

Furniture for students in home environment

Project II

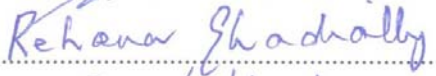
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APPROVAL SHEET

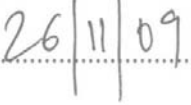
The Product Design Project-II titled "**Furniture for students in home environment**" by Pragati Kapur, 08613804 is approved as a partial fulfilment of the requirements for Post Graduate Degree in Industrial Design.

Project Guide.....

Chair person.....

Internal Examiner.....

External Examiner.....

Date.....

Declaration

I declare that this written submission represents my ideas in my own words and where others' ideas or words have been included, I have adequately cited and referenced the original sources.

I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/ source in my submission. I understand that any violation of the above will be cause for disciplinary action by the institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

Signature 

Name of the student PRAGATI KAPUR

Roll No. 08613804

Date: 25/11/09

ACKNOWLEDGEMENT

I would like to express my gratitude to my guide, Prof. Ramachandran for guiding me through the project at all levels and at all time and also thanks to the entire faculty for their precious feedback throughout the course of the project.

To my Parents who are always by my side.

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My thanks to the studio staff in IDC who have extended their support at various capacities during the project.

My regards to all my friends whose invisible hands have helped me during the different stages of my project.

ABSTRACT

In the present day scenario, where homes are getting smaller and needs of each member of the family, increasing, it is very important to look into the needs of all and at the same time, make the place enjoyable.

In each house there are on an average 2 children and this gives opportunity for design of furniture for students.

The project is an attempt in understanding and co-relating the three main aspects of the furniture system:

Product, User, and Environment.

This was achieved by case studies of homes, feedback through questionnaires, and dimensional specifications of different components.

The concept is to integrate the informality and comfort of home with the exciting environment required by students for studying.

The conceptualisation borrows clues from the study done and thereby formalise the product taking into consideration all the aspects of the system.

The aim is to create an organised work space to make studying at home a comfortable and an enjoyable experience for the children.

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INTRODUCTION

Definition and importance of furniture

“Books are not made for furniture, but there is nothing else that so beautifully furnishes a house “

Henry Ward Beecher

Furniture may be referred to as any movable thing that can possibly support and carry the human body, give storage for objects, or hold them on a flat or level plane above floors (eg. chairs, desks, cabinets, closets, etc.)

Furnishings make a room or other area ready for occupancy

Furniture is an important facility that helps in providing a conducive, convenient, comfortable and functional environment for students at home. The comfort and functional utility of the furniture depends on its design in relationship to the biomechanics of human body.

Children spend a lot of time, at home or in school, with books. They sit in a forward leaning position during writing and drawing and while reading, they lean against the backrest.
Furniture should suit the anthropometrical demands of user.

Classification of student furniture on the basis of purpose

Sitting, Writing, Display, Storage

Sitting furniture includes chairs and benches

Writing furniture includes tables and black boards

Display furniture includes pin up boards, display boards and show cases

Storage furniture includes cupboards, shelves and lockers

Products used by children



Desk with storage



Chair



Storage for books etc.



Computer table



Pin board



Bed table

Validation

Almost 30% (or more, including lower middle class) population of India falls under the middle class category.

Schools and also homes are workplaces for students where they spend a major part of the day. They work with books, notebooks, stationary etc. Middle class homes lack provisions to make space useful for student activities; hence children adapt to strange postures and have insufficient space for their activities.

These homes have no or little furniture designed for children to study, because of lack of space and resources but middle class supports a more sustainable growth model.

Centre for Policy Research, New Delhi:

By the end of the twentieth century 30 percent--some 300 million--of India's population will be middle class.

SCOPE OF THE PROJECT

In an already saturated home furniture market, it becomes necessary to create niches with products serving specialized needs.

Most of the furniture available in the Indian market does not cater to this area and therefore these kinds of products lack.

Furniture available for students includes computer tables and desks and chairs which are also are not designed for mass manufacture and are mostly imported.

Though there has been some work done for student furniture in schools but student furniture for home environment completely lacks.

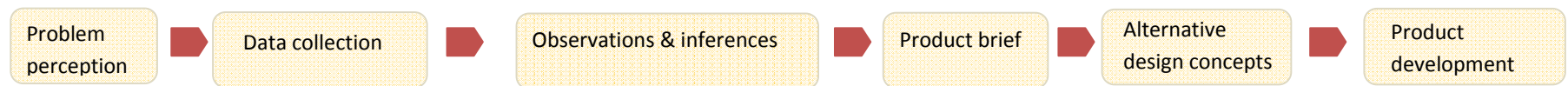
Therefore, looking at the Indian scenario, the need is to explore the possibility of furniture systems that can be mass manufactured and accommodated in small homes, giving the user the flexibility and control over use.

The scope is to design a system that facilitates better organization, flexibility of use and personalised environment.

Methodology

Define project objectives: furniture used by the child in his day-to-day scenario, academics, etc.

Design is carried out to fulfill the objectives, obtain results, the components and materials to be provided etc are decided and feed back is taken from the children. The result obtained is directly taken as a feedback for design.



Characteristics of the age group

Children in the age group of 11 to 15 years (6th to 10th grade students) have been selected as the target user group for the project.

Following are the keywords obtained from the characteristics of the age group which gives a better insight of the target group.

- Children become very critical of their own products.
- The children become very particular about how they appear to others.
- Children want privacy and a place of their own
- They want least intervention from parents or siblings into things what they call their own
- Children want products that can be customised according to their needs

The children want their furniture to have the following features

Provide personal space

Be dynamic – changing shape/orientation

Adjustable

Comfortable

Playful/colorful

DATA COLLECTION

The study included feedback from potential users for understanding key issues related to the study environment at home.

The data collection includes following aspects

Case study

To study the student environment at home

Questionnaire

To get proper feedback from potential users

Market survey

To have an insight of the market scenario

Ergonomic standards

To get the relationship of user and the furniture

Case Study

Sample size - 10 houses

Number of children interviewed: 8

Children in the age group of 11 to 15 years

Houses visited were in the following places

- IIT Bombay campus
- Satluj Apartments, Kandivili
- Houses outside IIT Bombay main gate, Powai

Approximate area of the houses: 350 sq.ft. to 600 sq.ft

Products/spaces used by students at home



Space for storing long books/colours etc



Storage for books



Storage of toys/games/CD s



Table used on bed



School bags



Folding table cum chair



3 cupboards in a row for storing clothes/books



Computer table used to store old newspapers



Loft to store things not in use



Carom board kept behind the head end of the diwan

Storage scenario in small houses

The living area

Furniture typically present in the living area of a small house:

Seating for family and guests

Display cabinet and entertainment centre

Occasional side tables and a centre table

Magazine and newspaper storage rack

Corner table for telephone

With the increase of daily necessities and a lot of already existing furniture, there is no place for new things and the results is that the house looks in a great confusion which also affects the mood of the students

Inferences from interaction with parents

Some of the insights obtained during the interaction with parents are:

- When buying furniture, they look at the its affordability
- They also look at its ease of maintenance
- Since the target group is middle class, they want something which is space saving and portable
- Parents are the best source to find out the likes and dislikes of the child.
- Mobility of furniture is a concern - Movable/portable furniture preferred
- There is very less space for storage
- When guests come in, it is a problem – not enough place to make them sit and serve
- Organization of the material inside the cupboards is a problem as the children grow up

Typical cases from the study



Shivani

12 years old – 7th grade

Studies on the bed or floor, without back rest (mostly), books scattered every where

Reasons – No better place to sit
TV is in the same room

Problems – Back ache
If guests come over, she has to go to either the terrace or to a friend's place, to study



Prateek

13 years old – 8th grade

Does not use the folding table in the kitchen

Reasons – Kitchen is not a study friendly environment
The table top is loose and comes down with weight of books

Problems - Has to study in noisy living cum bedroom
No privacy
Not enough place to keep books while studying

Inferences from interaction with children

The interaction with the children happened right from the beginning of the project. The interactions focused mainly on the activities in school and at home.

The children with whom the interaction happened were from IIT Bombay campus, houses opposite IIT main gate and Satluj apartments, Kandivili. Speaking to the children happened at home, which helped to understand them better

This also gave an opportunity to see and know about their problems while studying at home

Some of the important observations made during the initial interactions with the children are

- Most of the children faced problems with the furniture but they learn to deal with them.
- Most of their time is spent between school and tuitions
- There are 3 sets of books and two sets of note books for each child in the house for each subject
- Girls preferred to study in the squatting posture while the boys preferred a table and a chair

“I have been black and blue in some spot, somewhere, almost all my life from too intimate contacts with my own furniture.”

