Developing Toy Design Criteria for Visually Impaired Children: A New Play Set Design[1]

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ABSTRACT
Throughout history there have been two vital elements that naturally support child development: 'play' and 'toy'. Many scientific studies on the development of children have underlined the essential role of toys and play tools, as the objects of the play activity. However, play tools and toys designed for visually impaired children are inadequate. The study has been constructed upon an observation study carried out in the nursery and first grade classes in a primary school for visually impaired children. Based on observation study, the study has stated toy design criteria for visually impaired children to improve their skills. Underlining the design criteria, the study is finalized with a play set design to support them in their daily lives.
Keywords: Play, Play Tools, Toys, Toy Design Criteria, Visually Impaired Children.

INTRODUCTION
Childhood is a critical period of life. The character of an individual is shaped in these ages and the subconscious records countless events and memories. The development of cognitive skills is completed in childhood. Every child plays, regardless of nationality, location, belief, economic situation, physical condition or time and era. Play is a tool that supports the social, psychological, and physical development of children (Garvey, 1977; Weininger, 1979). Play is an extremely essential activity for imaginative and cognitive development (Singer, 1973; Piaget, 1951/2000). For Maria Montessori, a little child "[…] becomes a man by means of his hands, by means of his experience, first through play, then through work." (Montessori, 1949: 37). When a child plays with a toy, in Montessori words, "he has become a man seeking independence" (Montessori, 1949: 245-246). Play is the need and right of children (Clements and Fiorentino, 2004). Children should play in order to learn (Chance, 1979; Bergen, 1988), and to equip themselves for the world emotionally (Tait, 1972; Jeffree, et. al., 1977) and intellectually (Isaacs, 1930). Central role of play in childhood is emphasized by many works (Cohen, 2006; Elkind, 2007; Collins & Foley, 2008; Talu, 2018).

Children practice daily life through play activity, like an apprentice of life. They imitate actions and mimics of the people around them. They perform many roles, pretend to be adults. They discover spaces and places. They practice daily life activities and overcome possible difficulties in the context of self-sufficiency. The practice of life through the repetition of daily life patterns, improve the ability of remembering, knowing and learning. It is very hard to distinguish these three notions that are integrated with practicing and also play activity. The role of toys in play activity should not be ignored (Scognamillo, 1994: 140; Goldstein, 1994). They need to be designed to accompany play activity along with the acts such as remembering, knowing, learning, etc. For those reasons, high play

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valued toys need to be chosen (TRUCE, 2016; Talu, 2018). For a spontaneous and instinctive learning, toys should be the tools of play activity.

Visually impaired children too, need to attain life skills and practice daily life in their childhood through play activity. We live in a visual-centered world, even the simplest everyday actions are extremely challenging for visually impaired people. In daily life visually impaired children have some difficulties about reaching places, going around, exploring, finding and perceiving objects. They need to do more practice about every kind of daily actions, routines and works for a self-sufficient life. They have to use their other senses more efficiently and need to practice for the sake of this purpose. So it is important to note that attaining the skills concerning how to survive in daily life, is even more important for them in order to be independent throughout their adulthood. Unfortunately, the study observed that the toys that are designed for visually impaired children are not sufficient. All children need play activity but handicapped children need play activity with tools and toys which are specified according to their physical and mental conditions. The study claims that along with play activity and designing specified play tools we can support visually impaired children's daily lives.

The hegemony of the visual is also evident in toy design. The most dominantly used tools in toy design stand out to be the visual ones, such as colors, graphic arrangements, shapes, patterns and typography. Toys, offered to the consumer market, are almost created as visual things, with the intention of attracting attention and to increase sales. This feature of toys would be even a problem for healthy children. There are very limited options in the market when it comes to toys specifically designed for visually impaired children. The majority of the available examples have not been designed by professional designers, but by people who work with disabled children or are concerned with the subject of disability. For this reason, the study stated this reality as a problem and emphasized that it is an obligation not only to state design criteria for toy design, but also to design customized toys that will be fit for blind and visually impaired children.

METHOD OF THE STUDY: Observation Study

In order to determine the design criteria, the study conducts an observation study in a school for visually impaired children. Then the research proposes a new toy set design underlining these design criteria and the entire context concerning to the difficulties that are recorded in the observation.

The observation is improved: studying a single, isolated social situation, with its three primary elements, activities, actors and a single specific place (Spradley, 1980: 40) (Figure 1). The activities are learning, moving and playing. Actors are especially visually impaired children, and also teachers and parents. Place is a primary school for visually impaired children which is unique in İzmir. The study detects design criteria at the center of this social situation. The relations between activities, actors and the place determines some acts, methods, tools, situations, objects and conceptual keywords that all are defined as detections for design criteria.

The survey has been conducted as a nonparticipant observation in İzmir Aşık Veysel Primary School, which is unique in İzmir as a school for visually impaired children. The study observes children aged between five to eight years, who are in nursery class or first grade students in primary education. Children with multiple disabilities have been excluded from the observation range, since the large mental gap between the children would be an unwanted condition. The children have been observed in their courses and play times. It is a nonparticipant observation in that the observer do not interact with the participants. The observer only takes photos and notes without disturbing the routines of children and teachers.

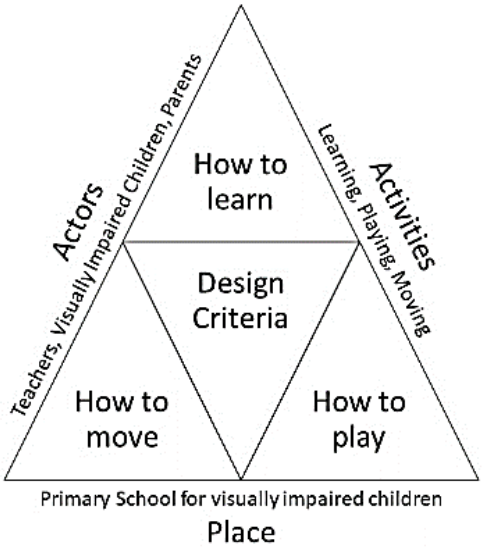


Figure 1. Observation Study as a Single Social Situation with its Three Primary Elements: Actors, Activities and a Place

There are nursery classes, primary and secondary classes in the school which has 125 students in total. There is also a dormitory for boarding students in the school which is not the concern of this study. The study was conducted on a three days a week basis for a five week period between December 24th. 2012 and January 23rd. 2013 with 25 visually impaired children aged between 5 to 8, in the nursery and first grade classes. The observation study has been done during class hours, breaks and also the lunch times. This timeframe, of 90 hours, has been considered as sufficient for observation of a single social situation.

