+	Pieces join with the circles under them Parçalar alttaki yuvarlaklarla birleşiyor	Pieces join with lines Parçalar çizgilerle birleşiyor	They detach hard	Firmness of joints
		+				Pieces join each other Parçaları birleşiyor	Pieces are sticking Parçaları yapışıyor	Pieces do not collapse unless they are detached	Stability of Constructions
		+		+		Pieces join each other Parçaları birleşiyor	Pieces are sticking Parçaları yapışıyor	Hamburgers look like real	Realism
		+				Pieces join each other both side by side and with the holes in the middle Hem yanlardan hem de delikten birleşiyor	Pieces are joining by superposing or adjoining Üstüste ya da yanyana birleşiyor	More joining can be made	Number of joining
	+					Pieces are attached Parçalar takılıyor	Pieces are put Parçalar koyuluyor	Easy to build things up	Ease of Construction

Table 5.3 (Continued)

C1-C2	C1-C3	C1-C4	C2-C3	C2-C4	C3-C4	+	-	**Reason of Preference**	**Related Criteria**
		+	+			Pieces can be attached (Parçaları) takılıyor	Pieces cannot be attached (Parçaları) takılamıyor	Pieces do not fall	Stability of Constructions
		+				Pieces are interlocked Parçaları geçmeli	Pieces are brought close together Parçalar biraraya getiriliyor	Fixing the pieces is enjoyable	Pleasure
	+	+		+		Pieces are put (side by side or on top of each other) Parçalar koyuluyor (yan yana, üst üste)	Pieces are attached Parçalar takılıyor	Easy to create and collapse	Ease of Construction
					+	Have lines for attaching Birleştirmek için çizgileri var	Have circles for attaching Birleştirmek için daireleri var	More joining can be made	Number of joining
			+			Pieces attach each other Parçalar takılıyor	Pieces cannot attach each other Parçalar takılmıyor	Houses cannot be broken	Stability of Constructions
		+				Pieces are stuck Parçalar yapışıyor	Pieces are joined, interlocked Parçalar birleşiyor, takılıyor	I can play castle and the princess game with them	Types of Games
		+				Pieces are attached with the stick-like things Çubuk gibi şeylerle birleşiyor	Pieces are adjoined or superposed Üstüne, yanına koyarak birleşiyor	Do not collapse easily	Stability of Constructions

Table 5.3 (Continued)

C1-C2	C1-C3	C1-C4	C2-C3	C2-C4	C3-C4	+	-	**Reason of Preference**	**Related Criteria**
			+			Pieces are attached slowly Parçalar yavaşça birleşiyor	Pieces are attached fast Parçalar hızlıca birleşiyor	Games last long	Duration of play
		+				Difficult to detach the pieces Parçaları çıkartması zor	Very easy to detach them Çıkartması çok kolay	Boys use hard pieces	Gender appropriateness
					+	Joints on and under pieces Birleşme yerleri üstte ve altta	Joints are the balls and the middle holes Birleşme yerleri topların üstünde ve ortada	Pieces join more orderly	Order
	+					Pieces join with the circles Parçaları yuvarlaklardan birleşiyor	Pieces join by superposing or adjoining Parçaları yanyana, üstüste birleşiyor	Difficult to be spoiled	Stability of Constructions

5.2.2. Form of the Pieces (f=28)

Nine children revealed twenty eight constructs related to form of the pieces. The constructs and the reasons of children's preferences are displayed in Table 5.4. In terms of forms of the pieces, C3 was preferred twelve times, C4 was preferred eleven times, C1 was preferred three times and C2 was preferred two times by children. The reasons why C3 was preferred most in terms of form of the pieces were related to types of constructions, durability of the constructions, stability, beautifulness, change in appearance and pleasure. The reasons why children secondly preferred C4 were related to beautifulness of the shapes, realism, types of constructions, pleasure, variety in shapes, ease of construction and stability of the constructions.

The results of the paired comparisons reveal that, children prefer construction materials including circular pieces rather than only rectangular pieces, they look at details such as circles on the pieces of C3 and cracks of C4 and flower-like shapes, and pieces with holes attract them besides rectangles.

For four children form of the pieces were affecting the stability of the constructions. For one child, the constructions that were made with flat pieces (C2) were stabile. For one child, pieces with holes (C3) were providing durable constructions. For one child, pieces with circles (C3) were making constructions indestructable and for one child, the structures made of bally pieces (C4) were not collapsing .

Two children preferred specific forms because they looked like realistic forms. One preferred sausage-like (long and narrow) cylinders to wheel-like cylinders (short and large), only because they looked like real sausages. The other child preferred pieces with circular forms (C4) because they looked like flowers.

Form of the pieces was associated with beautifulness five times by four children. The *lined* pieces were beautiful for two children. For one child, ball-like pieces (C4); for one child, rectangular pieces (C1) and for one child carrot-like shape of C1 were looking beautiful.

Three children associated form of the pieces with pleasure. They indicated that rectangular pieces were enjoyable to create houses, castles and buildings. For one

child pieces with circles were funny and for one child, bringing lines of C4 together were enjoyable.

For three children, form of the pieces were associated with types of constructions. For two children, form of the pieces of C4 were enabling them to build cameras and hamburgers. One child indicated that the empty circles on the pieces of C3 enabled her to use them as penholders.

For one child, it was important that the construction play materials included circular pieces instead of just rectangles. They liked to see variety in forms.

One child indicated that, *lined* forms of C4 were easy for constructing things.

One child preferred pieces with circles (C3) to rectangular pieces of C2 and to pieces of C4 because the joints of C3 were becoming invisible when they were joined.

Table 5.4 Constructs Related to Form of the Pieces

C1-C2	C1-C3	C1-C4	C2-C3	C2-C4	C3-C4	+	-	**Reason of Preference**	**Related Criteria**
				+		Pieces are flat Parçaları düz	Interlocking pieces Parçalar geçmeli	Pieces stand easily on their own	Stability of the constructions
				+	+	Circular pieces Şekilleri yuvarlak	Rectangular pieces Dikdörtgen şekilli	Pieces look like flowers	Realism
					+	Circular pieces Şekilleri yuvarlak	Rectangular pieces Dikdörtgen şekilli	Look beautiful	Beautifulness
					+	Circular pieces Şekilleri yuvarlak	Rectangular pieces Dikdörtgen şekilli	Hamburgers can be made	Type of constructions
		+			+	Has circular pieces Yuvarlakları var	No circular piece Yuvarlakları yok	Variety in shapes	Variety
	+					Has holes Delikleri var	No holes Delikleri yok	Durable constructions can be made	Stability of the constructions
+						Has carrot-like shape Havucu var (turuncu altıgen prizma)	Has not carrot Havucu yok	Carrot-like shape is beautiful	Beautifulness
	+		+			Has circles for joining the pieces Parçaları birleştirmek için yuvarlaklar var	No parts for joining, top surface is spread- out Birleştirmek için bir şey yok, üstü yayık	Do not collapse, indestructable	Stability of the constructions
				+		Rectangular pieces Dikdörtgen parçalar	Circular pieces Yuvarlak parçalar	Creating buildings with rectangular pieces is pleasurable	Pleasure

Table 5.4 (Continued)

C1-C2	C1-C3	C1-C4	C2-C3	C2-C4	C3-C4	+	-	Reason of Preference	Related Criteria
					+	Rectangular pieces Dikdörtgen parçalar	Circular pieces Yuvarlak parçalar	Rectangles look beautiful	Beautifulness
	+					Has not circles on pieces Parçaların Üstünde daireleri yok	Has circles Daireleri var	Creating houses is pleasurable	Pleasure
					+	Lined shapes Çizgili çizgili şekiller	Square shapes Kare kare şekiller	Look beautiful	Beautifulness
		+				Lined Çizgili	Not lined Çizgisiz	Lines make connecting the pieces easier	Ease of construction
	+		+			Top of the pieces are circular Parçaların üstü yuvarlak	Top of the pieces are quite smooth Parçaların üstü dümdüz	They look funny	Pleasure
		+				Sausage-like circles Yuvarlakları sosis gibi	Wheel-like circles Yuvarlakları tekerlek gibi	I like to eat sausages	Realism
		+				Rectangular pieces Dikdörtgen	Bally pieces Topçuk topçuk şekiller	Enjoyable to build castles with rectangles	Pleasure
			+			Hole in the midde Ortasında delik var	No hole in the middle Ortasında delik yok	Cameras can be made	Types of constructions
				+		Has bally parts Topçukları var	Has rectangles Dikdörtgenleri var	Structures do not collapse	Stability of the constructions

Table 5.4 (Continued)

C1-C2	C1-C3	C1-C4	C2-C3	C2-C4	C3-C4	+	-	Reason of Preference	Related Criteria
		+				Lined pieces Çizgili parçalar	Smooth Pieces Düz parçalar	I like bringing lines together	Pleasure
	+					Inside of the pieces are empty Parçaların içleri boş	Inside of the pieces are full İçleri dolu	Inside of the pieces can be used as penholders	Types of constructions
			+			Top of the pieces are circular Üstleri yuvarlak	Top of the pieces are smooth Üstleri düz	Circles become invisible, when they are joined	Change in appearance during play
					+	Joints are circular Takma yerleri yuvarlak	Joints are cracks Aralıklardan takılıyor	Circles become invisible, when they are joined	Change in appearance during play
					+	Rectangular pieces Dikdörtgen şekiller	Flower-like pieces Çiçek gibi şekiller	Enjoyable to build castles with rectangles	Pleasure
					+	Pieces are lined Çizgili	Pieces are bally Topçuk topçuk	Look beautiful	Beautifulness

5.2.3. Color (f=24)

Color was mentioned twenty four times by nine children. The constructs and the reasons of their preferences are displayed in Table 5.5. Twenty constructs revealed that all of the nine children preferred colorful pieces and pieces with different colors to colorless pieces and pieces in the same colors. Red and orange were the colors that were specified and preferred by children during paired comparisons. However, black, gray and brown were the colors that were not preferred. The responses of these nine children reveal that they like colorful pieces and they like to see pieces in different colors among the pieces of construction play materials. In terms of color, C1 was preferred nine times, C4 was preferred seven times, C3 was preferred five times and C2 was preferred one time.

Eight of the nine children associated color attribute with beautifulness. All of these children preferred colorful pieces and the pieces with different colors to *brown, colorless or gray* pieces and to *pieces in the same color* and described the colorful pieces as looking beautiful.

Three children associated color with their specific color preferences. For two children, it was important that the construction play materials had red pieces. One child preferred orange to black and one child preferred materials with black pieces.

One of the children associated his color preference with types of games. The child preferred colorless pieces because it had bigger bridges for crossing the cars under them.

One child preferred colorful pieces because he could make maps with them by associating color preference with types of constructions.

One child associated his color preference with types of pieces that the construction play materials included. He preferred colorful pieces because it had more semicircles.

Table 5.5 Constructs Related to Color

C1-C2	C1-C3	C1-C4	C2-C3	C2-C4	C3-C4	+	-	Reason of preference	Related Criteria
++			+	+++		Colored *Renkli*	Colorless *Renksiz*	Colorful pieces are beautiful	Beautifulness
+						Colored *Renkli*	In the same color *Aynı renk*	They look beautiful	Beautifulness
+			+			Colorful *Renkli*	Brown *Kahverengi*	Maps can be made	Types of constructions
				+		Pieces in different colors *Farklı renklerde parçaları var*	Brown pieces *Parçaları kahverengi*	No reason	___
+						Made of wood Tahtadan yapılmış	Painted Boyanmış	Cars can cross under colorless big bridge	Types of games
			+	+		(Pieces) in different colors *(Parçaları) farklı renklerde*	(Pieces) in same colors *(Parçaları) aynı renk*	They look beautiful	Beautifulness
+						Painted Boyanmış	Gray Gri	Colorful pieces have lots of semicircles	Types of pieces
++			++			*Colorful Renkli*	Gray Gri	They look beautiful	Beautifulness
		+				Red cylinder *Kırmızı yuvarlak*	Black cylinder *Siyah yuvarlak*	It is red, I like red	Pieces with specific color
		+				Has black pieces, ball and flowers Siyahları var, top ve çiçekleri var	Has not black piece, flower and ball *Siyahları, çiçekleri ve topu yok*	I like black pieces	Pieces with specific color
				+		Pieces are painted *Boyamışlar, güzel görünüyor*	Pices are not painted *Boyamamışlar*	They look beautiful	Beautifulness
+						Colored pieces *Parçaları renkli*	Colorless pieces *Parçaları renksiz*	I like red	Pieces with specific color

5.2.4. Size (f=13)

Ten children revealed thirteen constructs related to the size of the pieces. The constructs and the reasons of their preferences are displayed in Table 5.6. Eleven of the constructs reveal that children preferred big pieces to small pieces because of the reasons related to size of constructions, frequency of play, types of games, ease of construction, pleasure and color. In terms of size of the pieces, Product C2 was preferred ten times, C1 was preferred two times and C3 was prefereed one time by children. The reasons why children preferred C2 were related to size of the constructions, frequency of play, types of games, ease of construction and pleasure. Size of the bridges of C2 was important for children, since half of the constructs were related to size of the bridges.