Frank Lloyd Wright

The initial interactions with the kids lead to some insights for the design intervention

- The furniture should allow for change in height as the child grows up
- The child should have place to store his belongings and books
- The furniture should be easy to operate and use
- The furniture should need minimum operation from parents
- The product shall be inviting
- The product shall allow for customisation by the kid

The insights obtained during the interactions with the children were used in the ideation process, which was simultaneously underway. The questions that arose at this stage were

- The components of the product
- The various materials that should be used for making it



Use of corner table as study table



Computer table
used as study table

Open shelves for storage – books falling off

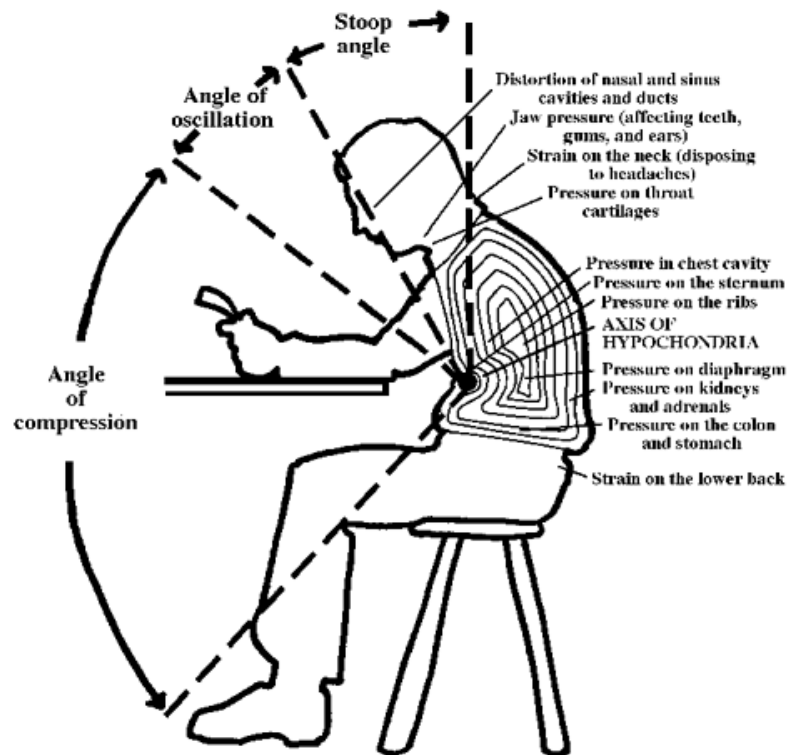
PROBLEM IDENTIFICATION

In small, middle/lower middle class* houses in India, in cities like Mumbai, a common problem encountered by children is lack of adequate study space which leads to difficulty in organizing their stuff and causes problems such as lack of concentration, postural problems etc.

Problems with furniture

- Difficulty to sit in the furniture- furniture not designed to match student's anthropometry
- Lack of storage provision for belongings
- Furniture does not permit flexibility
- Absence of surrounding free movement space
- Not much attention has been given to the materials, finishes and manufacturability of the furniture

* Middle class- class of people intermediate between the class of higher and lower social rank, having average status, income, education, etc.



Problems with incorrect ergonomics of sitting

Consequences of bad furniture

- Mismatch of furniture and body size
- Muscular skeletal disorders
- Pain in the lumbar region due to lack of support
- Head ache
- Strain in the neck

Suggestions (specific to the activity of sitting)

- Comfortable seat
- Lower back support
- Foot rest
- Wide work surface
- Provision for bag, books

Measures taken by people to make the most of the space available



Enclose shelves behind doors



Make it hide – glass furniture occupies no visual space



Over head storage



Think tall- maximise wall space with tall cases



Fold it – folding tables can be slid under the bed



Look up

Products existing in the market

Products in the market, both international and domestic, were studied to find out what furniture is available for the students.

The search for the existing products was done by

- Visiting furniture shops in Mumbai city
- Speaking with parents and children
- Searching the Internet.

The furniture available in the market for students is primarily computer tables or desks and chairs which are imported from Indonesia and other countries. There is no organised sector manufacturing furniture for students in India, therefore not enough thought has been given to the furniture from, ergonomics, aesthetics and mass production of the same.



17

Indian product solutions for students

The designer to these frames, Mukul Mandey, had one thing in mind — to provide students with a bedroom lifestyle that adapts to their whims and fancies.

Originally three pieces of furniture or three modular units, these can be made into

- three study tables to work with a laptop or while on a group study
- a comfortable chair or
- a single bed.

The three identical modular units can be used straight up or upside down, with ample storage at the bottom.



Furniture for school

For primary school kids in rural India

Student project at IDC, IIT Bombay

The product should provide adequate support to the study materials at the time of use and carrying. The product should be light and compact enough to carry.

Products for students in the international market

Flux e-des by Shane Crozier

This personal desk/chair unit was specially designed for use with a laptop. It features power cable management to get the wires out of the way. While the hard shell exterior is adequate to handle even the most powerful of keyboard typists. Padding on the underside of the desk helps against soreness developed from leg and knee impacts



1



The TIO concept

It is a single piece of furniture which has three interconnected parts which can be configured to form three different pieces of furniture - a stool, a table and a side table. The entire setup is constructed with three rotationally moulded glass and polypropylene parts interconnected with aluminium pins

2



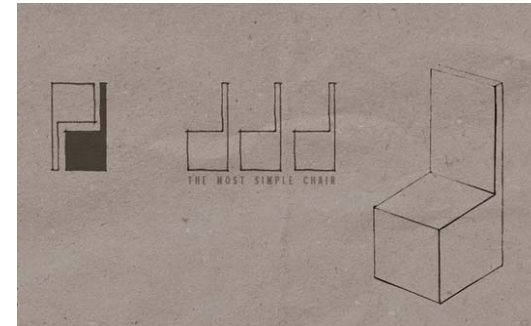
When the chairs are slid underneath the table with the front legs placed on the crossbar, they lock into position and handily provide wheels for the table. Space-saving and functional, this seems like it'd be a good fit for a space-tight spaces.



3



The most simple chair and table



4

Tok & Study by Helder Filipov

It is furniture capable of making the environment conducive for studies, combining comfort and dynamism. It fits both the study with traditional materials and the study with notebooks, while sitting on the couch or lying on a bed.



Examples of contemporary storage solutions

Olit by **Adrien Guerin** is a small piece of furniture with a filing space under a removable shelf. This plate makes it possible to practise various activities while remaining in bed





Can Onart, Elissa Myres and Bethany Casperite

Using bending technique for moulding the 8 layers of industrial gray felt (stuck with epoxy resin) and 2 layers of veneer, this piece could be used as a table

7



Elastico book case by Arianna Vivencio

The Elastic Bookshelf is made of wide elastic bands stretched over wall-mounted pegs

8



Exploration of materials

Wood is the most important material and is traditionally used for making furniture. Wood is a soft material and so can be easily worked with

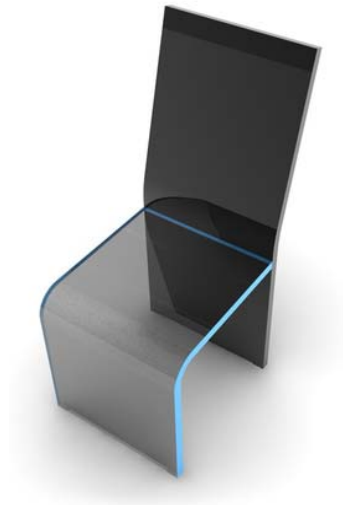
Laminates are the addition of a fake wood surface to the surface of furniture, and are made from thin slices of wood held together with glues



A **veneer** is where thin slivers of wood are used as a finishing material. Veneers are used to give a higher quality look to low cost furniture



Bamboo furniture is a low cost, lightweight and environmental friendly



Plastic is extensively used for making furniture

Made from black or colored acrylic

10

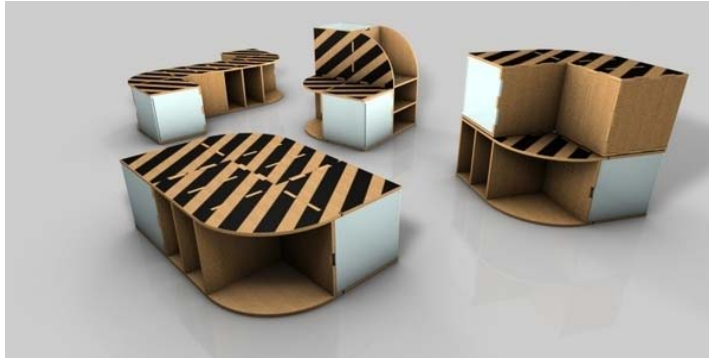


Metal

Aluminium - lightweight and affordable

Brushed aluminum, contrasted with an interior high gloss painted finish providing a classic feel

11



Cardboard and recycled polypropylene
Configurations are endless, from storage to a work area

12



High density cork
Cork is environmental friendly

13

This chair called "LIE" is a transformable chair which folds into a table.
It is made of **solid wood and OSB**



14



15

Glass furniture by Inez Kochanowicz



16

Caesar Stone offers a combination of form and function, allowing for a more diverse, durable, and practical countertop surfacing material than either granite or marble. It has stain, scratch, and heat-resistant properties.

