

EFFECTS OF THE DESIGN OF TOYS ON THE CHILD-TOY
INTERACTION IN SPECIAL EDUCATION

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INTERACTION IN SPECIAL EDUCATION**

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ABSTRACT

EFFECTS OF THE DESIGN OF TOYS ON THE CHILD – TOY INTERACTION IN SPECIAL EDUCATION

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The play materials designed for special education are commonly used by children with various disabilities. This study overviews these materials from the perspectives of special needs, special user groups and special education. Furthermore, the effects of different disabilities on the interactions of the children with the same toys are investigated, within the light of those special cases.

The base of the study is constructed with a literature review on toys, play and special education, followed by observations that are performed in a special education centre with six subjects having different disabilities, namely Rett's syndrome, mental retardation, hyperactivity, Down's syndrome, cerebral palsy and autism.

The study is concluded with compared results of the observations and design implications derived from the interactions between the toys and children.

Keywords: Special Education, Play, Toys, Educational Materials, Design Considerations for Special Needs

ÖZ

OYUNCAK TASARIMININ ÖZEL EĞİTİMDE ÇOCUK - OYUNCAK İLİŞKİSİNE ETKİSİ

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Özel eğitim için tasarlanmış olan eğitim araçları, farklı engel gruplarından çocuklar tarafından ortak olarak kullanılmaktadır. Bu çalışma, bu oyuncakları özel ihtiyaçlar, özel kullanıcı grupları ve özel eğitim perspektivinde gözden geçirmektedir. Bunun yanı sıra, bu özel durumlar bağlamında, farklı engellerin çocuklar ve ortak oyuncakların ilişkileri üzerine etkisi değerlendirilmektedir.

Çalışmanın temeli, oyuncak, oyun ve özel eğitim alanında literatür araştırması ve takiben Rett sendromu, geri zekalılık, hiperaktivite, Down sendromu, serebral palsi ve otizm gibi 6 farklı engel grubundan çocukla gerçekleştirilen gözlemler ile kurulmuştur.

Çalıřma, gözlemlerin karşılařtırmalı sonuçları ve oyuncaklarla çocuklar arasındaki ilişkiler sonucunda oluşturulan tasarım çıkarımları ile sonuçlanmaktadır.

Anahtar Kelimeler: Özel Eğitim, Oyun, Oyuncaklar, Eğitim Araçları, Özel İhtiyaçlar İçin Tasarım Kaygıları

To Special Children...

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CHAPTER 1

INTRODUCTION

1.1 Background of the Problem

The definitions of typical situations contain the word *normal*, which indicates that people who have any kind of disabilities or altering developmental stages are “not normal”. This study is about the special children, who are not *normal*, who are supported with special education, which is given in special education centres.

Children, who have special educational needs according to their disabilities, are given an education in special education centres with specially trained educators for improving their skills up to the self-sufficient level at least. People attending this education gain many advantages in life, so this special education is a successful starting point for their lives.

The attendants of these centres have different profiles. Not only children with different types of disabilities, also children having different levels of impairments are being taught. Therefore, the centres are obligated to be well equipped to serve all these varieties efficiently.

In special education, the needs and abilities of children with different impairments are studied and pointed out mostly by the special educators and psychologists. The collaboration of designers is needed in Turkey, in order to make the equipments more usable and appropriate. On the other hand, not recognizing the users and being not experienced in the field, the designers need information and design tools.

Designing assistive technology and developmental products needs knowledge and understanding of disabilities. There are many kinds of disabilities in different levels and of course within these classifications there are individual characteristics and differences too, which cause complex needs to be fulfilled by the designed products.

While designing products (assistive, educational or daily use) for special needs, a designer should combine his/her design abilities and this new area of problem from the basis of rehabilitation. The observation capability and pointing out the needs are the vital contributions of designers for this design process. The designers and the specialists of this field need a bridge to make collaborative designs for the special children.

1.2 Research Questions

As trying to be a stone on this bridge, this study aims to understand the special user group defined as children with various disabilities but at the same educational stage of preschool level. This user group will help the designer/researcher to explore the interaction between the children and the educational materials or toys in order to point out main usability problems which cause handicaps throughout their development process generally.

Consequently the main research question of this study is as follows:

- How do physical and/or emotional differences of children with special needs at the same educational level, affect their interaction with toys used in special education?

While searching for answers to this question, the focus will be on the design of the products. Therefore, supporting questions targeting the design related answers have to be added:

- How does special education fulfil the needs of children with disabilities?
- How do children with varying special needs at same educational stage interact with the same special education material?
- Why do the children at the same mental developmental stage give different responses to the same education?
- How can the design of a special education material be made suitable to the interests and abilities of children with varying special needs via design features?

1.3 Aim of the Study

The interaction and the characteristics of the children observed in the study conducted for this thesis will lead to an understanding of the users. The designers working in this field may use this study as an example that introduces the users, and discusses how such a study can be conducted, and how the results can be interpreted as to design implications. The study also aims to identify usability problems that are faced by the disabled children, so that redesign of existing products and new design solutions will have clues for removing the barriers in education process.

1.4 Definition of Terms and Key Concepts

The definition of disability was until recently, more or less equal to “a ‘personal tragedy’ and a social problem or ‘burden’ for the rest of the society” (Barnes et. al, 2003: 1). The society labelled people with disabilities for most of the twentieth century by using the terms *crippled*, *confined* to wheelchair, *suffering* from deafness, *mentally handicapped*, etc.

By the late 1960s, people with disabilities lead the policy changes with their demand of *independent living*, which redirected the attention on the social and environmental barriers also on the discriminatory attitudes that *disable*

people in social life. Consequently, the definitions of terms and the key concepts themselves began to change.

In order to bring a clear understanding to the most frequently used terms, *impairment*, *disability* and *handicap*, the contemporary definitions have to take place at the beginning.

1.4.1 Disability, Impairment and Handicap

Union of the Physically Impaired Against Segregation (UPIAS) in Britain, declared the manifesto, which entitled Fundamental Principles of Disability (1976), in order to direct the attention on their assertion that society disables people who have impairments. They rejected the disability definition which was something imposed on top of their impairments and in the social model, they built up new definitions on a clear distinction between disability, impairment and handicap (Barnes et. al, 2003).

Seeing the ignored social factors in disability approach, the World Health Organisation (WHO) created International Classification of Impairments, Disabilities and Handicaps (ICIDH) (WHO, 1980) which offered the recent definitions as follows:

Impairment: Any loss or abnormality of psychological, physiological or anatomical structure or function.

Disability: Any restriction or lack (resulting from an impairment) of ability to perform an activity in the manner or within the range considered normal for a human being.

Handicap: A disadvantage for a given individual, resulting from an impairment or disability that limits or prevents the fulfilment of a role (depending on age, sex, social and cultural factors) for that individual.

Although these definitions faced with many criticisms, the distinction they made was fully supported. Regarding these definitions, design cannot heal impairment or disability, but it can create an environment without handicaps or at least with manageable handicaps. In the context of child development and handicaps, design wise contribution is being chased in this study.

1.4.2 Play and Toy

“Play is a natural fun activity for children and also adults” and it is a self-motivated activity, which starts when the child wants and goes on until the child loses his will to play (Frost *et al.*, 2001: 34).

Play is also defined as “a fantasy world to act symbolically in where it becomes a therapy for the children to cure themselves when they can not reach their desires” (Freud, 1909; cited in Frost *et al.*, 2001: 40). Different from Freud, but again considering emotional motives of play, Erikson (1963; cited in Frost *et al.*, 2001) defines play as the reflection of past, dreaming about the present and explorations of the future for a child. Peler (1954; cited in Frost *et al.*, 2001) argues about the idea of the reflection of the past and brings a new perspective to play as *reflection of child’s wishes*.

Play and supporting toys are essential elements for the children in order to learn how to think and consider, to improve their physical capabilities and to start to communicate and socialize. A toy can be defined as all play materials that manage actions of children, assist mental, physical and psycho-social development of children and that improve their imagination and creative skills (Yavuzer, H. 1997). Natural play materials such as water, clay and sand can be regarded in the context of toys together with the daily use materials like boxes, pulleys and beads.

1.4.3 Special Education

Special education is a long-term education of people with disabilities for improving their both physical and mental skills up to the highest level possible. There are personal and group classes; also physical rehabilitation sessions exist. The main features of this education are “the influence of monitoring progress, providing explicit and systematic instruction, understanding the critical factors associated with progress in academic areas such as reading and math, and teaching students in small groups with many opportunities to practice and obtain feedback” (Vaughn, and Thompson, 2003: 140).

1.5 Structure of the Thesis

In Chapter 2, types of disabilities and developmental levels will provide an introduction to the topic. The concept of play material and specialized toys as educational materials will construct the base of the study. Play behaviour of non-typically developing children and toys that become obstacles for children with special needs will be mentioned to make clear the similarities and differences of toy interactions between typically and non-typically developing children. Also the interactions between the children with special needs and the assistive products will enrich the understanding of the general play behaviour of the children with disabilities.

A brief definition of special education will also take place to provide information about the educational steps of disabled children including educational materials used by them. The environmental conditions of these centres will also be evaluated in order to draw the picture of the settings.

In Chapter 3, different toy evaluation approaches are presented besides the materials used in special education in order to provide an

understanding of the interactions between the toys and children with special needs.

In Chapter 4, a study carried out in Akademik Adım Special Education Centre, which will be referred to as Akademik Adım throughout the thesis, will be described, and discussions will take place. The study is based on observations that were performed in the individual education rooms of six children who have different disabilities and are late developing mentally and/or physically but who are all at the same educational level, which is *preschool stage*.

A play bucket (a.k.a. in Turkish Bul-Tak Kova) aiming to teach basic shapes and colours with various play ideas, is used as the observation material for all the children as they are at the same educational level. The structure of the study is outlined in detail in Chapter 4.

Finally, in Chapter 5, the outcomes of the literature and the study will be evaluated according to the research questions as a conclusion. This chapter will also include design implications for toys for special needs.

CHAPTER 2

SPECIAL NEEDS AND SPECIAL EDUCATION

Examining development in general, sets the steps that must be taken from birth. Situations altering from the stages of typical development show the disability cases that cause delays (Lewis, 1987). On the other hand, these altering situations in some cases may be exceptional, being different rather than delay, such as visual impairments, which need to be concentrated in detail because of the difference from a typical child development especially in terms of social development (Urwin, 1983; cited in Lewis, 1987). Different types of disabilities are grouped under main categories.

2.1 Models and Categories of Disabilities

The International Classification of Functioning, Disability and Health (ICF), produced by the World Health Organization, define disability and its categories using different conceptual models. The two main models are the medical and social model.

The medical model sees disabilities as the results of individual physical conditions which reduce *quality of life* and cause clear disadvantages in life by restricting body functions including physical, sensory, cognitive and intellectual impairments.

On the other hand, the social model focuses on the *interaction* of the individual with the environment, rather than his/her own functioning. Seeing that the disability is the result of complex collections of conditions, individualized education or medical treatment is never enough. A complete

social action is required to make environmental modifications in order to manage the *full participation* goal.

The types of disabilities are generally grouped as physical, sensory, communicative and cognitive disabilities, which carry the idea that, children with disabilities follow the usual stages of development; therefore altering situations define disabilities by using the main developmental stages' names and context (Lewis, 1987, ICF, 2007, ADA, 2007, NICHCY, 2006). Also the levels of disabilities are rated by comparing the child's abilities with typical developmental levels.

To conclude, in this wide range of disability cases and categories there are too many different needs. In this study, children at the preschool level with various disabilities will be in the focus as the main user group. Children with mental and its consequent physical disabilities will be examined by comparing the typical development stage of preschool level. Although the characteristics of disability vary the restrictions faced by the children, this variety will help see the general characteristics of development under the interference of different impairments.

2.1.1 Children with Motor Handicaps

Being unable to control body movement and a delay in motor abilities are the common characteristics of children with motor handicaps and also most of these children have other disabilities as well. Children with cerebral palsy are the significant examples of this case.

Cerebral palsy (CP), which is the result of a lesion occurred on the immature brain, causes motor deficit and related impairments such as cognitive deficits, communication disorders, visual dysfunction, seizures, emotional and behaviour disorders, sensory impairments and orthopaedic deformities (Wu *et al.*, 2003). Most of the children with CP can hardly walk

and they can not sit or stand unsupported. The additional mental deficits prevent these children to follow a typical development both physically and mentally.

Children with CP at preschool level are trained by using general educational materials with addition of small supports for handling. They are supported with seat belts and pillows while sitting. In special education, the sitting units are customized for their sitting. Other than that, some of the children who can not be supported to sit efficiently are trained while lying on their tummies.

2.1.2 Children with Autism

Although the causes of autism are still full of mystery, it can simply be defined as the disorder of development causing neurological abnormality, and is a lifelong condition (Frith, 2002).

Delay on social development is the most significant sign of autistic children. They seem to be living in their own world, full of unbreakable routines, being unable to realise stimulations around them such as voices, smells or touches. On the contrary, in some cases they become deeply sensitive proving that they can not sense the environment successfully (Lewis, 1987).

Although autistic children show a slight delay in motor skills development, their motor behaviours show difference with repetitive movements like turning around themselves or rocking to and fro. As they are poor at representing movements, they encounter difficulties in joining activities that require gross motor abilities such as swimming, dancing, etc.

While having mental impairments, most of the autistic children show outstanding abilities in memorizing large amount of knowledge or a complex scene they have seen. The tests used for examining the mental

level of autistic children in all areas of development are specialized according to their characteristics.

The motivation of education and gaining their attention on the educational subjects is the most exhausting part of the lesson. Consequently, in their education, the generally used materials for improving the various skills are difficult to use. Despite that, the educational materials used for teaching preschool level concepts in autism are same with other children's, but the educators apply different methods in the lessons to focus their attention on the materials (Personal conversation, Murat Sezgin, 03.07.2007).

2.1.3 Children with Rett Syndrome

Rett syndrome, which was identified as neurodegenerative disorder, has been defined as neuro-developmental disorder pointing that it is a developmental problem in synapse formation rather than degeneration. That is, the nerve cells are too close together and the number of synapses (neuron to neuron connections) is about half the normal number. These findings cause problems with interaction or socialization, communication, autonomic nervous system problems (such as sleep, breathing, heart rate, swallowing, bowel motility, and blood circulation in hands and feet), and reduced sensitivity to pain (International Rett Syndrome Association IRSA, 2006).

The most visual sign of Rett syndrome is the continuous money counting or similar movements of the hands. The first step in their special education is taking this movement under control in order to gain their attention and develop their skills beginning with the communication. These children, at the beginning hardly respond to the basic directives such as "take" and "give". As a result, these basic directives keep the great amount of their laborious education (Personal conversation, Selcan Doğan, 05.07.2007).

As they show similar characteristics in social skills with children with autism, their individual education are parallel in the way of keeping their attention on the lesson. The educator repetitively calls the child's name and gives directions again and again.

2.1.4 Children with Down's Syndrome

Having 24 pairs of chromosomes instead of 23 pairs causes this syndrome, which has taken the name of the researcher J. Langdon H. Down (1866). The additional pair of chromosomes is the copy of the 21st but the reason of this copying has not been explained yet. The slanted eyes, flat shaped head and little, one-creased fingers are the most general visual characteristics of people having Down's syndrome.

Down's syndrome causes mental retardation and various physical abnormalities for instance, congenital heart defects, obstructed digestive systems, thyroid conditions, hearing problems, leukemia, increased susceptibility to infection, sleep apnea, and respiratory problems (Down Syndrome Research and Treatment Foundation, 2007).

After birth to a certain age about six months, the children with Down's syndrome show a typical development but after that period they begin to slow down significantly. Most of the adults are reported to reach the mental age of 4 or 6 at most but of course the experiences they gained during the years they lived have an effect on their abilities however their IQ declines over years.