Table 1. Schedule of Observation Study in İzmir Aşık Veysel Primary School for Visually Impaired Children.

Hours/ Dates	24-26.12.2012	31.12.2012-2-3.01.2013	7-8.01.2013	9.01.2013	14-16.01.2013	21-23.01.2013
9:00-11:30	Nursery Classes	Nursery Classes	First Class 1-A	Second Class 2-A	Nursery classes	First Classes
Lunch Break	Dining Hall	Dining Hall	Dining Hall	Dining Hall	Dining Hall	Dining Hall
12:30-15:00	Nursery Classes	Nursery Classes	First Class 1-B	First Classes	First Classes	First Classes

The purpose of this observation is not to measure or compare the abilities of visually impaired children, but to determine special needs of their daily lives in activities. The study asks the questions: What are the activities to accomplish? What are the actions to do? What are the things to learn? What are the methods to move? What are the objects to use in daily life activities? What are the practices to repeat? They have already deficiency of one of their senses, but what are the other problems they encounter because of their blindness or impairment.

The study examines the relationship between the activities: learning, moving, playing and 'practicing' that would be especially established on the relationship between 'play activity' and 'toys and play tools'. Finally, through a design project, it is intended to exemplify how design toys and play tools not only will support visually impaired children in learning skills to survive their daily lives; but they will also have fun.

CRUCIAL DATA AND FINDINGS

On Learning Activity

Techniques for Craft Works

The art courses, based on modeling, are very different from the other courses in the school (Figure 2). Children play with clay and learn how to make models and objects from the clay. In superior classes they learn how to make and use moulds. There is not any painting or drawing class in the primary school, but some activities are done in nursery class with oily pastel painting. Teachers encourage children to make some drawings using high contrast colours, if they have any remained vision.

Figure 2. Art Course of First Class Students

There are some methods used in art education of visually impaired children. In the observation, one method is seen in nursery class: the teacher draws a rabbit and a carrot on a big size of paper and glues a rope on the borders of this drawing (Figure 3). Children touch and feel the rope and fill inside of the rope by pasting two kinds of material: cotton and an orange craft paper. This was a very educative activity in that it let children to feel the rope, to perceive what the drawn figures are, to feel three different materials and to play with their friends together in a group work. Moreover, the figures are not small enough to realize in two hands, so children have to feel the parts of them and attach the parts in their minds. This is also called haptic perception for blind people and it is another thing that children should practice for daily life.

Figure 3. Perception of the Figures with Rope Technique

Table 2. Detections for Design Criteria

Detections	
Activities	Making craft, learning figures
Actions	Tracing borders, perception of borders
Objects/Materials	Different materials, using high contrast colours

Conceptual Keywords	Scale, border
Methodological Tools	Modeling, drawing, scaling
Methods	Representation, abstraction

Learning Braille and Abacus

Braille is started to be taught from nursery class by some simple exercises such as feeling the dots and learning the place of the dots in one letter. In beginning classes, the tools of Braille are the slates (tablets) and the stylus (pens). There are also some special typewriters for writing Braille in upper classes.

Firstly, to use these standard tablets a thicker paper is needed. When the paper is put in a tablet, the tablet is needed to bend from the middle and the tablet locks the paper. There are small rectangular holes on the front side of the tablet and there are six small dots on the back side of it which meet the rectangular letter spaces. When a child makes dots with the pen the six points help them to write properly and easily.

The complicated thing in this process is the need of writing from right to left and need to write the symmetry of letters vertically. When the paper is taken out of the tablet it should be read from left to write from the serrated side of paper which is the back side of the paper. This seems very confusing while doing observation, but the teachers claim that children do not have difficulties about it and they comprehend the differences between writing and reading in a few days. However, the need of learning symmetry at these early ages is a very interesting observation.

Figure 4. Writing in Braille Alphabet with the Tablet and Pen

To read the writing in Braille alphabet, children take the paper out of the tablets, turn the paper they dotted and read the letters from the opposite face in their order. While reading the writings, children should use both of their hands. For instance, a right handed child should touch to the beginning of the row with her/his left hand and read the writing with her/his right hand. When she/he comes to the end of the row, she/he follows the row by her/his left hand, takes the row below and finds the starting point of the next row. Then she/he continues to read with her/his right hand.

The tool abacus is not a Braille tool. However, it takes the place of the Braille tools in math classes as the main tool. Children also use their Braille tools in math classes. However, using abacus simplify students' work in mathematics. The usage of abacus is shown on the Figure 4. In the first photograph, the bead in the first row shows number 1 and the second photo indicates number 2. The beads on the right side of the abacus means 5 and the beads in the second row is for 10 digit. With this information the abacus beads on the Figure 5 indicates the number 173. In math classes children learn how to use abacus and learn both math operations and how to use abacus for calculating the solution of the operations. Generally, in the math operations, they use both sides of the abacus to reach the answers.

Figure 5. The Numbers 1, 2, 5, and 10 in Abacus

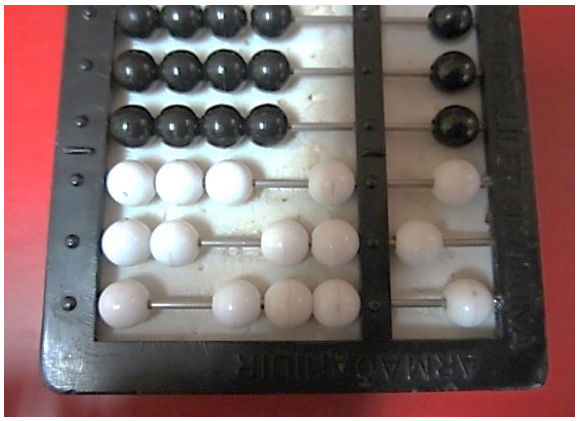


Figure 6. The Number 173 in Abacus

Table 3. Detections for Design Criteria

Detections	
Activities	Learning, reading, writing, calculating
Actions	Following the row, making indentation, feeling the bulges, memorization, focusing on details, repeating these actions
Conceptual Keywords	Symmetry, side, row, solid, void
Objects/Materials	Abacus, Braille tablet, Braille stylus, paper
Methodological Tool	Tactile modeling
Methods	Representation, abstraction, symbolization