Ice cubes – typical mass manufacturing plant

ICE CUBES, a new venture of Magppie offers personalized modular kitchens and wardrobes

Ice Cubes facility is set up in Sonapat, Haryana, with all machinery and technology from Italy & Germany.

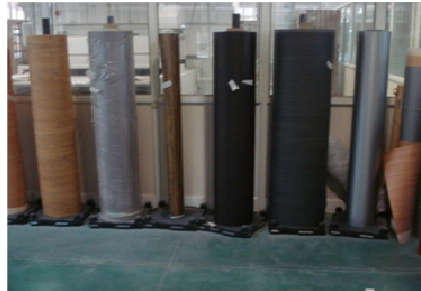
Materials used

Base material – Boiling Water Resistant (BRW) ply

Countertops – Corian (from Dupont)

Door finishes – Laminated, veneered, lacquered

Processes



Veneer sheet rolls



Parting of hinges from a long strip



Pressing of board after application of veneer



Polishing wooden surface



Trimming off edges



Rounding off edges of board

Height and weight of children at different ages

(Source: Nutrient Requirements and Recommended Dietary Allowances for Indians, I.C.M.R. 1990)

Age (years)	Weight (kg)	Height (mm)
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Average weight and height of **girls** at different ages

11	33.7	142.0
12	38.7	148.0
13	44.0	150.0
14	48.0	155.0
15	51.5	161.0

Average weight and height of **boys** at different ages

11	32.2	140.0
12	37.0	147.0
13	40.9	153.0
14	47.0	160.0
15	52.6	166.0

DESIGN BRIEF

To design furniture for students in the age group of 11 to 15 years of age, serving two or more functions. The product shall be used in home environment, in middle class homes (Approx. area = 500-600 sq. ft.) and shall provide solution in terms of personal space and should be safe, easy to use and handle and affordable

The product shall be designed such that it can be mass manufactured
This will be achieved by the type of materials and manufacturing techniques used.

Design specifications

After data collection and analysis, the final product requirements and expectations in different fields were listed down.

User requirements

- The product should provide adequate support for the study material at the time of use.
- It should provide adequate work surface

Ergonomics

- The product should satisfy ergonomics requirements prescribed for the user group.

Materials

- Material should be easily cleanable.
- The product should be attractive.
- Texture should not be coarse as it catches dust

Durability

- Product should be able to sustain abuse by the children.

Space

- A new layout, for better utilization of space.

CONCEPT GENERATION

Study environment can be made more productive with proper use of furniture which provides comfort and space for the student for his various activities

The proposed design intervention aims to take care of both

The ideation process started with rough sketches and doodles during data collection

The evaluation of these concepts was done by taking feedback from the user based on various attributes.

One concept has been taken for development and prototyping.

The concepts are based on the attributes listed below

The key words helping the ideation are:

PRODUCT

Flexible

Compact

Multi use

Personalised

USER

Comfort

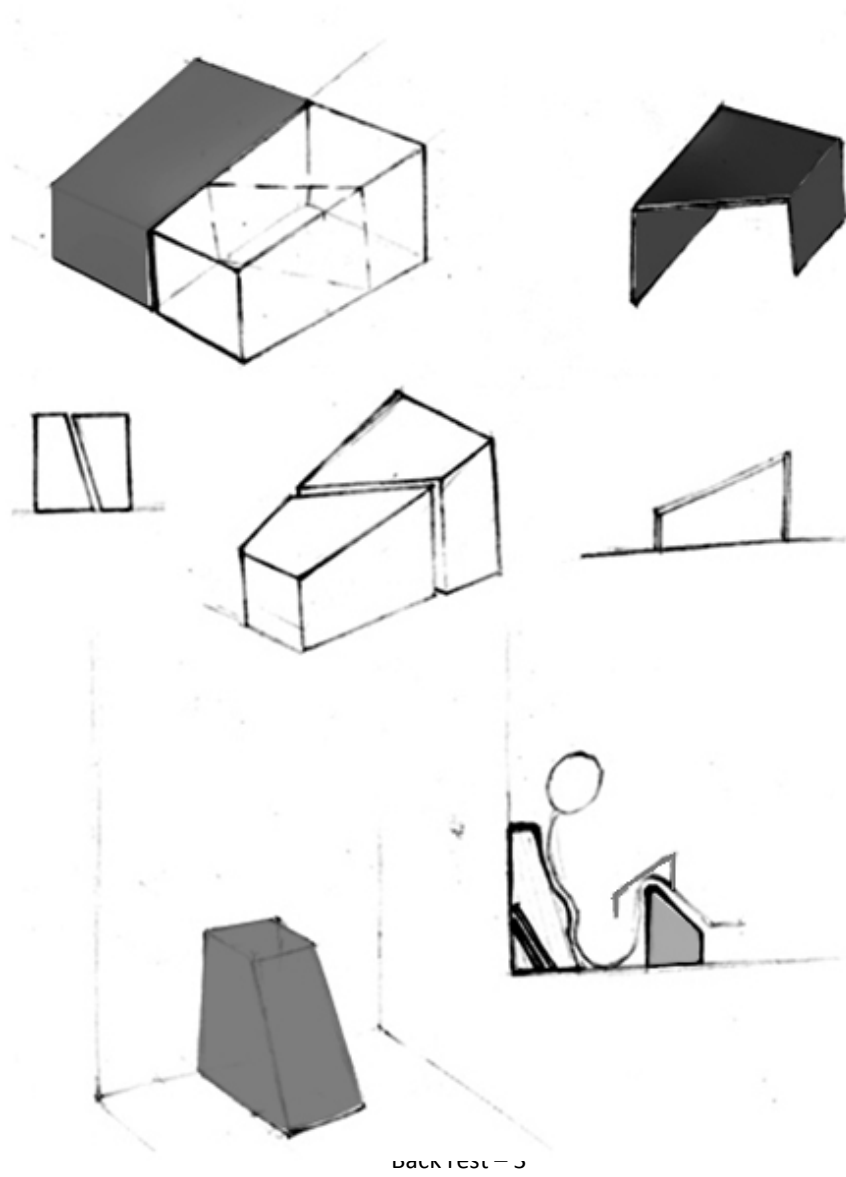
Control

ENVIRONMENT

Informal

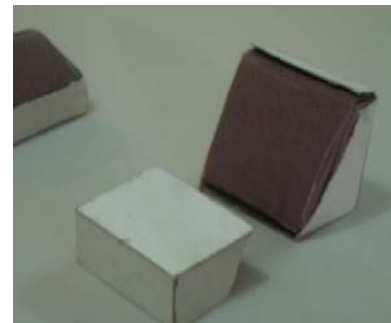
Safe

Warm



Ideas based on squatting posture

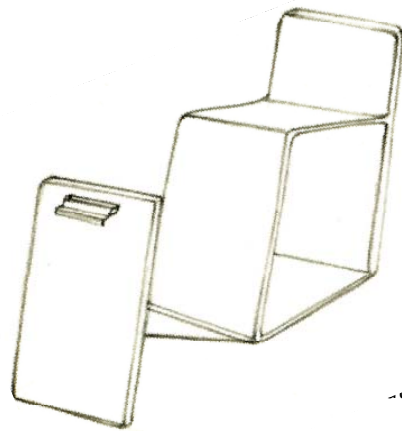
The initial ideas based on the feedback were based on the squatting posture.