The slowing down is also perceived in their actions that prevent their gross motor abilities to develop. Also because of anatomical difference in their hands, they show failure in the actions requiring fine motor skills.

Children with Down's syndrome have difficulty in remembering and building up complex knowledge rather than cognition. So the curriculum for them has to be built on this fact. The complex educational materials can not be used with them; they prefer more simple and more rehearsing products with successful feedback mechanisms (Personal conversation, Selcan Doğan, 05.07.2007).

2.1.5 Children with Mental Retardation

International Classification of Diseases (WHO, 2007) defines mental retardation as a condition of arrested or incomplete development of the mind, which is especially characterized by impairment of skills manifested during the developmental period, skills which contribute to the overall level of intelligence, i.e. cognitive, language, motor, and social abilities.

Although the case affects various abilities mentioned in the definition, the levels of mental retardation are conventionally estimated by standardized intelligence tests (Table 1).

Table 1 Degrees of Mental Retardation (<http://www.searo.who.int>, 24.08.2007)

Class	IQ
Normal	85-100
Normal but not retarded	70-85
Mild Mental Retardation	50-70
Moderate Mental Retardation	35-50
Severe Mental Retardation	20-35
Profound Mental Retardation	Below 20

People studying mental retardation, from the early 1900s have puzzled over how mental retardation affects development, whether people with mental retardation follow a similar but a slow development or have differences from the typically developing individuals (Dykens and Hodapp

1998). As the development is a complex field and the mental retardation affects various areas in this field, the puzzle has tried to be solved with combinations of secondary disabilities.

Typical or not, the development of the children is supported by toys and educational materials which begin to have the same meaning when appropriately selected for the skills of children. The toys and the play nature have to be overviewed in order to reach the understanding of appropriateness of a toy.

2.2 Special Education

A group of researchers argue that, separating children with special needs from other pupils is a way of social and curricular limitation and not suitable for reaching full potential (Hermon and Prentice, 2003). On the other hand, it is obvious that, children with high level disabilities need special care and environment. This special settlement can not be perceived as isolation or discrimination because there are group classes and also in most cases when the child gains main skills, the dual education begins and the special education takes its secondary place in the child's life as a supporter of the general curriculum.

2.2.1 Aims of Special Education in Turkey

Republic of Turkey, Ministry of National Education sets the aims of special education as follows (http://mevzuat.meb.gov.tr/html/2551_2.html, 17.08.2007):

1. Providing an education for the children with special educational needs according to the legislations of Turkish Constitution and Turkish National Education System in order to make them socialize and gain a job to work according to their abilities.

2. Developing their basic skills up to a self sufficient level to give them the power of living without the caregivers.
3. Removing or decreasing the levels of behavioural problems of children with special educational needs by using scientific methods and processes.
4. Supplying social development in order to make the children be prepared to the social life emotionally.
5. Giving the children the right of education according to their abilities and potentials.
6. Setting an environment for the children, which meets their physical and mental needs.
7. Removing the handicaps caused by the disabilities or at least reducing them.

2.2.2 Individual Education and Settlement of the Classrooms

Throughout the visits to schools (Akademi, Gülen Yüzler, Akademik Adım Special Education Centres) and during research, it was observed that special education includes different kinds of rooms and stations to provide the best environments for each child. There are individual education rooms, group activity halls, physical rehabilitation stations, outdoor play areas and other special care places.

The individual education classes are the main courses of the special education, which are performed by one child and a teacher using the educational materials successively during one hour periods at least twice a week. The aim is to provide intense concentration on the subjects that take place in their level's curriculum (Table 2) which are set by Republic of Turkey, Ministry of National Education.

Table 2 Weekly Curriculum in Special Education (Akademik Adım)

Development Areas	Pre-school (age 3-6)	Primary School (age 7-11)	Elementary School (age 12-15)
Preparation for Learning	4	-	-
Self Care	4	-	-
Daily Life	-	4	4
Communication	5	6	6
Motor Abilities	4	5	4
Play and Socialization	5	-	-
Social skills	-	5	5
Pre-academic skills	4	-	-
Academic skills	-	5	6
Eye-hand coordination	4	-	-
Play and art activities	-	5	5
TOTAL	30	30	30

The child and the educator sit opposed to each other at a table. The educator puts the material on the table and the lesson begins. During the lesson, various materials are used according to the activities they perform. The individual education is followed by group activities and rehabilitation sessions when needed.

The special education provides a safe and specialized environment for children with special needs. Throughout these *specialities*, when observed from outside, they run (if they can), shout and laugh during breaks. They built up friendships and supporting each other with their abilities, they play games, which show similarity with typical development in a sense.

2.3 Toys and Educational Materials

Toy design and manufacture became an industry after the toy concept was no longer regarded for its fun element but was also recognized as material supporting education. Nevertheless, it is observed that children not always welcome toys which are labelled educational and search more playful things (Almqvist, 1994). They tend to lose self motivation of play, when it is fenced with educational directions significantly.

As Almqvist (1994) argues, supporting children with the right toys in which children find pleasure and play successfully, rather than choosing a toy according to its label (educational or not) will facilitate the play appropriately to its nature.

2.3.1 Development of Toys as Educational Material

Until the 18th century, toys were considered to be “non-useful” play things moreover they were synonymous with the words *any petty commodity, a thing with no great value* (Almqvist, 1994). The new century brought new ideas of learning and play started to be valued as an enjoyable way of learning whereas the toys became tools for play (Chase, 1992).

In the 19th century, the toys took one further step to become materials for *improvement* and educational books joined to them. Friedrich Froebel built up the idea of schools for young children, which was the beginning of kindergartens. He and somehow later Maria Montessori designed toys as *specially designed play materials* for child education (Weber, 1979; cited in Chase, 1992).

Montessori Materials are still being used in modern day-care centres and kindergartens today. Association Montessori Internationale, which was founded in 1929 by Maria Montessori, gives certificates to the toy

companies that produce and distribute Montessori materials today (<http://www.montessori-ami.org/> 17.07.07).

Today, the concerns about the toys shifted to selecting the appropriate toy for the abilities of the children among thousands of kinds. Because of this reason, the toy companies and many non-profit organisations provide information on educational materials and toy selection guides, which will be discussed in the next chapter in detail.

2.3.2 Specialized Toys and Educational Materials

Specialized toys, of which some significant examples will be illustrated in the following chapter, are generally the redesigns or adaptations of typical toys. They are revised in order to be specialized according to the different needs of children with various disabilities. On the other hand, the typical preschool education materials and toys are also used in special education as though they are appropriate for the different abilities of children with special needs.

Although selection of the appropriate material plays a significant role in special education, adapting them to increase learning and social interactions is also vital (Simpson and Lynch, 2003). The toy adaptations, which are introduced by the Let's Play Project (a model demonstration project funded by the US Department of Education, Early Education Programs for Children with Disabilities), aim toy stabilization, toy extension, toy attachment and toy confinement for the aim of promoting play activity.

To give examples of toy adaptations; besides the fine motor skills improvement, the concept teaching toys have special pegs and knobs or supporting materials such as Velcro to make handling easier. Large icons and bright basic colours are the significant characteristics of these

materials in order to give efficient stimuli to users who lose their attention easily.

Computer-aided toy stations are also used in advanced adaptation cases while teaching basic concepts to the children who cannot use their hands completely. The researcher has not come across this kind of adaptation in the visited centres.

Lastly, for the safety issue, it has to be stated that, children having disabilities as a result of some kind of illnesses or diseases may show allergic reactions against most of the plastic materials and paints. To prevent this, wooden materials and special paints are chosen in special toys production. Besides the regular and mandatory warnings on toy packages, such as “choking hazard”, the toys have to be used under the supervision of educators or parents at least until a level of development when the children are able to take care of themselves, or to handle toys appropriately.

2.4 Play of Children with Disabilities and Assistive Technology

Rather than a natural daily activity, play has become the vital action of children with disabilities to improve their skills so that, they are directed to play by parents and educators different from the typically developing children, most of the time. The *obligation* state of the play may be seen as an important distinction between typical and non-typical development.

The contemporary toys may not be suitable for children with special needs because they are “difficult to manipulate and some building and psychomotor exploration play activities are partially or totally precluded for evident functional reasons” (Besio, 2004: 119). As a result, the specialized toys took their place in the lives of children with special needs.

From another point of view, the obviously needed support may be provided with an assistive product, which helps the child manipulate *real toys* in the real world rather than being surrounded by *specialized toys* (Prazak *et al.*, 2004).

The play activity can become frustrating for the disabled children if the toys/materials are not appropriate for their (dis)abilities. Consequently the play becomes a negative reinforcing factor that prevents improvement. In order to facilitate play, assistance has to be seen as a must in some cases either on the toy or as separate. The ease of use and support improve both development and playfulness which significantly motivates the child.

2.4.1 Motivation and Improvement

Since motivation has a direct relation with the previous experiences, which were built up with successes and failures, children with special needs have a lower motivation. Low motivation causes poor performances; inevitably a negative self-reinforcing cycle interrupts their education and improvement (Kunnen and Steenback, 1999).

Children load emotions on success and failure, which generally causes fear of not being successful or on the other side, of failure. With a strong feedback mechanism and a healthy communication, this fear can be kept in positive limits.

Children with special needs, especially communication disorders, have difficulty in managing their emotions. These emotional problems can be reflected in different ways. The study of Kunnen and Steenback (1999), points out two different behaviour models.

The first model was described by a school teacher as “I am OK, you are not!” which is a phrase that is being usually used by children who are

hiding behind their fears of failure. They become reluctant and aggressive when they are faced with a situation in which they can not succeed and they tend to attribute their failure on other people and external circumstances such as educational materials.

The second model seems, and most of the time really, not to be interested in success at all. These children tend to hide behind or even worse, get lost in their disabilities. They are under too much help by their families and the demands from them are very low or inconsistent. Further more, their mental problems may also be preventing them, building up the connections between actions and the reactions.

In special education, several techniques are used to manage the motivation of children, which are not special and unique for special education but more explicit, intensive, and supportive (Vaughn, and Thompson, 2003). As all of the children's abilities and performances are monitored continuously, teachers update the task difficulties and contexts. Teaching students in small groups and personal lessons, aim to provide an ongoing and systematic feedback mechanism, which repairs misunderstandings and keeps the education on a more communicative and healthy base.

The products that are used in special education have to support the motivation management endeavour. In order not to be obstacles for children with special needs, the toys and educational materials have to fit the children's (dis)abilities. Long and frustrating tasks have to be avoided while strong feedback mechanisms provided.

2.4.2 Play Environments with Assistive Products

In a study by Wessels *et al.* (2003), it is indicated that assistive technology mostly deals with the moving-walking assistance but the researches about

the usage of assistive devices report a high rate of *non-use*. The solution suggestions were offered such as constant coaching and motivation by an expert or therapy for depressive attitudes. On the other hand the same research gave different results among the younger users.

A study conducted by Skär (2002) states that, the children are thankful to their technical aids because they feel these aids are the connections rather than constraints, to the play environment, which occupies a significant part of their life in that age. From very early ages, disabled children with assistive products know that they are different from others. But the perception of this situation may be more positive than the disabled adults. They see these equipments as an integrated part of their bodies, which give them self esteem and independence.

The assistive devices become a *bridge* for the children, which enables them to perform activities for their cognitive development, psychological status and constructing personal independence (Besio, 2004). The interaction with an environment is performed with the assistive device but the interaction between the child/person and the assistive device should not be ignored.

In the play environment, for a child, the wheelchair may become a toy which the other normal children do not have. In this environment, there are no limitations; the only limit is their imaginations for the games. On the other hand, for the daily life of an adult, the wheelchair causes a large number of accessibility problems and the perception begins to change in a negative way.

The consciousness of disability is more or less an imposition of the adults. Children, as they are all *children*, find equal places through play. Their need is support from both adults and products. Special education provides them both, for preparing them to life.

CHAPTER 3

EVALUATIONS OF TOYS FOR SPECIAL NEEDS

In this chapter, some example products are investigated in order to build a base for the study that will follow. For that reason, the products are chosen from the materials that are being used by special education centres in Turkey, in the preschooler individual classes where the observations were performed. Firstly, the different approaches to product recommendation will be explained and then, the toys will be introduced under main categories.

3.1 Approaches to the Evaluation of Specialized Toys

The analysis of special education toys has been a research field that is supported by the toy companies, organizations and researchers. In this part of the study, the organisations and companies, which provide structured and organized information on this subject, will take place in order to exemplify their approaches. From the research side of the subject, the industrial design approach will be illustrated with USERfit as a product analysis method.

3.1.1 Organisations' Approach

Able Play™, which is “a toy rating system and website that provides comprehensive information on toys for children with special needs” (www.ableplay.org), analyzes the contemporary special education materials in order to give ideas of appropriate toy selection to the families and educators. This system is developed by the non-profit organization of Lekotek, which has the aim of promoting the inclusion of children with

special needs into family and community life by providing ideas on interactive play experiences (www.lekotek.org, retrieved 10.7.2007).

Besides providing a wide resource of product information, Able Play™ evaluates products according to four disability categories, which are physical, sensory, communicative and cognitive (Figure 1). The categorization is inevitable because the most suitable toy for a child who can not speak may not fit with the abilities of a child with visual impairment. On the other hand, they are placed together because a child may be suffering from more than one of those disabilities at the same time.



The graphic shows the Able Play Rating System for a toy named 'Around the Block Wagon'. It features a table with two columns: 'DISABILITY CATEGORY' and 'RATING (1-5)'. The categories and their ratings are: Physical (3 stars), Sensory (5 stars), Communicative (5 stars), and Cognitive (5 stars). Below the table, it says 'Detailed review at www.ableplay.org' and 'Play products for children with special needs Independent evaluation by National Lekotek Center'.

DISABILITY CATEGORY	RATING (1-5)
Physical	★★★
Sensory	★★★★★
Communicative	★★★★★
Cognitive	★★★★★

Figure 1 The Able Play™ Rating System (www.ableplay.org, 10.7.2007)

The “five-star rating system” was helpful while selecting the toy to be used in the study, as well as the titles that Able Play™ includes in the product evaluation such as descriptions, applications (for all of the disability categories separately), benefits and the list of developmental processes promoted.

Apart from Able Play™, there are numerous toy rating systems available. Although they do not directly refer to children with special needs, they

provide valuable information on toys and toy selection guides, having parallel approaches with Able Play™.

The Toy Man™ 2007 Product Guide (www.thetoymanonline.com) is adopted by Child Safe International, which is a non-profit organisation having the mission to identify and bring attention to quality products for children of all ages and safety issues (www.childsafe.com, 27.07.2007). The guide was developed to serve education professionals, wholesale buyers/resellers, commercial store chains and families.

The Toy Man™ staff, including professionals in the fields of education, behavioural science, and children's medicine, rate the toys from 1 to 5 under six different categories, which are:

- Design quality,
- Educational value,
- Fun factor,
- Visual appeal,
- Innovation, and
- Marketing value.

Following, the guide gives an overall rating that shows the appropriateness of the toys for the children's mental, physical, social and emotional development.

Since Toy Man™ ratings are initially targeted to be used by toy companies, they also evaluate commercial values. More over, they also rate the design quality and other issues that are subject to industrial design profession. However, designers are not included among the staff.

3.1.2 Toy Companies' Approach

Another categorization took place in the 2006 Toy Guide for Differently-Abled Kids (Figure 2) which is the 13th guide published by Toys"R"Us (www.toysrus.richfx.com) in favour of introducing the toys that have been chosen for the special needs of children.