Individual Training

The way of teaching something to a visually impaired child is a little bit more difficult than teaching a healthy child. For instance, teaching how to write a letter in Braille alphabet with the help of tablet; firstly the teacher needs to explain what they want to do in detail and do one, in this example he/she writes the letter. Teacher should let the child touch his/her hand, while he/she is writing. Next, teacher writes one more time with the child, like cutting a cake together. Further, lets the child to try writing. However, as children start to learn quicker, the levels of children separate more and more with time according to their ability. Under these circumstances teachers need to do their courses by studying with children individually. The difficulty here is making the other students stand still quietly. These students are very young and they want to play. They start to talk to each other, stand up and walk in the class; if they have a tic they start to do it, like wobbling or pressing on eyes. Teachers have trouble to study with one of the students and amuse the rest of the class at the same time.

Figure 7. Teacher of First Class Studying with One of the Student

Table 4. Detections for Design Criteria

Detections		
Activities	Learning-Teaching	Waiting
Methodological Actions	Studying with one of the student	Waiting classmates
		Playing/Talking/Walking students, appearing of tics
Situation	Dissimilar levels of knowledge	

On Moving

Orientation and Mobility

Moving around, walking in three dimensional space, is considered as one of the critical problems of visually impaired people. In some studies, the use of hand held ultrasonic devices are proposed to improve blind children's spatial awareness (Shimizu, Yoneda, Minagawa, Ohnishi & Uchiyama, 1999). However, it is very nice to see children in the garden of the school, playing with their friends, no matter how much they see. In Aşık Veysel Visually Impaired Primary School, children are taught to hold their hands in pairs. These pairs comprise of one blind and one partially visually impaired children (Figure 8).

Figure 8. Children Walk in Peers in the Garden of the School

The partially visually impaired children who sees more than his/her pair, walks in school breaks by controlling also his/her pair's path. By this way, all children can go around and feel the sun in good weather, make some physical activity and have fun. Besides, it is also very interesting to see some of the totally blind children going around alone, playing with friends without a guiding friend.

Figure 9. Children Playing Together in the Class

Some of the blind children even walk more confidently, than some of the children who have perception of light or have some remained vision. This unusual observation is not a strange situation after being informed about visually impaired people. There are many blind elder people who can live self-sufficiently. There are many activities and projects, organized and done by self-sufficient blind people, that all exist in the website of Six Dots Foundation for the Blinds. They take buses, go to work, do their job, do shopping and care about their houses without any help as some of the teachers in the school. Consequently, every blind child can live and survive by themselves with the right manner, education and support.

Besides the good examples, unfortunately, there are many children which have some difficulties to move independently. Teachers and the parents of the children work to teach them how to feel safe, while they are moving by some techniques. One technique that was observed in the school is both for learning the space and how to walk indoors. Teachers of nursery class direct one of their students to find the wall and touch the wall with the back side of her left hand (diverse of palm side). Then they want her to walk by the way the wall goes with a continuous touch to the wall. When there is a cupboard near to the wall, they support her to pass it and reach the other side and touch the wall again. By this method the girl draws a circle in the room and learns the places of things and how to walk along to a wall. If they know places of the objects in a space then the space gets safer with the help of map which they have in their mind. The architectural spaces would be miniaturized, so that visually impaired children could learn their living environment and understand the relation of the spaces and how walls and ceilings connects to each other (Schneekloth, 1989: 196-201; Rettig, 1994: 419).

Figure 10. The Use of Walls to Move Independently

Another technique that teachers use in the school is to make a queue with children. In this queue children's hands are on the shoulders of the child which stands in the front of her/him. Generally, in this method, the first child in the queue is partially sighted. By using this queue method, children walk in an order and have fun. This technique is based on following or tracking a route for children.

Figure 11. Children in Queue like a Train

For safe and confident walking, the notions of direction and orientation are very vital for the movement of children. Children with visual impairment need to know positional vocabulary such as their sides (right and left), up and down and the notions as- on the top of, under, inside, beside, over, front, on, in, etc. (Özyürek, 1995: 96-98).

Another feature that visually impaired children have to gain for comfortable moving is understanding and using voices. There is not a special and isolated world for visually impaired people. Thus the schools even are not designed especially for them. To survive in the world, the only solution is to do practice in the real world which are not safe places. Actually, this education should be started in the family from the early ages of children. They can use the reflection of sounds to realize the dimension of a space or the distance between them and wall, and this is something developed by practice. In the school, teachers cannot help all the children one by one and take them from one place to another. Of course, usually they walk with their friends, hand in hand, but they also try to walk alone. If they always use a companion, they always need a person, that's why they need to do walking practices alone. Especially in the nursery class, teachers do not help children to walk to the dining hall. They want them to practice going to the hall by themselves, sometimes they call them from the entrance of the dining hall and let them learn and practice using the voices while walking.

Table 5. Detections for Design Criteria

Detections	
Activities	Orientation, mobility
Methodological Actions	Following the route/path, memorizing space, feeling the surfaces, making queue, repeating the actions
Keywords	Path, border side, row, up, down, on, in, top, under, inside, beside, over, front, left and right, solid, void
Materials	Walls, furniture
Methodological Tools	Borders, textures, sounds, material/living bodies
Methods	Space mapping, tracking the paths, memorizing space

On Playing

Not all the visually impaired children, but the blind ones cannot use imitation in their lives. Imitation is an essential tool for playing. We learn many things by observation and imitation during life.

