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Design & Development of Children's Wear with Braille Script and Abacus Using Banana Fabric for Visually Impaired Kids

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Abstract: ***Visually impair is one of the disabilities where the person cannot visualize what's happening in the environment. These people use canes to support them while walking and braille script as a system of learning. Braille script is a tool where blind people can explore themselves to read and write. Most of the kids use Abacus as a tool to explore themselves in mathematics to solve various problems like addition, multiplication, division, subtraction and place values. This study was done by exploring braille script and abacus tools in an innovative way for the school going children till the age of ten, by which children's can be educated by the costumes which are worn. The designs were developed by two letter words and three letter words are implemented on the surface by adding sequences. Abacus tools for different age levels are implemented with replicas through beads on the garment to make the kids learn as fun activity without giving stress. The designs were developed on the surface of the garments by adding value addition to the apparels in an innovative way where braille script and abacus are implemented with the sequences like colorful beads with different sizes, half moulded plastic motifs, kundan stones of different diameters. The research is to implement braille script and abacus on the garment is to educate the visually impaired kids in fun activities. The designs were developed using banana fabric dyed with coffee extract.***

Keywords: Braille script, surface value addition, Banana fabric, Abacus and visually impaired kids

1. Introduction

Banana cotton fabric is dyed with coffee powder to construct trousers. Designs are explored for visually impaired kids by adapting easy methods to learn Braille script and abacus and also to give solutions for mathematics and simple two letter or three letter words. Braille script makes visually impaired and partially sighted people to easily read and write. Abacus is a tool used for arithmetic to solve addition, multiplication, division, subtraction and place values. The study was conducted to reduce the consumption usage of braille books and abacus tools in an innovative way for the school going children till the age of ten and educate themselves through the costumes which they wear. The designs were developed on the surface of the garments by adding value addition to the apparels in an innovative way where braille script and abacus are implemented with the sequences like colourful beads with different sizes, half moulded plastic motifs, kundan stones of different diameters. The use of braille script on the garment can be learnt by the wearer and instructor.

As visually impaired kids learn by touch and feel, when these surfaces are explored with different sequences of garments, it can make them feel a new experience of learning which gives more of fun. Most of the kids feel difficulty in learning mathematics. That's the reason abacus was implemented as it is the best tool for kids to learn mental mathematics. The intended approach is done with one on one interviews with visually impaired kids to analyze the experience towards the touch and feel of the surface exploration samples created with braille script and abacus. The choice of the surface exploration to be made from the preferences observed while interviewing. In order to get a detailed and professional insight on Visual impairments the survey was approached with blind schools like Jyothi Seva Home for Blind Children, Venkateshpuram, Bangalore, Sri Rakum school for the Blind and the Sighted Unprivileged Indira nagar, The Karnataka welfare association for blind, Mobility India J. P. Nagar Bangalore and have gained the knowledge in order to incorporate while designing the garment. To also find the acceptance of the Apparels from the blind schools and orphanages.

Banana cotton fabric is used for the construction of unisex shorts and trousers. This banana fabric is dyed with coffee dye extracted from coffee grains to bring in sustainability. Coffee seeds are purchased and grinded in the machine for powder and dye bath prepared to get coffee dye solution. Onion peels, pomegranate and alum are used for mordanting. Four final products are prepared with different mordanting techniques and a study is carried forward.

Value addition to a garment can be given by converting raw materials into finished products. These types of value additions can increase the aesthetic look of the garment and also can improve the quality without affecting the garment. This type value addition can attract the consumers by its uniqueness. These type value additions can be given through finishes like printing, special processes, closures, zippers, embroidery, sequences.

The designs were developed by adding surface value addition techniques like embroidery and sequences implementing braille script and abacus on the garments for a group of kids who come under specially disabled kids below 8 years. Mainly half beads, kundan stones with various sizes and colours, wooden beads of different sizes and diameters of various colours and embroidery threads, cording threads with elastic are used as surface embellishment. .

Objective:
To design and develop braille script and abacus for visually impaired kids by using eco dyed banana fabric and development of braille script and abacus effect through surface value addition on trousers and shorts and acceptance of products.