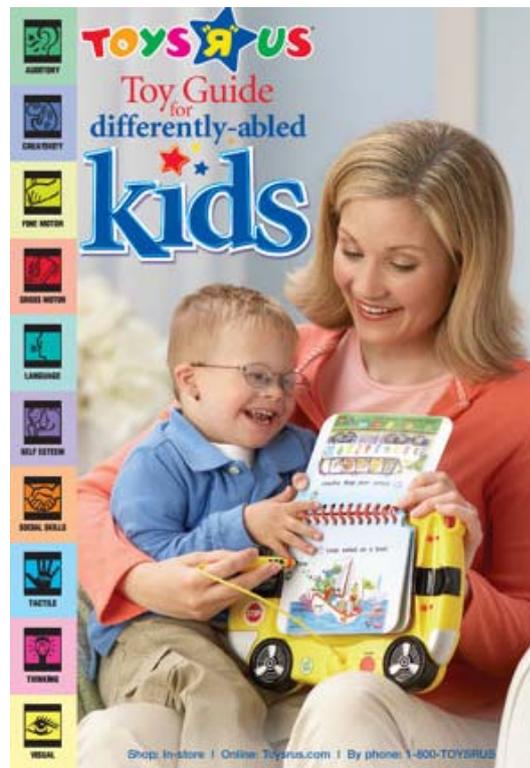


Figure 2 Cover Page of ToysRUs Guide for Differently-Abled Kids

The guide uses visual signs (Figure 3) to indicate which toy improves which of the auditory, language, visual, tactile, gross motor, fine motor, social, self-esteem, creativity and thinking skills. Certainly, many toys have more than one sign, which means that the toys generally improve more than one skill since play itself is the combination of complex activities performed by the children.



Figure 3 Toys”R”Us Easy-to-Use Toy Selection Guide (<http://toysrus.richfx.com>, 09.08.2007)

Another toy company, Fisher-Price, who aims to provide a supportive environment in which children can grow, learn, and get the best possible start in life (<http://www.fisher-price.com>, 01.08.09), recommends selecting the toys according to the play stages of the child, not to age considering the differences in the developing rates of the children. These stages include:

- The Experience Stage: The child explores the toy and its physical features and visual, auditory and tactile reactions by using his senses.
- The Discovery Stage: The toy guides the child to discover ways to use it and its pieces.
- The Expanding Imagination Stage: The child uses imagination and creativity to determine even more ways to interact with the toy.

Fisher-Price also provides in-depth information on how to make the child get ready for the play and the toy features to be looked for in the categories of different special needs such as seeing, hearing, manipulating toys,

thinking/learning, moving and talking. The company does not directly point to specific toys but gives guidance in selection.

3.1.3 Product/Toy Classifications of Specialized Toy Suppliers in Ankara

The specialized toys suppliers in Ankara/Turkey, who do not provide a toy selection guide or features to be searched for, are generally the distributors of imported toys, whereas some of them manufacture similar designs here. None of the three companies Işık Oyuncak, Yelken Oyuncak and Pediko, who are the main suppliers of Akademik Adım Special Education Centre, employ an in-house designer.

Two companies, Işık Oyuncak and Yelken Oyuncak target special needs initially. Işık Oyuncak (www.ahsapoyuncak.com), groups its most demanded products for individual education as

- Puzzles,
- Concept teaching toys,
- Rehabilitation equipments,
- School equipments,
- Activity toys, and
- Custom made products for special education centres.

Besides this, Yelken Oyuncak (www.yelkenoyuncak.com) offers the toys under general toy categories such as

- Wood and plastic toy sets,
- Building blocks, and
- Science and nature sets.

Both companies introduce the rehabilitation materials separately. These categories are limited to the product range of these companies.

Pediko (www.pediko.com), different from the other two companies in terms of product range, mainly targets typical pre-school classes and kindergartens. The company does not have a separate category including specialized toys; but it provides these kinds of products under five main product types, which are

- Toys for motor abilities development,
- Educational materials,
- Activity centres,
- Toys for music and drama activities, and
- School equipments.

The founding director of Akademik Adım Special Education Centre, Murat Sezgin, states that, generally the educators direct these companies while selecting product range and supply them with information on special needs. He adds that most of the time they have to manipulate and adapt the toys they buy from the companies according to the different needs of their children.

3.1.4 Design Approach

When considering products for children with special needs, industrial design emphasizes two main subjects; the design features of the product itself and the interaction between user and the product. Not having the same focus with the organisations or toy companies in product evaluation, professionals of design do not consider educational toys under the categories of developmental stages or ability ratings.

Among the various researches and studies on products for children with special needs, USERfit, which is a well-established methodology focused on “the generation of usability specifications, specifically created for the assistive technology field that proved to be very suitable for the Design for All paradigm” (Abascal *et. al*, 2003: 141), may be the most efficient

example for illustrating this approach, since it has been used in the evaluation of products for special needs because it has a summarizing nature of the different product analysis methods and especially adapted those methods for special needs (Wu *et. al*, 2003).

USERfit can be identified as a tool for building up a design philosophy (Abascal *et. al*, 2003: 141) that is

- *user centred* (involving user requirements as the starting point),
- *system orientated* (considering the environment in which all technology operates) and
- *iterative design promoter* (allowing modification of requirements and validation of new requirements in later phases)

Therefore it *fits* in the special needs field containing a diverse user profile.

USERfit methodology helps in the analysis of all user needs from diverse categories by avoiding generalizations and presuppositions and also in the selection of the most adequate method for the development stage of the products by the use of nine protocols (Table 3), which are called “summarizing tools” (Abascal *et. al.*, 2003).

Table 3 Nine Protocols of USERfit (Abascal *et al.*, 2003: 143)

USERfit	Objectives
Environmental Context	Provides a high level summary of the product, covering such issues as the initial justification for it: who its users are likely to be, who will purchase it, etc.
Product Environment	Summarizes what is known about the support environment for the product (including likely training, documentation, installation, maintenance and user support).
User Analysis	Identifies the range of people who should be considered in the development of the product, and describes their attributes in detail.
Activity Analysis	Identifies and describes the range of activities that people will engage in when using the product and the implications that these will have for product design.
Product Analysis	Summarizes the functional aspects of the product as they are understood and lists these as operational features.
Product Attribute Matrix	Summarizes the match between emerging functional specifications and product attributes inferred from user and activity analysis.
Requirements Summary	Summarizes the design features identified through user and activity analysis and their degree of match to user requirements.
Design Summary	Summarizes, in more detail, the functional specification for the product and its operational details.
Usability Evaluation	Summarizes plans for evaluation along with objectives, methods to be used and evaluation criteria. Also documents the degree of match between evaluation criteria and the results of the evaluation activities.

The general overview of evaluation of toys for special needs in hand, has helped in gaining familiarity on special education materials. The appropriateness ratings of organisations, ability based introductions of companies and the diverse product analysis methods have sourced this familiarity.

3.2 Toys Used in Special Education

Since special education is a long-term process, the same materials have to be used by the same children for a very long time. This long-term education requires various materials in order to develop the children's different abilities in a parallel process. Furthermore, the toys have to be suitable for the long-term education with differing processes for each child. In this section will be described toys and play materials that are frequently used in special education.

3.2.1 Puzzles

In her visits, the researcher has observed that jigsaws and tiling puzzles are among the most frequently used materials in special education. Every kind of concepts, colours and shapes can be put into practice with puzzles; moreover the physical abilities are promoted at the same time.

Since puzzles are mainly for individual play and only have one exact solution that helps children to learn easily at the basic level (Dixon, 1990), they are suitable for special education and especially for individual education classes dependently.

In general, wood is preferred as the material of the puzzles as long as it is low cost, easy to manufacture, robust and safer than plastics for the health of the children. Another reason for choosing wood is that, it has a self thickness, which helps handling for children with less developed fine motor

skills and also additional knobs and pegs can be mounted on the pieces easily (Figure 4).

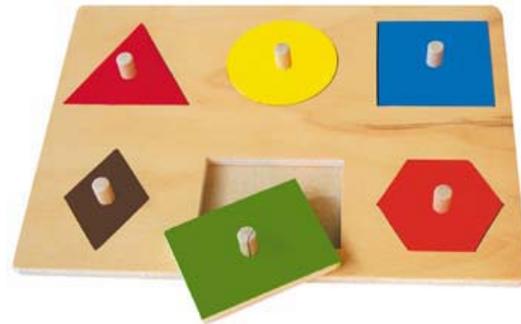


Figure 4 Example of a Puzzle for Colours and Geometric Shapes
(<http://www.ahsapoyuncak.com>, 08.08.2007)

Besides basic shapes and colours, more complex concepts are also taught with puzzles by using pictures of real objects. The sizes and complexities of the pieces have to be kept in a range not to make them inappropriate for the skills of the children. The very small pieces are not only hard to see and hold, they also become meaningless when used with a knob, which overlaps the picture and the piece itself (Figure 5).

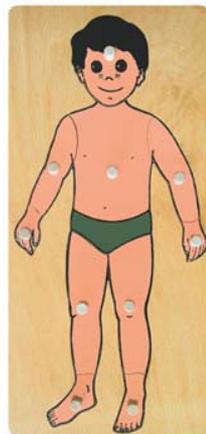


Figure 5 Example of a Puzzle with Small Pieces for Hands and Feet
(<http://www.ahsapoyuncak.com>, 08.08.2007)

These kinds of puzzles promote the children's thinking, fine motor, visual and language skills (Dixon, 1992). Besides the numerous concepts painted on the pieces, they also teach *the part and whole relation* while requiring eye-hand coordination. Lastly, they give strong feedback that provides positive reinforcement to the child when the pieces are placed in the correct positions.

3.2.2 Building Blocks and Dot-Pin Toys

These two kinds of products are grouped together because of their common aim of providing children with freedom, without demanding one solution or having strict rules of the progress, in order to encourage them create different shapes, which will promote their creativity while developing physical, sensory, communicative and cognitive skills at the same time.

Dot-pin toys are generally made of plastic, while building blocks come in various materials such as wood, cardboard, plastic, etc. For the sake of durability, which is very important for special education, wooden blocks are preferred most of the time (Figure 6). The blocks help practicing whole hand grasp while illustrating spatial relations and utilize the sorting skills. The different shaped and coloured blocks are also used for teaching basic colours and shapes to the children.



Figure 6 Example of Building Blocks (<http://www.ahsapoyuncak.com>, 08.08.2007)

The small pieces of dot-pin toys, which require precision grip that is the holding type of precisely performed tasks (Stephen, 1996), firstly aim to develop fine motor skills of children. They also need fine dexterity skills while pinning them into the smaller holes on the base (Figure 7). The toy provides an open ended play and promotes colour recognition with the different colours. Throughout the play, the child is directed to identify the shapes he created in order to develop his communicative skills as well.

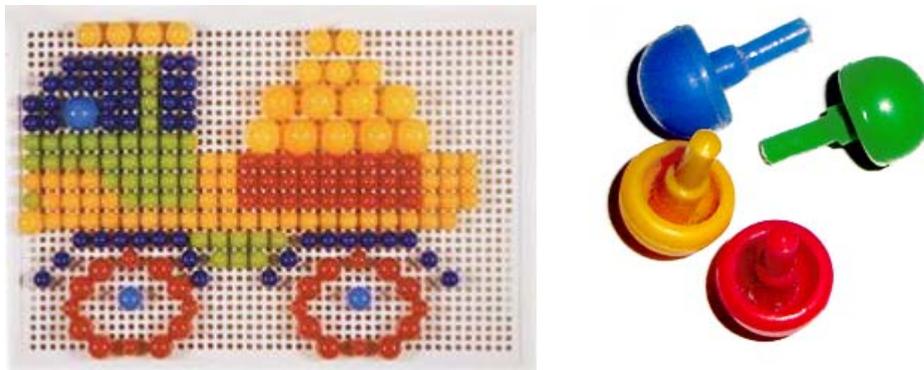


Figure 7 Example of a Dot-Pin Toy (www.yelkenoyuncak.com, www.espanol.geocities.com, 17.07.2007)

These open ended toys are also used in group sessions; consequently the children learn to share an activity and become socialized. Completing the activity with a meaningful outcome provides a strong feedback to the children.

3.2.3 Art and Creativity Tools

Painting tools, clays, coloured cardboards and the other art and craft materials that depend on the imagination of the child and the educator are included in this group (Figure 8). The activity performed by using these materials is a complete creative process, which inevitably promotes creativity skills at first. Using all of these different materials also aims to improve fine motor skills of children. Besides, they are used to build a

bridge between the children and the world, forcing their communicative skills.



Figure 8 Example of Art and Creativity Materials (www.yelkenoyuncak.com, 17.07.2007)

Celebrating the differences through artistic characteristics may find a place in the potential of the children with special needs. Their intellectual capability may open up creativity and be energising and exciting (Hermon, 2003). On the other hand, coping with basic skills and repetitive failure may lead to the reaffirmation of poor self-image that will prevent creativity. Consequently, these kinds of activities have to be supported with assistance when needed.

3.2.4 Montessori Materials

Maria Montessori (1870-1952) was a medical doctor and pioneer educator. She defined the goal of education as a preparation stage for the children in order to make them live successfully in *their* life. Seeing the children as developing human beings, her approach was focusing on children and observing their needs (Lillard, 1996).

Montessori created special environments with specially designed materials for children. In this environment, there is a significant orderly sequence and logical progression takes place, which gives children the experience of

orientation in cause and effect. Every material has its own place in the classroom and also there can be only one set of each material found in the classroom (Figure 9).



Figure 9 Montessori Classroom (www.woodcreekmontessori.com, 08.08.2007)

The logically placed materials also have the same progression and special features such as being a part of a sequence of materials from simple to complex. The materials have bright and basic colours but at the same time natural and smooth coloured cases and bases, not to detract the materials themselves. An example of colour usage in materials can be the cylindrical pegs below (Figure 10). Not only do they directly offer a sensorial experience with colours, but indirectly help holding the pegs similar to holding pencils as a preparation, and the differing grades of cylinders allow for an introduction to mathematics.

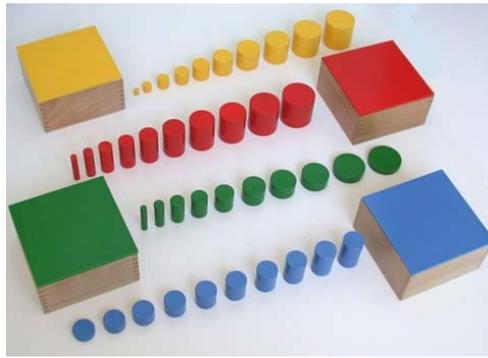


Figure 10 Cylindrical Pegs (www.montessorimaterials.com, 17.07.2007)

Montessori materials are based on the idea of demonstration in all fields of education like sensorial, language, practical life, science and mathematics. To illustrate the amounts of numbers, Montessori uses spindle boxes (Figure 11) on which the numbers are also printed. The child can learn the symbols of numbers at the same time they see the real meaning of them by seeing the spindles.



Figure 11 Spindle Boxes (www.montessorimaterials.com, 17.07.2007)

Montessori materials give a structured education without giving more than needed stimuli to the children and ordering the tasks according to the children's levels. Profoundly due to this, the Montessori materials are the most commonly used products in special education.

3.2.5 Rehabilitation Equipments

Children with special needs may have to be directed in play; but as it is discussed in the play nature of the typically developing children, it is questionable whether they like it or not, because they are first *children*, then *disabled*. Unfortunately, as they cannot take the steps that are supposed to be taken individually, their play more or less becomes an 'obligation' to improve their skills by the directives of expert adults who surround the child like an army from birth (Mulderij, 1996).

The most significant example of this directed play has to take place in rehabilitation sessions with rehabilitation equipments, which are *exercise equipments* rather than toys.

Rehabilitation equipments are used in order to develop motor skills of children and increase their sensory abilities. The toys that are developed for improving self-care abilities, which contain different tasks such as zips, buttons, ropes, etc., are also categorized as rehabilitation equipments (Figure 12).



Figure 12 Self-Care Cubes (www.yelkenoyuncak.com, 17.07.2007)

The equipments for fine motor abilities are used in both individual and group classes whereas the equipments aiming development of gross motor abilities are used in outdoor play areas and rehabilitation stations.