One child preferred big pieces to small ones because bigger structures could be built.

Frequency of play affected the size preferences of two children. One of them preferred big pieces of C2 to small pieces of C1 because she rarely played with C2. The other child preferred small pieces of C1 because she always played with them. It is difficult to form a relationship between size and frequency of play by considering the responses of these two children, since they were completely different.

Three children preferred big pieces to small pieces without specifying a reason.

One child preferred tall cylinder to short one because of its color.

For one child, small pieces were cute and preferrable.

One child stated that big pieces were easier for constructing things.

For two children, it was enjoyable to play with big pieces only because they were big.

Two children associated their size preferences with types of games that they could play and indicated that they preferred big bridges of C2, because big bridge enabled them to cross the cars under it.

Table 5.6 Constructs related to Size

C1-C2	C1-C3	C1-C4	C2-C3	C2-C4	C3-C4	+	-	Reason of preference	Related Criteria
+						Bigger pieces *Parçaları daha büyük*	Small pieces *Parçaları küçük*	Bigger buildings can be made	Size of constructions
+						Big bridge *Köprüsü büyük*	Small bridge *Köprüsü küçük*	Play with them rarely	Frequency of play
			+			Tiny pieces *Parçaları küçücük*	Big pieces *Parçaları büyük*	Pieces are cute	Cuteness
++						Big bridge *Büyük köprü*	Small bridge *Küçük köprü*	Cars can cross under the big bridge	Types of games
+						Long bridge Uzun boylu köprü	Short bridge Kısa boylu köprü	No reason	___
+						Big blocks Büyük bloklar	Small blocks Küçük bloklar	Easy to build things up	Ease of construction
+				+		Big pieces Parçaları büyük	Small pieces Parçaları küçük	I like to play with big toys	Pleasure
		+				Tall cylinder *Kırmızı yuvarlak*	Short cylinder *Siyah yuvarlak*	It is red	Color
+						Small pieces *Parçaları küçük*	Big pieces *Parçaları büyük*	Playing with them always	Frequency of play
++						Big bridge *Köprüsü büyük*	Small bridge *Köprüsü küçük*	No reason	___

5.2.5. Types of Pieces (f=9)

Six children elicited nine constructs related to types of pieces. In general, the pieces they mentioned were semicircles, bridges, cylinders, balls, rotating pieces and flower-like shapes and children liked to see these pieces among construction play materials, which could enrich the types of constructions that could be built. The reasons of their preferences are displayed in Table 5.7. The pieces of C4 were the most frequently mentioned ones by children (six times). These pieces were ball, flower-like shapes and rotary pieces. The pieces of C2 that attracted children were bridges (two times). In terms of types of pieces, one child stated that he liked the cylinders of C1.

Three children associated types of pieces with types of constructions. One child preferred pieces having semicircles (C2) because they enabled him to create bridges. One child preferred pieces which had cylinders (C1) because with cylinders he could create mosques. For one child C4 was preferrable because the ball and the cylinder of it enabled her to create microphone.

Four children associated types of pieces with pleasure. Playing with bridges of C2, throwing the ball of C4, watching turning pieces of C4 and turning those pieces were enjoyable according to the children.

One child indicated that, he liked egg and flowers because they looked like real flowers and eggs.

Table 5.7 Constructs related to Types of Pieces

C1-C2	C1-C3	C1-C4	C2-C3	C2-C4	C3-C4	+	-	Reason of preference	Related Criteria
			+			Have semicircle *Yarım dairesi var*	Do not have semicircle *Yarım dairesi yok*	Big bridges can be built	Types of Constructions
				+		Has bridge *Köprüsü var*	Has not bridge *Köprüsü yok*	I like playing with bridges	Pleasure
	+					Has cylinders Yuvarlakları var	No cylinders Yuvarlakları yok	Mosques can be created	Types of Constructions
		+				Has ball and short cylinde *Topu ve küçük yuvarlağı var*	No ball and short cylinder Topu ve yuvarlağı yok	I like throwing the ball	Pleasure
								Microphone can be made	Types of constructions
				+		Have turning pieces *Parçaları dönüyor*	No turning pieces *Parçaları dönmüyor*	Funny to watch	Pleasure
		+				Has a ball *Topu var*	No ball *Topu yok*	I like throwing the ball	Pleasure
				+		Has turning wheel and ball *Tekerleği ve topu var*	No wheel, no ball *Tekerlek ve top yok*	Enjoyable to turn the pieces	Pleasure
		+				Has flower and egg *Çiçeği ve yumurtası var*	Has no shape, only squares *Şekli yok, sadece kareler var*	It's good that it has shapes like real flowers and eggs	Realism

Table 5.7 (Continued)

C1-C2	C1-C3	C1-C4	C2-C3	C2-C4	C3-C4	+	-	Reason of preference	Related Criteria
				+		Has rotating pieces, rotary flowers can be made *Dönmesi var, dönen çiçek yapılır*	No rotary piece *Dönmesi yok*	Enjoyable to rotate the pieces	Pleasure

5.2.6. Types of Constructions (f=6)

Three children specified six constructs related to types of constructions. In terms of types of constructions that could be built up, C1 was preferred three times, C3 was preferred two times and C2 was preferred one time by children.

All of the three children thought that it was more pleasurable to construct buildings, houses, garages and parks than to construct smaller objects like fans, sprays, etc. One of the children indicated that constructions made of C3 were more realistic than the constructions made of C2, because their size was resembling the size of the real objects.

5.2.7. Ease of Construction (f=6)

Ease of construction was mentioned six times by four children. The reasons of children's preferences and the related categories of children's evaluation criteria are displayed in Table 5.9. Product C3 was mentioned as easy to construct things four times because its pieces interlock firmly, the constructs that were made with it were stabile and it was easy for constructing stairs and flags. C1 and C4 were preferred one time each, in terms of ease of construction.

Three children associated ease of construction with stability of the constructions. If the constructions can stand on their own and if they do not fall, the pieces are easy to construct things for children.

For one child, firmness of the joints was making construction easier.

One child indicated that it was important for him that the materials were easy to construct bridges. For one child, it was important that the construction play materials were easy to construct stairs and for another child, it was important that the materials were easy to construct flags.

Table 5.8. Constructs related to Types of Constructions

C1-C2	C1-C3	C1-C4	C2-C3	C2-C4	C3-C4	+	-	Reason of preference	Related Criteria
		+	+			Buildings can be created (schools, mosques, houses) *Okul, cami, ev yapabilirim*	Objects can be created (sprays, fans, rolling pins, tables, etc.) *Fısfıs, yelpaze, merdane, masa gibi şeyler yapabilirim*	I like creating buildings, houses	Pleasure
			+			Spray is in the same dimensions with real sprays *Spray gerçek sprayle aynı boyda, gerçek gibi*	No stuff in the house, not realistic *Evin içinde eşya yok, gerçek gibi değil*	The shapes I created are like real	Realism
		+			+	Places are made (garage, tower, car wash place *Yerler yapılır (garaj, kule, araba yıkama yeri)*	Small things are made (microphones, mirrors, guns) *Küçük şeyler yapılır (mikrofon, ayna, silah)*	I like creating places	Pleasure
		+				Houses and mosques can be made *Evler, camiler yapabiliyorum*	Snowman and crowns can be made *Kardan adam ve taç yapabiliyorum*	I like creating buildings, houses	Pleasure

Table 5.9 Constructs related to Ease of Construction

C1-C2	C1-C3	C1-C4	C2-C3	C2-C4	C3-C4	+	-	Reason of preference	Related Criteria
					+	Easy to construct *Yapması kolay*	Difficult to construct *Yapması zor*	Pieces interlock firmly	Firmness of joints
	+					Easy for constructing things *Yapması kolay*	Not that much easy to construct things *Yapması o kadar da kolay değil*	When joined, pieces stay easily in that position	Stability of constructions
		+				Easy to construct bridges *Köprüleri var*	Difficult to construct bridges *Köprü yapması zor*	Car driving can be played	Types of games
	+					Easy to make flags *Bayrak yapmak kolay*	Flag cannot be made *Bayrak yapılmıyor*	Pieces do not fall while making flags	Stability of constructions
	+					Pieces do not fall down, while constructing *Yaparken parçaları düşmüyor*	Pieces fall down *Parçalar düşüyor*	Stairs can be made	Types of constructions
		+				Pieces do not fall down, while constructing *Yaparken parçaları düşmüyor*	Pieces fall down *Parçalar düşüyor*	Constructions are durable	Stability of constructions

5.2.8. Material (f=3)

Three children revealed three constructs related to material. One of them preferred plastic material (C4) to wood because it was nice to touch the cracks of the plastic material for her. One child preferred wood (C2) to plastic because wood pieces could not be bent. The other child preferred plastic material (C3) to wood because it had joints and the houses he made with them could not be broken.

Since these three children have different reasons for material preferences, there is no specific material preference of children.

Table 5.10 Constructs Related to Material

C1-C2	C1-C3	C1-C4	C2-C3	C2-C4	C3-C4	+	-	Reason of preference	Related Criteria
		+				Made of brick (plastic) *Tuğladan yapılmış*	Made of wood *Tahtadan yapılmış*	Nice to touch the cracks	Pleasure
				+		Made of wood Tahtadan yapılmış	Made of colored balls Renkli toplardan yapılmış	Hard, cannot be bent	Durability
			+			Pieces are plastic *Parçalar plastik*	Pieces are wooden *Parçalar tahta*	Houses cannot be broken	Stability of the constructions

After grouping the constructs, preferred attributes of four construction play materials are determined. Table 5.11 displays the preferred attributes of four construction play materials based on paired comparisons. In terms of color and types of constructions, C1 was the most preferred play material. C2 was preferred by children because of the size of its pieces. In terms of form of the pieces and ease of construction, C3 was mostly preferred. C4 was preferred by children because of the form of its pieces, its method of construction and types of pieces it contained.

Table 5.11 Preferred attributes of four construction play materials

P. C1	P. C2	P. C3	P. C4
Color Types of constructions	Size of the pieces	Form of the pieces Ease of construction	Form of the pieces Method of construction Types of pieces

5.3. Children's Evaluation Criteria related to Construction Play Materials and the Relationships Between Them

Figure 5.1 displays children's evaluation criteria related to construction play materials with their frequency of mention and with the number of children who specified these criteria. Pleasure, beautifulness, stability of the constructions and types of constructions were the most frequently specified criteria for children's preferences related to construction play materials.

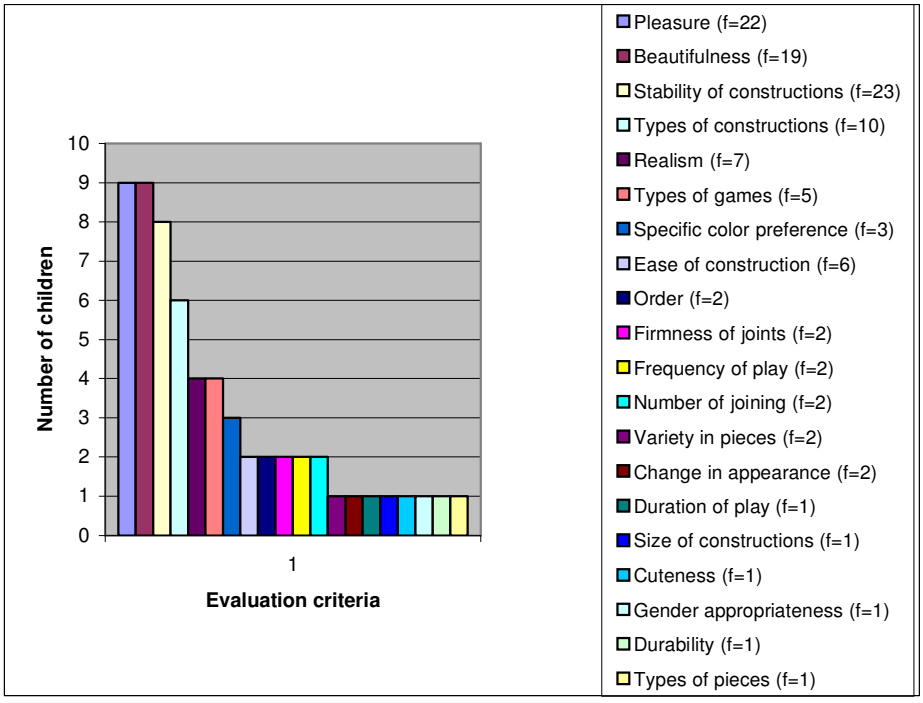


Figure 5.1 Distribution of children's evaluation criteria according to number of children

Relationships between children's evaluation criteria and the attributes preferred according to these criteria are displayed in Figure 5.2. The most distinctive relationships are explained below.

Relationship between color and beautifulness is the most apparent one according to children's responses. Figure 5.2 displays that beautifulness of the pieces is connected with color according to eight children. For four children it is connected with the form of the pieces. Relationship between color and beautifulness is the most apparent one according to children's responses.