2. Methodology

2.1 Product Study

Braille script makes visually impaired and partially sighted people to easily read and write. Braille script is a system of writing which is a combination of six raised dots, not a language, hence this system of writing can be used for any language according to the requirement. On a special paper the signs are embossed by hand with a tool called a stylus which is pressed into the paper through holes in a perforated frame, or by using a braille writing machine. In 1800 soldiers in France used Braille as secret code to communicate in nights when there was no light and called it night writing. One of the soldiers visited the blind school where Louis Braille studied and spoke about night writing. This inspiration of night writing in the future was turned to braille script which opened the eyes of many blind students to read and write. Louis braille implemented this night writing in a simpler manner at the age of 15 and published the first braille book at the age of 20 in 1829.

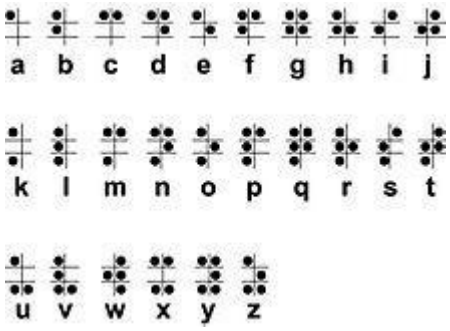

Figure 1: Braille script

Braille learnt a system of communication from Captain Charles Barbier, a French army, in 1821. Charles used code of dots and dashes which was impressed on thick paper called night writing. This was implemented with the soldiers to share the information that occurred in the battlefield which was interpreted through fingers when it was dark in the night without lights. Braille felt that the code used by the captain was too complex to use as it was in its original military form; he took inspiration from that system of code and developed his own system of reading and writing in the future known as braille script.

Abacus is a frame with movable beads also known as counting frame which was used for calculation before the invention of the system of numerals in Arabic. This method of calculation was mostly used by Chinese. For youngsters to sharpen their mathematics Abacus is an excellent tool. Maths is very much important to build a career, to take effective decision making and to make proper judgement. Abacus is very much useful for children not only in solving arithmetic problems but also reduces fears when they work with big numbers also by working capability of the brain. Once children are used to Abacus it improvises their observation skills, mental maths, imagination skills, creative memory and visualization with time management. Analytical skills are developed in a child for solving the problems when they learn abacus.

Figure 2: Children with abacus tool

Children's start to learn abacus from the age 4 and there are many levels in abacus where the learning skills can extend till the age of 9. In preparatory courses students learn with place value, addition, multiplication and subtraction. Learning Abacus makes a child's brain to improvise in concentration, to work efficiently, to memorise, to solve problems and to visualize things in a better way. The children can play a better role in their academic's performance and solve mathematical problems in an efficient way. Due to this the ability and mathematical skills in solving the problems increases in a child. Lot of practice is required to learn abacus.

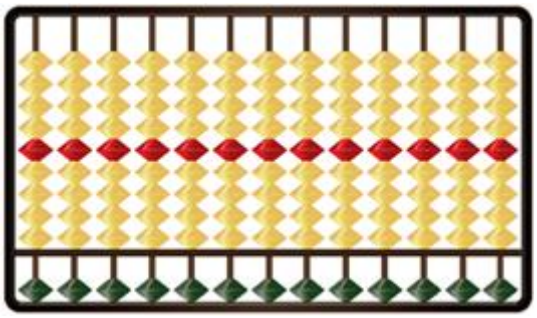

Figure 3: Abacus tool

Ethnography Study

Ethnographic study was conducted to find out the awareness of different natural fabrics, surface value addition, comfortably factor, and frequency of buying clothes. A study on design and development of braille script and abacus on banana fabric with coffee dye for visually impaired kids was conducted through google forms. Study was conducted for 30 samples through Google forms.

3. Methodology

Banana fabric was sourced from Telangana in Andhra Pradesh from a dealer Mr. Chandramouli. Coffee seeds were purchased from India mart and then grinded in the machine to get powder for dyeing. Sequences used for value addition were sourced from R. V. Collections No.28 Ganigarpet, Avenue Road Cross, Bangalore. Frames used for braille script marking were sourced from A. M Mesh shop, Kamaraj Road. Elastic cording thread and plastic mesh sourced from Venkateshwara shop, old market road, seppings road, Bangalore.