Fine motor skills can be defined as the small muscle movements that occur in the hands with the coordination of eyes (Essa, 2003). The dexterity, which is the term used for these coordinated movements, is practiced with educational toys but in some cases more intensive exercises are needed to develop the muscles themselves before dexterity exercises. The finger weights and the stairs for finger movement exercises are the best examples of these intensive exercises (Figure 13).



Figure 13 Left: Finger Weights (www.yelkenoyuncak.com, 17.07.2007); Right: Finger Stair (www.ahsapoyuncak.com, 17.07.2007)

As finger weights help to strengthen the finger muscles when they are held from the rings on their top sides, there are also equipments for the hand and the wrist muscles (Figure 14). The velcro that is placed on a wooden plate and the special pieces helps the children's muscles get stronger. The pieces with different knobs are rotated through the velcro in order to exercise different muscles of hands.



Figure 14 Hand Exercise Equipment with Velcro (www.ahsapoyuncak.com, 17.07.2007)

Just like the rehabilitation equipments for fine motor abilities, the equipments for gross motor skills development are far from being playful when their appearances are taken into account (Figure 15). On the contrary, the playful nature of children helps them to find a joy in these equipments as much as possible. Children need to reach spontaneous and intentional play rather than strictly following adults' rational curriculum (Mulderij, 1996).



Figure 15 Standing Aid (www.yelkenoyuncak.com, 17.07.2007)

According to the child's abilities, there are numerous gross motor exercise equipments including typical outdoor play toys such as swings and slides. For the specific example for special education, the balance equipments and supported steps can be given (Figure 16), as they are among the most commonly used products. These products are manufactured by the toy companies with directions of the special education specialists and physiotherapists. The manufacturers also derive information from bench markings of the existing products.



Figure 16 Balance and Supported Steps Equipments (www.yelkenoyuncak.com, 17.07.2007)

Besides gross motor skill development, these equipments also help the development of social skills and self esteem. With the guidance of educators, these materials can be used safely and as much as they become joyful, the improvement accelerates significantly.

3.3 Discussion on the Literature on Toys Used in Special Education

In the education of children with special needs, there are numerous materials, various evaluation approaches and diverse needs. The parallel development and distinctions have to be understood initially. The special

needs in the education of children with disabilities are found to be grouped under two main fields, which are physical and cognitive needs.

The physical needs cover the complete interaction between the toy and the child from perceiving to manipulating it. In order to identify a toy as appropriate for the child, it has to fulfil the physical needs at first. Cognitive needs are at one step further, where the educational aims of the toy is tried to be reached. The characteristics of the development process, such as being a very long-term process, have to be considered while designing or evaluating the products. The intensive and explicit knowledge generation, stronger feedback mechanisms and playfulness may be counted as the main qualifications of a product, which are adequate for the cognitive needs.

The evaluations of the toys have a variant structure as the evaluators are from various professions. The organisations focusing on disability issues consider the developmental stages and abilities, whereas the toy companies introduce their products from a similar perspective but in a more commercial manner. The industrial designers take the toys as products and analyze it in a wider range including the (dis)abilities as a part of user interaction.

Finally; the materials, developed by the help of technology and design, keep their places in the education as the tools of the educators or as supporting materials, since solitary and self-motivated play is not in general a common activity of children with special needs at preschool level.

CHAPTER 4

A STUDY ON THE CHILD TOY INTERACTION IN SPECIAL EDUCATION

Besides literature review, studies undertaken in naturalistic settings have to be included in research in order to produce robust findings in education for special needs (Davis *et. al.*, 2004). A study is performed in Akademik Adim Special Education Centre with six children in order to observe their interaction with a toy. In the selection of the toy, various toys are discussed with educators and observed in individual classes as a material used by both the child and the educators. The appropriateness of the toy for the educator's use is also taken into account in this selection.

The reflections of the literature review on both play materials and types of disabilities are chased in the study. In order to obtain design implications, children with special needs are observed while interacting with toys during the lessons performed with their educator. In this manner, the types of interaction and the problems that are faced by the children due to the products' design and to the requirements of special education are pursued in individual education classes of the centre.

4.1 Aim of the Study

The aim of the study is to find answers to the question;

“How do children with varying special needs at same educational stage interact with the same special education material?”

through the observation of interaction of children with a toy used in special education. Based on the findings, it is also hoped to find supportive answers to the questions;

- “Why do the children at the same mental developmental stage give different responses to the same education?” and
- “How can the design of a special education material be made suitable to the interests and abilities of children with varying special needs via design features?”.

4.2 Expected Outcomes

As a result of the study, it is expected to obtain

- data for outlining the interaction differences of the children with the toy selected as the test material;
- usability problems of the test material according to each child and
- clues for design implications.

4.3 The Pilot Study

4.3.1 The Aim of the Pilot Study

Prior to the study, a pilot study was conducted with the aim of understanding the characteristics of children with special needs and their educational materials in order to draw out main problems of usage and suggesting new design solutions for improving toys used in special education. Another aim was to observe the children in their educational setting and understand the nature of their interaction with their teachers and educational materials. It was also hoped to set a basis for the main study.

For the pilot study, it was decided to observe the usage of puzzles that have the common goal of teaching the child form-position relation and main concepts such as colours or animals, in order to draw out the problems and design failures. The following questions were tried to be observed:

- Can the child complete the required task of the material physically?
- Can the child complete the required task of the material cognitively?
- Does the material gain child’s attention?
- How much assistance is required for the task/play and with which reason?

4.3.2 Expectation

The expectation was that all children would

- show preference among three puzzles placed in front of them on the table,
- give reasons for their preference, and
- fully complete the puzzle.

4.3.3 Subjects

There were three subjects at different ages and who had different disabilities. They were all in the same mental age and were currently learning the same concepts with the use of same or similar materials. The demographic information of the subjects of the pilot study may be found in Table 4.

Table 4 Subjects of the Pilot Study

	Age	Mental Age	Gender	Education duration (in years)
PS SBJ. 1	17	5-6	Male	5
PS SBJ. 2	10	6	Male	3-4
PS SBJ. 3	15	5	Male	6

4.3.4 Setting

In the pilot study the children were observed in their individual education lessons. The individual education lessons are given in small classrooms, which only have a table, two chairs and a storage unit for materials. This place has to be very simple not to give children much and unwanted stimuli. During the lesson the child sits face to face with his/her educator and performs a series of activities with educational materials (toys, puzzles, concept cards, etc), books, and writing or drawing equipment.

4.3.5 Toys Used in the Pilot Study

For the pilot study, three puzzles were chosen as the toys to be used during observation (Figure 17). The first puzzle was made of wood, which had a thickness to be held easily. In addition to that, little pinch grips were mounted on the pieces. The picture was a body of a little boy, the aim was to teach the body parts while improving the form and positioning ability. The second puzzle was again made of wood, which also had the thickness of 7 millimetres and pinch grips. The pictures were the basic geometrical shapes in basic colours. So the aim was teaching colours and shapes. The third puzzle was made of paper with a thickness of 2 millimetres. It has a more complex picture, which narrates a scene. It is not designed in particular for special education.



Figure 17 Puzzles used in Pilot Study.

Left: Human body puzzle. Centre: Basic colours and shapes puzzle. Right: Picture puzzle.

4.3.6 The Structure of the Pilot Study

The pilot study was structured such that the child and the educator began their usual lesson and as an ordinary activity, the educator set the three puzzles on the table and asked the child to choose one of them. The reason of choice was asked. Then the child was told to complete the puzzle. The duration of the task differed for each subject.

4.3.7 Recording Technique

The pilot study was recorded with video. Then, the recordings were revised in order to note the timings of the manipulation and placement of each piece. A table was prepared for the timings of the subjects in order to compare the results (Table 5).

Table 5 Timings for PS Subjects

	PS SBJ. 1 17 (5-6), M Human body puzzle	PS SBJ. 2 10 (6), M Human body puzzle	PS SBJ. 3 15 (5), M Human body puzzle
1st piece	2 sec.	24 sec.	2 sec.
2nd piece	32 sec.	19 sec.	2 sec.
3rd piece	11 sec.	33+42+25+40=140 sec.	45+59=104 sec.
4th piece	7 sec.	14 sec.	18 sec.
5th piece	23 sec.	17 sec.	20 sec.
6th piece	19 sec.	28+19=47 sec.	2 sec.
7th piece	5 sec.	10 sec.	14 sec.
8th piece	5 sec.	20+14=34 sec.	7 sec.
9th piece	5 sec.	11 sec.	5 sec.
10th piece	7 sec.	8 sec.	3 sec.

4.3.8 Results of the Pilot Study

PS Subject1

Having poor ability to communicate, PS Subject 1 can use his hands fine. His improvement level is poor because he cannot learn without lots of trials and he can not keep his attention for the needed time. In the middle of the task he loses his attention completely and needs to be reminded the task. After focusing on the task for the second time, he can complete the task easily.

PS Subject2

Subject 2 can communicate fine but his major problem is that he can very poorly use one of his hands. His cognitive skills are adequate but the physical problem interrupts his trials and causes loss of attention. He focuses on the physical task and while trying to achieve it he fails at the cognitive tasks.

PS Subject3

Communicative skills of PS Subject 3 are very poor. His physical abilities are not poor but he has mental disability and in addition to that he is very aggressive. He gets angry when he makes a mistake or cannot complete a task as a result of this he fails at the following activities. This aggressiveness prevents him from making trials and he has serious attention problem.

4.3.9 Discussions on the Pilot Study

The pilot study reaffirmed that there are learning differences among children with special needs although they have the same mental age. In this study, these differences seemed to depend on:

- different physical impairments,
- cognitive problems (emotional status, aggressiveness, etc.), and
- concentration problems (too many parts of a puzzle, taking too much time, etc).

Subjects

In the pilot study, the subjects were selected according to their education levels but their disabilities were not taken into account in detail. For the main study, characteristics of children which are mainly results of their disabilities were also considered.

Toys Used in the Pilot Study

Also the test materials were not familiar for all of the subjects so interactions differed according to both abilities and familiarity, which caused ambiguity in the results. For the main study, it was decided to choose one toy, with which the subjects would be familiar.

Structure of the Pilot Study

At the beginning, three different puzzles were chosen with an expectation of fully completed task with minimum support from the educator. The study was oriented towards solitary play, which rarely happens in special education. Thus, it was seen that both the educational levels of the children and their disabilities were not suitable for unsupported play yet. Therefore, it was decided to observe the interaction between the children and the play material in the individual education class with the usual support of the educator, to obtain more realistic results referring to their education.

The unexpected demands from the children and an unfamiliar face with a video camera in the classroom were distracting for the children, therefore the interactions with the puzzles were not natural and the results were not healthy. It was decided to perform the observations after getting acquainted with the child during the break right before the lesson and also

the usual progress of the lesson was preferred rather than one that is structured by the researcher. Furthermore the video recording is left a side completely.

Type of Data Recording and Methodology

The timings of placement of puzzle pieces that were recorded for all the subjects did not give the expected results that could be compared and be indicative of any improvement in the trials of the children. Firstly, one lesson period was not enough to make a comparative measurement of such an improvement. Secondly, as the children were not familiar with the puzzles and the required task itself, they lost motivation and rejected completing the task. Thirdly, measuring the timings of the task proved not to be a correct approach in studying children with special needs in such a long education.

Although the results gave comparable data on the motivational problems and interactions, the evaluation technique was not appropriate for the goal of the pilot study. It was decided that the type of data recorded and the evaluation techniques for the main study require a more comprehensive technique than analysing the subjects relatively.

4.4 The Study

The study is carried out with the support of two child development and education specialists and a special education teacher. The contribution provided by the specialists and the teacher (who will be referred to as “educator” from here on) are:

- Selection of the subjects;
- Selection of the toy to be used in the study;
- Performing the activities to be observed during the lessons;

- In-depth information about each child by verbally explaining the behaviours and disability characteristics; and
- Information on education history of each child.

4.4.1 Subjects

The subjects of the study are six children who have six different disabilities, namely autism, Down’s syndrome, hyperactivity, Rett’s syndrome, cerebral palsy and mental retardation. The general information on these types of disabilities can be found in Chapter 2; in Table 6 the demographic information of the subjects can be seen. The information on their education duration is limited with the school’s records which do not include the past education records like whether they attended another special education centre or not.

Table 6 General Information about the Subjects

	DISABILITY	DATE of BIRTH	GENDER	EDUCATION DURATION (in months)
SBJ.1	Rett’s Syndrome	08.05.2001	Female	12
SBJ.2	Mental Retardation	28.05.2003	Female	13
SBJ.3	Hyperactivity & MR	13.03.1999	Male	23
SBJ.4	Down’s Syndrome	06.06.1997	Female	21
SBJ.5	Cerebral Palsy & MR	07.12.1996	Female	11
SBJ.6	Autism & MR	25.09.2003	Male	13

These children are chosen as the subjects because they are all at the same educational level and they have been using the toy usually in their lessons, which means, all of the subjects were familiar with the toy and its various play ideas.

4.4.2 Data Recording Technique

One lesson for each child was observed and the recorded results were discussed with educators right after the lesson and compared with their recordings, which covered the time period of previous three months for each child. The observation recordings can be found in Appendices A to F but the recordings of the educators are confidential. Instead of their full recordings, their comments on the children were noted.

Besides interaction with the toy chosen as the test material, the other activities that the children carried out were also observed during the lesson in order to get an idea of each child's general behaviour derived from their disabilities. The educators also explained specific reactions of the children, which were characteristic of their situation.

Observations are the most appropriate way of learning about how children mature and develop; they also give valuable clues on education materials or toys used. The observations may be performed by using different methods such as checklists, sampling, diagrammatic or written recording (Sharman *et al.*, 1995).

Although the director of the school gave permission for video recording, the pilot studies showed that a camera in the classroom is a very distracting factor for the children. For that reason, structured written recording technique, which requires specific and objective statements to avoid assumptions or sweeping statements (Sharman *et al.*, 1995), is preferred and supported by discussions with educators.

This technique, which is an observation organisation and recording method, requires previously set aims of observation. The researcher watches the activities of children and records the events that are related to the aim of observation in detail including time, duration, environmental conditions, etc. in an objective manner (Sharman *et al.*, 1995) in the form of notes.

4.4.3 Duration of the Observation Sessions

The children were observed for 45 minutes each, which means one lesson, (Table 7). This short time period must be seen as a section of a long-term education. In other words, observing the development of children with different special needs to gain in-depth information requires a long time, which would be more than 3 months. Therefore these observations are supported with the educator's development recording sheets and comments.

Table 7 Observation Program

	MON.	TUE.	WED.	THU.	FRI.	SAT.
09:30-10:15						
10:30-11:15				SBJ.1		
11:30-12:15				SBJ.2		
12:30-13:15				SBJ.3		
14:00-14:45						
15:00-15:45	SBJ.4			SBJ.6		
16:00-16:45	SBJ.5					

4.4.4 Setting

The study is performed in the individual education classrooms, which are the rooms where the children attend their lessons twice a week. The rooms are approximately six square meters and contain 1 desk, 2 chairs (sometimes a third specialized chair is placed in the classroom) and a cabinet for educational materials.

4.4.5 Toy Used in the Study

The play bucket (Figure 18 “Bul-Tak Kova”) was chosen as the toy to be used in the study because the educators defined it as being appropriate for a wide range of abilities and providing numerous play ideas that directly promote children’s different abilities.



Figure 18 “Bul-Tak Kova” play bucket used in the study.

This toy is a skill building material, which can be used in developing different kinds of abilities and at different levels of development. The bucket is made of plastic and contains 16 plastic pieces in four different colours (red, yellow, green and blue) and shapes (cylinder, cube, triangle pyramid and star shaped pyramid), which are approximately 3-3,5 cm in dimensions. The bucket also has a cover, which has four holes, with the minimum widths of 4 cm, in the shapes of the pieces in order to put the

pieces into the bucket through them. The bucket itself is transparent, which allows children to perceive the pieces in the bucket easily.