Relationship between method of construction and stability of the constructions is also important. Seven children explained their reason of preferences related to method of construction with stability of the constructions. According to three children, form of the pieces affect stability of constructions. In addition, for three children ease of construction is connected with stability of the constructions.

There is a relationship between pleasure and form of the pieces according to five children. Types of pieces included in play materials is also in relation with pleasure according to six children. According to three children, pleasure is related with types of constructions that can be constructed.

Pieces with specific colors such as red, orange and black affected four children's color preferences.

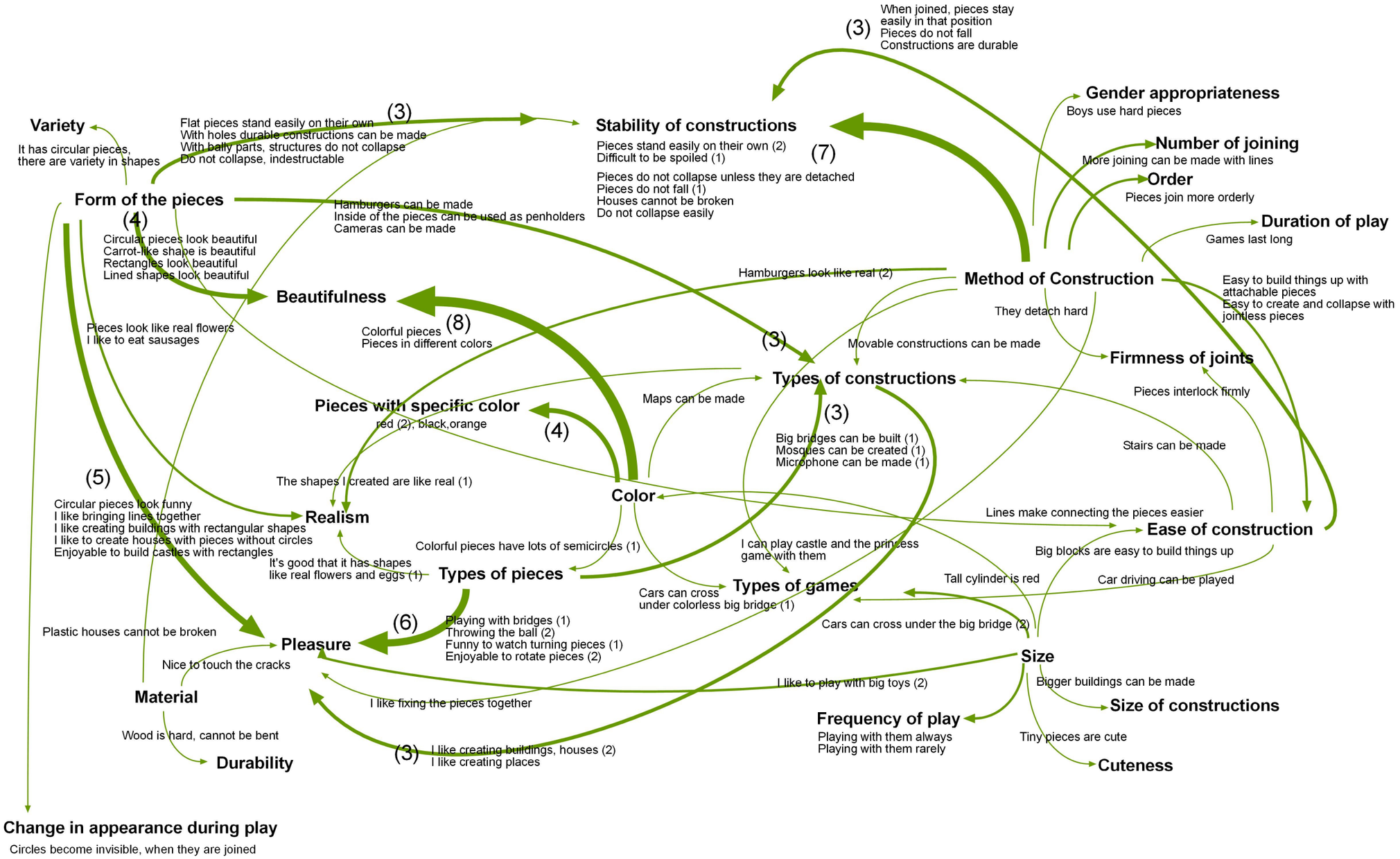


Figure 5.2 Relationships between constructs related to construction play materials

5.4. Rankings and Primarily Important Attributes of Metallophones

Table 5.12 reveals that M2 was ranked as the first by six children. Five children ranked M4 as the second, M3 is ranked as the third by five children and M1 was ranked as the third by three children and as the fourth by three children. The reasons of preferences of children related to metallophones are analyzed in depth in the next section.

Table 5.12 Rankings of Metallophones

	M4	**M1**	**M2**	**M3**
Subject A	2	3	1	4
Subject B	1	4	2	3
Subject D	2	4	3	1
Subject E	1	3	2	4
Subject F	4	3	1	2
Subject G	2	3	1	4
Subject H	4	3	1	2
Subject I	2	4	1	3
Subject J	2	4	1	3
	2	**3**	**1**	**3 and 4**

Table 5.13 displays that, six out of nine children chose Metallophone 2 as the most preferred. Two children chose Metallophone 4 as the most preferred play material. Metallophone 3 was chosen as the most preferred by one child and none of the children chose Metallophone 1 as the most preferred.

Table 5.13 Number of children who chose the types of metallophones as the most preferred

	All (n=9)
Metallophone 2	6
Metallophone 4	2
Metallophone 3	1
Metallophone 1	0

The rankings of the children reveal that the most preferred metallophone is M2. Six of the nine children preferred M2 as the most preferred. The attributes that made it preferable were its colorful keys and mallets, its circular keys and the numbers on them. None of the children ranked M2 as the least preferred. The most important attribute that made it preferable was its colors. Although it made the most incorrect sound, children preferred it only because it was very colorful. The results indicate that color is more important than sound for children, even though the evaluated product is a musical instrument.

The secondly preferred metallophone was M4. Two children ranked it as the most preferred. The attributes that made it preferable were its loud sound, its big size, its bright keys and its big sponges. Two children ranked M4 as the least preferred because its sound was very noisy and it was very colorless.

The thirdly preferred metallophone was M3. One child ranked it as the most preferred. The reason why he ranked it as the most preferred was because it was the biggest metallophone. Three of the nine children ranked M3 as the least preferred because it was closed with a box, its keys were not bright and there were large gaps between its keys, which looked unappealing.

The least preferred metallophone was M1. None of the children ranked it as the most preferred. The reasons why children did not like M1 were because it was small, it made a little sound, and it was colorless. The most important attribute that influenced children's preferences related to M1 was its colors and size. Children preferred M2 because it was colorful and M4 because it was big and made too much sound. Since M1 was neither colorful nor big and it was not making too much sound, it was not preferred by children.

5.5. Constructs related to Metallophones

During the evaluation of metallophones based on paired comparisons, eight types of constructs were revealed by children. These were, in order of frequency of mention, method of construction, form of the pieces, color, size, types of pieces, types of constructions, ease of construction and material. In the following sections, constructs related to construction play materials will be displayed in groups with the reasons of children's preferences. The reasons of the preferences of children are

also grouped and the relationships between constructs and these reasons are investigated.

5.5.1. Color (f=39)

Color attribute was mentioned 39 times by nine children during the paired comparisons. During paired comparisons, M2 was preferred 29 times, M3 was preferred six times and M4 was preferred four times by children. The color of M1 was not preferred by any of the children during paired comparisons. Children's responses indicate that they liked colorful metallophones. Color of the mallets was also important for them and they liked purple mallets of M2. Constructs related to color and children's preferences with related reasons are displayed in Table 5.14.

All of the nine children associated the color attribute with beautifulness. Colorful keys, white keys, bright keys, purple mallets, green frame and colorful handle were the attributes that make a metallophone or mallet beautiful according to children.

One of the children associated the color attribute with size and preferred black mallet to purple one because of its big size.

One of them associated color with durability, stating that white gibs were preventing the keys to be removed.

One of the children associated color with pleasure because holding the green handle was enjoyable for him.

Table 5.14 Constructs related to Color of the Metallophones

M1-M2	M1-M3	M1-M4	M2-M3	M2-M4	M3-M4	+	-	Reason of preference	Related Criteria
+						Colorful Renkli	Gray and mustard color Gri ve hardal rengi	Colorful looks beautiful	Beautifulness
+						Purple mallets Çubukları mor	Colorless, because the mallets are wooden Çubuğu tahta olduğu için renksiz	Purple mallet looks beautiful	Beautifulness
			+ + + + +			Colorful Renkli	Black and white Siyah-beyaz	Colorful looks beautiful	Beautifulness
+						Has lots of colors Bir sürü rengi var	Has no color Rengi yok	Colorful looks beautiful	Beautifulness
	+					Has white keys Beyaz tuşları var	Glass keys Tuşları ve noktacıkları cam	Whites look beautiful	Beautifulness
	+					Has white keys Beyaz tuşları var	Glass keys Tuşları ve noktacıkları cam	Whites prevent the keys to be removed	Durability
		+		+ + +		Colorful Renkli	Black and gray Siyah ve gri	Colorful looks beautiful	Beautifulness
			+ +	+		Purple mallets Çubukları mor	Black mallets, black is a bad color Çubukları siyah, siyah kötü bir renk	Purple is more beautiful than black	Beautifulness
+						Very colorful tubes, beautiful colors Boruları çok renkli ve çok güzel	Gray and cream Tuşları gri ve krem rengi	Colorful looks beautiful	Beautifulness

Table 5.14 (Continued)

M1-M2	M1-M3	M1-M4	M2-M3	M2-M4	M3-M4	+	-	Reason of preference	Related Criteria
+						Green handle Tutma yeri yeşil	Wooden handle Tutma yeri tahta	Enjoyable to hold the green handle	Pleasure
+						Colorful mallets Çubukları renkli	Colorless mallet Çubuğu renksiz	Colorful mallets look beautiful	Beautifulness
	+					Wooden part is painted, colorful Tahtası boyanmış, renkli	Wooden part is not painted Tahtası boyanmamış	Colorful looks beautiful	Beautifulness
			+			Too many colors Çok renkli	Three colors (red, white, black) Üç renk (kırmızı, beyaz, siyah)	Colorful looks beautiful	Beautifulness
					+	Has bright sponges between the keys Tuşların arasında parlak süngер var	Has pompoms between the keys which are not bright Tuşların arasında parlak olmayan ponpon var	Bright look beautiful	Beautifulness
					+	Black, white and red Siyah, beyaz ve kırmızı	Completely black Hep siyah	It has more beautiful colors	Beautifulness
+ + + +				+		Colorful Renkli	Colorless Renksiz	Colorful looks beautiful	Beautifulness
	+					White keys, look more beautiful Tuşları beyaz, daha güzel görünüyor	Gray keys Tuşları gri	White looks more beautiful	Beautifulness

Table 5.14 (Continued)

M1-M2	M1-M3	M1-M4	M2-M3	M2-M4	M3-M4	+	-	Reason of preference	Related Criteria
+						Purple mallets, colors are very beautiful Çubukları mor, renkleri çok güzel	Brown mallets Çubukları kahverengi	Purple is beautiful	Beautifulness
+						Green sides Kenarları yeşil	Brown base Altı kahverengi	Its colors are very beautiful	Beautifulness
+						Colorful handle Tutma yeri renkli	Colorless handle Tutma yeri renksiz	Its color is very beautiful	Beautifulness
					+	Bright keys Tuşları parlak	Black and white keys Tuşları siyah ve beyaz	Bright keys look beautiful	Beautifulness
+						Colorful Renkli	Wooden Tahta	Colorful looks beautiful	Beautifulness
	+					White nails Çivileri beyaz	Colorless nails Çivileri renksiz	White looks more beautiful	Beautifulness
+						Colorful sides, look beautiful Kenarları renkli, güzel görünüyor	Colorless sides Kenarları renksiz	Colorful sides look beautiful	Beautifulness
					+	Bright gray keys Tuşları parlak gri	Black and white Siyah ve beyaz	Bright is more beautiful	Beautifulness
		+				Black mallet Siyah çubuk	Colorless mallet Renksiz çubuk	Black mallet is big	Size

5.5.2. Placement of the Keys (f=22)

Placement of the keys was mentioned 22 times by all of the nine children during paired comparisons. M1 was mentioned and preferred eight times during paired comparisons. M2 and M4 were preferred five times each. M3 was preferred three times by children.

According to children, it was important that the keys were stuck on the base because of the reasons related to playability, durability and sound.

Three children associated placement of the keys with ease in playing. The width of the gaps between the keys and the frame of M2 were affecting ease of playing the metallophones according to these children.

Three children associated placement of the keys with durability. Keys and sponges that are attached to the body, pins on the keys were making the metallophones durable.

Two of the children indicated that if the keys are not placed with screws and they are removable, it may affect playability of the metallophone.

Two children associated placement of the keys with beautifulness. The gaps between the keys and the metallophones without visible sponges make a metallophone beautiful for them.

For three children placement of the keys was associated with pleasure. Playing the metallophone that has small gaps between its keys, the mallets that stuck between the keys and pulling out and replacing the tubes were enjoyable for them.