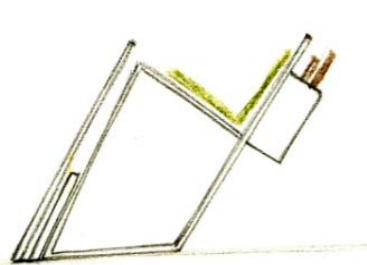
Unit which can be separated into 3 different components and brought together again

1 b

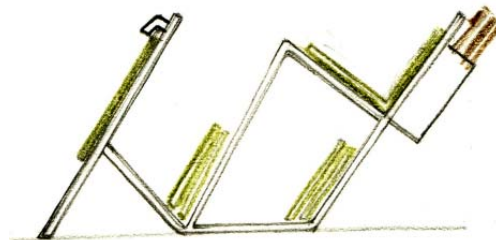
Book mounted on box



Stationary storage

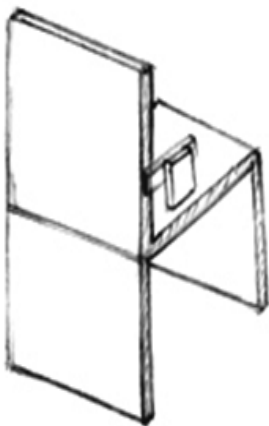


Unit folds and compacts

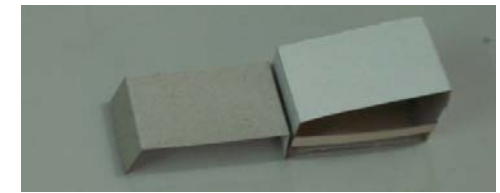


Storage for books

1 c

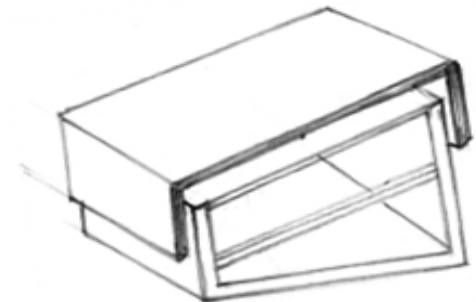


Chair folds to form writing surface and storage

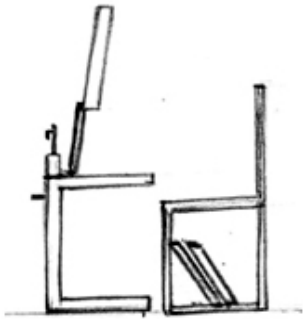


Various configurations possible with the unit

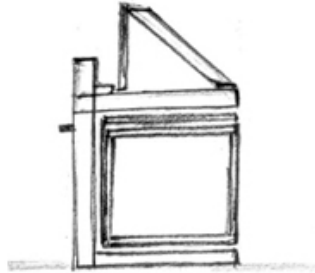
Separable stool



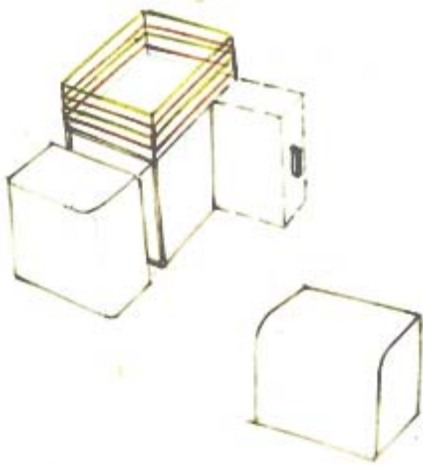
2 a



Chair with storage



Chair folds inside the table



Pull out storage

Pull out seat

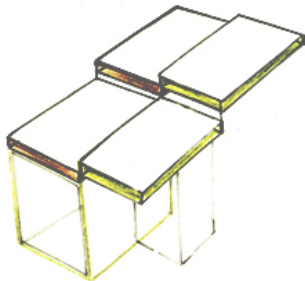


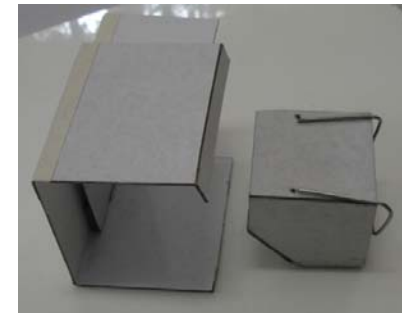
Table surfaces open at different levels

Ideas based on sitting posture

While making ideas for the sitting posture, an effort was made to save on floor space