The toy is introduced to be appropriate for children older than 6 months, on the package. It promotes children's physical abilities by directing them to manipulate the pieces in order to put them through the holes whereas it enhances eye-hand coordination and spatial information. The shell structure of the pieces makes the handling easier for the children with poor fine motor abilities. The children also gain timed release abilities, which helps them to learn how they control their environment (www.ableplay.org, 23.07.2007).

The toy gives stimuli in visual (colours and shapes), tactile (the feeling of weight and texture) and auditory form when the pieces are dropped into the bucket. The concepts of colours and shapes can be taught by using different play ideas and by asking the child to name these concepts; the communicative skills are also promoted.

The simple and uncomplicated design of the toy encourages the children to operate it without guidance. The multiple play ideas that are offered by the toy prevent frustration. The direct results of the tasks give strong feedback to the children, that supports cognitive development. The toy offers the play idea of putting the pieces into the bucket from the holes on the top. Besides this,

- naming the colours and shapes,
- grouping the pieces according to their colours and shapes,
- using the pieces as building blocks and
- counting the pieces can be additional play ideas.

Furthermore, the educators place the pieces on the fingers of some of the children in order to make them hold their hands open and steady.

The features and benefits that are listed above and the durable structure of the toy make it appropriate for special education consequently it has been used by all of the educators in most of the lessons.

4.5 Levels of the Subjects and the Requirements of Interaction

The toy used in the study covers a wide range of an educational phase, from where children learn to respond to basic directives to where they carry out more complex activities. Therefore, educators in Akademik Adım group their students at preschool stage under three different levels: basic, intermediate and advanced.

Basic Level: Children that use the toy at the basic level are able to respond to basic directives such as “take”, “give” or “put”. In this level, even holding the piece and distinguishing the colours are sufficient tasks for rating the toy as appropriate. Subject 1 uses the test material at basic level.

Intermediate Level: At the intermediate level, the children can respond to more complex directives such as “put the piece through the hole” but still have difficulties in both colour and shape recognition, also having physical impotence. Subjects 3 and 4 can be grouped as intermediate level users.

Advanced Level: The last level contains advanced users who have completed the recognition tasks of colours and shapes separately and are now studying on the final tasks which demand both shape and colour recognition at the same time. They also have fine dexterity abilities. The appropriateness of the toy for Subjects 2, 5 and 6 can be evaluated at this level.

The six subjects, who took part in this study, are rated as at the same educational level which is preschool. Table 8 shows the levels of the

subjects as rated by the teachers. Therefore the subjects were observed with their level in consideration.

Table 8 Subject Levels

	Basic	Intermediate	Advanced
SBJ.1	X		
SBJ.2			X
SBJ.3		X	
SBJ.4		X	
SBJ.5			X
SBJ.6			X

Profoundly preschool level has many steps and covers a wide educational period in which the subjects are at different levels (Murat Sezgin, 03.07.07). Due to this, the interactions between the toys and the children have to be evaluated with considerations of their different levels and the ratings of appropriateness of the toy have to be parallel with the requirements of their levels. The following table of requirements (Table 9) is built with the help of educators for this study. These requirements are physical, sensory, cognitive and communicative skills that the children are expected to perform in their interaction with their teacher and the toy used in the study during the observed lesson. In the observation sessions the fulfilment of these requirements were sought for in the interaction between the subject, the toy and the teacher.

Table 9 Required Skills of the Levels

LEVELS/ REQUIREMENTS		BASIC	INTERMEDIATE	ADVANCED
PHYSICAL	Holding the piece	√	√	√
	Manipulating		√	√
	Time release		√	√
SENSORY	Colour distinction		√	√
	Stimuli response		√	√
COMMUNI CATIVE	Eye contact		√	√
	Emotional expression		√	√
	Answering questions		√	√
COGNITIVE (FOLLOWING the DIRACTIONS)	Look	√	√	√
	Listen	√	√	√
	Hold / Drop	√	√	√
	Show (point)	√	√	√
	Take	√	√	√
	Give	√	√	√
	Put into the bucket		√	√
	Select colours (recognition)		√	√
	Select shapes (recognition)			√
	Select both colour and shape (recognition)			

4.6 Observation Notes

In order to make the data obtained from the observations easy to follow, the recordings are structured by using tables that contain three columns including the directives given by the educator to the child, the response of the child and the comments with possible design clues. The steps of the tasks can be followed through the rows.

Table 10 Subject 1 / Observation Record

SUBJECT 1 (Basic Level) RETT'S SYNDROME Age: 6 Gender: Female		
DIRECTIVES	RESPONSE	COMMENTS
Introduction of the materials (verbally and by hitting the pieces on the table) by the educator.	No response after a short glance (keeps playing with her fingers).	Gaining the child's attention is hard. Suggestion: adding sound.
Calling her name and holding her hands to keep on the table.	Glances at educator for a few seconds.	Preventing her from playing with her fingers helps gaining attention. Suggestion: keeping hands occupied on toy.
Placing red cylinder piece in her hands and giving "hold" directive.	Giggles and shakes the piece up and down.	Getting tactile stimuli keeps her concentrated. Suggestion: Adding more tactile stimuli.
Guiding to complete the task "Stop shaking, put in the bucket".	Hits the piece on the table accidentally; is alarmed and lets go of the piece.	The child is so nervous, that concentration is lost. Suggestion: Preventing sudden stimuli.
Re-giving the piece and repeating the "hold" directive.	Closes hand with assistance of the educator and waits for the directive.	Needs directive to continue the task. Suggestion: The relation of the piece and the hole needs to be emphasized.
Assisting the child to place the piece on the hole and giving "drop" directive.	Opens the hand and lets the piece drop without manipulation for correct positioning.	Educator decides that placing the piece into the hole is too much for her.
Repeating the "hold" directive, reinforcing it by pointing at the piece.	Picks up the pointed piece and keeps it in hand.	Not motivated to go on with the task, even does not remember.
Verbally directing to give the piece.	Holds the piece without response.	Loss of concentration. Suggestion: Continuous stimuli.
Holding the child's hand and dropping the piece together.	Glances at educator's face instead of the toy.	The child is now far away the task. Suggestion: Reminder for the task.
Placing two pieces on table and directing to pick the red one.	Stares at the educator's face while playing with fingers.	The child has to be directed again.
Pointing to the red piece and repeating the directive.	Raises hand to pick and waits for confirmation.	The child has to be confirmed to complete the task.
Confirming the child and assisting her to place it on the hole.	Drops the piece but again without manipulation.	The child completed the task according to her abilities.

Table 11 Subject 2 / Observation Record

SUBJECT 2 (Advanced Level) MR Age: 4 Gender: Female		
DIRECTIVES	RESPONSE	COMMENTS
Educator includes the child in preparation of the toy.	Takes out the pieces unwillingly and points at another toy.	She perceives the activity as <i>lesson</i> and wants to <i>play</i> with another toy. Suggestion: Increasing playfulness.
Puts a yellow and a red piece closer to her and asks her to name the colours	Says "saah" for yellow (sarı) and "mmbaahh" for red (kırmızı).	The answers are correct but her pronunciation is poor.
Congratulates her by saying "Well done!"	Smiles and turns back to the rest of the pieces full of interest.	Positive feedback motivates the child's concentration. Suggestion: Positive reinforcement.
Directs the child to "give" the yellow piece.	Gives the piece without hesitation and points at the other toy again.	She wants to play with other toy as a reward. Suggestion: Including rewards for motivation.
Rejects her.	Gives out cry like sounds and turns the face to other side.	The child fully loses concentration when rejected.
Persuades the child to go back to the task and wants her to "put" a red piece.	Picks up the red piece and places it correctly on her third trial.	The child seems not to be capable of matching the shapes yet.
Continues with "placing" the red pieces.	Raises her hand but hesitates at choosing.	The child needs encouragement.
Places a red piece closer to her for providing assistance.	Places the rest of the pieces without hesitating on colours.	Confirmation helps the child finish the task.
In the same task...	Places a cylinder piece into the square hole.	The toy has dimensional design problems. Suggestion: Preventing misleading designs.
Asks the child to "show" the <i>blue cylinder</i> .	Gets confused and leaves the task.	It's too much for her to identify both the colour and the shape at the same time in this level.
Insists on the previous task.	Pushes the bucket away and cries.	The child loses concentration and interest because of failure. Suggestion: Preventing negative feedback.

Table 12 Subject 3 / Observation Record

SUBJECT 3 (Intermediate Level) HYPERACTIVITY Age: 8 Gender: Male		
DIRECTIVES	RESPONSE	COMMENTS
Educator gains the child's attention by shouting "Shut up, listen!"	Becomes silent and looks at the bucket.	Preparing him for the lesson is difficult Suggestion: Appealing toy.
Takes out the pieces one by one.	Helps to take out the pieces impatiently.	<i>Impatience</i> is the key word for his education.
Quickly places two pieces in front of him and asks him to name the colours.	Names red (kırmızı) as "kırııızi" and yellow (sarı) as "saagaa".	The educator has to be quick in order not to give intervals, which cause attention loss.
Directs him to choose one piece and place it into the bucket.	Grasps a piece and tries it on all of the holes for 1 second each, successively.	His impatience prevents him to stop, think and match the shapes.
In the same task...	Pushes a cylinder shape through a square hole.	Succeeds by pushing hard. Suggestion: Preventing misleading of the toy.
Tries to ask the colours by interrupting him.	Without listening continues to put the pieces into the bucket.	Rejects to perform the activity in the directed way. Suggestion: Meaningful free play activities.
Insists on naming the colours and takes back the piece.	Shouts at the educator "Give!" for several times and raises his hand to hit the educator.	Does not like to be interrupted and gets angry easily.
Tries to change his way of communication from "Give!" to "Please give me the piece."	Goes on shouting and throws away whatever he can reach.	Looses control.
(after two minutes of quarrel) Asks him to pick up the pieces he threw.	Calms down and asks if they will play football if he picks the pieces.	Needs motivation all of the time.
Points at a green piece and asks him to name it.	Answers "Red!"	It takes time to regain his attention on the task. Suggestion: Intervals between tasks.
Corrects the answer and repeats the same question.	Gives the correct answers and without directive pushes them through holes.	He wants to complete the task immediately. Suggestion: Short tasks.
Allows him to finish putting all the pieces.	Pushes the pieces through the holes with less false trials.	When he is allowed to finish the task in the way he wants, he seems to be more successful. Suggestion: Informing what is ahead.

Table 13 Subject 4 / Observation Record

SUBJECT 4 (Intermediate Level) DOWN'S SYNDROME Age: 10 Gender: Female		
DIRECTIVES	RESPONSE	COMMENTS
Raises the child's head and introduces the material.	Gives short glances at educator and reads lips.	The child has to be prepared physically for the lesson.
Illustrates the task by putting the first piece into the bucket.	Watches carefully and nods head.	The task has to be demonstrated for her. Suggestion: Visual information, modelling.
Directs the child to take a piece and put it into the bucket.	Takes a piece and while trying to place through the hole, taps it on the bucket first then on the table.	The sounds distract her from the task. Suggestion: Adding sound as an end result of the task or preventing distracting sounds.
Warns her not to hit the piece.	Stops hitting and just stares at the educator.	The child has to be reminded to go on with the task.
Repeats the "place the piece" directive.	Continues with the task skilfully and through the correct hole at the first try.	Looses concentration easily. Suggestion: Motivation with auditory stimuli.
Keeps the child's attention on the toy by hitting on the bucket with her fingers continuously.	Puts the pieces through the holes successively.	Keeps attention when alerted with continuous stimuli by the educator. Suggestion: Self alerting toy.
Encourages her by saying "Well done!" and directs her to go on with the task.	Takes a star shaped piece but fails in manipulating it with one hand.	The left hand is always occupied with her hearing aid. Suggestion: Including both hands in the task.
Repeats the directive and takes her hand from her hearing aid.	Begins to tap the piece on her head and knee.	Looses attention when cannot succeed for a certain time, also when her habit is interrupted.
Insists on the directive	Lets go the piece by mistake and throws one more willingly to hear the sound again.	Sudden sounds get her attention. Suggestion: Including these sounds in the toy itself or preventing them when required.
Warns child not to throw the pieces while holding her chin and repeats the directive.	Looks at educator's face and lowers the head again.	The child seems to have forgotten the task. Suggestion: Short un-interrupted tasks.
Holds her chin and raises the head to repeat the directive again.	Gains back concentration and puts the pieces successively and quietly.	The child needs to be reminded of the task.

Table 14 Subject 5 / Observation Record

SUBJECT 5 (Advanced Level) CEREBRAL PALSY Age: 11 Gender: Female		
DIRECTIVES	RESPONSE	COMMENTS
Educator places the pieces on the small table which is mounted in front of the special chair.	Noddes head and waits for the directives.	The child looks at the toy confidently.
Asks the child to name the colours of the pieces.	Points the pieces with her palm and names the colours correctly.	Colour recognition task seems to be achieved by the child.
Continues with the directive of putting the pieces into the bucket.	Grasps the first piece clumsily.	She has to be supported while carrying the piece to the bucket.
Assists the child by holding her arm and wants her to place the piece.	Directs to the correct hole but fails in manipulating the piece and the bucket slips a side on the table.	She can match the shapes but needs the toy to be stable. Suggestion: Non-slip material or surface.
Helps the child to put the piece through the hole.	Smiles when the piece drops into the bucket and tries to get the next piece without a directive.	She seems to be fully concentrated on the task.
Encourages the child to put it through the hole.	Carries the piece by putting her finger into the hole under the piece.	Finds better ways to carry the pieces. Suggestion: Adapting the toy according to the child's abilities without preventing skill improvement.
Gives less assistance while putting the piece through the hole.	Places the piece into the bucket and smiles while saying "çaak!"	Improves her skills and success makes her happy. Suggestion: Encouraging tasks.
Gives her a cylinder piece which does not require rotating in manipulation.	Directly takes the piece to the round hole.	The educator tries to prevent continuous failure. Suggestion: Easier tasks as interventions of the main task.
Encourages her to put the piece by herself this time.	Tries to use her both hands but her slanted sitting position does not allow.	The child needs a better supported sitting unit to use both hands.
Insists on giving her no assistance.	Places the edge of the piece on the hole and drops it by hitting with her finger.	Success makes her motivation stronger.
Helps the child to finish the rest of the pieces.	Places the pieces into the bucket with assistance and names the colour without being asked with a directive.	She develops her motor skills with this toy and she seems to like it.

Table 15 Subject 6 / Observation Record

SUBJECT 6 (Advanced Level) AUTISM Age: 4 Gender: Male		
DIRECTIVES	RESPONSE	COMMENTS
Educator introduces the task by showing the toy to the child.	Stares at the educator without blinking his eyes.	He stays still usually. Suggestion: Alerting the child.
Places a red and a blue piece close to him and wants him to give the red one.	Seems not to hear the directive and keeps staring.	The child needs stronger stimulation.
Pinches his nose gently while calling his name and says "Give the piece!"	Blinks his eyes and hands both of the pieces to the educator.	He can not remember the directives that were given while he was <i>not focused</i> .
Repeats the names of the colours and again asks him to give the red piece.	Looks at the pieces and gives the correct one to the educator.	He needs time to decide.
Holds the child's hands and tries to clap to congratulate.	Tries to keep his hands closed strongly.	He refuses strongly directed tasks. Suggestion: Playful activities.
Asks him to take a green piece and put it into the bucket.	Picks the piece quickly but waits on the hole without manipulating the piece.	He seems to get used to assistance.
Explains to observe the different rotation angles needed by the pieces for manipulation.	Places a star shaped piece without a directive and stares at the educator's face.	The concentration of the child is ruined by the interval. Suggestion: Short intervals.
Holds from his chin and wakes him up by calling his name loudly.	Blinks his eyes and gives answers to the questions.	Needs to be alerted after each interval. Suggestion: Continuous stimuli.
Gives a square shape in his hand and directs him to put it into the bucket.	Brings it at the correct hole but does not manipulate it.	He seems to get used to being assisted.
Gives another square piece and says "Put it by your self!"	Finds the correct hole with help and manipulates it by using his both hands.	Self success motivates him and wakes him up completely. Suggestion: Positive/Strong feedback.
Asks him to name the colour of the piece in his hand.	Answers correctly.	He does not need a directive to take the next piece.
Says to him "Put it into the bucket!"	Says "Put it!" and puts it successfully.	He repeats the first parts of the long sentences.
Directs him to complete the task by putting all of the pieces left.	Uses his both hands and keeps repeating the words of the educator.	When he is well concentrated, he completes the task in a short time.