Ideation for the Silhouette generation

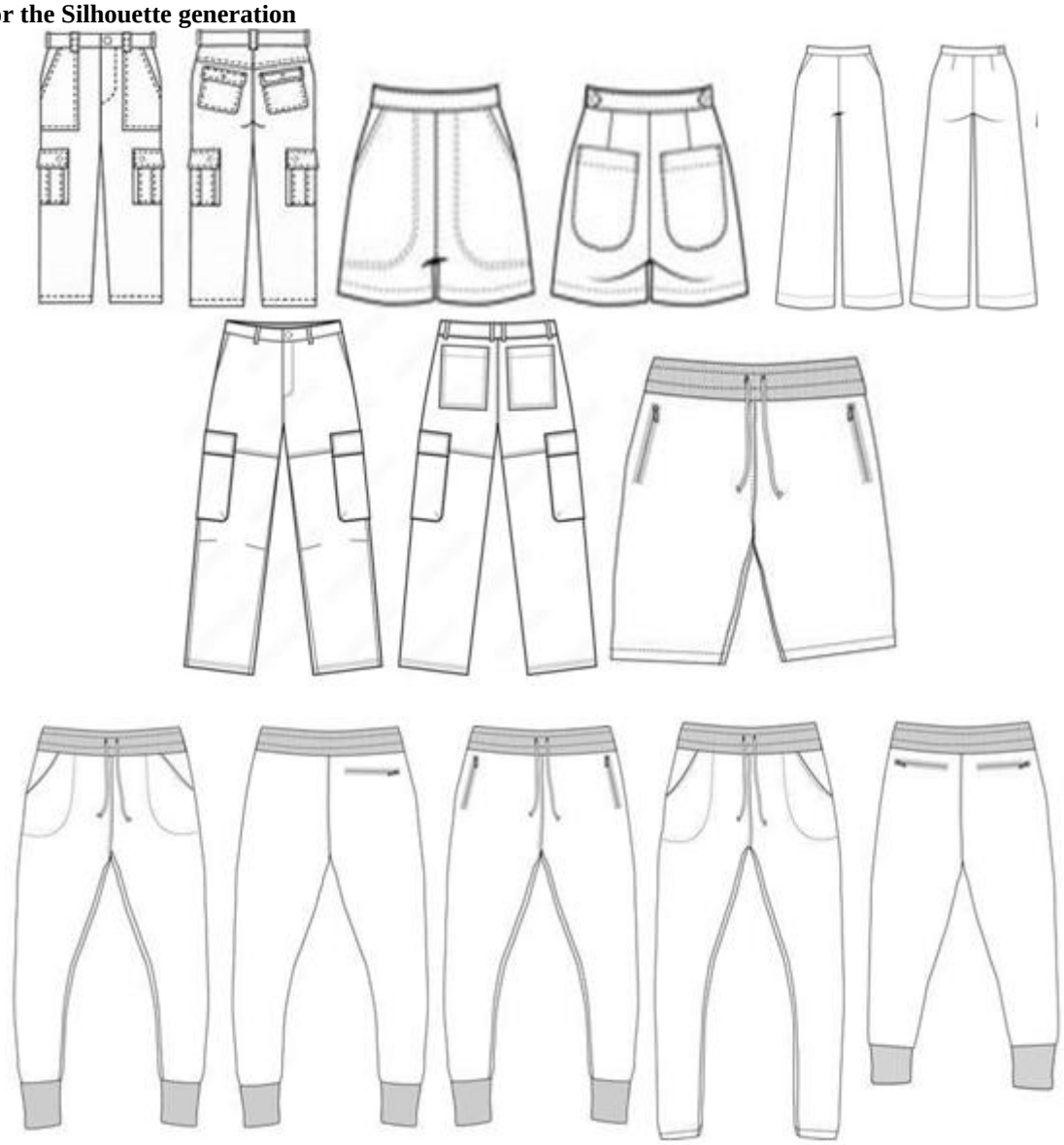

Figure 4: Ideation sketches

Sample preparation of Braille script using different sequences

Frames were sourced one in plastic and another one in iron. So that it replicates the tool used for writing Braille script. This tool was used to mark the alphabets. To get an embossed effect mainly half beads, kundan stones with various sizes and colors, wooden beads of different sizes and diameters of various colors and embroidery threads, cording threads with elastic are used as surface embellishment for this dissertation**.**

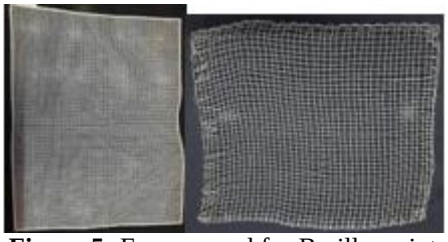

Figure 5: Frames used for Braille script

Sample 1 preparation

Tulsi beads was used to prepare first sample, braille script was marked on the fabric with the plastic frame which resembles the braille script frame. Tulsi beads was attacked by applying back stitch on the fabric.