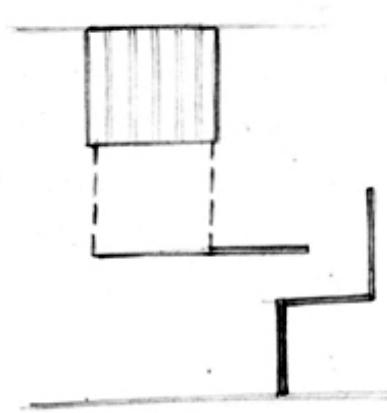


Metal frame used to impart lightness to the structure



Concept based on saving space- table and seating integrated into one

2 b



Ceiling mounted storage

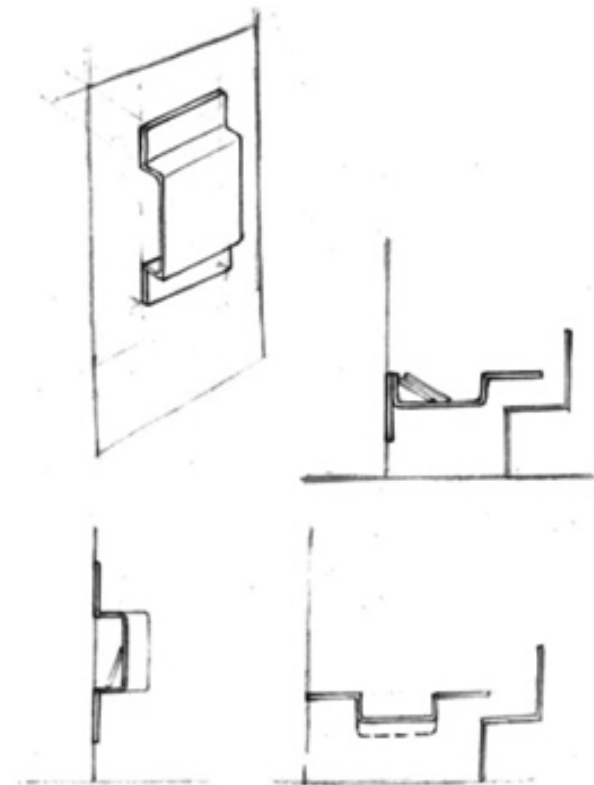
Lamp on ceiling when not in use

Lamp on ceiling when not used

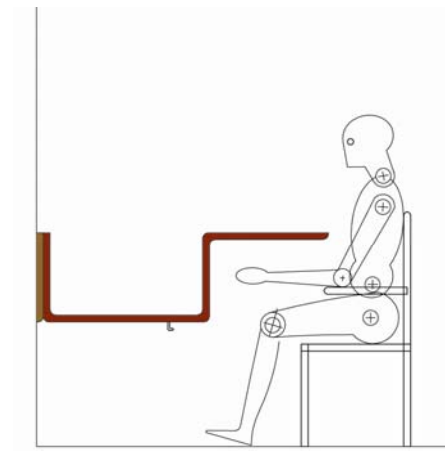
Pull down

Flap opens – writing surface

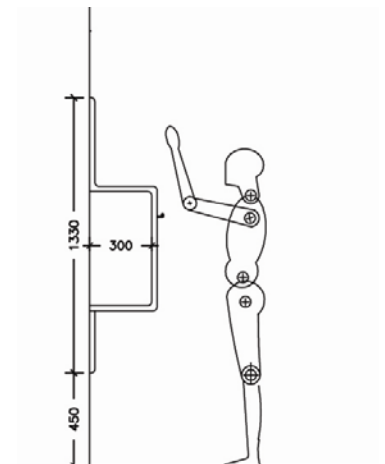
2 c



wall mounted table cum storage unit

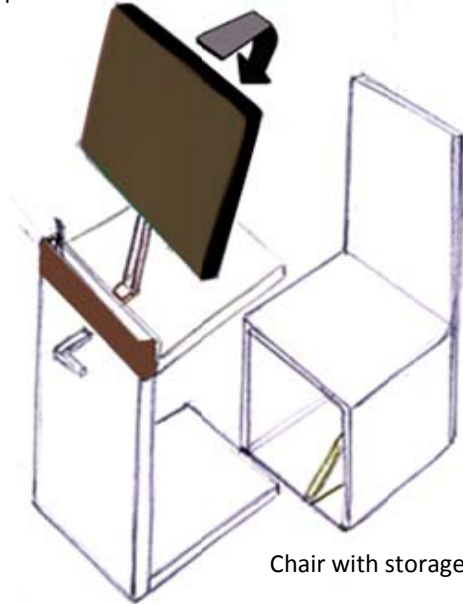


Open



Closed – put against the wall

Folding pin board



CONCEPT 1

Floor area occupied = 3.6 square feet

This concept is based on the sitting posture

The chair folds into the table, which saves floor space

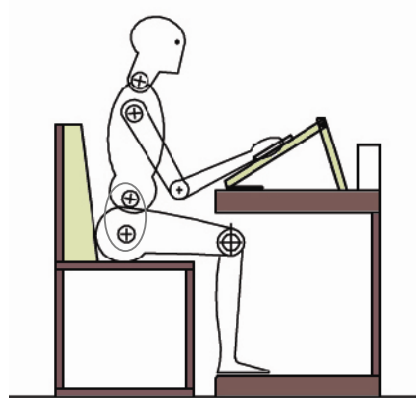
The pin board folds down to form a writing surface

Disadvantages

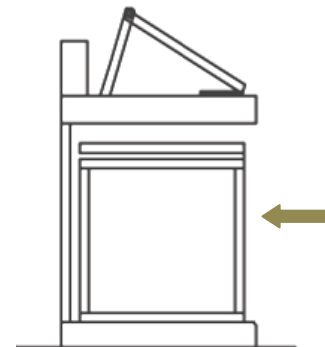
Folding of the back rest of chair and putting it under the table is a difficult task

The furniture looks very table chair like which does not attract students

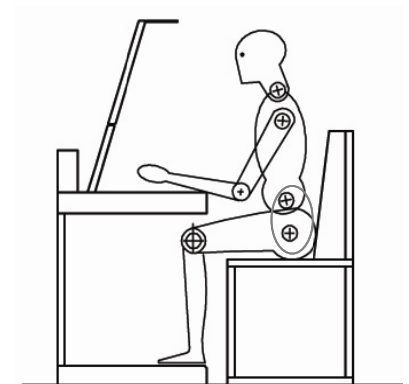
There is no play or interest in the form



Pin board folds to make writing surface

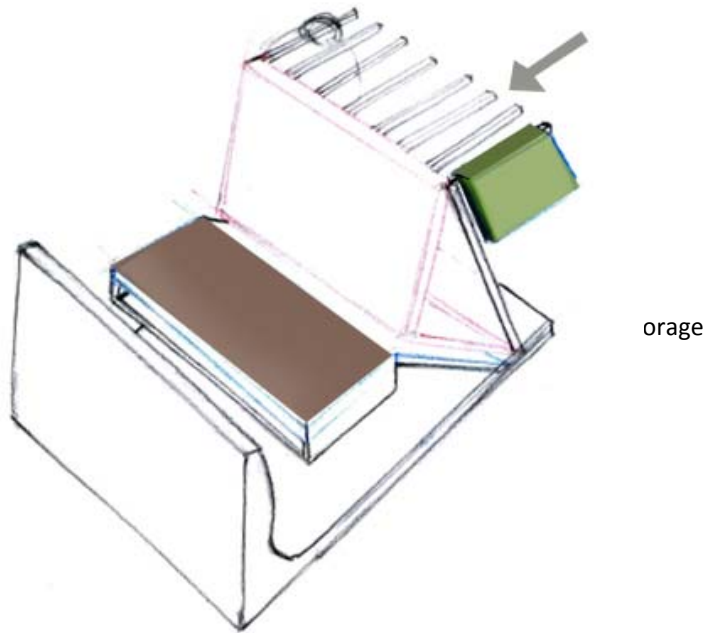


The chair inside the table



CONCEPT 2

Writing :



Floor area occupied = 10.8 square feet

This concept was derived from the squatting posture

The unit is complete in itself incorporating seating, storage and a writing surface

The unit can be carried around in the house

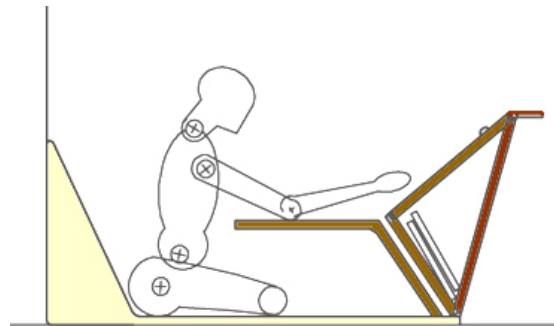
Disadvantages

The unit would get heavy with the weight of the books and the unit itself

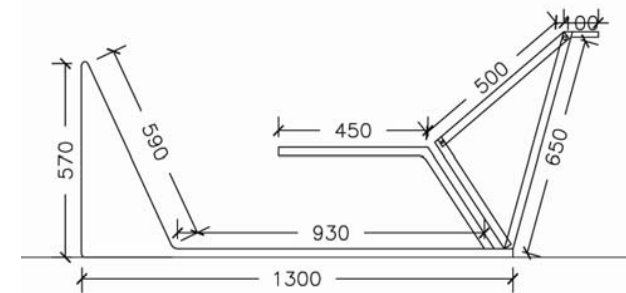
It is rigid and no configurations possible

The children do not find it interesting

Inflatable back rest



Can be put against the wall





ect back rest

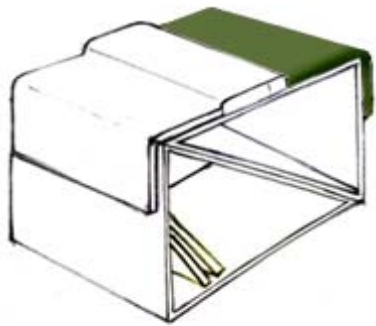
CONCEPT 3

Floor area occupied
Open = 11.95 square feet
Closed = 9.5 square feet

The back rest can be made upright or can fall back to become a small bed
This concept can be used both for squatting and sitting postures
The space below the seat can be used for storage of books etc
The unit also has a folding table, which folds under the seat and can be taken out

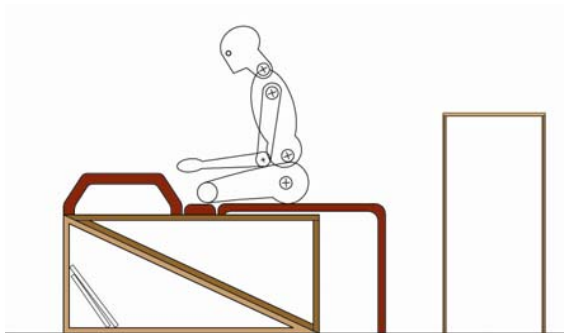
Disadvantages

Occupies a lot of floor area when open
Operation and functions look very complicated

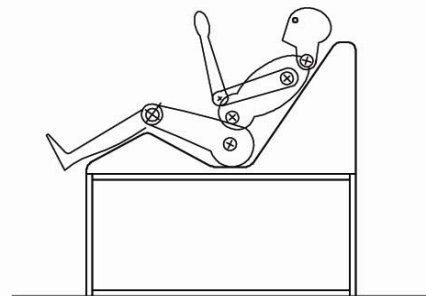


ack rest falls to become a flat bed

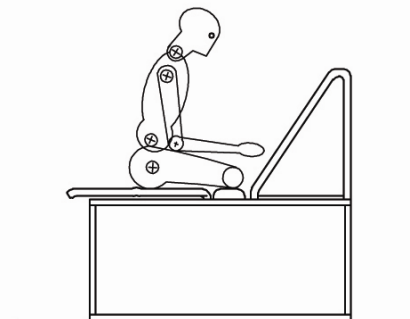
torage for books under the seat



Sitting



reading



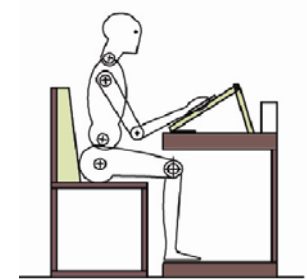
Unfolding

EVALUATION

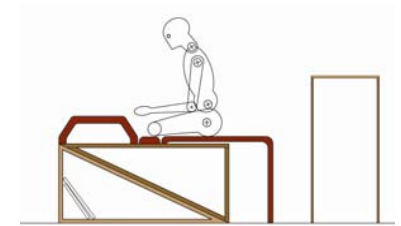
Weightage %	Attribute	1	2	3
40 %(*0.4)	Storage	8	8	5
60 %(*0.6)	Area occupied	7	5	6
70 %(*0.7)	Ergonomics/ comfort	8	7	7
50 %(*0.5)	Handling	8	8	8
		17	15.1	15