4.7 Evaluation of the Toy for Each Child

Subject 1 (Rett's Syndrome, Basic Level): Most of the educational aspects have to be excluded from the evaluation of the material for the first subject since she uses it at the basic level. The material is used as a tool for teaching the basic directives (take, hold, give, etc.) and the pieces in the adequate size for hands and bright colours make the toy appropriate for the aim.

The holding action also serves for occupying her hands in order to make her give up her habit of playing with her fingers harshly. The basic shell structured piece may be developed to occupy hands in a better way, which may also be helpful for children with poor fine motor abilities such as Subject 5 with cerebral palsy and other children who have repetitive habits that not only occupy their hands but also gets their attention from the task to unrelated actions. On the other hand, this time consuming quality may be distracting for children in higher levels like Subject 3 (hyper activity) who shows impatience in completing tasks.

The child, since she only studies basic directives, cannot see any relation between the pieces and the holes. She interacts individually with the pieces; consequently the bucket remains as a separate item and she cannot understand and carry out the task (putting the piece into the bucket), which has to be performed by the educator. The educator decides it is early for her to follow the directives of the next levels.

Subject 2 (Mental Retardation and Communication Disorder, Advanced Level): This subject uses the toy in advanced level and her communicative skills allow her to express her feelings about the toy, which are not positive. She perceives the toy as a material for being used only in lessons and she searches for more playful toys.

The child has achieved colour recognition, but the educators still use the toy in order to teach her colours and shapes in a combined task. She finds it boring to put the pieces into the bucket because she did it for several times successfully. The toy has to provide more actions to the child in order to gain her attention.

Subject 3 (Hyper Activity, Intermediate Level): The toy cannot attract the attention of this subject, either. He has to be directed for several times to focus on the toy. When finally he does focus on the toy, he wants to play with it as he wants without any interruptions. He ignores the questions of the educator about the colours and shapes, because the only thing he wants is completing the task as fast as possible and leaving the toy a side. He cannot focus on both the physical and the cognitive aspects of the tasks.

Also within the task, he shows great impatience and tries the pieces on each of the holes for less than a second. He does not stop and match the shapes by thinking. As he pushes the pieces harder through the holes, he finds a design mistake on the toy, which is that some of the pieces can be pushed into the bucket through incorrect holes. These kinds of errors are misleading and give completely wrong feedbacks to the children so they have to be prevented.

This subject seems to be interested in completing the task and passing to another task immediately. Therefore, any questions asked to him during the task become obstacles. His tasks need to include the integration of physical and cognitive activities. Also, being informed about the next activity calms him down.

Subject 4 (Down's Syndrome, Intermediate Level): Besides Down's syndrome the subject has hearing problems so she needs to be informed

about the tasks visually. She may follow the directives by reading lips but modelling is more efficient for her.

Since she can hear loud sounds, she continuously searches for auditory stimuli; as a result she hits the pieces on the table to make sound. For the same reason, as it makes a sound, she plays with her hearing aid and this occupies one of her hands continuously. The educator keeps her attention on the toy by tapping on the bucket, which also shows the place where the pieces in hand are going to be pushed from.

Subject 5 (Cerebral Palsy, Advanced Level): This subject is an advanced user and she likes playing with the toy. Subject 5 is about to achieve the cognitive tasks, but she still has to develop her physical skills.

The child is so motivated to play with this toy that she finds alternative holding ways to make it easier for her. The holes under the pieces invite her to hold the pieces by putting the index finger inside.

Since the child plays with this toy on a small table, which is a part of her special seating unit, and her fine motor abilities are not developed, the bucket needs to be stabilized by the educator.

Although she faces with usability problems while interacting with the toy, she enjoys playing with it, which is proven by her display of happiness after placing each piece. The transparent bucket shows the dropped pieces and this positive feedback is strengthened by the sound it makes.

Subject 6 (Autism, Advanced Level): The last subject is completely attracted by moving and especially turning objects as a consequence of autism. This *stable* toy needs to be introduced by the educator for several times in order to gain his attention.

Despite his attention problem, the child is an advanced user of the toy. He can manipulate the pieces and recognise the colours. On the other hand, he seems to get used to assistance of the educator while completing the tasks because he brings the pieces near the holes, positions them correctly but staring at the educator's face he waits for approval before dropping.

The child frequently loses attention and stays still without giving any response. The educator has to alert him by sound and also by touching him. The silent and stable toy cannot alert the child again after those intervals.

4.8 Discussions

Throughout the observations and discussions with the special education specialists, it was explicitly outlined that each child has a unique interaction with the selected toy. Although the performed tasks were identical, each child responded differently. The assistance given by educators, the expectations and the directives were adapted according to the children's abilities and needs.

Since each child has incompetence in different fields, various usability problems were observed. However, adapting the play ideas for children's individual educational needs and supports given by the educators compensated for these shortcomings. Furthermore, the selected toy offered a wide range of play ideas, which can be rated as appropriate for each level of the subjects' educational stage.

When the toy is evaluated for each child, apart from the support given by the educators, usability problems become obvious in solitary play. The subjects with physical disabilities encountered physical usability problems while holding the pieces or manipulating them through the holes. Subjects with sensory problems searched for sensorial stimuli during their play, but

the stimuli were not adequate, except for the bright colours of the pieces. Those bright colours and shapes of the pieces explicitly served for the cognitive tasks and were easily distinguished by all the subjects.

From the educators' side, the toy was rated to be one of the most appropriate toys for this educational stage. The reasons given were:

- potential of creating various play ideas,
- robust design,
- improving a wide range of abilities,
- playfulness.

The educators added that, the toy was easy to control while using with children that have aggressive behaviour; on the other hand, they face stabilization and controlling problems while studying with children having CP or similar motor handicaps.

As a result of the observations and during discussions with the educators, the toy was evaluated in detail and some suggestions were built up. These suggestions will be presented in the final chapter as design implications.

CHAPTER 5

CONCLUSION

This study was carried out with the aim of investigating the effects of different special needs on the interactions between the children with various disabilities and their common educational materials used in preschool level. The *causes* in the differences between the interactions were tried to be identified based on the various disabilities and personal differences. Finally, the effects of these causes were chased in the responses of the children during their education process.

In this last chapter, the study is concluded with answers to research questions, design implications, discussions on observing children with special needs and suggestions for further studies.

5.1 How children with varying special needs at the same educational stage interact with education materials

The answer to this question is given based on the study conducted. The results of the study show that each child has a unique interaction, which has to be evaluated separately according to personal characteristics and abilities. The problems that are faced by the subjects during interaction with the toy are summarised in Table 16.

Subject 1 (Rett's Syndrome, Basic Level): Subject 1 interacts with the toy by the help of educator because she does not show intention for play.

The educator gains her attention by hitting the piece on table in order to provide her auditory stimuli and also keeps calling her name.

The child responds to basic directives and *takes*, *holds*, and *gives* the pieces successfully. The use of the toy helps to prevent her habit of playing with her fingers. She holds the pieces for more than ten seconds, which she could not do 3 months ago. She shakes the piece up and down when feels it in her hand.

It is decided that passing to the next task, which is putting the piece into the bucket, is early for Subject 1 so the educator does not direct her to manipulate the piece for the correct position. Instead, the educator holds the child's hand and they put the piece together for only preparing her to the task.

Problems that Subject 1 encountered: During interaction with the toy, the problems that Subject 1 encountered, due to design features of the toy are letting the piece go because of her loose holding ability and getting alerted by the sudden sound that comes out when it is hit on the table by accident.

Subject 2 (Mental Retardation and Communication Disorder, Advanced Level): During interaction, Subject 2 showed unwillingness to play. She did not speak but by pushing the toy a side, turning her face away and crying, she presented her displeasure.

She completed the physical tasks successfully without any manipulation problems. The cognitive tasks were completed as well, but with support and encouragement of the educator because she tried to reject the directives. She demanded to play with another toy as a reward of the completed tasks.

Problems that Subject 2 encountered: Subject 2 does not find the toy playful and searches for different actions. She pushes a cylinder piece into a square hole and succeeds.

Subject 3 (Hyper Activity, Intermediate Level): Subject 3 has to be persuaded to begin the task by promising about further activities such as playing football. After beginning the task he does not like to be stopped and wants to finish it as soon as possible.

The questions about colours and shapes seem to be obstacles for him to finish the physical task and he refuses to answer them. Within the physical task, he is impatient too. He does not stop and think for manipulating the pieces correctly. He pushes the pieces very hard and tries them on the holes very quickly.

Problems that Subject 3 encountered: Subject 3 pushes a cylinder piece into a square hole and succeeds. He cannot concentrate on both the physical and the cognitive tasks. When the educator insists on asking questions he loses control and throws the pieces around.

Subject 4 (Down's Syndrome, Intermediate Level): Besides verbal instructions, Subject 4 needs visual modelling of the task. She can follow the directions until a distracting sound comes from the pieces, which draws her attention. She searches for more auditory stimuli by hitting the pieces around.

The educator keeps her attention on the toy by hitting on the top of the bucket and the child performs the task successfully if her hands are not occupied with her hearing aid.

Problems that Subject 4 encountered: Subject 4 searched for auditory stimuli within the task but could not find any, so she hit the piece, which is in her hand, on table, her head or knee. The educator had to re-motivate her for the task.

Because she played with her hearing aid with one of her hands, she faced problems while manipulating the pieces with her single hand. When the educator took her hand from the hearing aid to the piece, she lost her concentration.

Subject 5 (Cerebral Palsy, Advanced Level): Subject 5 completed the cognitive tasks successfully with some sort of differences from other users, such as instead of *putting* the piece into the bucket she *points* it with her palm and names the colour.

The educator still uses this material not for teaching her concepts but for improving her basic motor abilities. As she has been using the toy for a long time she finds better holding ways and tries to complete the tasks willingly. On the other hand, the toy slips aside when she puts her arm on the bucket while trying to position the piece on the hole and the educator helps her by holding the toy in position.

Problems that Subject 5 encountered: Subject 5 cannot use the toy without the help of the educator who holds the bucket in position. In addition, the child faces difficulties while holding her arm up to the top of the bucket, which is placed on the specialized table and becomes higher. Furthermore, one of the child's hands is occupied with supporting herself as a result of her slanted sitting position.

Subject 6 (Autism, Advanced Level): The toy does not get Subject 6's attention and the educator introduces it to the child for several times

because the child is in some kind of a sleep and does not give any responses.

When the educator manages to focus the child's attention on the toy, the tasks are easily performed. However, the child waits for assistance while putting the pieces through the holes and stares at the educator's face for confirmation before releasing the piece. He recognizes the colours' names and is good at manipulating the pieces.

Problems that Subject 6 encountered: Subject 6 is an advanced user so he can follow the directives and complete the tasks successfully unless he loses attention. The toy does not provide enough stimulation for alerting him.

Table 16 Problems faced during interaction with the toy

	Physical	Sensory	Cognitive	Communicative
Subject 1	Child holds pieces loosely. The pieces do not provide alternative holding ways.	Pieces make sudden sound when accidentally falls or is hit. This is a result of the pieces being shell-like and also due to the material used.	The educator has to repeat the directives.	
Subject 2				The child does not find the toy playful enough. She demands new activities from the toy.
Subject 3	The child cannot spare time for manipulation and therefore		The child cannot focus on the task. The child is more	The child tends to lose control and throws pieces when

	matching the pieces with the holes. The toy has to be error-free, and motivate self-correcting.		interested in physical activities and is bored of sitting for more than a few seconds.	insisted on the cognitive tasks. The toy needs to integrate physical and cognitive tasks. Also it should be safe against being thrown.
Subject 4	The child has poor manipulation due to using one hand only. The toy should encourage the use of both hands.	There is a lack of auditory stimuli from the toy.		
Subject 5	The toy remains high for the child who sits slanted on a specialised chair. It also needs to be stabilized not to slip away.			
Subject 6		The toy does not contain alerting stimuli and therefore does not gain attention of the child.		The child is not alerted by the toy; the toy is motionless.

5.2 Making the design of a special education material suitable to the interests and abilities of children with varying special needs via design features

Design of a material for special needs requires an understanding of toy-child interaction under the effects of various disabilities. Throughout the design process, the special education counsellors and child development specialists have to be consulted while the designed materials have to be tested by children in their environment.

Inevitably, the problems faced by the children during the use of the toy in the study and the evaluation of the results roused up ideas for design solutions. At this stage, since those design *ideas* have not been developed and tested, suggestions on basic features of the toy and similar products are given. The suggestions derived from observations are grouped according to four ability categories: physical, sensory, communicative and cognitive, and are given as design implications.

The following suggestions are noted during the toy evaluations in Chapter 3 and observations carried out in the study. Some of them are directly related with the case specific problems but many of them describe general design features for children with special needs.

5.2.1 Physical Suggestions

Non-slip material or surface: Subject 5 had poor fine-motor skills and had difficulties in controlling her arm movements. This also obstructed her interaction with the toy, as she involuntarily hit the toy and pushed it away during play.

Stabilizing the toy on a slip resistant surface could provide ease for keeping the toy in position during the play of children with physical

impairments. This can be done either by placing a slip-resistant mat on the tabletop, or with a slip-resistant stopper placed under the toy.

Alternative holding solutions: Subject 1 resisted to hold the pieces whereas Subject 5 faced with holding problems and found alternative holding types for herself.

Children with poor fine-motor abilities have difficulties in holding the pieces. Also at the beginning of the education some of the children completely reject to hold pieces. Considering these various needs, external holding aids like small belts with Velcro or hooks may be added on the pieces, which will enable children to perform the tasks and as they develop their skills, these aids can be removed.

Keeping hands occupied on toy/including both hands in task: The left hand of Subject 3 was mostly occupied with her hearing aid and Subject 1 faced a similar problem during the lesson. Educators tried to keep both hands of the children on the toy.

Distracting actions such as repetitive habits of money counting movement or playing with something else prevent children from completing the required tasks. Providing activities that demand usage of both hands may be a solution for this problem. It may also increase concentration and manipulation skills.

These activities may demand tasks that require the use of hands successively, or at the same time within a task. For example, related to the toy used in the study, the child may have to open a cover over the holes with one hand while the other hand manipulates the piece.

Children with repetitive behaviour problems may give up their habits by the help of these kinds of solutions with a more playful way rather than the rehabilitation aids, which do not allow them to move their fingers.

5.2.2 Sensory Suggestions

Altering stimuli channels: It was observed during the study that Subject 4 was searching for auditory stimuli because she had a hearing problem. The sound created by the educator while tapping on the bucket significantly helped the child to complete the task.

Children with sensorial impairments need stimuli that are appropriate for their skills. Seeing that those children use toys commonly as educational materials, stimuli channels have to be altered. By this way, the toy will gain a wider range of skill improvement.

Adding motion to the material: Similar with the other subjects, Subject 6 has motivational problems. He loses his attention and begins to stay still while interacting with the toy. His educator has to remind him about the task and also mostly needs to touch him and call his name loudly.