Two children stated that they could use the metallophones differently by removing and replacing the tubes and hitting with the tubes as if they were mallets.

One child stated that the metallophone which had slots for holding the keys was looking orderly than the others. One child stated that if the keys are removable, the sound may be bad.

Table 5.15 Constructs Related to Placement of the Keys

M1-M2	M1-M3	M1-M4	M2-M3	M2-M4	M3-M4	+	-	Reason of preference	Related Criteria
+						Keys are stuck Tuşları yapıştırmışlar	Keys can be pulled out Tuşlar çekince çıkıyor	When keys are removable, it cannot be played	Playability
	+					Blanks between the keys Tuşların aralarında boşluklar var	No blanks between the keys Aralarında boşluk yok	Blanks between the keys look beautiful	Beautifulness
+			+			Keys move in their place, cannot be removed Tuşları sadece yerinde oynuyor, çıkmıyor	Keys can be pulled out, should be stuck for playing Tuşları çıkıyor, yapıştırmazsak oynayamayız	If the keys are removable, it cannot be played	Playability
			+			Has beads, preventing the keys removed Boncukları var, tuşların çıkmasını engelliyorlar	No beads, keys can be removed Boncukları yok, tuşlar çıkabiliyor	Songs can be played wrong, if the places of the keys are forgotten	Playability
					+	No blanks between the keys Tuşların arasında boşluk yok	There are blanks between the black keys Siyahlar aralık aralık	Enjoyable to play from one end to the other	Pleasure
+						Keys are attached to the wood Tuşlar tahtaya takılmış	Keys are stuck Tuşları yaıştırmışlar	Durable, has attached keys	Durability

Table 5.15 (Continued)

M1-M2	M1-M3	M1-M4	M2-M3	M2-M4	M3-M4	+	-	Reason of preference	Related Criteria
				+		The keys and the sponges are fixed with the screws on the keys, cannot be pulled out Tuşları ve süngerleri çıkmaz, çünkü vidalamışlar	The keys and the sponges are not screwed, can be pulled out Tuşları ve süngerleri çıkarılabilir, çünkü vidalanmamış	Durable	Durability
+						Tubes can be pulled out Boruları çıkabiliyor	Keys cannot be removed, because it is wooden Tuşları çıkmıyor çünkü tahta	Different songs can be played by changing the place of the tubes	Variety of sound
	+					No gap between the keys Tuşların araısnda aralık yok	Gaps between the keys Tuşların arası aralık aralık, çubuklar aşağıya düşüyor	Mallets do not fall into gaps	Ease in playing
			+			Tubes are stuck to the sponges Borular süngere yapışık	Pins on the keys Tuşların üstünde iğneler var	No reason	___
+						Slots for holding the keys Tuşları tutmak için yer yapmışlar	Nails for holding the keys Tuşları tutmak için çiviler var	Look orderly	Order
+						No frame Yanları yok	Has a frame Yanları var	Easy to hit the keys	Ease in playing
			+			Keys can be pulled out Tuşlar çıkıyor	Keys cannot be pulled out Tuşlar çıkmıyor	Enjoyable to pull out them and replace again	Pleasure

Table 5.15 (Continued)

M1-M2	M1-M3	M1-M4	M2-M3	M2-M4	M3-M4	+	-	Reason of preference	Related Criteria
				+		Keys do not fall down, they are stuck Tuşları düşmüyor, yapışık	Keys fall down Tuşları düşüyor	It cannot be broken	Durability
					+	Small gaps Araları küçük	Big gaps Araları büyük	Its wood cannot be hit accidentally	Ease in playing
					+	Mallets are stucked between the keys, while playing Çalarken, çubuklar sonuna kadar gitmiyor, takılıyor	Mallets can be moved from one end to the other, they do not stuck between the keys Çalarken çubuk sonuna kadar gidiyor, aralara takılmıyor	Funny that mallet stucks between the keys	Pleasure
+						Keys are fixed with screws Tuşları vidalamışlar	Keys are tucked in Tuşları sokmuşlar	Durable	Durability
+						No sponges between the keys Aralarda sünger yok	Sponges between the keys Aralarda sünger var	Look beautiful	Beautifulness
					+	Keys cannot be removed, stuck Tuşlar çıkmıyor, yapıştırmışlar	Keys can be removed Tuşlar çıkıyor	Good music is made	Sound

Table 5.15 (Continued)

M1-M2	M1-M3	M1-M4	M2-M3	M2-M4	M3-M4	+	-	Reason of preference	Related Criteria
+						Keys can be pulled out Sopaları çıkıyor	Iron pieces cannot be removed Demirleri çıkmıyor	Places of the tubes can be changed and tubes can be used as mallets	Variety in use
		+				Have pins on the keys, they do not be corrupted Üstünde iğneleri var, bozulmaz	No pins İğneleri yok	It cannot be broken	Durability

5.5.3. Sound (f=17)

Sound was mentioned 17 times by seven children during the paired comparisons. In terms of sound, M4 was preferred nine times by children, because it made louder sound than the others. Children's responses indicate that they liked metallophones which made loud sound. The constructs of two children revealed that they liked to hit the base of the metallophones to make different sounds.

Three children associated sound with beautifulness. Egg sound that was made by hitting the base of the metallophone and loud sound of the metallophones were beautiful for children.

For three children it was important that the sound of a metallophones was audible.

The evaluation criteria of two children indicated that sound was associated with clangour.

Loudness of the sound was also important for three children during the evaluation of metallophones. One child stated that he could play the metallophone as the drum by hitting its box. He indicated that it was enjoyable for him.

Table 5.16 Constructs Related to Sound

M1-M2	M1-M3	M1-M4	M2-M3	M2-M4	M3-M4	+	-	Reason of preference	Related Criteria
++						Makes too much sound Fazla ses çıkarıyorr	Makes a little sound Az ses çıkarıyor	Hearable	Audibility
		++		+		Big sound Sesi büyük	Little sound Sesi küçük	Its sound is beautiful	Beautifulness
		+				Big sound Sesi büyük	Little sound Sesi küçük	Its sound is loud	Loudness
			+			Can be played like the drum Bundan davul da olur	Can be played like a zither Bundan bir tek kanun olur	Enjoyable to play it like the drum	Pleasure
+						Big sound Sesi büyük çıkıyor	Little sound Sesi daha küçük çıkıyor	Easy to hear in the classroom	Audibility
				+	+	Biggest sound Sesi en büyük çıkıyor	Less sound Sesi daha az çıkıyor	Big sound is beautiful	Beautifulness
				+		Sound dies away slowly Ses uzata uzata duruyor	Sound dies away quickly Sesi çabuk kayboluyor	Songs last long	Clangour

Table 5.16 (Continued)

M1-M2	M1-M3	M1-M4	M2-M3	M2-M4	M3-M4	+	-	Reason of preference	Related Criteria
					+	Makes a very big sound, can be heard from everywhere *Çok büyük ses çıkarıyor, sesi her yerden duyulabilir*	Makes a normal sound *Normal ses çıkarıyor*	Can be heard from everywhere	Audibility
				+		Makes less sound, less noisy *Sesi az çalıyor, az gürültülü*	Makes too much sound, noisy *Sesi çok çalıyor, gürültülü*	Less noisy	Loudness
	+	+				Little sound, does not disturb the neighbours Sesi az, komşuları rahatsız etmez	Too much sound Sesi çok	Does not disturb neighbours	Loudness
					+	Egg sound can be made by hitting the sides of the metallophone, egg sound is a beautiful sound Kenarına vurunca yumurta sesi çıkıyor, yumurta sesi çok güzel	Egg sound cannot be made Yumurta sesi çıkmıyor	Egg sound is beautiful	Beautifulness

5.5.4. Being in the open- Being closed (f=13)

Eight children revealed thirteen constructs related to being in the open-closed during paired comparisons. M3 was preferred eight times by children, because it was in a box and it had locks. For this reason, the storage of M3 was easy, it was pleasurable to open the box for surprises, its box made it different from the others, it was easy to carry and it was durable. However, some of the children indicated that the keys of the metallophones that were in the open could be hit easily, comfortable to play on lap and the colors of the keys could be seen.

Three children stated that the metallophones without the box were easier to play because their keys could be hit easily and they were comfortable to play on lap.

For two children the metallophone in the box was durable.

One child stated that it was enjoyable to make surprises with the box. Another child indicated that the box made the metallophone different.

For one child it was better that the metallophones were in the open, because colors of them could be seen.

For one child it was easy to store a metallophone with a box.

Two children stated that the metallophone with the box could be carried easily.

Table 5.17 Constructs Related to Being in the Open-Being Closed

M1-M2	M1-M3	M1-M4	M2-M3	M2-M4	M3-M4	+	-	**Reason of preference**	**Related Criteria**
					+	Open Açmışlar	Closed Kapatmışlar	I can hit its keys immediately	Ease in playing
	+					Has a box Kutusu var	Not in the box Kutusu yok	Metallophone does not get lost	Ease of storage
					+	In the open Açıkta, kucakta çalması rahat	Closed with a box, uncomfortable to play on lap (because of the cover) Kutunun kapağı yüzünden kucakta çalması rahat değil	Comfortable to play on lap	Ease in playing
			+			Has a box Kutusu var	Has no box Kutusu yok	Enjoyable to make surprises with the box	Pleasure
			+			Has a bag Çantası var	Has not a bag Çantası yok	Bag makes it different from the others	Otherness
					+	Open Açık	Closed Kapalı	It can be played quickly	Ease in playing
			+			Has no box Kutusu yok	Has a box Kutusu var	It can be played quickly	Ease in playing
			+			No cover Kapağı yok	Has cover Kapağı var	Colors can be seen	Visibility of colors
					+	Has a box and locks Kutusu ve kilitleri var	No box and locks Kutusu ve kilitleri yok	The keys inside never fall while carrying	Ease in carriage
	+					Can be closed and locked Kapatılıyor, kilitleniyor	No cover, no lock Kapağı ve kilidi yok	No one can break it	Durability

Table 5.17 (Continued)

M1-M2	M1-M3	M1-M4	M2-M3	M2-M4	M3-M4	+	-	Reason of preference	Related Criteria
					+	Can be closed Kapatılıyor	Open Açık	The keys inside it cannot be broken	Durability
					+	Has cover Kapağı var	No cover Kapaksız	Keys do not become hot	Durability
			+			It is closed Kapalı	Open Açık	Easy to carry	Ease in carriage

5.5.5. Form (f=12)

Eight children revealed twelve constructs related to form. Nine of these were associated with the existence of handle and ease in carriage. In term of form, M2 was preferred six times, M1 was preferred five times and M4 was preferred one time. The reasons why M2 was preferred by children were because it had handle and its handle had a tree-like shape. Similarly, M1 was preferred by children, because, it had a handle. Ease in carriage was the reason why children selected the metallophones with handles. The metallophones with handles were easy to carry for six of the children.

For one child the metallophone without a handle (M3) was pleasurable to carry by clasping.

For one child the form of M1 was strange and he could not name it. He preferred it because it was different from the others.

One child mentioned the form of the handle stating that the handle of M2 looked like a tree.

5.5.6. Size (f=8)

Size of the metallophones and size of the keys are mentioned eight times by five children during the paired comparisons. Two children preferred big metallophones and three children preferred small ones. The reasons why three children preferred small metallophones were related to ease in carriage, loudness and age appropriateness.

Three children associated the size attribute with loudness of the sound. Two of these children preferred big metallophones beacuse they had loud sound. One of them preferred small metallophone because small metallophone was making less sound.

Size was associated with ease in carriage by two children and both of them preferred small metallophones because they were easy to carry. One of the children stated that she preferred small metallophone, because it was more appropriate for her age.

5.5.7. Storage of the Mallets (f=7)

Five children revealed seven constructs related to storage of the mallets. In terms of storage of the mallets, M1 was preferred four times, because it had a defined space for the storage of its mallet and two children stated that it was orderly to attach the mallet to the handle.

The other five constructs were related to ease of storage. For two children it was easy to attach the mallet to the handle and in this way mallet would not get lost.

One child indicated that attaching the mallets into the tubes of M2 was easy for storage. During the comparison of M3-M4, the same child indicated that putting the mallets in the box of M3 makes storage easier than putting the mallets on M4.