Ranking is from 1 to 9 from bad to good

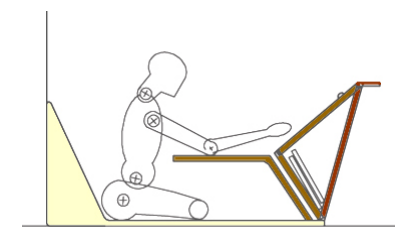
Concept 1 was chosen for further detailing after evaluation was done based on user feedback.



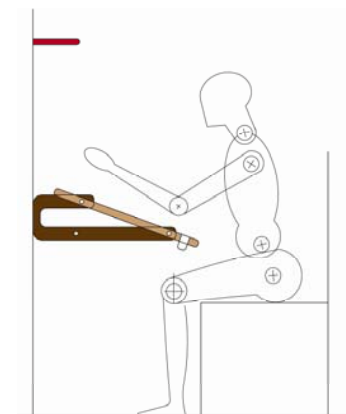
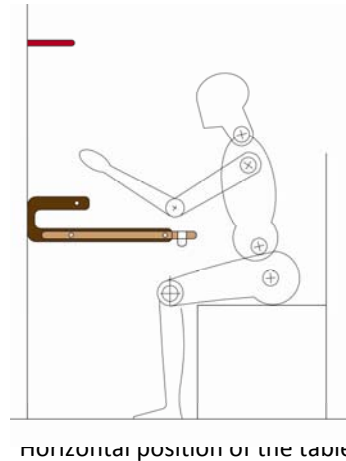
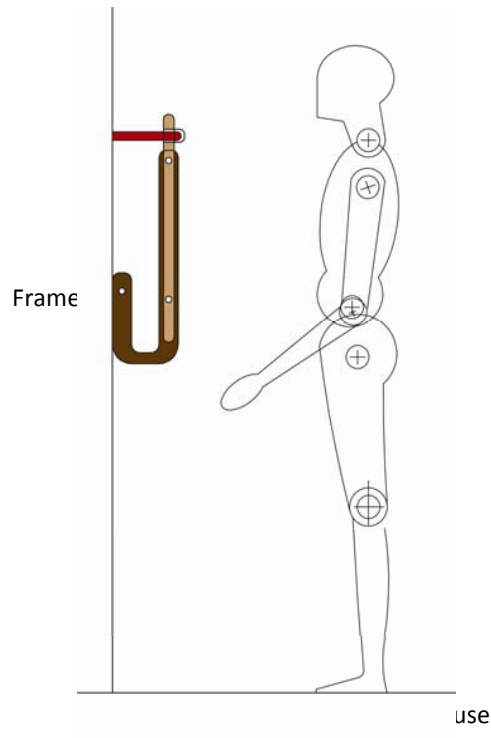
1



2



3



Refinement of concept 1

The following changes were made to concept 1 to make it more efficient

- The table was wall mounted instead of being kept on the floor
This saves space. Only the chair has some foot print
- Storage for books and belongings incorporated into the table
- The working of the unit made interesting
- There is motivation for students to keep things in place after using the table to hide their belongings from siblings etc.

Disadvantages

- No space for storage of books or belongings
- Changing the angle of the writing board for reading and writing is not required

The following slides show how the product shall roughly look like and function

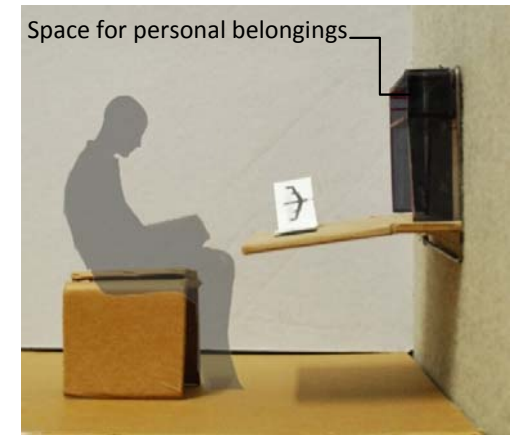
Exploratory model



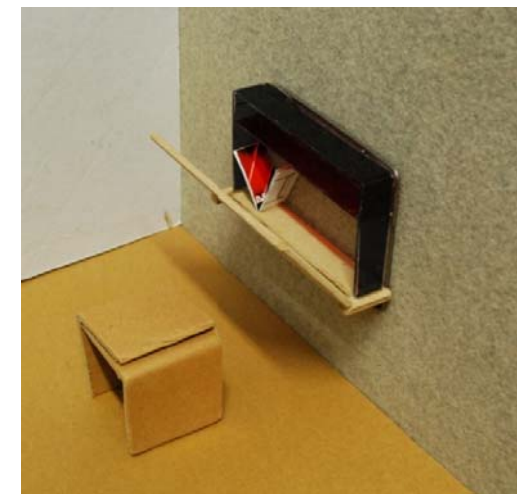
Unit fixed on wall - closed



Height can be adjusted as the child grows up



Books kept horizontally



Books kept vertically

STORAGE FOR BOOKS

Product features

- Hangs on the wall, so there's no foot print on the ground
- Protrudes only 8" when closed
- Movable unit- height and location can be changed
- There is space for storage of personal belongings which are hidden once the table is put against the wall
- Magnets are used for temporary closing so it is easy to operate
- Books and notebooks that can be stored is approximately 14 in number



The adjoining figures show the wall mounted furniture in various stages of opening

Translucent acrylic frame occupies less visual space

Provision for storage of stationary which can be accessed even when the writing board is closed



The plastic mould (depicted in yellow colour in the adjoining figures) can be customisable according to the choice of the children

The design is children friendly with no sharp corners





- occupies zero floor space
- lightweight honeycomb structure
- occupies less visual space
- storage for books and belongings