Blind children need to be guided in the beginning of playing for every new toy or game. If there is not anyone to tell them the variety of activities in playing with objects then they use the objects, tools and toys just in one simple way. If someone teaches them to play with objects as if they are something else, then they can use this type of playing automatically. For instance, children from first grade class play with the rainwater in a stone container as if it is a soup. They stir the water with the branches and put some leaves as the vegetables and salt. There is one blind boy with them. He also joins the game by the help of a girl who tells him about their play and gives him a stick for stirring (Figure 12). This is an example of free play in which children set play without any real restrictions. When a group of children are left together, we see that how nature becomes a unique source to be used instantaneously for creative and unexpected expressions (Moore, 2012: 58)

Figure 12. Children's Pretend Play in the Garden of the School

The study observes another play, which is set by the teacher. The game is putting hands to the right position according to the teacher's directions. There are three positions for hands in the game which teacher inform to children, up, on and under. When teacher says up, hands go to up in the air and when teacher says on or under, then the hands go directly on or under the table. One of the children, who can see partly, can copy the motions of others; while others cannot because of their inadequate remaining vision.

Table 6. Detections for Design Criteria

Detections	
Activities	Play
Methodological Actions	Imagining, pretending, imitating, repeating the actions
Keywords	Up, on and under
Situation	Playing together
Materials	Things around them such as leaves, stones
Methodological Tools	Haptic objects, body parts
Methods	Free play, directed play

On Basic Conditions

Different Sight and Ability Levels

Every child in the world is unique, but how does this situation turn into a problem? In many education systems there are some criteria which are used to divide students into some groups. In addition to the separation of children according to their ages; the determination of the cognitive levels, basically, may create different groups. Beside the psychological condition of children, in fact this is good for both educators and quality of children's education. However, when we examine the education of visually disabled children, it is not even possible to separate them according to their remained vision. For instance there are children who have some remained vision and some blind students in the same class (Figure 13). One of the reason that children study in same class, is that there are not many visually impaired students in one region. In the school there are also many boarding students, who are from other cities. Even with this dormitory potential of the school, there are not enough children. Educators separated students according to their ages, as commonly applied. Still, these children's IQ levels, characters, the education given in family and the disability levels are not same.

In classes teachers should give lessons one by one. Moreover, teachers should remember all children's knowledge level. For instance, in one of the first grade classes in Aşık Veysel Primary School while one of the student tried to learn how to write sentences like "Ela Lale el ele" [Ela and Lale are hand in hand], another student tried to learn how to read and write one of the letter properly by using the Braille alphabet (Figure 13).

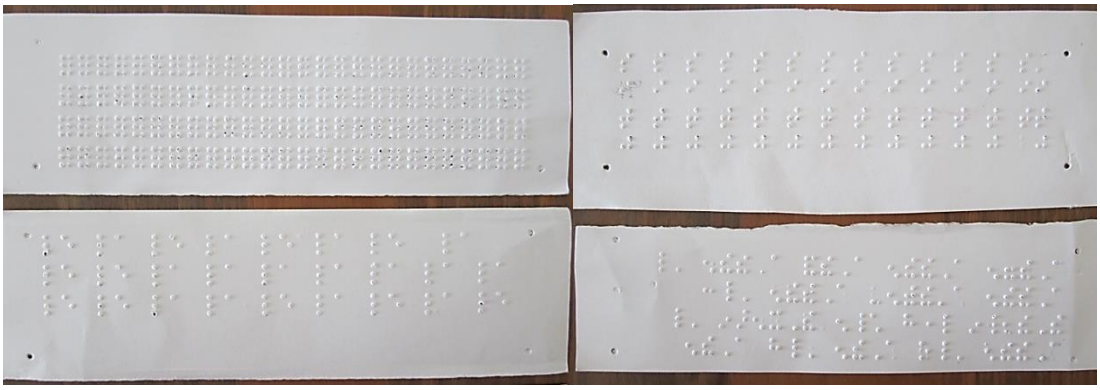


Figure 13. Four Different Writing Levels of Four Children in the Same Day

Family Care

An important educational gap between the students concerns not their level of sight, but their level of learned life skills. This is closely related to the families' awareness about blindness. When a family, usually mothers in Turkey, behave in a protective manner to the visually impaired children, they do all the things for their children. In order to protect him/her, they do not let the child have any opportunity to do some acts. Then these children could not walk later or could not walk confidently in their childhood, they could not go to toilet by themselves or could not eat their lunch without help. This is actually the worst parent manner for the sake of these special children. Parents should teach them to do things; support them to learn daily life activities; and invite them to do exploratory behaviours (Olson, 1983). Because, as many others, these activities are learned by repetition. The more children practice, the more they learn.

As a result, there is a big difference between abilities of these children according to the growing up methods of their parents (Campbell, 2007). In the school, it is observed that a blind girl (Figure 14) with a good education can walk confidently in the garden of the school and can use stairs as well as any healthy children, but there is a boy in the same age who could not walk in a relaxed mode, even if he can see more than his classmate.

Figure 14. A Blind Girl Walks in the Garden of the School

Moreover, to be filled with compassion is essential for development of these children. Unfortunately, some families could not be conscious; no matter the health of the children, every child need peace and compassion at home. As in every school and every class there are some children who could not feel this love and behave in a rude, shy or nervous and offensive manner. Children's physical, mental and psychological development regress when the lack of enough interest and tenderness are combined with the impairment. These children need to endeavor more than a healthy child to be a self-contained person.

Need of Guidance

Blind and partially visually impaired children need much more attention and effort from their parents and teachers. To teach objects, notions, actions; parents and teachers should patiently define, practice and show them the details about what they want to teach. These children need leading and repetition of the instructions until they learn the notion or object in their daily lives. For example, at lunch time teachers always tell what the meal is in the plate and where the meals are (Figure 15). These children also spend their times mostly indoors with restricted activities. So, they have similar lifestyles and have a tendency towards social isolation, which are considered as an important issue in the writings (Khadka et al., 2012; Salleh & Zainal, 2010).

Figure 15. The Children Having Their Lunch

Habit Spasms and Tics

Some children observed in the school, while they were rubbing their eyes and making a cluster of movements like pendulating or waggling and wobbling. Teachers do not want children doing these tics, they usually warn them not to do- especially if they rub or press on their eyes- because these tics are also bad for health of their eyes. Blindness tics may influence their social life adversely and also reduce children's desire and willingness to explore (Özyürek, 1995: 75-76). These motions come from their childhood. Özyürek defines those tics as a turn into oneself's own body. He explains that in babyhood many blind babies stay alone in their bed for long hours as they could not get any external stimulus and start to play with his/her own body. The information given in his book is very interesting that blind children in Africa do not have any tic because their mothers always carry them on their backs. The deduction of this information states that a baby who is close to his/her mother and who can touch and feel his/her mother anytime does not need to do any chronic motion, so do not have blindness tics (Özyürek, 1995: 71-78).