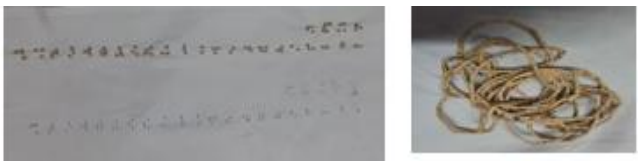

Figure 6: Braille script effect done with tulsi beads

Sample 2 preparation

Half moulded pearl beads were used to prepare sample 2, braille script was marked on the fabric with the plastic frame which resembles the braille script frame. Half molded pearl beads were attached by applying back stitch on the fabric.

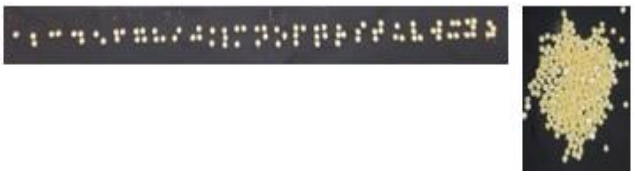

Figure 7: Braille script effect done with half molded pearl beads

Sample 3 preparation

Kundan stones with small diameter were used to prepare sample 3, braille script was marked on the fabric with the plastic frame which resembles the braille script frame. Kundan stones with small diameter were attached by applying back stitch on the fabric.

Figure 8: Braille script effect done with kundan stones

Sample 4 preparation

Wooden beads with bigger size were used to prepare sample 4, braille script was marked on the fabric with the plastic frame which resembles the braille script frame. Wooden beads with bigger size were attached by applying back stitch on the fabric.

Figure 9: Braille script effect done with wooden beads

Sample 5 preparation

Kundan stones with bigger size were used to prepare sample 5, braille script was marked on the fabric with the plastic frame which resembles the braille script frame. Kundan stones with bigger size were attached by applying back stitches on the fabric.

Figure 10: Braille script effect done with kundan stones

Sample 6 preparation

Small size wooden beads were used to prepare sample 6, braille script was marked on the fabric with the plastic frame which resembles the braille script frame. Small size wooden beads were attached by applying back stitch on the fabric.

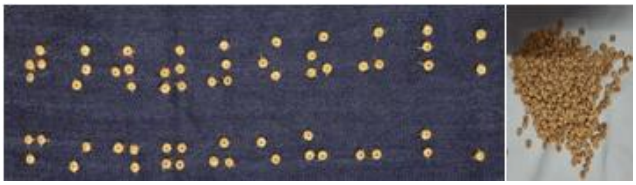

Figure 11: Braille script effect done with wooden beads

Sample preparation of Abacus using different sequences

Abacus is a tool used for addition, subtraction multiplication and division. This tool is made of beads attached to the rods which are connected to the frame. To get the same effect beads, elastic, anchor threads, wool and cording threads are used to prepare the sample of abacus tool.

Figure 12: Abacus tool

Sample 1 preparation
Wooden beads and cording thread are used to get the replica of an abacus tool. Wooden beads are inserted into the cording thread and a chain stitch is applied on the fabric to get the wooden frame effect.

Figure 13: Abacus effect done with wooden beads and cording thread

Sample 2 preparation
Wooden beads with big holes and anchor embroidery thread are used to get the replica of an abacus tool. Wooden beads are inserted into the anchor thread and a chain stitch is applied on the fabric to get the wooden frame effect.

Figure 14: Abacus effect done with beads and anchor thread

Sample 3 preparation
Wooden beads with big holes and woolen braided thread are used to get the replica of an abacus tool. Wooden beads are inserted into the woolen braided thread and a chain stitch is applied on the fabric to get the wooden frame effect.

Figure 15: Abacus effect done with beads and woolen thread

Product development
To develop a final product these processes were followed

Patterns were drafted for 7-8 and 9-10-year groups of kids.

Fabrics were cut according to the pattern developed and embellishments were applied on the cut components and garments were constructed to get a final product.

Figure 16: Design 1

Figure 17: Design 2

Figure 18: Design 3

Figure 19: Design 4

4. Results & Discussion

Ethnography Study:

Ethnographic study revealed that 90% of them are aware of natural fabrics, and 93.3% of them feel more comfortable while wearing organic fabric and 53.3% of them do not buy new clothes very frequently as shown in figure.