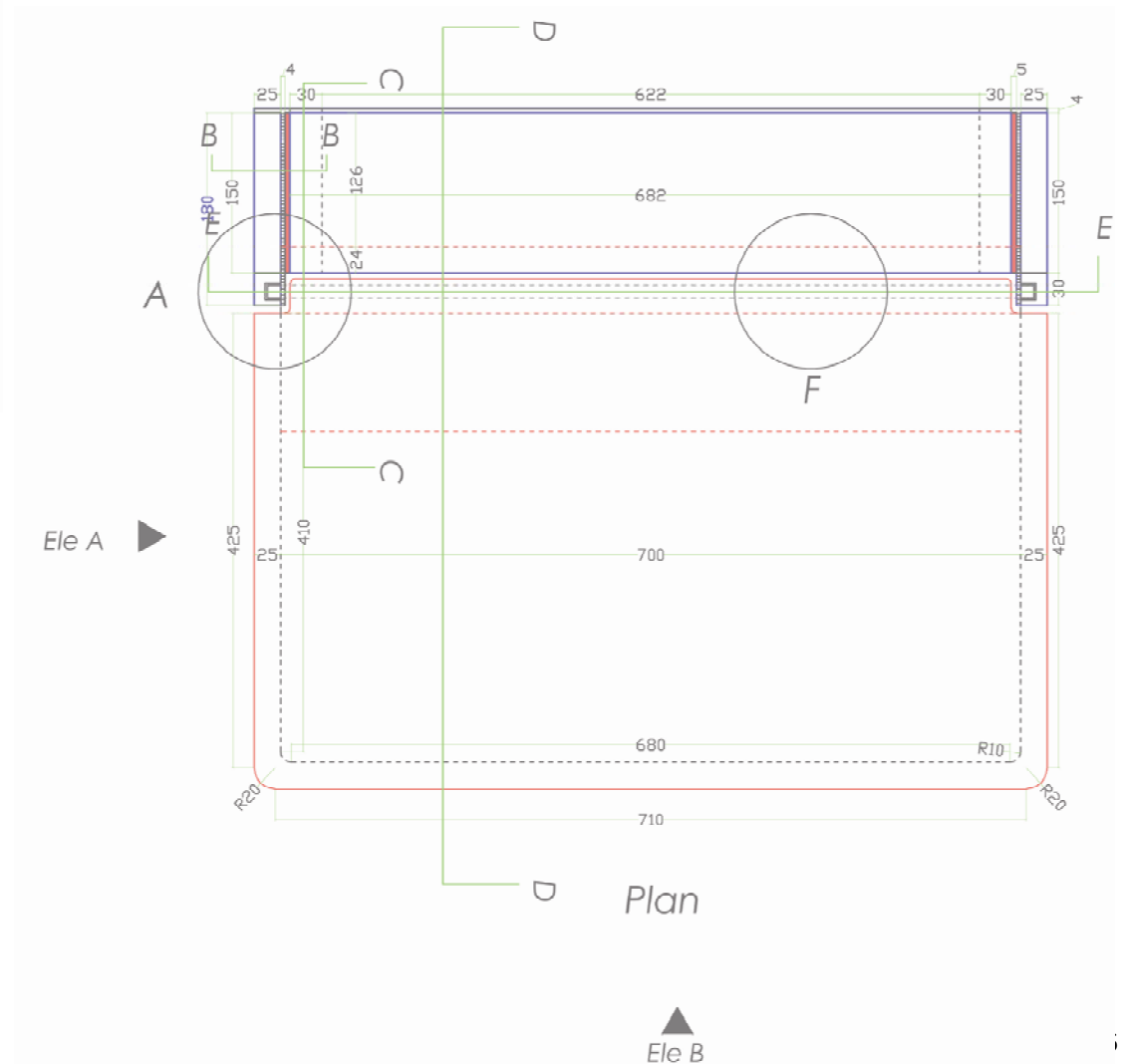
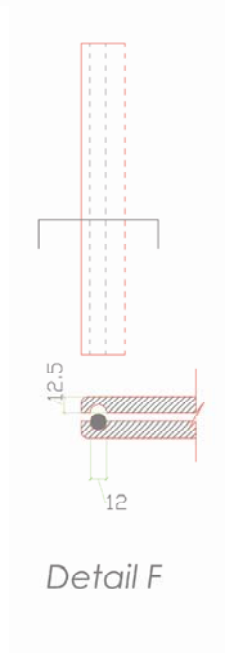
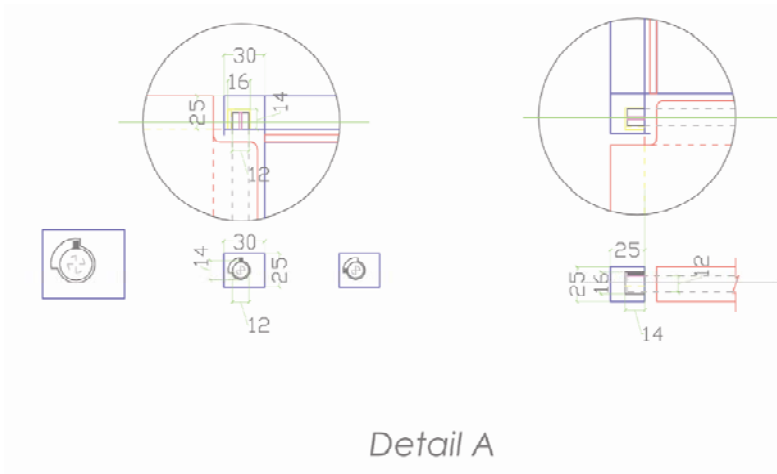


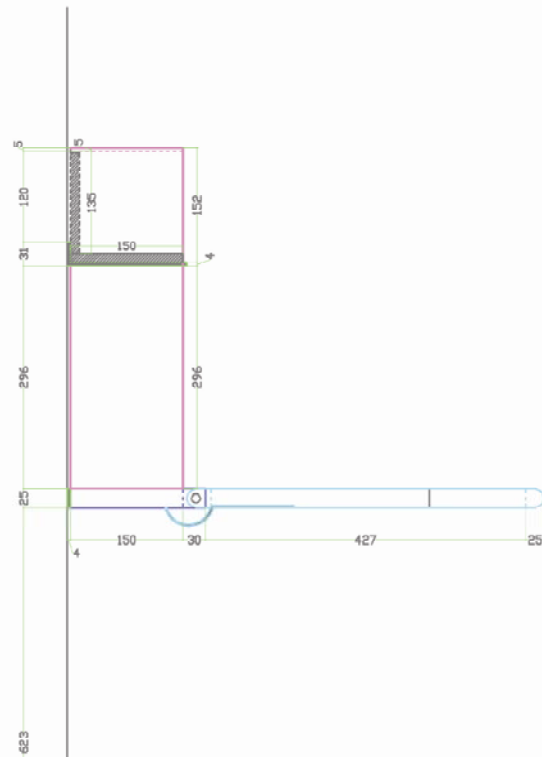
Hinge which holds the writing surface in horizontal position

Child using the furniture

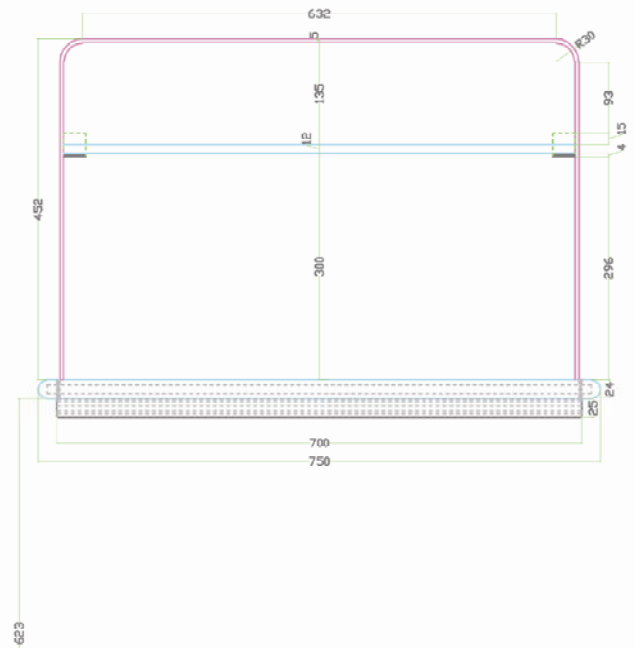


Dimensioned drawings and details of the furniture



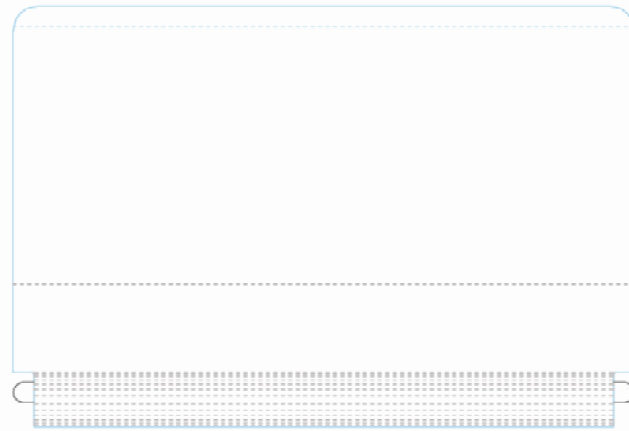


Elevation A

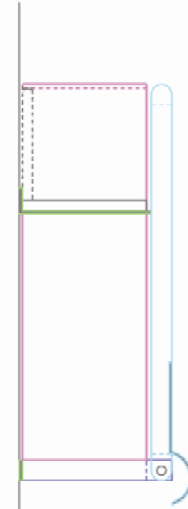


Elevation B

All dimensions in mm



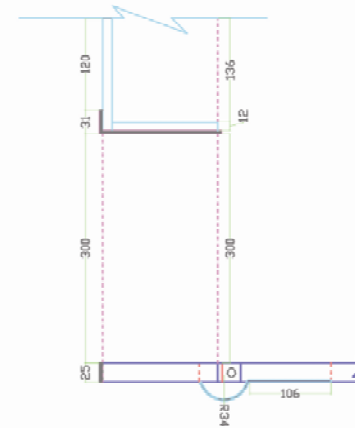
Front elevation (closed)