Figure 16. Robbing Eyes as an Example of Tic.

Another habit that children used to do is repeating the words of people around them. The teachers of the nursery class try to avert this habit of one child professionally. According to the information, this habit prevents the development of linguistic and social interaction skills of children. May be this is an outcome of the imitation habit of all children. Every child learns by imitation. They watch and observe their parents and elders around them, and replicate them. This is a useful tool which children do instinctively. However, blind children do not have the visual information to imitate and they may use words for this instinctive copying habit.

Table 7. Detections for Design Criteria

Basic Conditions	Keywords and Situations
Dissimilar Vision and Ability Levels	Individual training, multi-aged groups
Family Care	Awareness of blindness, learning/teaching daily life activities, developing self-confidence, self-improvement
Need of Guidance	Need of instruction, need of practicing, need of repetition
Habit Spasms	Socializing, linguistic, imitation, need of physical interaction

EVALUATION OF THE FINDINGS

Based on the observation, concerning to basic conditions, visually impaired children need guidance more in their daily lives with relevance to remained visions. Every action should be explained and taught to them. Children should be instructed about what the objects are, which materials they are made of, for which purpose it is used, how it is used, where is the place of them, by whom are these objects used generally, how it may be used more

safely, etc. Under the section of family care, it is very important to emphasize that if the parents are overprotective, the children become more dependent in daily activities. Lack-of-sense brings a lack of imitation and this means parents of these children should spend more time with their children and spend more effort to get them self-sufficient, compared to the parents of healthy children. As for the section- habits or spasms, these children should not be left alone without any kind of stimuli such as sound, object or movement. If they are left alone to their inner worlds, they interact with their bodies that is when some tics appear.

In the section of 'On Learning', it is clarified that educationally blind children need to learn Braille and abacus to read, write and to calculate. Braille and abacus are important objects in their lives. Both of them are haptic, planar, small scale objects. They function by tracing along a row, and coping with the interrelation between reverse sides. The techniques for craft works help to gain abilities in order to perceive or define objects and their borders. They are trained individually to learn these techniques.

In the observation, the second focused subject is 'On moving'. The most important issue in this section is the perception of space and surroundings. Visually impaired children have difficulties to move independently and confidently, according to their remained vision levels. They should practice much more than sighted children to get used to do many physical movements and to perceive the space. They practice to learn the techniques such as listening to the sounds or echoes, tracing the borders and routes.

The section of observation, 'On Playing', underlines the necessity of guidance in play activity. In group plays, even if there is a more sighted child, the play activity could be sustained more easily. As the study clarified: their remained visions are various even in very small groups that create advantage for play activity and socializing.

Finally, the last issue concerning thoroughly all the sections of their lives which visually impaired children should do much more than sighted children is memorizing. Memory of a blind person provides to him/her: orientation, mobility, learning, communication and socialization. There are many things to learn and memorize for visually impaired children. Repetition, either the necessary actions or exercises, may be the key tool that functions not only for memorizing but also for understanding, and learning (Montessori, 1966).

There are a group of detections as a result of the observation study. These are categorized along with the main categories and with the four segments of observation. These detections are shown in the Table.

Table8. Detections of Findings.

Detections	On Learning	On Moving	On Playing	On Basic Conditions
Activities	Making craft, learning figures, learning, reading, writing, calculating, learning-teaching, waiting	Orientation, mobility	Play, individual training, learning/ teaching daily life activities, imitation	Learning/ teaching daily life activities
Methodolo-gical Actions	Tracing borders, perception of borders, following the row, making indentation, feeling the bulges, using high contrast colours, memorization,	Following the route/path, memorizing space, feeling the surfaces, making queue, repeating the	Imagining, pretending, imitating, repeating the actions	Repeating the actions

	focusing on details, studying with one of the student, waiting classmates, playing/talking/ walking students, appearing of tics, repeating the actions	actions, using the sounds		
Conceptual Keywords	Symmetry, side, row, scale	Path, border side, row, up, down, on, in, top, under, inside, beside, over, front, left and right	Up, on and under	Self-confidence, self-improvement, self-sufficiency
Materials	Different materials (textures), clay,rope, abacus, braille tablet, braille stylus, paper	Walls, furniture	Things around them such as leaves, stones	
Methodolo-gical Tools	Modeling, drawing, tactile modeling, scaling	Borders, textures, sounds, material/living bodies	Haptic objects, body parts	Linguistic, socializing, imitation, repetition
Methods	Representation, abstraction, symbolization	Space mapping, tracking the paths, memorizing space	Free play, directed play	Individual training, multi-aged group education
Situations	Dissimilar levels of knowledge, practicing, need of physical interaction		Playing together	Awareness of blindness, need of instruction/ practicing/ repetition/ physical interaction

DESIGN CRITERIA

According to Gielen, there are three important concepts which make toy quality higher when they are used in design process: aimlessness, empathy and play value (Gielen, 2010: 4). There is a big popularity on games which have an aim of win. On the contrary, a good play motivates children for imagination and creativity rather than win. Moreover, Gielen adds that play value is also clarified by the enjoyment of children while they are playing (Gielen, 2010: 4). The most important clue here is to design a toy which children love to play.

TRUCE Organization defines the toys which have play value. According to the list, first they need to be used in many ways. The toys are valued when it encourages to set up a play without constraints. A valued toy could be played by different age groups in many ways, and also it needs to support individual plays as well as group plays. An ideal toy needs to be unisex. A good toy needs to develop new interests, skills and sense of mastery. Moreover, a toy would be integrated with other toys and objects around the children. A toy needs to be disengaged with digital media and games. A toy needs to exclude violent and stereotype interactions (TRUCE, 2016).

For the toys of visually impaired children, Jain claims that presenting attractive toys for identification is important for these children. He also mentions that teachers should help these children by asking them about tracing drawn pictures and figures, giving them three dimensional objects, using flash cards for developing memory, teaching tracing and wiring ropes (Jain, 2006).