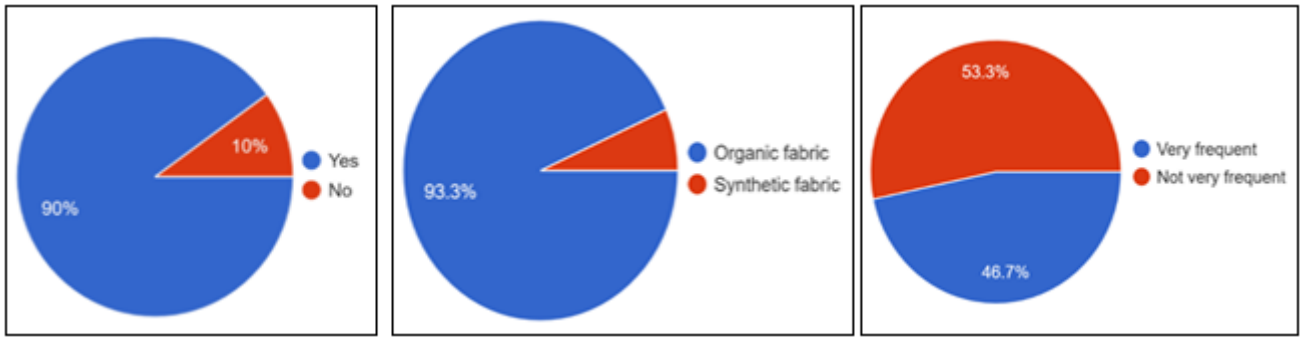

Figure 20: Awareness of Different Natural Fabrics, Comfortably factor, and Frequency of buying Clothes

40.7 % people opted for Banana fabric eco-dyeing and colour shades derived from the coffee dye extract were selected by the consumers through the ethnography study.29.6 % people selected for coffee dye, 51.9 % people liked the Coffee color shade, 44.4 % prefer for on-line purchase of a product and 37 % of the people are ready to buy a product worth of Rs1000 which is shown in figure

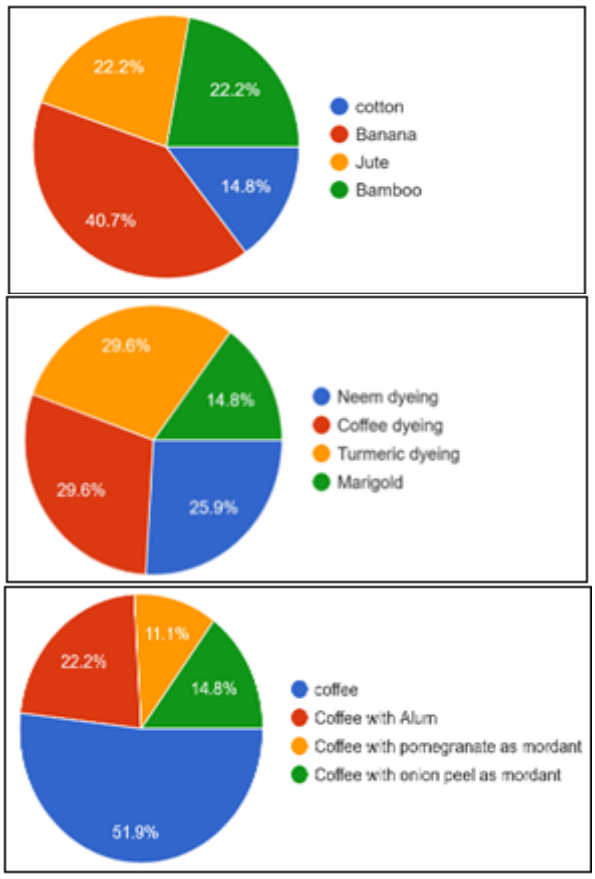

Figure 21: Natural fabric opted for Eco-dyeing, Encouragement for natural dye, Preference for colour shade derived using natural mordants.