Table 5.18 Constructs Related to Form of the Metallophones

M1-M2	M1-M3	M1-M4	M2-M3	M2-M4	M3-M4	+	-	Reason of preference	Related Criteria
	+					Strange form Değişik bir şekli var	Rectangular Dikdörtgen	Its shape is different	Otherness
				+		Has a handle, easy to carry Tutuluyor, götürmesi kolay	No handle Tutma yeri yok	With handle, it is easy to Carry	Ease in carriage
+						Handle is on the side Tutma yeri kenarda	Handle is on the top Tutma yeri üstte	When handle is held, metallophone stays appropriately	Ease in carriage
+		+		+ + +		Has handle Tutma yeri var	No handle Tutma yeri yok	Easy to carry	Ease in carriage
				+		Has no handle Tutma yeri yok	Has a handle Tutma yeri var	Carrying it by clasping is enjoyable	Pleasure
	+	+				Has handle Tutma yeri var	Has not a handle Tutma yeri yok	Easy to hold, lift up and carry	Ease in carriage
			+			Tree-shaped handle Kaldırmak için şeyi var, ağaç gibi	No handle Kaldırmak için şeyi yok	Handle looks like a tree	Resemblance to familiar shapes

Table 5.19 Constructs Related to Size of the Metallophones

M1-M2	M1-M3	M1-M4	M2-M3	M2-M4	M3-M4	+	-	Reason of preference	Related Criteria
	+	+				Big Büyük	Small Küçük	Its sound is fast	Loudness
					+	Big keys, long metallophone Tuşları büyük, boyu uzun	Small keys, short metallophone Tuşları küçük ve metalofon kısa	Big keys make big sound	Loudness
		+		+		Small Küçük	Big Büyük	Small one is light, easy to carry	Ease in carriage
		+				Small Küçük	Big Büyük	No reason	___
				+		Small Küçük	Big Büyük	Small is more suitable for me	Age appropriate ness
					+	Small keys Tuşları küçük	Big keys Tuşları büyük	Small keys make less sound	Loudness

Table 5.20 Constructs Related to Storage of Mallets

M1-M2	M1-M3	M1-M4	M2-M3	M2-M4	M3-M4	+	-	Reason of preference	Related Criteria
					+	The mallets are put in the box Çubukları kutuya konuyor	The mallets are put on the metallophone Çubuklar üstüne konuyor	Mallets can't be lost or can't fall down	Ease of storage
+						The mallets are placed in the tubes Çubuklar boruya takılıyor	The mallet is placed in the handle Çubuk tutma yerine koyuluyor	Easy to place the mallets in the tubes	Ease of storage
				+		The mallets are placed in the tubes Çubuklar borulara sokuluyor	The mallets are placed in the hole of the base Çubuklar alttaki deliğe sokuluyor	Mallets can't be lost or can't fall down	Ease of storage
	+					The mallet is attached to the handle Sopası sapa geçiyor, daha düzenli görünüyor	The mallets are put in the box Sopalar kutuya konuyor	Look more Orderly	Order
	+					The mallet is attached to the handle Çubuk tutma yerine takılıyor	The mallets are put under the keys Çubuklar tuşların altına konuyor	Easy to attach the mallet to the handle	Ease of storage
	+					The mallet has a place to be attached Çubuğun takmak için yeri var	The mallets are put in the box Çubuklar kutuya koyuluyor	The mallet does not get lost	Ease of storage
	+					Has a hole to place the mallet into the handle Çubuk sokma deliği var	No place for mallets, the mallets are put into the box Çubuk için yer yok (sadece kutunun içine koyuyorum)	Look more Orderly	Order

5.5.8. Weight (f=6)

Three children revealed six constructs related to weight of the metallophones. All of them preferred light metallophones to heavy ones because of their stability while carrying (two children), ease in carriage (one child) and age appropriateness (one child). M2 was the most preferred metallophone by children in terms of weight, since its frame was made of plastic and it was light.

5.5.9. Size of the Mallets (f=5)

Five of the children revealed five constructs related to size of the mallets. Two of them preferred small mallets because they were purple. One of them preferred big mallets because they were the biggest mallets. One of them preferred big mallets because he was also big. One of them associated size of the mallets with loudness of the sound and preferred small mallets because they made less sound.

5.5.10. Form of the Keys (f=5)

Five children revealed five constructs related to the form of the keys. All of the children preferred tubular keys of M2 for different reasons. Three children preferred tubular keys because of their colors. One child preferred them because they made louder sound. One child did not specify a reason for his preference.

5.5.11. Coding (f=4)

Four children revealed four constructs related to coding on the metallophones. Three children preferred M2 because it had numbers on it instead of letters. One child preferred M4 because its coding was visible. Since children did not know how to write, it is important to use coding that is appropriate for their age.

Two of the children assoicated their coding preference with ease in playing and the other two associated their coding preference with age appropriateness.

5.5.12. Number of Mallets (f=3)

Three children revealed three constructs related to number of mallets. All of them stated that they liked metallophones with two mallets rather than one mallet for different reasons.

One of them preferred the metallophone with two mallets because different sounds can be made by hitting different surfaces of the metallophone at the same time. For one child the loudness of the sound of the metallophone was associated with the number of mallets. One child preferred the metallophone with two mallets only because it had two mallets.

5.5.13. Number of Keys (f=2)

Two children revealed two constructs related to the number of keys. Both of them preferred metallophones that have more keys with reasons related to sound (Variety of sound and loudness).

5.5.14. Height (f=1)

One child specified constructs related to height of the metallophones. He preferred M4 because it was high and easy to play.

5.5.15. Material (f=1)

One child revealed constructs related to material and defined *stick* material (M2) as looking beautiful.

Table 5.21 Constructs Related to Weight (Metallophones)

M1-M2	M1-M3	M1-M4	M2-M3	M2-M4	M3-M4	+	-	Reason of preference	Related Criteria
+			+			Light Hafif	Heavy Ağır	Easy to carry	Ease in carriage
+			+			Light Hafif	Heavy Ağır	Difficult to fell and be broken	Stability
	+					Very soft Yumuşak	Heavy Ağır	It can fall down	Stability
				+		Light Hafif	Heavy, not for children Ağır, çocuklar için değil	Light things are suitable for children	Age appropriateness

Table 5.22 Constructs Related to Size of the Mallets

M1-M2	M1-M3	M1-M4	M2-M3	M2-M4	M3-M4	+	-	Reason of preference	Related Criteria
			+	+		Has small mallets Küçük çubukları var	Has big mallets Çubukları da büyük	Small mallets are purple	Color
			+			Big mallets Büyük çubuklar	Small mallets Küçük çubuklar	I like big things because I am big	Age appropriateness
		+				Small mallet Küçük sopa	Big mallet Büyük sopa	Small mallet makes less sound	Loudness
		+				Big mallet Büyük çubuk	Small mallet Küçük çubuk	They are the biggest	Maximum size

Table 5.23 Constructs Related to Form of the Keys

M1-M2	M1-M3	M1-M4	M2-M3	M2-M4	M3-M4	+	-	Reason of preference	Related Criteria
			+			Circular keys Tuşları yuvarlak	Rectangular keys Tuşları dikdörtgen	No reason	___
+						Keys look like tubes Tuşları boruya benziyor	Keys look like railway Tuşlar tren yoluna benziyor	Tubes make louder sound	Loudness
+			+			Circular keys Tuşları yuvarlak, rengi güzel	Rectangular keys Tuşları dikdörtgen	The color of circular keys are beautiful	Color
+						Sausage-like keys Tuşları sosis şeklinde, renk renk	Rectangular keys Tuşları dikdörtgen	Varicolored keys	Color

Table 5.24 Constructs Related to Coding

M1-M2	M1-M3	M1-M4	M2-M3	M2-M4	M3-M4	+	-	Reason of preference	Related Criteria
+						Numbers on the metallophone Üstünde sayı var, sayı saymayı biliyorum	Letters on the metallophone Üstünde harfler var	I know how to count	Age appropriateness
+						Has numbers on it Üstünde sayılar var	No numbers Sayılar yok	It shows how to play the songs	Ease in playing
			+			Has numbers Sayıları var	Has letters Harfleri var	I can count the numbers	Age appropriateness
					+	Letters are visible Yazıları görünüyor	Letters are invisible Yazıları görünmüyor	Music can be read easily	Ease in playing

Table 5.25 Constructs Related to Number of Mallets

M1-M2	M1-M3	M1-M4	M2-M3	M2-M4	M3-M4	+	-	Reason of preference	Related Criteria
		+				Has two sticks (mallets), two sticks İki tokmağı var	Has one stick (mallet) Bir tokmağı var	Bigger sound can be produced with two mallets	Loudness
+						Two mallets İki çubuğu var	One mallet Bir çubuğu var	More than one mallet	Maximum number of elements
		+				Two mallets İki çubuğu var	One mallet Bir tane çubuğu var	It can be played by making two different sounds	Variety of sound

Table 5.26 Constructs Related to Number of the Keys

M1-M2	M1-M3	M1-M4	M2-M3	M2-M4	M3-M4	+	-	Reason of preference	Related Criteria
+						More number of keys Çok tuşu var, daha fazla şarkı çalınabilir	Less number of keys Az tuşu var	Makes too much sound	Loudness
					+	Two rows of keys Tuşları ikili	One row of keys Tuşları tekli	Two songs can be played at the same time	Variety of sound

Table 5.27 Constructs Related to Height of the Metallophones

M1-M2	M1-M3	M1-M4	M2-M3	M2-M4	M3-M4	+	-	Reason of preference	Related Criteria
					+	High Yüksek	Thin İnce	Easy to play	Ease in playing

Table 5.28 Constructs Related to Material (Metallophones)

M1-M2	M1-M3	M1-M4	M2-M3	M2-M4	M3-M4	+	-	Reason of preference	Related Criteria
			+			Keys are made of sticks Tuşları sopadan yapılmış	Keys are made of iron Tuşları demirden yapılmış	Look beautiful	Beautifulness

5.6. Preferred Attributes of Four Metallophones

After grouping the constructs, preferred attributes of the four metallophones are determined. Table 5.29 displays the preferred attributes of four metallophones based on paired comparisons. In terms of placement of the keys, form and storage of the mallets M1 was the most preferred play material. M2 was preferred by children because of its color, form, weight, form of its keys, coding, number of mallets and material of its keys. In terms of placement of the keys, being closed and number of mallets C3 was preferred. C4 was preferred by children because of the reasons related to placement of the keys, sound, number of mallets and height.

Table 5.29 Preferred attributes of four metallophones

M1	M2	M3	M4
Placement of the keys Form Storage of the mallets	Color Form Weight Form of the keys Coding Number of mallets Material	Placement of the keys Being closed with a box Number of mallets	Placement of the keys Sound Number of mallets Height

5.7. Children's Evaluation Criteria related to Metallophones and the Relationships Between Them

Figure 5.3 displays children's evaluation criteria related to metallophones with their frequency of mention and with the number of children who specified these criteria. Beautifulness, ease in carriage, loudness, ease in playing, durability, pleasure and color were the most frequently specified criteria for children's preferences related to metallophones.

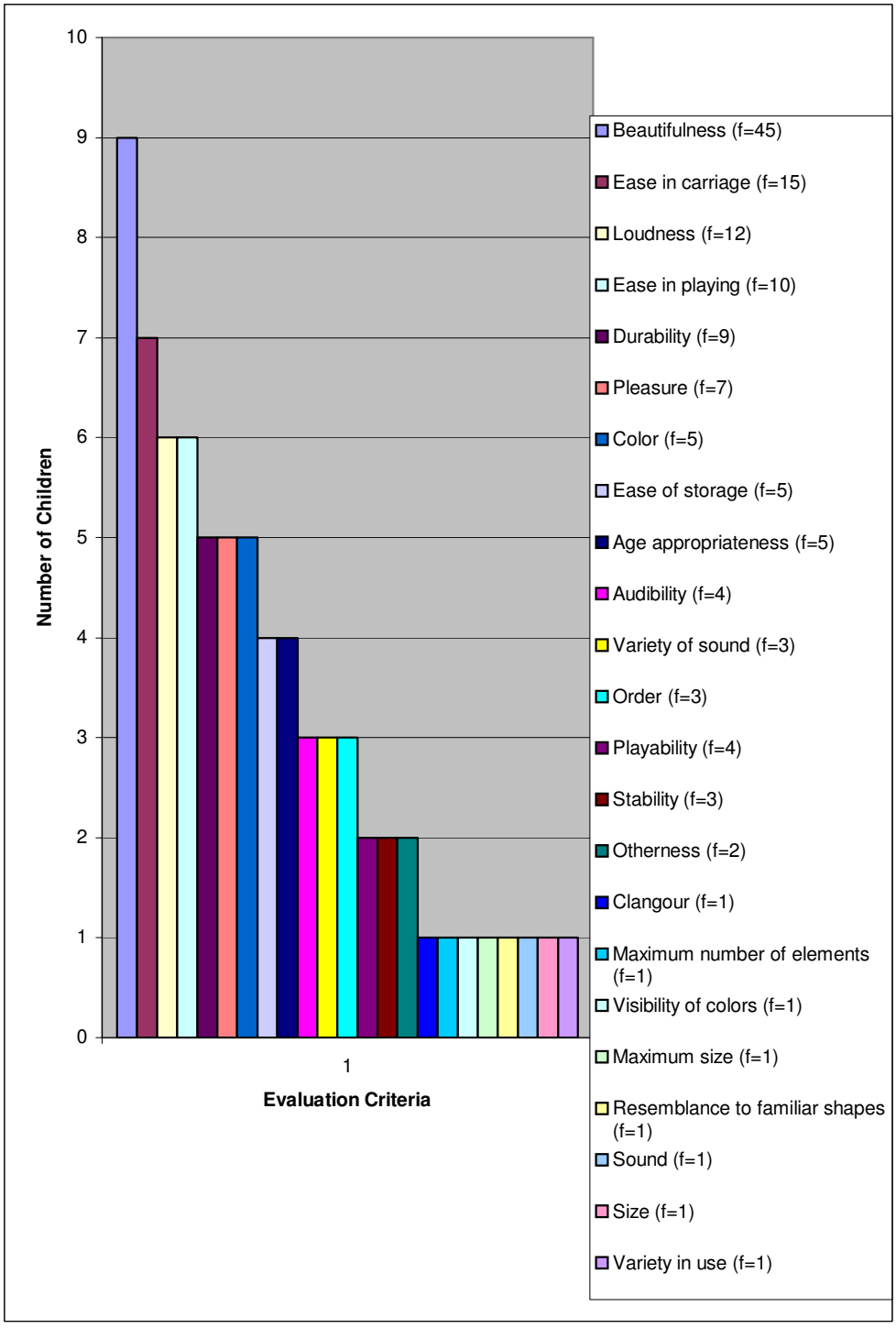


Figure 5.3 Distribution of children's evaluation criteria according to number of children

Relationships between children's evaluation criteria related to metallophones and the attributes preferred by children according to these criteria are displayed in Figure 5.4. The most distinctive relationships are explained below.