Children with visual impairments need to have some toys which have sounds, smells, special textures and shapes according to meet their need of stimulus (Sevinç, 2004: 237; McElligott, 2004). Findings of the observation study reveal clearly the importance of improvement of the tactile sense. Sense of touch, tactile perception, is the common point of the learning, walking and also playing.

Evyapan determines some criteria for toys which encourage a visually impaired children interaction with surrounding environment. According to the study, support of independence, providing basic information of space and objects, developing cognitive skills, giving chance for using creative talents, providing social interaction are to be objectives of the toys (Evyapan, 2002: 110). Also she claims that the toys should maintain a sense of accomplishment by its simplicity, play in various ways, get more complex according to the experience child achieve, not make child rushed (Evyapan, 2002: 170).

This study claims that toys can support the developments of daily life practices of visually impaired children when they are designed according to their features and needs. For this reason, three tables are drawn to determine the toy design criteria according to developmental needs of some skills, senses and abilities.

Table 9. Senses and Some Applications for Design Criteria

Senses				
Visual	Auditory	Tactual	Gustatory	Olfactory
	Using sounds for orientation	Exercise with fingers	Without seeing, tasting foods	The smell of different materials
	Listening audio books	Improve texture awareness		Memorizing the smell of people and spaces
	Playing an instrument	Different materials		
	Differentiating voices/tones of people	Haptic perception of 3D objects		
		Awareness of shapes		
		Tracing borders/lines		

Table 10. Developmental Domains and Needed Skills for Design Criteria

Developmental Domains		
Physical	Cognitive	Social
Gross motor	Mind mapping	Linguistic
Fine motor	Remembering/Memorizing	Communication
Perception	Finding position	Friendship

'Repeating the actions' is methodological common action which is detected in all activities of moving, learning and playing (Table 8). In Table 11, the key statement of observation study is based on this detection. The toys for visually impaired children should make

children practice their skills according to the result of observation study. According to these statements and findings, the toy design criteria are determined (Table 12).

Table 11. Daily Life Skills from Observation Study for Design Criteria

Key Statement of Observation	Skills Needed for a Self-Sufficient Daily Life	Actions for the Skills	Concepts for the Actions
"The more children practice the more children learn."	To be mobile, To be organized, To do daily activities	Exploring, practicing, repeating, perceiving	Row, side, border, path, symmetry, in, top, below, solid, void, etc.

Table 12. Design Criteria

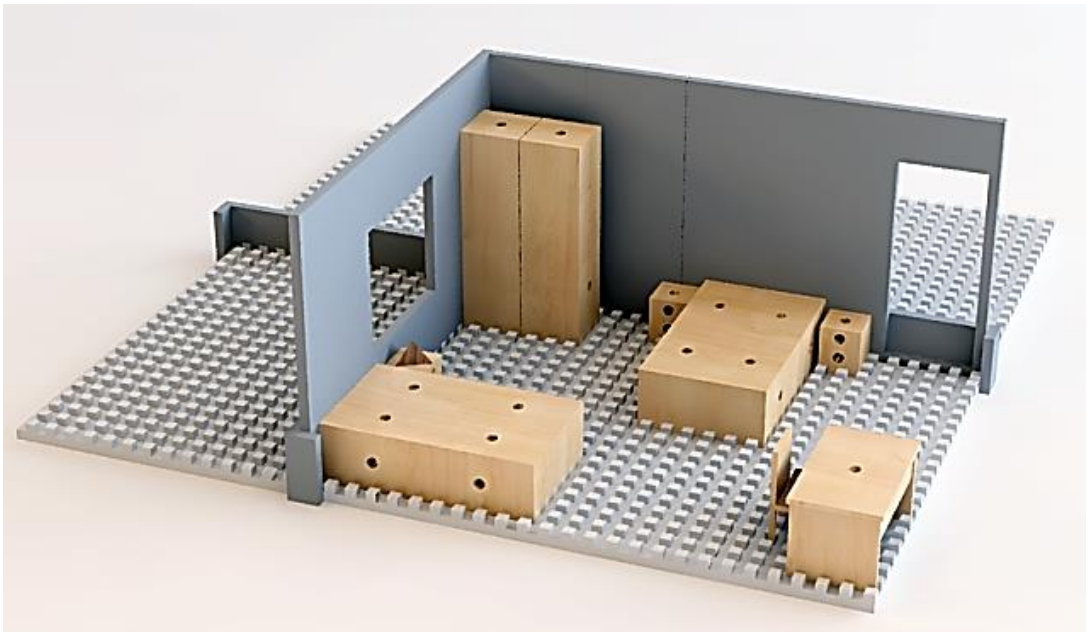
Criteria which are valid for all toys	Criteria which are valid for toys of visually impaired children
-Not to restrain imagination of children rather improve their imaginary world and creativity. -Parts are simple as possible. -Parts are durable as possible. -Simple, enjoyable and fun to play. -Appropriate to play alone and play with others. -Improve sociability of children. -Appropriate to play with other toys. -Appropriate to play in alternative plays. -Appropriate to play by both girls and boys. -Should be designed and produced according to the safety regulations.	Daily Life Skills -Improve mobility, orientation and spatial skills. -Improve learning, reading and calculating skills. -Exercising for fingertips. -Integrated perception of the objects such as walls and furniture that children know well from their daily life. -Contain models of objects from real world for practicing daily life skills. -Encourage children for repetition of daily life skills. -Support them to be self-confident and self-sufficient individuals.
	Senses -Improve the sense of touch and perception skills. - Exercising for tracing borders, making indentation, feeling the bulges. -Designed by using variety of materials, textures, and shapes. -Designed by using high contrast colours. -Designed by using variety of sounds. -Designed by using some materials which have different smells.
	Development Stages -Exercising for fingers. -Encourage children for exploration. -Encourage children to use their imagination and creativity. -Encourage children to create mental maps by using and improving haptic perception. -Exercising for following the path/route.

	-Encourage children to use and develop their memory. -Provide interaction between these children and their adults/peers. -Playing individually and playing together. -Improve language skills. -Improve necessary terminology such as symmetry, side, row, scale, path, border, up, down, on, in, top, under, inside, beside, over, front, left and right.

Toy Set Design: 'Install a Room'
This set is designed to improve mobility and orientation skills, to create mental maps by haptic perception and to encourage children to explore. In addition to these criteria, improvement of the fine motor skills criterion is also met with the toy.