Although it is not tested and may turn out to be a wrong approach, the turning movement that keeps the attention of children with autism may be used within the educational materials in order to alert them and help them focus.

Gaining the attention of children on the toy is a difficult process for the educators. Adding an unexpected motion that is controlled by the educator, to the toy may help this process at the beginning of the lesson and whenever they lose their attention. For example, a lid on the toy may open unexpectedly for the child and reveal the pieces inside.

Preventing sudden and distracting stimuli: Subject 1 gets alerted by the sudden sounds and lets the piece in her hand go.

Since children with special needs are sensitive and have difficulties in adapting to an environment, making the toy trusty and not letting it distract the child's attention is important.

Using materials that will prevent sounds to come out when the pieces are hit somewhere accidentally may be a solution. At this point, the unexpected motion, that is suggested to be added previously, may contradict with this idea. So, both of these ideas must be tested for using conjointly.

Continuous alerting stimuli: This may be a suggestion for keeping the child's attention on the material like the educator did for Subject 4 by tapping on the top of the bucket. It may also help the child to find connections between the parts of the tasks by following a sound or light.

5.2.3 Communicative Suggestions

Increasing playfulness: Children, like Subject 2, who has successfully completed many of the tasks that the toy provides begin to see the toy as "a material for the lesson" and do not find joy in it. A self-improving toy that provides more advance activities may be found more playful and challenging.

Making the toy more appealing aesthetically for the child and providing free play activities will increase playfulness and promote interaction between the child and the toy. Also, the toy should allow imaginative and creative play ideas that the child can perform in solitary play, besides play with the educator. This may help the child see the toy as a "play material" rather than an "educational material".

Motivating through the activities that the child likes: Subject 3 demands activities that he likes, such as playing football, from the educator and Subject 2 points at another toy which seems more interesting to her.

Including these kinds of specific interests into the educational materials may increase the motivation of the children. Adding images of various concepts (football, family members, etc.) or integrating the tasks in different activities (singing, sports, etc.) can be suggested.

5.2.4 Cognitive Suggestions

The relation between the hole and the pieces: Children with poor physical abilities, similar with Subject 1 and Subject 5, lose so much time at the first stage of the task, which is responding to the directives “take” and “hold”. Consequently they forget the rest of the task and have to be reminded by the educators.

Building a visual, tactile or auditory relation between the pieces in hand and the target places, like holes in this toy, will help children to follow the tasks from beginning to end. For example adding colours around the holes that match the colours of the shapes or bonding them with pieces of strings may be helpful. Such a relation may also promote cognitive skills by reducing the educator’s support within the tasks.

Positive reinforcement (feedback): When children with special needs complete a task successfully, educators congratulate them and put into words the task they have completed (“Well done, you’ve put the red piece in the bucket!”) in order to reinforce their success. This reinforcement may be included in the toy by adding sound on the pieces that will tell the name of the colour or shape when dropped into the bucket, combined with altering stimuli such as flickering lights.

Besides the reinforcements within the tasks, feedbacks at the end of the tasks performed with a toy are also important. A closed, covered or changed toy will show that the task is completed by them and give children self-confidence and a sense of accomplishment.

Short activities with intervals: Subject 3 is tried to be motivated to do the task by directing him to name one colour at first, but then allowing him to put three more pieces, without naming any colours or shapes.

As children with special needs face with attention problems commonly, they should not be subjected to long and frustrating tasks. The activities have to be simple whereas the directives must be clear. If it is needed, the main tasks may be divided into shorter tasks. Educators use this method in order to prevent continuous failure or negative reinforcement.

Preventing misleading design mistakes: Because of dimensional errors, the cylinder pieces of the toy used in the study can be pushed through square holes, which cause children to be misled. In these kinds of toys, since the toy aims to teach basic shapes and matching, any mistakes will hamper the educational process of the children who need to get clear and intensive knowledge repetitively for a long time.

5.3 Reasons why children at the same mental developmental stage give different responses to the same education

The reasons for different responses of the children that cause unique interactions are searched for in the literature. Rather than exact answers, many arguments were found.

The arguments begin at the distinction of developmental characteristics of the children with disabilities whether following a similar path with delays or having significantly altering situations (Lewis, 1987). The responses

observed and mostly the physical capabilities of the children seem to support the second idea.

Another argument takes place in the emotional status of the children with disabilities (Kunnen and Steenback, 1999). The support of adults and special conditions may cause different behaviours such as getting used to the support and not having motivation for developing, or abandoning each failure to disability and again not having any motivation. On the other hand, there are also opposed cases that deeply believe in development and fight for it.

To conclude, being at the same educational level or having similar disabilities can only be the characteristics of superficial groupings for *user group* identifications. The special needs also include personal differences besides the kinds and levels of impairments.

5.4 How special education fulfils the needs of children with disabilities

The answer of this question is mainly in the definition of special education, which includes providing explicit and systematic instruction with intense individual practices in an appropriate environment for the special needs of each child (Vaughn, *et al.*, 2003). Besides, the observation results support and illustrate this fulfilment.

Educators can be nominated to be the heart of special education, who take care of every behaviour of the children and provide individual care. They compensate for the shortcomings of the materials and manage the lessons by selecting the most appropriate equipment for each child by monitoring their development carefully.

5.5 Discussions on Observing Children with Special Needs

Despite the shortcomings, such as limited time for observations and recording constraints, the study provided a scope for becoming acquainted with children in their education environment. Besides, the educators contributed with the information they gave and also with their interpreter role for the children's behaviours and reactions.

The lessons were performed as usual despite the existence of a visitor. Without any interruption and with gaining the least attention possible, the interactions were observed and recorded. The task with the selected toy was performed at the beginning of each lesson. During the task, the educators explained and underlined the characteristic responses of the children in order to help build a general understanding and right after each lesson, the performed tasks were evaluated collaboratively.

Considering the effects of children's disabilities on their social and communicative capacities, those who wish to conduct research need support from the educators in order to build an understanding of the children's behaviour. Gaining personal information and general knowledge about the disability of the child develops this understanding significantly.

As much as the communication skills of the children, the researcher's skills are also determinative in the study. Seeing that the children give natural responses to their educators, introducing the researcher as a *guest educator* may be a successful beginning. Although the child may become irritated at the beginning, the familiarity of the *educator* concept helps decreasing the effects of this uncomfortable visit of a third person.

Throughout the observation sessions, it was noted that the motivation and concentration of the children are the most sensitive parts of the lessons. As a result, all kinds of distracting activities such as video recording,

photograph taking or asking questions to the children directly in the middle of a lesson have to be avoided or at least planned and guided by the educators.

5.6 Suggestions for Further Study

A first suggestion for further study would be to develop design solutions from the suggestions listed in Section 5.2 and test them with children. Different to this study, the subjects may be chosen from among different disability cases from those in the six categories that have been observed for this study. Repeating this designing-testing sequence, the toy designs can be developed fully and appropriate to the special needs. This may also lead to the development of design methods that can be used in developing products for special user groups.

Instead of choosing one common material for the observations, observing interactions between the child and all materials that are used in the preschool level would provide a wider overview on the education process of children with special needs. This widened research area may be divided into sub studies that only focus on one disability case.

Within a similar scope, the user of the materials can be shifted from child to educator and the needs of educators can also be explored. Furthermore, with the role of interpreters of the children, the educators can be included in the design processes. This will contribute to build the bridge between the product designers, who need knowledge and support in special education, and specialists, who need products for the education of their children with special needs.

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APPENDIX A

NOTES ON SUBJECT 1 – 05.07.2007

Beginning Time: 10:30

Ending Time: 11:15

Disability: Rett Syndrome with Mental Retardation

Date of Birth: 08.01.2001

Gender: Female

Special Education History: She attends the classes in Akademik Adım since 01.07.2006 and she has been studying the basic directives such as “take” and “give” in addition to physical rehabilitation.

Educators’ Comments: Her prior problem is the habit of playing with her fingers which causes bruises and deformations on her fingers and also prevents her to do any activities with her hands while keeping her attention on the fingers continuously. They work on discarding this habit initially and also on basic directives.

Lesson: She came to the classroom from the family waiting room by holding the educator’s hand. She met me in the classroom and gave her hand to me after several directives of the educator, without looking at my face. Educator assisted her while sitting on the chair and talked to her about what they are going to do (“We will play with this bucket by putting all of the pieces into it...”) but she looked in front of her and kept playing with her fingers.

Educator took her hands and placed them on the table separately. She attempted to close her hands together but the educator insisted on keeping them separate both holding her hands and warning her verbally. After

gaining her attention by making eye contact she released her hands, but the habit came back instantly. This chain of action was repeated for several times.

Educator brought the test material on the table. She just glanced on them for a few seconds and began to stare at her hands again. The top of the bucket was opened by the educator and the pieces were taken out one by one making sounds by hitting them on table and informing her that they will put them all back to the bucket. She raised her head for a few seconds while the educator called her name loudly.

Educator took her hands again and placed them on the table and kept talking with her about the toy (“Do you see the pieces; there are pieces in different colours. Let’s put them into the bucket together...”). She did not respond but looked at the educators’ face for a longer time like 5 seconds.

Educator took the cylinder shaped red piece and put it into her hand. She did not begin to hold it before the educator said “Hold it!” and assisted to close her hand. A small giggling sound came out from her and she began to shake it up and down. The piece hit on the table and she opened her hand immediately when she heard the sound. Educator gave her the piece she dropped and assisted her again to hold it.

By holding her hand, the educator showed the round hole and said “Drop it here!”. She opened her hand clumsily and the first piece is placed in the bucket by the help of the educator. For the second piece, educator directed her to take the piece by herself. The educator repeated the directive several times and pointed her hand and the piece. She held the green star shape which was the closest piece to her. Because the educator thought that placing it in the bucket by herself was too much for her, the educator just wanted her to “Give!” it. But she turned her head to the other side and

did not respond. Finally, the educator and the child placed the second piece into its place together.

Educator placed the blue cube and the red cylinder in front of her. First she asked her to pick the red one a few times. Because she had returned to her fingers, the educator warned her and raised her head up again holding from her chin. She pointed to the red piece and said "This is red, pick up the red!". After the educator repeated the directive a few times, she raised her hand to pick but just stared at the educator's face without taking the piece. With the encouragement and confirmation that it was the right piece, she picked it but waited for the educator to help her again in putting it through the hole.

At the fourth piece, she lost her concentration fully as a result she did not respond to any directives and resisted to hold the given pieces. They again studied on placing her hands on the table and keeping them open for a while.

The educator placed two plastic toys which make sounds when squeezed. They worked on the "choose" directive. She did not choose it by using her hands because her hands were occupied, but she placed her head on one of them. The sound made her giggle and raise her head up.

They moved to the social and communicative studies by using a story book. She responds to the family member concepts and some animals especially to the cats. At the end of the lesson they stood up together and looked at the mirror for a while, she giggled at her image. Educator demonstrated her gross motor (dis)abilities by placing some toys on the floor and trying to pick them up together. She resisted bending forward very strongly and did not raise her head while walking out the classroom door.

APPENDIX B

NOTES ON SUBJECT 2 – 05.07.2007

Beginning Time: 11:30

Ending Time: 12:15

Disability: Mental Retardation and Communicative Disorder

Date of Birth: 28.05.2003

Gender: Female

Special Education History: She was brought to Akademik Adım on 01.06.2006 by her family for the reason that she can not speak at all. The test results showed that she was also suffering from moderate mental retardation which means her score in the IQ test was between 35 and 49. She began to use single syllables since that time but she can not speak fully yet. Her physical abilities are slightly below the ordinary level.

Educators' Comments: Although she does not have any hearing problem, she has communicative disorder and a mid-level mental retardation. By the help of special education support, she can say the first syllables of the words however she prefers communicating with signs. She does not have any physical disabilities but because of her mental condition she shows a developmental delay in general.

Lesson: She was sitting near her mother in the waiting room when we got there to take her to the classroom. She began to cry and run! The educator took the little girl in her arms and brought to the classroom but as long as she sat on the chair she kept crying again and ran to outside. Her mother explained that she was ill last night and did not sleep well so she was very grumpy.

After she was calmed down, we set around a table in the garden of the school. She was sitting quietly while the educator was introducing me. She just glanced at me and lowered her head again.

The bucket is set on the table and opened by the educator while she was giving the instructions on the task they will perform. Educator wanted help from her to fill-out the bucket; she began to take the pieces out of the bucket but did not pay much attention on the pieces. She pointed at an irrelevant toy that was left by another child near the table. Educator explained that she knew the difference between lesson and the real play and today she did not want to make anything about lesson. She just wanted to play with an irrelevant toy built up with wires and beads. She began to cry again, the educator talked to her and promised to play with her after the task. She said “Let’s *play* with this first, OK?” and she accepted by nodding her head.

The educator put one yellow and one red piece on the table and asked “Which colour is this?” successively. She said “sah” for the yellow (sarı) and “mmbahh” for the red (kırmızı). These answers were accepted because it was the way she can say the names of those colours. She became happy and smiled at the educator when she gained a positive feedback. “Give me the yellow!” said the educator and she gave it without hesitation. She began to point the other toy again. When rejected, she began to show displeasure and give out cry like voices.

The educator persuaded her again and asked her to put the red one in the bucket from the holes on the top. She picked up the piece and found the right hole at the third try. Educator continued with directing her to put all of the red ones into the bucket. She hesitated at first but after the educator helped her a few times by passing the pieces in front of her, she began to put them successively without any interval.

She pushed the pieces into the wrong places but some of the pieces dropped inside from the wrong holes consequently she kept on trying them into the wrong holes. The educator tried to ask her to show the “blue cylinder” but her mind was confused and she got bored of putting the pieces. Educator explained that it was too much for her to ask both the shape and the colour together at this level. This question made the task frustrating for her so she began to yell when insisted on the task. She pushed the bucket away from her and tried to go away from the table. For the reason that she was ill, the educator let her go to the waiting room where her mother was waiting for her.

APPENDIX C

NOTES ON SUBJECT 3 – 05.07.2007

Disability: Hyperactivity and Mental Retardation

Beginning Time: 12:30

Ending Time: 13:15

Date of birth: 13.03.1999

Gender: Male

Special Education History: He has been attending classes in Akademik Adım since 01.07.2005 and showed great success in language development. His hyperactivity affects his IQ test results which show variety but his score is definitely below 60. He is supposed to be taking medicine but the educators are not sure that his family gives him the medicine regularly.

Educators' Comments: Besides his hyperactivity, he has behavioural disorder. He has aggressive reactions and uses bad words most of the time. On the other hand, his cognitive skills are fine. He learns fast if he can concentrate on the lesson. His physical abilities are at the ordinary level.

Lesson: We met him while he was running in the garden; he stopped for a moment, told his name and began to run around again. When the time for the lesson came, the educator held his hand and took him to the classroom promising that after the lesson we would play football altogether.

He sat on the chair and began to talk about the children in the garden so loudly. The educator prepared him to the lesson by talking about the task that they will perform more loudly than him (Listen to me! Look at the

bucket! Shut up and listen! We will play with this toy now and if you do well we will play football!”). After a few more promises about playing football he became silent and looked at the bucket on the table.

While educator was taking out the pieces one by one, he put his hand into the bucket and began to take them out faster. Educator took two different coloured pieces quickly and asked him in which colour were they. The “red” and “yellow” answers were right but there were some pronunciation problems like “kkııııǵǵmıızııı” and “saaǵaa”.

When he was asked to put these two pieces into the bucket he grasped one of them and began to try it for 1 second on each hole. He was so quick that the right hole was also missed. He pushed the cylinder shape into the square hole, and he succeeded. He wanted the rest of the pieces to put into the bucket, but the educator preferred to ask the colours first. He got angry and began to shout “Give!”. In order to manage his behavioural disorder, the educator ordered him to say “Please, give.” But he refused and began to use bad words and throw away whatever he could reach. This loss of concentration happened just 1 minute after the lesson had begun.