The most apparent relationship is seen between color and beautifulness. All of the nine children asssociated color with beautifulness. Colorful keys, white keys, bright gray keys, purple mallets, green frame and colorful handle were the attributes that made a metallophone beautiful according to the children.

According to six children form was affecting ease in carriage. Metallophones that had handles were easy to carry.

Three children specified the beautifulness of sound. *Big* sound and *egg sound* that is made by hitting the base of the metallophone were beautiful for them.

Loudness affected three children's sound preferences and three children's size preferences. In addition, audibility affected three children's sound preferences.

Ease in playing was connected with placement of the keys for three children and connected with being open or closed for three children.

Color affected three children's form preferences related to keys.

Durability was connected with placement of the keys for three children.

According to three children, pleasure was connected with placement of the keys.

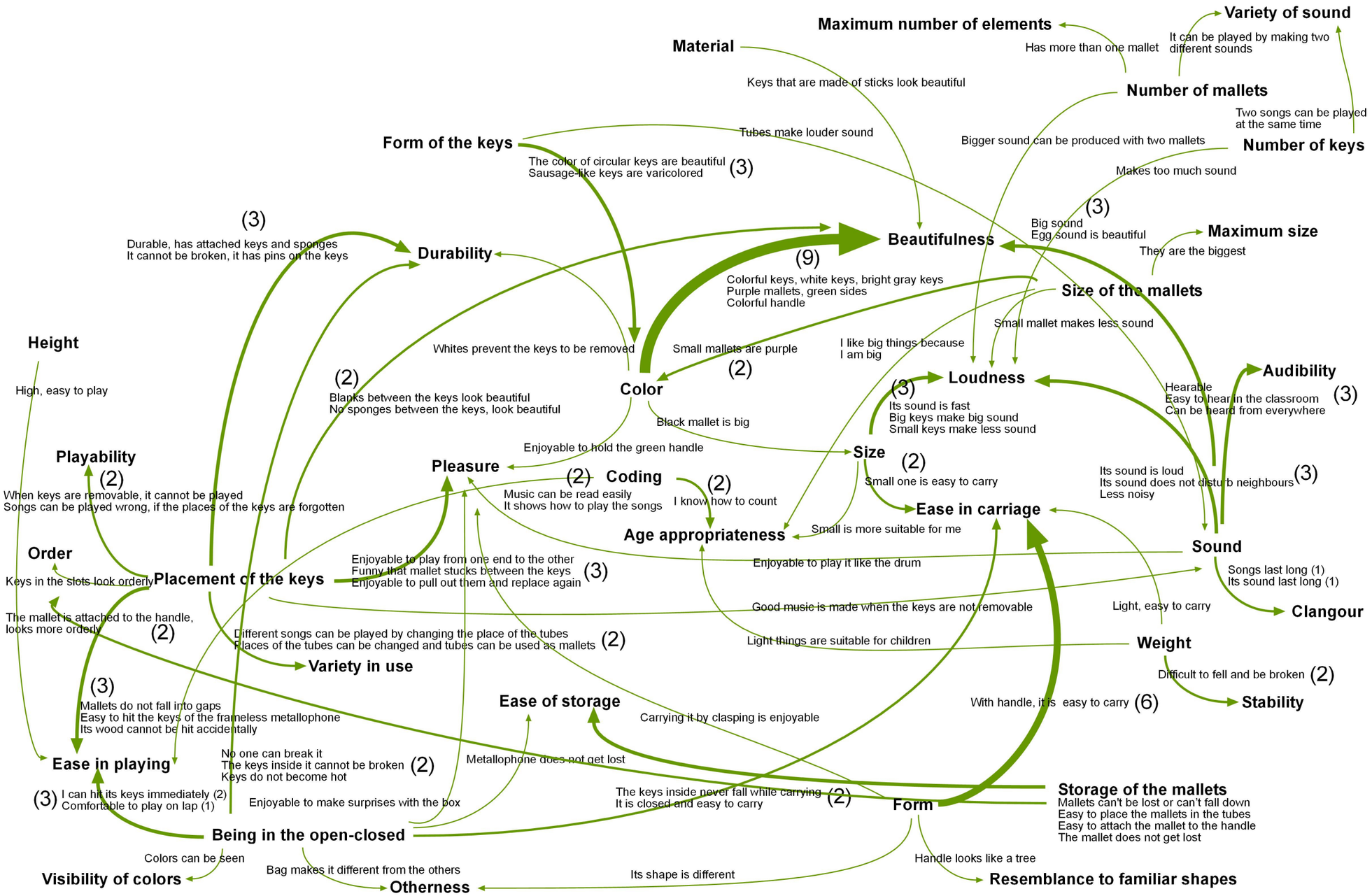


Figure 5.4 Relationship between constructs related to metallophones

5.8. Relationships Between the Constructs of Children Related to Construction Play Materials and Metallophones

The constructs elicited by children reveal that there are some common product attributes mentioned by children in the evaluation of both types of play materials. These are color, size, form and material.

In construction play materials group, children preferred colorful pieces and pieces in different colors with reasons related to beautifulness, specific color preferences, types of constructions, types of pieces and types of games. In some cases color has been the attribute, which makes a certain type of piece preferrable. In metallophones group, color was even more important than in construction play materials for children. Although the most colorful metallophone was making the most incorrect sound, most of the children preferred it because of its color. Children's responses indicate that they liked colorful metallophones with reasons related to beautifulness, pleasure, size and durability. Color of the mallets was important for them and they liked purple mallets. In Figure 5.2 and 5.4 , it can be seen that, there is a strong relationship between color and children's perceptions related to beautifulness.

In terms of size of construction play materials, the constructs reveal that children preferred big pieces to small pieces because of the reasons related to size of constructions, frequency of play, types of games, ease of construction, pleasure and color. Big bridges were attractive for them because they enabled children to cross the cars and other objects under them. In some cases big pieces are preferred because they were easier to construct things. Sometimes, children preferred the big pieces only because they were big. In contrast, children preferred small-size mallets and metallophones during the evaluation of metallophones. The reasons why children preferred small metallophones were related to ease in carriage, loudness and age appropriateness. Size attribute was associated with loudness according to three children. Children thought that small sized keys made less sound and bigger sized keys made more sound. It can be seen in Figure 5.2 and 5.4 that, the criteria affected children size preferences related to construction play materials and metallophones were completely different.

In terms of form, the results of the paired comparisons reveal that, children prefer construction play materials including circular pieces rather than only rectangular pieces, they look at details such as circles on the pieces of C3 and cracks of C4 and flower-like shapes, and pieces with holes attract them besides rectangles. The reasons of children's form preferences were related with beautifulness, stability of constructions, pleasure, realism, change in appearance, variety in forms, types of constructions and ease of construction. Constructs about the form of the metallophones were related to the existence of handle, box, shape of the keys, gibs and screws on the keys, shape of the handle, gaps between the keys and the number of rows of keys. Children liked the form of M3, because it was in a box, which made it durable. They liked the circular keys of M2 because they were colorful. They did not like the large gaps between the black keys of M3 because they sometimes hit the box accidentally. A metallophone with a handle is preferred in six cases, because handle made metallophone easy to carry. For both types of play materials, a relationship between form and pleasure can be seen in Figure 5.2 and Figure 5.4 but the attributes that make the two types of play materials are completely different.

Children elicited three constructs related to material of construction play materials and one construct related to the material of metallophones. In construction play materials group, children's material preferences were related with durability, stability of the constructions and pleasure. In metallophones group, one child indicated that M2 was made of sticks and M4 was made of iron. She preferred M2, because its colors were more beautiful. Actually, the keys of both metallophones were metal, however she preferred the colorful one, defining its material according to its shape (tubes-sticks). Since material is mentioned few times for both types of products, it is difficult to identify material preferences of children for both types of play materials.

5.9. Observations Related to Construction Play Materials

During the construct elicitation process with construction play materials, children created different structures. Since the test materials were including fourteen pieces each, three of the ten children asked where the remaining pieces were in some cases.

It was obvious that play contexts of P. C1 and P. C2 were different than of P. C3 and P. C4. While playing with P. C3 and P. C4, they created small sized objects in general such as microphones, hamburgers, etc., whereas they created different types of buildings with P. C1 and P. C2.

While playing with P. C1 and P. C2, they used bridge-like pieces in all of their structures. Since P. C1 and P. C2 had no joints, children were very careful while placing the blocks of them on top of each other and in some cases they had to try to put them together twice or more times in order to place the blocks approppriately. Children could construct what they wanted with P. C3 and P. C4 faster than with P. C1 and P. C2. It was common among the children that they used the pieces of P. C1 and P. C2 together in their structures. One child used the pieces of P. C3 and P. C4 together and one child used P. C2 and P. C4 together. Three of the children used P. C1 and P. C2 together. The usage of the pieces of different products together was related to the degree of shape similarity between the pieces and children's need for specific objects in their pretend play (use of rectangular pieces of P. C2 as plates for putting hamburgers made of the pieces of P. C4).

Children were attracted by realistic pieces such as bridges, balls, table-like pieces and besides constructing things by combining them with the other pieces, they used them as separate objects. Children used the constructions they produced during construction play, in their pretend play. Six out of ten children used the pieces of construction play materials as pretend objects such as using thin pieces of P. C4 as pencils or using the bottom side of the pieces of P. C3 as penholder.

It was common among the male children that they liked to build up bridges and cross the cars under it.

It was common among the female children that they were more careful about the color attributes of the products than the male children. Color was one of the most primarily mentioned attributes by female children.

The preferences of seven out of ten children were directly related with the play materials they preferred to play during the familiarization process. During free play and familiarization, children spent more time with specific play materials than the

others and the materials with which seven children preferred to play longer were the play materials that were ranked as the most preferred by them.

5.10. Observations Related to Metallophones

During the familiarization process conducted in the classroom with the guidance of the teacher, children had the opportunity to use the four types of metallophones in turns. Metallophone 2 was the product that seven out of nine children wanted to play most, before playing them. After they heard the sound of the four metallophones, five of them changed their mind and wanted to play with Metallophone 4 first, since it made too much sound and it was big.

While children played the metallophones and sang songs at the same time during the classroom activity, they hit the keys randomly and the rhythms were unrelated with the songs they were singing. Another important hitting behaviour was that they played the metallophones by hitting their keys from one end to the other. During the tests of six children this behaviour was observed.

One child tried to play M2 both horizontally and vertically, holding its handle and also he held it like the guitar. The same child used the tubes of M2 as the flute and stated that it could be played like the zither whereas M3 could be played like the drum. In order to make different sounds, four children also hit the wooden or plastic parts of the metallophones. In addition, two children hit the mallets against each other.

While playing the metallophones, all of the children sometimes played them one by one, holding each of the metallophone's mallets approppriately. Four of them also played metallophones at the same time holding the mallets of one metallophone in one hand and of the other in the other hand and four of them also played the metallophones with the same mallet. It was also a common movement that children hit the keys of the metallophones one by one. Eight of the children stood up and started to walk holding the metallophones, carrying them and making comments about their weight. One of the children played the metallophones with their fingers as if they were piano.

Since there were large gaps between the black keys of M3, one child hit the wooden box accidentally. The same problem is observed for M2 while one child playing it and hitting its frame accidentally.

One of the children had difficulty while placing the mallet of M1 into the handle. It was difficult for him to align the mallet with the holes on the handle. After children saw that M1 had a place for storage of the mallet, six children looked for different places for storing the mallets of the other metallophones.

Six of the children preferred to play the metallophones on the carpet. Three of them wanted to sit on the armchair.

Children's preferences related to metallophones were very similar to their preferences observed during their free play activities. During free play and familiarization, children spent more time with specific metallophones than the others and the metallophones, which eight children preferred to play longer during free play, were the metallophones that were ranked as the most preferred by children.

CHAPTER 6

CONCLUSION

This study aimed to find out the evaluation criteria, primary concerns, preferences and the reasons behind the preferences of children related to two different types of play materials. With the analysis of semi-structured interviews based on personal constructs, children's preferences were tried to be identified and the relationships between the evaluation criteria of children related to construction play materials and metallophones are revealed.