In this study the importance of practice is underlined. Parallel to the claim of the study, it is thought that a play set where children built indoor environments may help them to practice mobility. The architectural spaces would be miniaturized, so that visually impaired children would practice spatial environment on miniaturized models tactilely. It is decided to design a toy set which let children build a variety of spaces they have been in or they imagine. It is assumed that children will learn and build spaces with the toy set, and by this way they will practice mobility as a part of a play activity. Using their hands and fingers, they imagine walking in the play set. They exercise creating mind maps and at the end, they get more confident in the spaces.

The toy set involves some scaled models of furniture and some basic spatial elements. Some of the models let children arrange the size of the furniture. Moreover, the set lets children determine the ratio and sizes of spaces or created rooms.



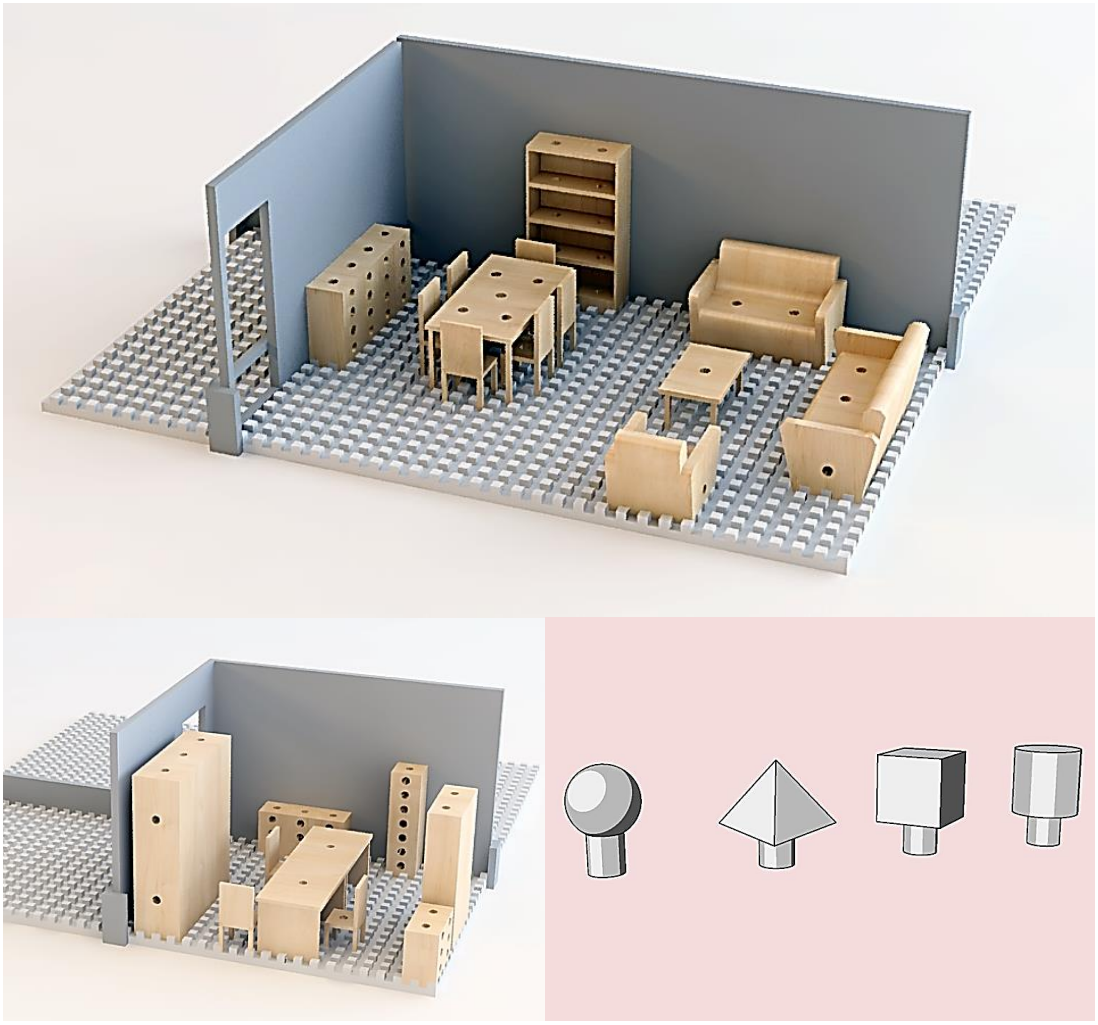


Figure 17. Toy Set: 'Install a Room': Bedroom, Living Room, Office and Set of Pins

The set includes a base for floor, panels for walls, models of furniture, location pins, workspace cloth, two blindfolds and the bag for the set.

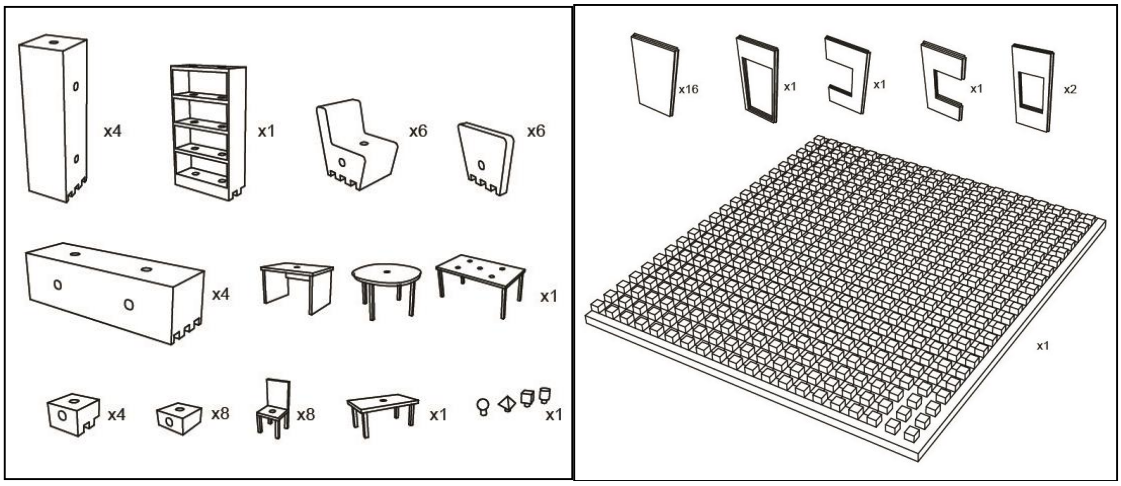


Figure 18. Elements of the 'Install a Room' and Quantities of Elements Provided in One Set