After the quarrel which took 2 minutes, he said calmly “Will we play football if I tidy up the classroom?” and stood up to get back the things that he threw, quietly. When they took their places again, the educator asked the colour of the piece which was green and was placed near a red piece. He said “Red!” and the educator corrected “No, this is green. The red one is this! Now, tell me, which colour is this?” and after the second rehearsal, he named the colours correctly and put the pieces in the bucket as fast as he did the previous ones.

Even he repeated his questions about playing football, he put all of the pieces in the bucket. He rushed, he pushed them hardly altering the holes

quickly but he managed to finish the task too fast. When he heard “Well done!” he stood up and ran to the window showing the children outside he began to shout again. He was called again to the table but he shouted more.

When the educator managed to make him sit again, she gave him five cubes with different pictures on each side. The educator pointed an umbrella and asked what it was. The answer was “Rain!” but when the rejecting answer came he corrected himself by saying “Umbrella!”. The educator gave him the cube and asked another picture which was a helicopter. He did not want to answer and began to talk again.

He did not respond when the educator shouted him back “Listen to me, shut up and listen!” and went on asking if we would play football or not for several times. He used bad words and the educator said she was not going to talk to him again and he would not be allowed to get out the classroom until he apologized. He repeated the bad words and the educator repeated her words. At the end, he calmed down again and apologized by giving her a kiss.

A jar which was full of coloured beads was set on the table this time. He was asked to line up the beads on a piece of rope. He took three beads from the jar and tried to line them up at the same time. Surprisingly, he did. He never stopped talking about the children outside.

Every time he gave up the rope the educator told him that he could not get out if the beads did not finish. He tied them up quickly but unwillingly. The educator wanted him to name the colour of the bead in his hand, but he did not answer. When the educator insisted, he threw away the beads and rope. The quarrel began again. He went near the window again while they were shouting at each other.

After he calmed down again he picked up the jar and began to put the beads into it which were spread around by him. When he was picking the beads, the educator asked the names of the colours. He could not give right answers consequently he seemed to forget the ones he could name at the beginning of the lesson.

He was answering all of the questions by putting the answer in the middle of his sentences about going outside. When he managed to calm down once more and gave each of us kisses, he was let to go outside. We saw him in the garden through the window, before the last sentence of the educator ended: "OK, you can go out and play football now!"

APPENDIX D

NOTES ON SUBJECT 4 – 09.07.2007

Disability: Down's Syndrome

Beginning Time: 15:00

Ending Time: 15:45

Date of birth: 06.06.1997

Gender: Female

Special Education History: In addition to her main disability, she has moderate mental retardation and hearing loss. Since the beginning date of her education (01.10.2005), she seems to have learned reading lips but still she can not speak at all. She responds the directives and learns easier if she looks at the educator's face consequently they work on her social and communicative skills intensively.

Educators' Comments: She uses a hearing aid and always one of her hand is occupied with the aid because she likes the sound it makes when it is slightly pushed a side. She holds the given things in her hand in a very short time but this is a one step forward level because she was not taking things into her hands at all when she began to special education. She is a very quiet and peaceful girl. She uses signs most of the time such as beating her knees when she can not be understood or giving out the "Aaağğhh!" voice.

Lesson: She was sitting on a chair next to her mother, looking at her shoes quietly when we entered the room to take her to the lesson. She gave short glances to the educator, when she hold her hand and helped her to stand up. We left mother behind and went to the classroom, again quietly.

She sat on the chair with a little support and after giving a short glance on the educator, she kept staring at the empty table surface while she was playing with the hearing aid behind her left ear. The educator explained that she preferred it to the one behind the right ear most of the time because she is a right handed person and has to perform tasks with her not-occupied right hand.

The educator put the bucket on the table and raised her head to make her see what she is saying. She informed her about the task that will be performed. The pieces were taken out by the educator and she was going to put them back into the bucket by using the holes on the top. The educator put the first piece into the bucket to illustrate what she was going to do.

The child took a piece skilfully and tapped it on the plastic surface that contains holes in order to put it through a hole but the sound that the piece made directed her to hit the piece on the table. She smiled at the educator while she was making a loud voice by hitting the piece on the table. The educator held her and said “No! Don’t hit it, put it in the bucket!” clearly to her face. She stopped and dropped the piece through the right hole without hesitation.

She put three more pieces successfully but with a few seconds of false tries at each holes. She gave a smile when she succeeded at the first try of the fifth piece. The educator said “Well done!” when she caught the child’s look.

She took a star shaped piece and tried it through all of the holes. Because she was playing with her hearing aid with her left hand, she made all the tries by using one hand. She could not manage to drop it into the bucket even from the right hole. She tapped the piece on her head and than on her knee. At that time, she dropped it on the floor by mistake. However she

liked the sound it made and threw one more piece willingly and gave out an “Aaagghhh!” voice with a smile on her face. Her smile went of when she looked at the educator’s *angry* face and lowered her head immediately.

The educator warned her not to throw the pieces by holding her head from her chin to make her look at her face. When the educator left her chin, she lowered her head again and starred at the pieces left, while playing with her hearing aid silently.

The educator raised the child’s head up once more and repeated the directives of “Take the piece!” and “Put it into the bucket!”. She seemed to be concentrated on the task again and began to drop the pieces from the holes. While trying to put the pieces into the bucket, she dropped some of the pieces on the table accidentally. Although the most entertaining parts of the task were those accidents according to her, she completed the task without hitting the pieces on the table again.

The educator brought five cubes and put them in a raw. She put one cube on another cube and said “Put all of the cubes on top of each other.” and took back the one she put. She grasped the cube which had 7cm edges, immediately. She could not carry the cube by one hand and it fell on the table. She grasped it again and hit it on the table a few more times. The educator took the cube from her hand and repeated the directives again.

She had to stop playing with her hearing aid to be able to hold the cube. When she put two cubes on each other she stopped and her hand went to her ear again. But as soon as the educator warned her not to play with her aid she turned back to the task and completed it in a very short time.

The educator took the cubes from the table while congratulating her. She continued the lesson with a puzzle of strawberries in different sizes with pegs on the pieces. While removing the pieces, she directed the child to

put the pieces into their places using a loud voice. The child looked at the educator's face unwillingly but when the educator gave the first piece in her hand, she began to rotate it to locate in the place. Instead of the peg, she preferred to hold the piece from the edges. She used her both hands and after a few turns she placed the largest piece successfully.

The educator had to give the second piece because the child did not continue herself. She tried to hold it from the peg but could not manage to rotate it accurately. By the help of her other hand she placed it into the socket but did not take the next piece again. She looked exhausted and began to give out sounds.

The following activity was drawing basic shapes by connecting the dots on the notebook. The educator gave her the pencil but she could not hold it as it was needed consequently they began to draw lines together. When the educator went near her and held her hand to draw lines, she turned her head away without looking at the notebook. She lost all of his concentration but the educator went on holding her hand and drawing lines on the notebook in order to make her got used to hold pencil.

The educator gave her a toy tambourine to play and regain her attention. She did not want to hold it in her hand and placed it on the table. While she was tapping on the metal pieces with her fingers, the educator brought the book of colours and they worked on showing the colour "red".

The educator used the sound making toys in order to make the child look at her face. When time went on she did not even respond to the sounds. The educator explained that the lesson that takes 45 minutes is too long for her.

APPENDIX E

NOTES ON SUBJECT 5 – 09.07.2007

Disability: Cerebral Palsy and Mental Retardation

Beginning Time: 16:00

Ending Time: 16:45

Date of birth: 07.12.1996

Gender: Female

Special Education History: She uses a specialized chair in the classroom to be supported while sitting. She has been attending the classes since 01.12.2005 but she began to speak four months ago, she has pronunciation problems but she can give out the words at least using first syllables. She has mild mental retardation which means her IQ is between 50 and 70, on the other hand her physical abilities are at the basic level. Developing her physical skills is the initial aim of her education.

Educators' Comments: Her cognitive abilities are fine so she can learn the concepts fast. Even her physical abilities prevents her from using the materials used for concept teaching, she is supported by the educators.

Lesson: Her father brought her to the classroom by carrying her in his arms and with the help of the educator he placed her on the specialized chair. The educator took her chair nearby and they began to talk about the daily activities she did. She gave me her hand when we were introduced to each other.

The educator said "Let's begin the lesson with this bucket." and took out the pieces from the bucket and placed them on the small table mounted in front of the child's chair. The educator directed her to put the pieces into

the holes which have the same shapes and explained me that she had learned both shapes and colours but they had been using this toy in order to develop her physical abilities and dexterity skills for more than two months.

The educator asked the child to show the red piece and the child pointed the piece with her palm immediately. The colour recognition task went on with the other colours and she answered all of them by pointing or by telling their names.

When they finished studying on colours, the educator said "Let's put these pieces into the bucket!" only one time. The child did not need the directives to be repeated but she needed time for reaching the pieces and holding them in her hand without letting them fall. At the time that she managed to grasp the first piece, the educator supported her arm to move through the bucket. The child tried the right hole but she could not manage to position the piece further more the bucket slipped a side and the educator hold it in its place. After a few more tries, the educator helped her to place it into the bucket.

They looked each other with smiling faces and the child tried to took another piece immediately. She turned the piece on its side by pushing it with her finger and held it by putting her index finger through the hole at the bottom of the piece. In this position she carried the piece to the bucket without help but she was supported while rotating the piece. She became very happy and we congratulated her by giving her five.

The educator gave a cylinder piece to her not to make her get exhausted by repeated failure of taking the piece and also she gave her the piece that does not require rotating in order to be placed. She encouraged the child to try this time by herself. She directly took the piece on the right hole and tried to position it clumsily. She tried to bring her other hand to change the

horizontal position of the piece to vertical but because of her slanted sitting position she could not manage it. She placed the edge of the piece on the hole and by pushing her finger she dropped it into the bucket on her own. She laughed loudly and the educator said “Well done!” while holding the child’s clumsy hand.

For the forth and the rest of the pieces they worked together to finish the task together. The child carried the pieces to the holes and the educator helped her to drop it into the bucket. She was naming the colours on her own even the educator did not want her to do.

The task with the bucket was over and the educator brought fruits and vegetables that are made of plastic. She put them on the small table and took a stack of cards with pictures of the pieces on the table. The educator was testing that whether she forgot the fruits and vegetables that she had learned last week. She gave 8 correct answers out of 10 cards and after the correction of the names by the educator; she could point the correct pieces.

The educator took back the plastic toys and placed small pieces of papers with numbers from 1 to 8 on them both in symbols and words. I was informed that she had begun to learn numbers two weeks ago and also she had been given homework about numbers.

The numbers 1, 2 and 3 were placed on the table and the educator wanted her to show one number at each time (“Which one is 2?”, “Show me the 3!”). She was giving the answers by pointing to the papers and the educator changed their places several times.

Finally they counted from 1 to 8 a few times together and the child counted alone a few more times. She skipped the 4 each time and had difficulties in

spelling “eight (sekiz)”. The child got very happy when the educator kept congratulating her and giving her five and hugs.

APPENDIX F

NOTES ON SUBJECT 5 – 19.07.2007

Disability: Autism

Beginning Time: 16:00

Ending Time: 16:45

Date of birth: 28.05.2003

Gender: Male

Special Education History: Since 01.06.2006, the child has been attending individual education classes in Akademik Adım. During one year period, he has become to be able to speak and developed his self care abilities such as having his meal by using spoon and wearing her shirt on his own. The basic colours and concepts, physical exercises to improve his fine motor abilities and animals are included in his current education.

Educators' Comments: He showed a successful development in his behavioural and social skills since he came to the school. To illustrate, used to bite his own hand and sometimes his educator's but today if you put your hand on his mouth; he kisses in stead of biting. On the other hand, his fine motor abilities are poor so he can not hold things in his hand especially the pencils. The educator has to fix the pencil in his hand using a type.

Lesson: When I entered the waiting room, there was a birthday party and all of the children were dancing. The educator pointed a child who was jumping up and down by holding another educator's hands. After the party was ended, we entered the classroom and the child took his place without assistance.

The educator wanted him to introduce themselves to me and said “Tell our names to our guest.”. He turned to me in his chair and told his name and his educator’s (Yeejla/Necla). He kept looking at me and the educator turned him to herself and asked questions about his mother and father in order to gain his attention. He answered the questions again turning to me but the educator raised her voice and said “Turn this side and put your hands on the table!”. The child seemed unhappy but exactly did what he was told to.

The bucket was placed on the table before the lesson so the educator began to take out the pieces and inform the child what he would do (“We will name the colours, let’s see whether you have forgotten them or not!”) without losing time. The child sat quietly and stared at the educator’s face without blinking his eyes.

The educator took one blue and one red piece and placed them closer to him. The directive of “Give me the red piece!” seemed not to be heard by the child. The educator pinched his nose gently and called his name to “wake him up”. The child smiled and the educator repeated only the “give” part of the directive (“Come on, wake up and give the piece to me!”). The child picked up the two pieces and tried to give both. The educator refused the pieces by holding his hands and putting them back on the table with the pieces.

The educator pointed to the pieces and reminded him their names (“No! This is blue and this is red. Now, give me the red piece!”). The child looked at his hands for a few seconds and gave the red piece to his educator. She wanted to make him congratulate himself by clapping his hands but he did not respond so she took his hands and clapped them while he was trying to close his hands not to clap, strongly.

For the next pieces, the educator wanted him to pick up a green piece from the table and put it into the bucket. He succeeded in picking the piece up but when he brought it on the hole he had to take assistance in order to rotate the triangle shaped piece to send the piece through the hole.

While the educator explaining me that the triangle piece was the hardest to manipulate because of the need of rotating a large angle (approximately 100°), he placed a star shaped piece through the hole easily (which required least than 70°) without a directive and he began to wait for the educator staring at her face.

The educator hold the child's chin and *waked him up* again by calling his name loudly. She began to talk to her when he blinked his eyes (What's wrong? Are you bored? There are a few pieces are left, let's finish them, OK?) and gave a square shaped piece into his hand. The child brought the piece automatically on the hole but kept it there without manipulating it. The educator supported him to rotate it and place into the bucket.

She gave another square piece and said "Put this into the bucket by your self this time." The child took the piece on the round hole and tried a few times. The educator pointed to the right hole and he manipulated the piece by using his both hands. Finally he dropped it through the hole. They clapped hands this time more willingly.

The child took the last piece without a directive and the educator wanted him to name its colour. He said "Red!" which was correct and when the educator said "Put it." he repeated "Put!". (I was informed by the educator that he repeated the things that are told to him most of the time but he did not do that until that time because he was sleepy since the lesson had begun.) Again using his both hands he placed the piece in a very short time. He became very happy and began to hit on the table while smiling at me.

The bucket was taken away and a set of cards was brought to the table which had the pictures of different animals on them. He began to repeat both the questions (“What is this?” / “What is this?”) and the names or sounds of the animals (Cat! / Cat! Miyaav! / Miiuuu). He answered correctly most of the time but never stopped repeating the questions even when he lost his concentration on the cards and began to look around.

The educator touched his nose and asked him to show his nose. He turned back to his educator and showed his nose saying “Nooose!” with a smile. The educator asked him where his ears were. He held his ears and shouted “Ear!” this was his favourite game and he completed it without waiting the educator to ask the rest. He showed his eyes, chin and hair.

As the child became happy and concentrated on his educator, she decided to give him a task that most of the time he did unwillingly. The educator took a piece of paper and a pencil case. She began to draw a cherry on the paper while the child was playing with the pencils by touching them one by one.

By the help of a tape, the educator fixed the pencil in his hand and gave him the paper directing to paint it. He painted a small place but he felt uncomfortable with the tape so the educator had to take it out. He did the task more willingly when the educator took a pencil for herself and helped him painting the cherry. When he again started to stare at his educator’s face in stead of the task he was performing, the time was up so the educator took his pencil. He kissed the educator and turned to me to do the same.