The study is concluded with the results of the interviews by revisiting the research questions. Evaluation of methodology and suggestions for further studies are included in the final section of the study.

6.1. Research Questions Revisited

During the study, the main focus was on children's own evaluation criteria related to two types of play materials in order to identify the important design attributes for them. Research questions investigate the preferences of children and the primarily important attributes that made children decide specific products as the most preferred and the least preferred. In addition, research questions look for the evaluation criteria of children related to construction play materials and metallophones and the relationships between the evaluation criteria of children for each separate product group. Since the selected products were purposefully non gender-specific, gender issues are not raised within the conclusions. The relationships between the evaluation criteria of children are reviewed by revealing the common features mentioned by children for both product groups. Finally, suggestions for the design of two types of play materials are put forward.

6.1.1. Preferences of Children and Primarily Important Attributes of Construction Play Materials and Metallophones

The rankings of the children acquired in the end of each interview revealed the preferences of children related to the play materials used in the test. Primarily

important attributes of the materials are identified based on the responses of children that they gave at the end of each interview as the reasons of their rankings.

6.1.1.1. Construction Play Material Preferences of Children and Primarily Important Attributes of Construction Play Materials

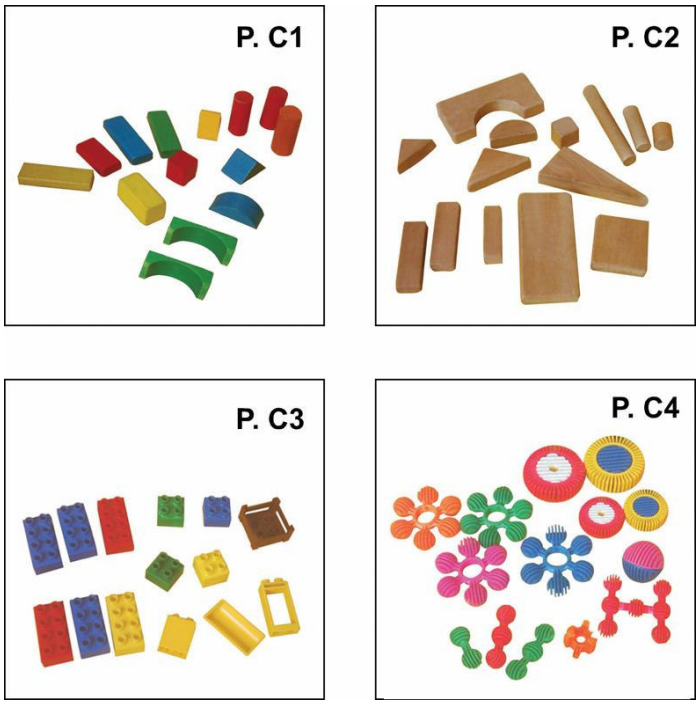


Figure 6.1 Construction Play Materials

Table 6.1 displays the construction play materials in the order of children's rankings and explains primarily important attributes of the materials based on the responses of children that they gave at the end of each interview as the reasons of their rankings.

The rankings of children indicate that the most preferred construction play material is C4. Half of the children ranked C4 as the most preferred. None of the children ranked C4 as the least preferred.

Two children ranked C3 as the most preferred. Two children ranked C3 as the least preferred because car driving and hamburger selling could not be played with it and it had no bridges.

P. C1 is ranked by one child as the most preferred. Two children ranked P. C1 as the least preferred, because it could collapse easily and its pieces were small.

P. C2 is ranked as the most preferred by two children. Six children ranked P. C2 as the least preferred, because it was colorless. It is obvious that, color is one of the most important attributes that affect children's preferences related to construction play materials.

Table 6.1 Rankings and primarily important attributes of construction play materials

 C4	Its colors, shapes such as flower-like shapes, its joints with cracks, method of construction, its joining in an inclined way, types of constructions created with it
 C3	Durable constructions which do not collapse, circular joints and the empty circles under its pieces
 C1	Bridges and type of constructions (houses, bridges, mosques, castles)
 C2	Types of constructions (houses, bridges, mosques, castles) and types of games (car driving)

6.1.1.2. Metallophone Preferences of Children and Primarily Important Attributes of Metallophones

Table 6.2 displays the metallophones in the order of children's rankings and explains primarily important attributes of them based on the responses of children that they gave at the end of each interview as the reasons of their rankings.

Figure 6.2 Metallophones

The rankings of the children reveal that the most preferred metallophone is M2. Six of the nine children preferred M2 as the most preferred. None of the children ranked P. C4 as the least preferred.

The secondly preferred metallophone was M4. Two children ranked it as the most preferred. Two children ranked M4 as the least preferred because its sound was very noisy and it was very colorless.

The thirdly preferred metallophone was M3. One child ranked it as the most preferred. Three of the nine children ranked M3 as the least preferred because it was closed with a box, its keys were not bright and there were large gaps between its keys, which looked unappealing.

The least preferred metallophone was M1. None of the children ranked it as the most preferred. The reasons why children did not like M1 were because it was small, it made a little sound, and it was colorless.

Table 6.2 Rankings and primarily important attributes of metallophones

 M2	Colorful keys and mallets, circular keys and the numbers On it (coding)
 M4	Loud sound, size (big), its bright keys and its big sponges
 M3	Size (the biggest metallophone)
 M1	_____

6.1.2. Evaluation Criteria related to Construction Play Materials and Metallophones and the Relationships between Them

During semi-structured interviews, children revealed constructs, which revealed their evaluation criteria related to play materials. In order to understand the importance of certain criteria for children, frequency of mention is considered. By analyzing the reasons of children's preferences related to each construct group, the relationships between the construct groups are identified for each separate product category.

6.1.2.1. Constructs related to Construction Play Materials

Figure 6.3 displays the constructs related to construction play materials based on frequency of mention. During the dyadic comparison of construction play materials, the most frequently mentioned attribute by children was method of construction (30 times). The others were in order: form of the pieces (28 times), color (24 times), size (13 times), types of pieces (9 times), types of constructions (6 times), ease of construction (6 times) and material (3 times).

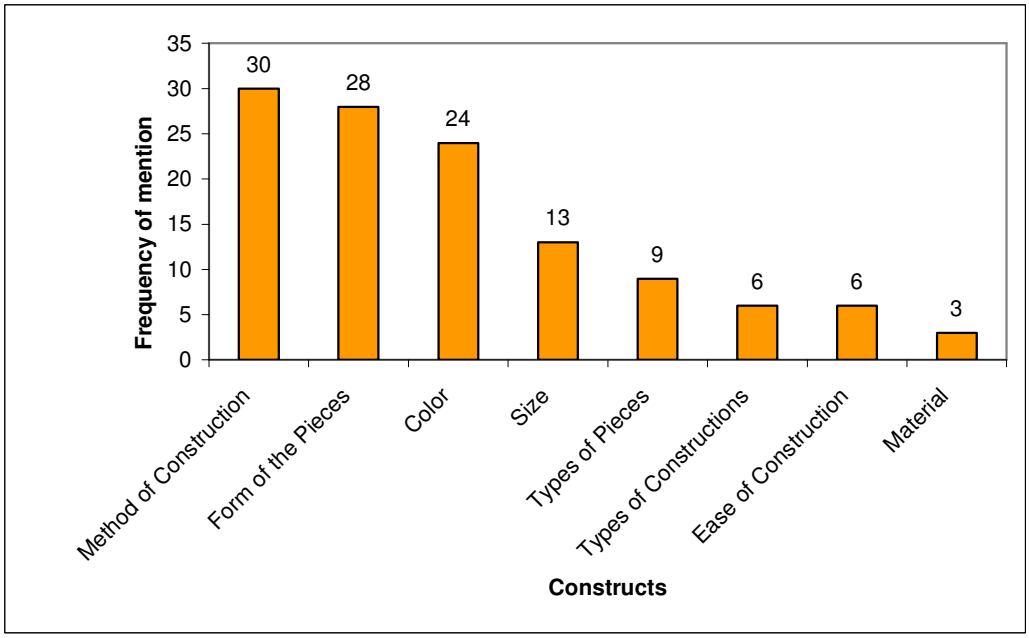


Figure 6.3 Constructs related to construction play materials based on frequency of mention

The reasons of children's preferences related to these constructs are also grouped and it is found that pleasure, beautifulness, stability of the constructions and types of constructions are the most frequently specified reasons for children's preferences related to construction play materials. The relationships between the constructs and related reasons are displayed in Figure 5.2.

6.1.2.2. Children's Preferences Related to Their Evaluation Criteria about Construction Play Materials

The interviews conducted with children revealed the preferences of children related to the constructs that they mentioned.

Method of Construction (f=30)

In terms of method of construction, C4 (fifteen times) and C3 (nine times) were mostly preferred by children. Children preferred constructing things with attachable pieces instead of putting pieces side by side or on top of each other, because of the reasons related to stability, ease of construction, types of construction, order, realism of the constructions, gender appropriateness and number of joining that

could be made. Stability of the constructions was the most frequently mentioned reason for the preferences of children related to method of construction.

Form of the Pieces (f=28)

Children elicited constructs related to the form of the pieces, considering the surface qualities of the pieces. In terms of forms of the pieces, C3 was preferred twelve times and C4 was preferred eleven times. The reasons why C3 was preferred most in terms of the form of the pieces were related to types of constructions, durability of the constructions, stability, beautifulness, change in appearance and pleasure. The reasons why children secondly preferred C4 were related to beautifulness of the shapes, realism, types of constructions, pleasure, variety in shapes, ease of construction and stability of the constructions. The results of the paired comparisons reveal that, children prefer construction materials including circular pieces rather than only rectangular pieces, they look at details such as circles on the pieces of C3 and cracks of C4 and flower-like shapes and pieces with holes attract them besides rectangles.

Color (f=24)

Constructs revealed that all of the nine children preferred colorful pieces and pieces with different colors to colorless pieces and pieces in the same colors. Red and orange were the colors that were specified and preferred by children during paired comparisons. However, black, gray and brown were the colors that were not preferred. In terms of color, C1 was preferred nine times, C4 was preferred seven times, C3 was preferred five times and C2 was preferred one time.

Size (f=13)

Constructs reveal that children preferred big pieces to small pieces because of the reasons related to size of constructions, frequency of play, types of games, ease of construction, pleasure and color. In terms of size of the pieces, Product C2 was the most preferred material because of the reasons related to size of the constructions, frequency of play, types of games, ease of construction and pleasure.

Types of Pieces (f=9)

The pieces of C4 were the most frequently mentioned ones by children (six times). These pieces were ball, flower-like shapes and rotary pieces. The pieces of C2 that attracted children were bridges (two times). In terms of types of pieces, one child stated that he liked the cylinders of C1. Children's responses indicate that they like variety of pieces in construction play materials. Besides variety, it may be important for children that these types of toys include more realistic shapes such as flower-like pieces, bridge-like pieces and table-like pieces.

Types of Constructions (f=6)

In terms of types of constructions that could be built up, C1 was preferred three times, C3 was preferred two times and C2 was preferred one time by children. All of the three children thought that it was more pleasurable to construct buildings, houses, garages and parks than to construct smaller objects like fans, sprays, etc.

Ease of Construction (f=6)

Product C3 was mentioned as easy to construct things four times because its pieces interlock firmly, the constructs that were made with it were stabile and it was easy for constructing stairs and flags.

Material (f=3)

Three children revealed three constructs related to material. Two of them preferred plastic to wood and one of them preferred wood to plastic. Since these three children have different reasons for material preferences, there is no specific material preference of children.

6.1.2.3. Constructs related to Metallophones

Figure 6.4 displays the constructs related to metallophones based on frequency of mention. During the dyadic comparison of metallophones, the most frequently mentioned attribute by children was color (39). The others were in order: placement of the keys (22), sound (17), being in the open-being closed (13), form (12), size (8), storage of the mallets (7), weight (6), size of the mallets (5), form of the keys (5), coding (4), number of mallets (3), number of keys (2), height (1) and material (1).