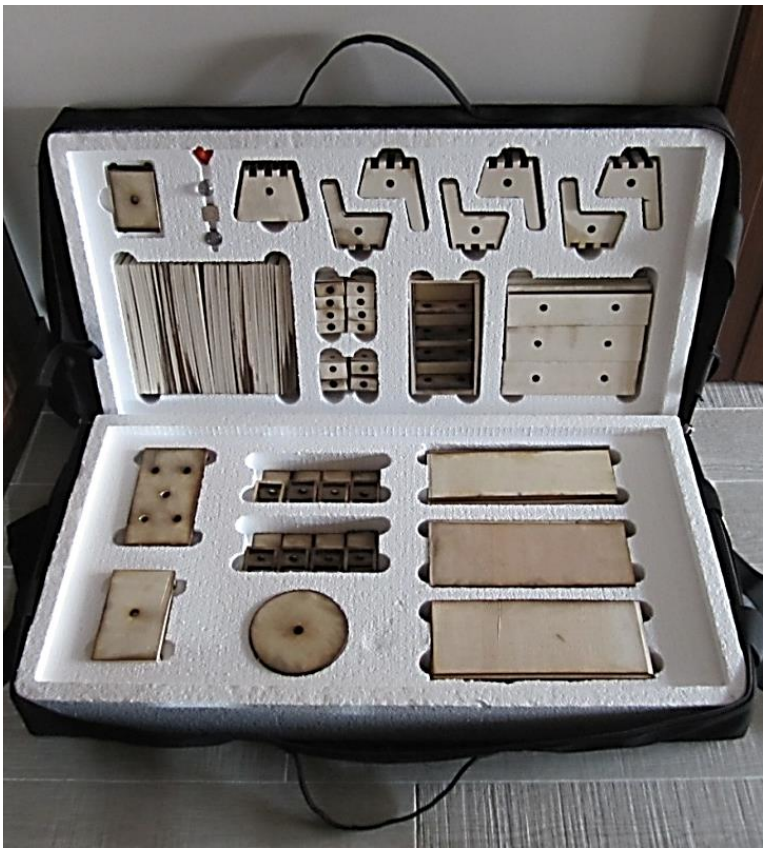


Figure 19. Housing of Elements in the Bag of Play Set

Potentials and Limitations of the Toy Set

'Install a Room': the set can be played indoors, alone or with a companion/in group, by using other objects. The toy set is suitable for functional play, imaginative/pretend/fantasy play, manipulative play, dramatic play and cooperative play.

This toy set includes furniture models and spatial elements which are scaled in 1/10 proportion. The base component of the set is 60x60 cm.This dimension was decided to make it suitable to the arm dimensions of children. According to this dimension the maximum area of the room will be 36 m², which is enough for indicating many types of rooms.

The base element has been designed as compatible to the practices of tracing, positioning and following the lines and rows; which are needed skills for children's perception, mobility and using Braille.

Limitations of the toy set may be the need of a flat surface to place base elements and being suitable for only indoor playing.

How to Play

One of the features of good toys is providing many different play activities. Toys should not define the play activity sharply. Scognamillo also stated that toys based on over-specification damage the imagination of children (Scognamillo, 1993: 136-140). A good toy invites the child to ask: "How can I play with it? And how can it play with me?" (Rasmussen, 2003: 50). One of the features of good toys is providing many different play activities. Children should be physically and mentally free to use toys in various types of play. Positioning in the design discipline, the thing to do is suggesting some proper play activities.

Possible ways to play with 'Install a Room':

1. Build rooms like bedrooms, childroom, dining room and living room.
2. Play with only furniture models.
3. Playing with a figure toy/doll which fit the ratio of the play set.
4. Play with both real furniture and furniture models, guessing which part of the furniture may be the touched part.
5. Playing in group: one child chooses a part from the set, others try to guess which part it is by questions.
6. Using inactive hand in some play options to make it harder and tricky.
7. Building a room which blind child knows well, and the child goes around in model room with fingers to explore and guess.
8. Building an imaginary room.
9. Children may describe and the other one can build and they may check if it is the same room.
10. A child may firstly explore and find the pin in the room set (same as the real one) and then go around in the real room and find the thing the other child/parent located in the same place where pin stays.
11. Playing "hot and cold" game with a sighted companion.

These eleven play activities are only some instances of playing which can be realized with the toy set, 'Install a Room'. Many other varieties are hidden in the imagination of children.

CONCLUSION

The aim of this study is to determine the toy design criteria for visually impaired children and design a toy set according to the determined design criteria. 'Install a Room' is produced as an exemplary design applying the set of criteria suggested to support visually impaired children with a product that will have a high impact for a healthy development. If applied by more designers and designs; the set of criteria will bring a healthier development chance to visually impaired children via play objects.

To point out, in the observation study the vital effect of practice is underlined. It is observed that the effect of impairment can be overcome by the help of practice. Here the repetition of acts, movements and skills gain value. All these activities take place in the activity of play. Because playing is one of the strongest methods for childen to repeat something without becoming bored. For this reason, playing is one of the strongest tools of learning. In other words, play activity integrates with the exercise of life and learning.

Unlike sighted children, visually impaired children have some difficulties in learning some of the skills which they use in their daily lives. Also, they need to learn some different skills like mobility, orientation and using Braille alphabet. For these needs and difficulties they need to do more practice for the sake of their healthy development. Also, in the design criteria this statement is underlined. Moreover, the toy set is designed according to encourage the practice of daily life. It is assumed that children will play with the toy set in interaction with the space they are in or they know well.

As a final word, it can be said that the most important issue is the well-being of children. It both covers the emotional and other developmental stages. The very best feature of playing activity is making people happy without any age restrictions. In point-of-fact, the study was done in the hope of providing happy and healthy childhoods and self-sufficient lives for visually impaired children, which is above all other aims.

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