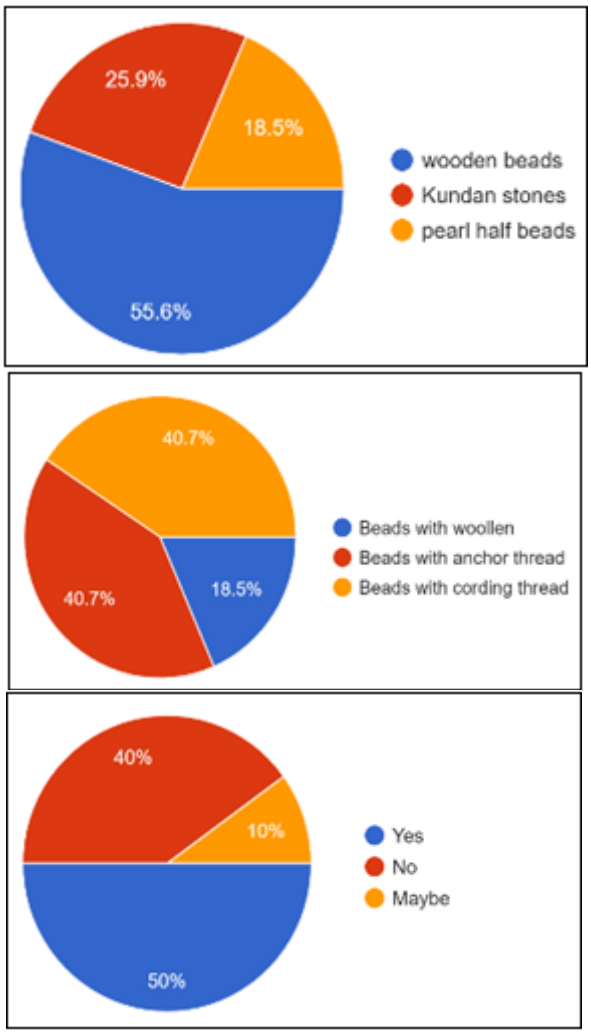

Figure 22: Awareness of surface embellishments, Braille script, and embellishments for abacus and braille script

Survey was done through google forms with 27people in which 55.6 % was male and 44.4 % was female.100 % of people are aware about surface value addition and Abacus.50% of people are aware of braille script. In that 55.6 % people preferred for wooden beads for implementing the surface value addition of the braille script.40.7 % people

selected for beads with cording thread for the value addition for Abacus.

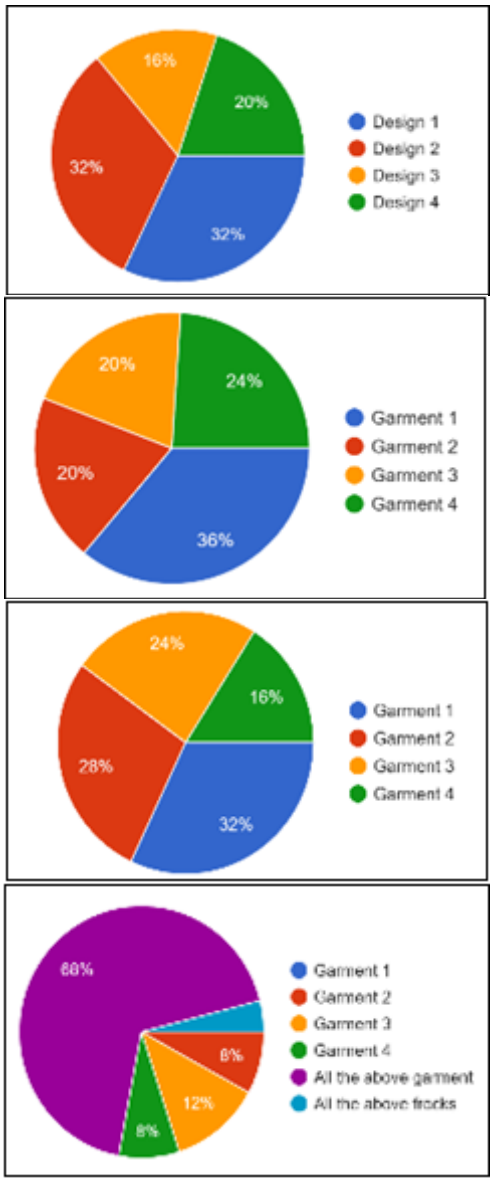

Figure 23: Selection of the design

68% people preferred to purchase all the four garments.68 % people preferred all the four garments for mass production.

5. Conclusion

The present research was an exploration with braille script effect and abacus as a fun activity educating visually impaired kids and disabled children by using coffee dyed banana fabric, and also to understand the acceptance level of the consumer. Banana fabric gained weight after dyeing and the yarn count was increased. Study showed that GSM of dyed fabric was higher when compared with raw fabric. Different Shades and textures of light brown were achieved by adding different natural mordants to coffee powder. In the acceptance survey many consumers liked the design aesthetic, texture, colour, design, silhouette and pattern. Many respondents suggested mass production. The study revealed that braille script effect and abacus can be implemented on the garments which helps kids for improving their memory. The developed garments can be very useful for the upcoming generation.

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