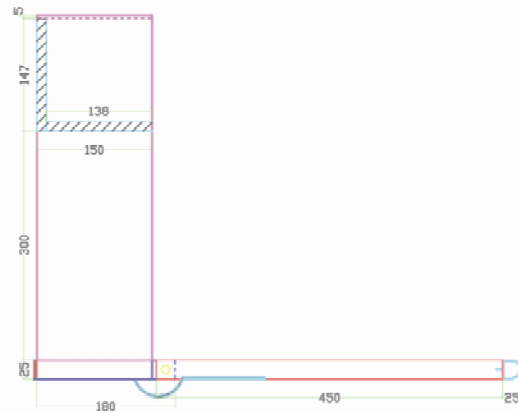
Side elevation (closed)



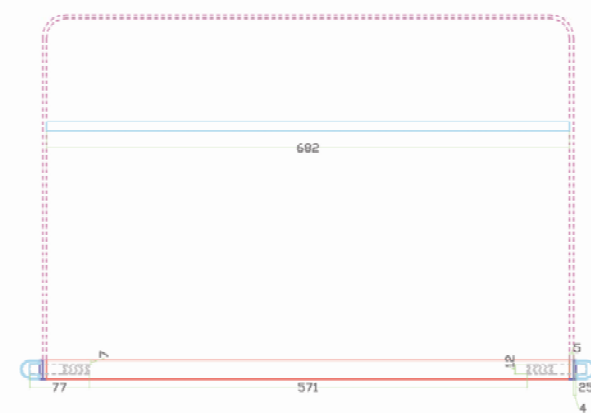
B-B



C-C



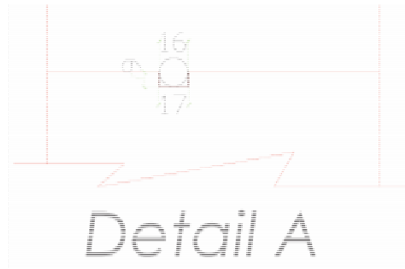
D-D



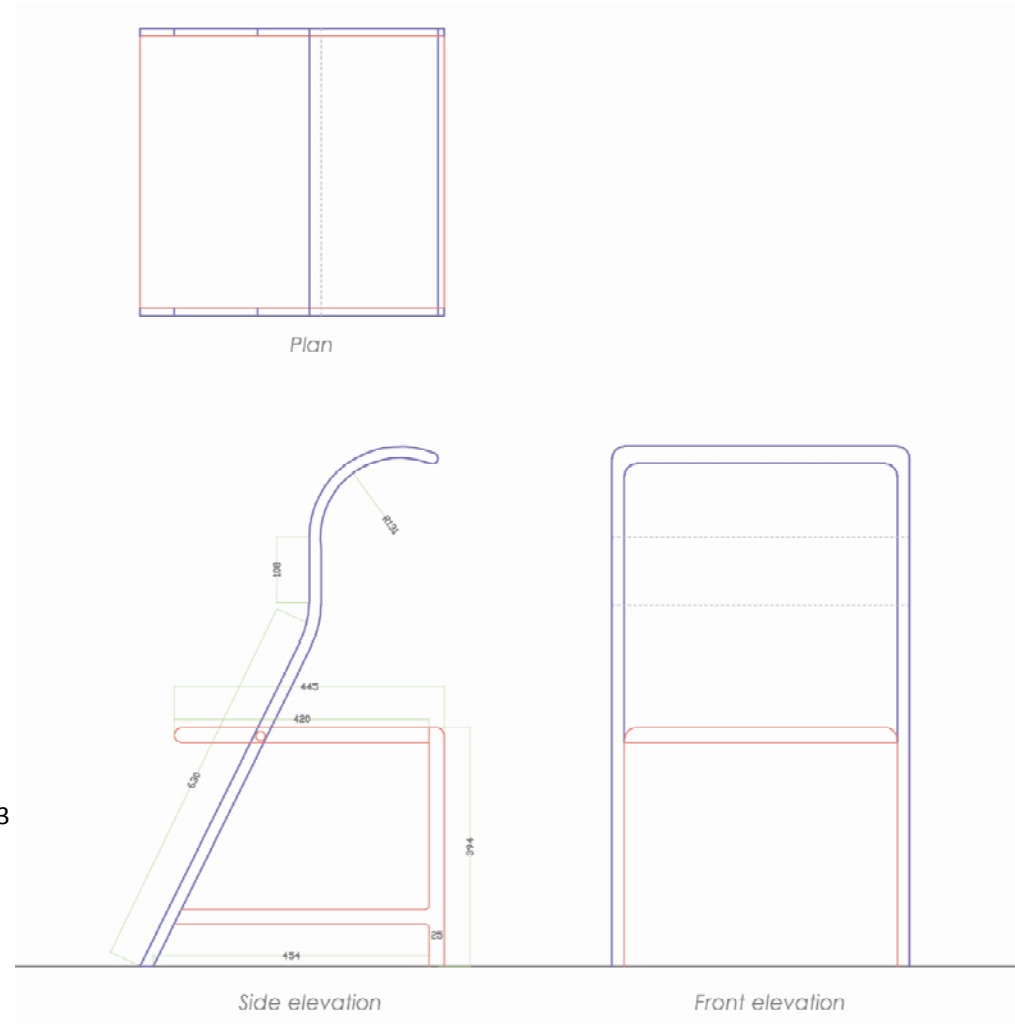
E-E

All dimensions in mm

Chair dimensions



Storage below the chair accessible from 3



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<http://sitagita.com/home-and-lifestyle/budgetwise/space-saving-in-small-apartments.html> September 2009

Pictures

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- 8 <http://www.behance.net/ariannavivenzio/frame/279693> August 2009
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- 13 <http://www.behance.net/Gallery/Biscuit/241952> August 2009
- 14 http://www.coroflot.com/public/individual_set.asp?set_id=296359&individual_id=49030 September 2009
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http://www.coroflot.com/public/individual_file.asp?portfolio_id=2244130&individual_id=262755 September 2009

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October 2009

Annexure

Questionnaire for parents

- Is furniture with multiple uses preferred
- Are there problems regarding storage
- When buying furniture, is care taken that it complements the old ones
- Is gifted furniture retained
- What kind of furniture is preferred - fixed or movable
- What piece of furniture in the house is the most difficult to use in terms of its weight and mobility
- How is space managed when guests come over
- What are the problems faced with the current pieces of furniture
- How often is new furniture bought

Questionnaire for students

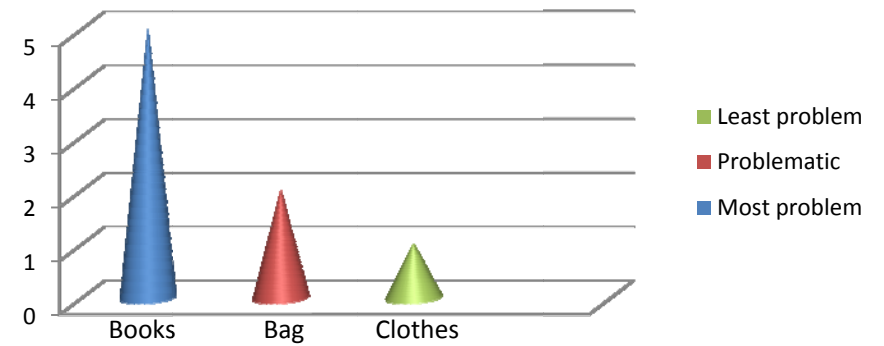
- Where in the house do they sit and study
- Where do they store bags after coming back from school
- Where do they study when guests come over
- How many books do they have on an average
- Are there problems like back ache etc. due to the existing furniture
- What is preferred- sharing space with the siblings or having their personal space
- Is the computer used often
- What is preferred – studying on a table or on the floor

Analysis of student's comments

Storage problems are faced by children at home

MAJOR STORAGE PROBLEM FOR STUDENTS IS CONCERNING BOOKS

Reason: Storage of clothes etc is taken care of by parents



Preference for study place

CHILDREN PREFER TO STUDY AT TUTION OR SCHOOL RATHER THAN AT HOME

Reason: More conducive study environment and friends are around