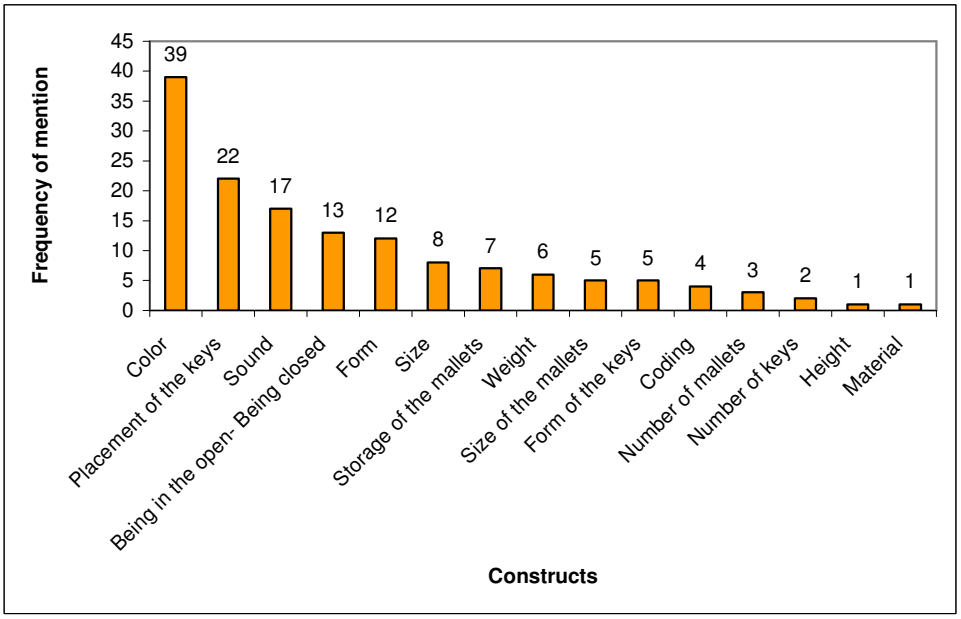


Figure 6.4 Constructs related to metallophones based on frequency of mention

Although metallophone is a musical play material, children see sound attribute less important than color and placement of the keys. The reasons of children's preferences related to these constructs are also grouped and it is found that beautifulness, ease in carriage, loudness, ease in playing, durability, pleasure and color were the most frequently specified reasons for children's preferences related to metallophones. The relationships between the constructs and related reasons are displayed in Figure 5.4 in detail.

6.1.2.4. Children's Preferences Related to Their Evaluation Criteria about Metallophones

The interviews conducted with children revealed the preferences of children related to the metallophones that they mentioned.

Color (f=39)

During paired comparisons, M2 was the most preferred metallophone in terms of color (29 times). Children's responses indicate that they liked colorful metallophones. Color of the mallets was also important for them and they liked purple mallets of M2. The least liked metallophone in terms of color was M1,

because it had gray keys, a wooden base and a wooden mallet, which did not attract children.

Placement of the Keys (f=22)

M1 was mentioned and preferred eight times during paired comparisons. M2 and M4 were preferred five times each. M3 was preferred three times by children. According to children, it was important that the keys were stuck on the base because of the reasons related to playability, durability and sound.

Sound (f=17)

In terms of sound, M4 was preferred nine times by children, because it made louder sound than the others. Children's responses indicate that they liked metallophones which made loud sound. The constructs of two children revealed that they liked to hit the base of the metallophones to make different sounds.

Being in the open- Being closed (f=13)

M3 was preferred eight times by children, because it was in a box and it had locks. For this reason, the storage of M3 was easy, it was pleasurable to open the box for surprises, its box made it different from the others, it was easy to carry and it was durable. However, some of the children indicated that the keys of the metallophones that were in the open could be hit easily, comfortable to play on lap and the colors of the keys could be seen.

Form (f=12)

Nine of the twelve constructs were associated with the existence of handle and ease in carriage. In term of form, M2 was preferred six times and M1 was preferred five times. The reasons why children preferred M2 were because it had handle and its handle had a tree-like shape. Similarly, M1 was preferred by children, because, it had a handle. Ease in carriage was the reason why children selected the metallophones with handles. The metallophones with handles were easy to carry for six of the children.

Size (f=8)

Two children preferred big metallophones and three children preferred small ones. The reasons why three children preferred small metallophones were related to ease in carriage, loudness and age appropriateness.

Storage of the Mallets (f=7)

In terms of storage of the mallets, M1 was preferred four times, because it had a defined space for the storage of its mallet and two children stated that it was orderly to attach the mallet to the handle.

Weight (f=6)

Three children preferred light metallophones to heavy ones because of their stability while carrying (two children), ease in carriage (one child) and age appropriateness (one child). M2 was the most preferred metallophone by children in terms of weight, since its frame was made of plastic and it was light.

Size of the Mallets (f=5)

Five of the children revealed five constructs related to size of the mallets. Two of them preferred small mallets because they were purple. One of them preferred big mallets because they were the biggest mallets. One of them preferred big mallets because he was also big. One of them associated size of the mallets with loudness of the sound and preferred small mallets because they made less sound.

Form of the Keys (f=5)

Five children revealed five constructs related to the form of the keys. All of the children preferred tubular keys of M2 for different reasons. Three children preferred tubular keys because of their colors. One child preferred them because they made louder sound. One child did not specify a reason for his preference.

Coding (f=4)

Three of the four children preferred M2 because it had numbers on it instead of letters. One child preferred M4 because its coding was visible. Since children did not know how to write, it is important to use coding that is appropriate for their age.

Number of Mallets (f=3)

Three children revealed three constructs related to number of mallets. All of them stated that they liked metallophones with two mallets rather than one mallet.

Number of Keys (f=2)

Two children revealed two constructs related to the number of keys. Both of them preferred metallophones that have more keys with reasons related to sound (Variety of sound and loudness).

Height (f=1)

One child specified constructs related to height of the metallophones. He preferred M4 because it was high and easy to play.

Material (f=1)

One child revealed constructs related to material and defined *stick* material (M2) as looking beautiful.

6.1.3. Relationships between Children's Evaluation Criteria Related to Two Types of Play Materials

The constructs elicited by children reveal that there are some common product attributes mentioned by children in the evaluation of both types of play materials. These are color, size, form and material.

For both types of products, color was important for children and they preferred colorful play materials. There is a strong relationship between color and beautifulness according to children. When color difference is not apparent, some of the children indicated that colors such as red and orange are more beautiful than black, gray and brown. In the same way, bright colors are preferred to pale colors (bright gray-pale gray).

In terms of size of the construction play materials, children preferred big pieces and specifically big bridges because of the reasons related to size of constructions, frequency of play, types of games, ease of construction, pleasure and color. On the contrary, children liked small metallophones. The reasons why children preferred small metallophones were related to ease in carriage, loudness and age

appropriateness. Children thought that small sized keys made less sound and bigger sized keys made more sound.

In terms of form, the results of the paired comparisons reveal that, children prefer construction play materials including circular pieces rather than only rectangular pieces, they look at details such as circles on the pieces of C3 and cracks of C4 and flower-like shapes, and pieces with holes attract them besides rectangles. For construction play materials, children looked at the surface characteristics of the pieces such as joints and holes and they preferred pieces with joints to smooth pieces. For metallophones, form was related to the existence of handle, box, shape of the keys, gibs and screws on the keys, shape of the handle, gaps between the keys and the number of rows of keys. For both types of play materials, a relationship between form and pleasure can be seen in Figure 5.2 and Figure 5.4 but the attributes that make the two types of play materials are completely different.

Children elicited three constructs related to material of construction play materials and one construct related to the material of metallophones. Since material is mentioned few times for both types of products, it is difficult to identify material preferences of children for both types of play materials.

6.1.4. Recommendations for Design of Construction Play Materials and Metallophones

Based on the findings of the interviews, recommendations are put forward in order to improve the design of play materials for preschool children.

6.1.4.1. Design Recommendations for Construction Play Materials

Based on the findings, it can be concluded that, color is an important product attribute for preschool children. Children like colorful pieces and they like vivid colors such as red, orange, purple, green, etc. Use of more than one color in one piece is also attractive for children. Brown, gray and black can also be used in the pieces unless all of the pieces are brown, gray or black. Use of colors enables children to create constructions, which are directly related with color, such as maps.

Since stability is important for children, in terms of method of construction, it may be better to use pieces that can be attached and detached. Children like to join pieces in different ways. Play materials should provide opportunities for children's exploration and creativity. By diversifying the joint types, exploration can be enriched. C4 is a good example in terms of types of joints. In addition to cracks, there are holes in the middle of some of the pieces, which provide more number of joining.

In addition, joints can be designed in different ways, so that the constructions can be developed in different directions instead of just developing vertically and horizontally.

Design of the joints is also important for play opportunities after construction. If pieces can be joined loosely but firm enough, movable constructions can be made, which may enrich children's pretend play activities.

Form of the pieces in a construction play material set can be diversified and prisms and more amorphous forms can be used at the same time in order to increase realism and exploration.

Instead of using only solid forms, pieces with holes and rotary pieces (like wheel-like pieces of C4) can be used in order to increase the detail of the constructions.

Realistic forms such as bridge-like pieces, flower-like shapes are also preferred by children and for this reason, pieces which resemble objects of real life can be included in toy sets.

Children enjoy creating buildings with construction play materials. For this reason, pieces, which enable children to create different types of buildings, can be used such as pieces representing different forms of roofs, chimneys, doors, etc.

While children were constructing things with attachable pieces, they controlled whether the pieces were attached or not. Feedback with sound, such as clicks, can be provided during construction process. Visual feedback may also be provided such as dissappearance of joints (as in the case of C3).

As the results of the study indicate, size of the pieces may affect the types of games (Size of the bridges-opportunity for playing car driving). Use of different sizes in the same toy set may solve this problem.

6.1.4.2. Design Recommendations for Metallophones

Similar to construction play materials, color is also important for metallophones. Children like to see colorful keys, bases and mallets on metallophones. Use of vivid colors such as red, purple and green is also important for the metallophones.

Since it is difficult to understand letters for preschool children, use of colors and numbers is more appropriate for representing the notes. By coding notes of the songs with related notes on the metallophones with the use of colors or numbers, children can play simple songs easily.

While using color on metallophones, it is important to use the same color for the same note. Hues of the same color can be used for displaying the increase in the pitch.

Besides using color on the keys, for the bases and mallets it is better to use vivid colors.

Use of colors such as brown, gray and black should be avoided, since children at this age do not like these colors very much.

In terms of placement of the keys, it is important that children can play the metallophone accordingly without hitting a different surface. For this reason, width of the gaps between the keys and width of the keys should be adjusted. Mallets should not be stuck in the gaps between the keys, while playing.

It is better not to use a frame for holding the keys of the metallophone, because the frame can be hit accidentally.

It is also important that the keys are fixed to the body accordingly, because children use play materials in many different ways, which cause the breakage or deformation of the materials.

In terms of sound, children liked metallophones, which make loud sound. For this reason, it is better to use metal bars instead of wooden bars for the keys. In addition, use of metal bars makes the instrument durable and clangorous sound is obtained.

Children like to produce different sounds by hitting different surfaces. Use of small areas with different materials and sound qualities can be provided for enriching the musical experience of the children. It is also better to use two mallets for hitting different surfaces.

Handle should be provided for the metallophones that are difficult to carry. It is also important to consider the size of the metallophone for ease in carriage.

Putting the metallophone in a box with locks provide ease in storage and durability. However, it is better to create a space for handle on the case in order to make the metallophone easy to carry. When the box is opened, it should not be uncomfortable to play the metallophone in different positions, such as on lap or on the ground. In order to prevent this discomfort, the way the box is opened can be changed, such as removing the top surface of the box, while playing.

It is also better to define a space for the storage of the mallets of the metallophone. It is important to make the storage of the mallets easy, because it may be difficult to place the mallets in a small hole or into a narrow tube. It should be considered that the mallets do not fall, while carrying the metallophone.

Weight of the metallophone should be light, in order to make it easy to carry for children.

It can be concluded that use of vivid colors is an important design attribute for both types of play materials according to children.

6.2. Evaluation of Methodology

The semi-structured interviews based on personal constructs revealed children's primary evaluation criteria, preferences, the reasons of their preferences and the relationships between all of these.

The method was advantageous since it provided an in-depth understanding of children's preferences related to play materials. Laddering technique used during the interviews helped the reasons of children's preferences and the relationships between the construct groups to be understood to a certain extent.

During the comparison of the play materials, children found more differences than similarities. There are few constructs elicited from similarities. The more there were differences between the two products, the clearer were the constructs elicited.

Sometimes, children could not explain the reasons of their preferences related to specific attributes such as color, size and material. They associated these types of attributes with other attributes such as associating size with sound.

The disadvantage of the method was its duration. The tests conducted with children lasted more than forty five minutes most of the time, which made children become bored. For this reason, it may be important to conduct such an interview with children in a game-like way in order to motivate children. Giving small presents was also helpful for keeping children's attention. Familiarization process was also beneficial for providing children time for adapting to the environment and the products. This process gave clues about children's preferences, since their preferences and the materials that they preferred to play during familiarization were similar. Test environment was suitable for conducting the test and children felt comfortable while playing with the play materials used in the test.

6.3. Suggestions for Further Study

Firstly, the study can be developed further by creating design solutions based on children's preferences and evaluation criteria. These solutions can be tested with preschool children in order to develop play materials that are more preferred by children. In addition, educators can be included in the design process actively in order to support designer's knowledge with educational information. In the evaluation process, educators can be included as observers for comparing existing products and the designed products. In this way, educators can compare educational benefits of the new products with the existing products and provide feedback on this subject.

By increasing the number of subjects, preference data can be acquired more clearly. The variety of play materials can be increased for further studies and this may provide new evaluation criteria and more common constructs among different types of play materials.

Finally, the method can be developed in a game-like way in order to make it more suitable for children at the preschool age. In this way, children less than five years of age may also be included in the study.

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APPENDIX A

NOTE SHEET

Date:

Duration:

Age:

Duration of Education:

Gender:

+	-

Notes: