

The Brief

With children's bedrooms becoming more stylish many companies and individuals are looking for a modern lighting solution. The brief is to design a lighting solution for the children's bedroom shown in the picture. It should be for ages 6 to 14.



ANALYSIS

Ergonomics

Anthropometrics, Physiology and Psychology

- Age range - reach, hand and finger dimensions
- Switching on/off - switch size and position
- Use of switch - ease of operation
- Adjustment - flexibility
- Weight - mobility, linked to stability
- Position of lighting in room
- Safety links

Materials

- Electrically safe (240 volts remember at mains) - Insulation imperative
- Heat resistant at bulb end?
- Wood, metal, plastics or composites
- New materials
- Cost implications including manufacturing

Economics

- Affordable
- Product lifespan
- Profitability
- Manufacturing costs
- Materials used
- Production volume
- Big links to materials and safety design issues

Aesthetics

- Fit in with style of room, decor and furniture.
- Children's tastes - boy or girl?
- Colours, textures - linked to materials
- Style - what's the competition and latest styles like?

Safety

- Electrical safety - conforms to BSI and CE standards
- Strength of light - not blinding
- Too much heat - linked to materials used in manufacture
- Stability - balance (top heavy) and weight of base or even wall fixing issues

Function/Operation

- Give Light - night time reading and bright for cleaning etc.
- Safety for kids - big issue- see Safety above
- Fit in with style of room - aesthetics
- Economical as kids grow up and room needs changing



ANALYSIS - IMPORTANT DESIGN ISSUES 1

Ergonomics

As the bedroom is for children the lighting will be used predominately by children although adults (i.e. The parents) will use it from time to time. The age group range is stated in the brief at 6 to 14 years.

The lighting should be easily operated by the full range of ages and for adults.

Anthropometric data such as reach, hand and finger size for the range will be required. A check that adults will be able to operate it will also be needed.

Research areas: -

- ☺ Anthropometric data
- ☺ Options for different users
- ☺ Existing lighting
- ☺ Types and size of switches

Materials

As this type of product will use electricity (probably 240 volt mains) the materials and components used must protect the user i.e. they must insulate the user from the electricity.

Lamps and bulbs generally generate heat so the materials must take this into account - there are possibly lower voltage or low temperature bulb options.

This is an indoor situation therefore the materials used for the lamps and lights need not be resistant to the extremes of our weather. The costs of materials need to be considered as this kids grow up and want new styles. The life time of the lamps is limited so expensive materials may be out.

The materials should match or compliment the colours and style of the other furniture and decor.

This issues has strong links to safety.

Research areas: -

- ☺ Insulation including switches and components
- ☺ Types of bulbs and lamps
- ☺ Material costs and type
- ☺ Existing lighting
- ☺ Types of switches

Safety

As this product is to be used by children and will use electricity then safety is of vital concern.

As mentioned under materials, electrical insulation is to be vital. Products in this category must satisfy British Standards and have a CE mark which indicates that it complies with European safety standards. This applies to the whole product and to any components such as switches, bulb holders and cables.

Safety in operation and adjustment needs to be considered for the complete product to be safe and comply with safety standards. The materials and manufacture standards are another safety consideration.

Research areas: -

- ☺ Safety regulation (BSI and CE)
- ☺ Materials

ANALYSIS - IMPORTANT DESIGN ISSUES 2

Aesthetics

Fitting in with the room - aesthetics is important as is linking in to a style that would be of suitable taste to the age range. This has already been touched on in materials.

The turquoise colour and the shiny metal construction of the bunkbeds has to be a major consideration in the types of lighting and materials to be researched.

Research areas: -

- ☺ Styles of lighting suitable for the age group
- ☺ Matching or contrasting colours
- ☺ Existing lighting

Function/Operation

The lamp has a main function of providing light but this can be for various reasons and can be delivered in a number of ways.

The brightness of the light should be flexible to be used for low level security, for reading, for play and bright light for adult use (cleaning and decoration).

The type of light can help these different functions - ranging for directional light in a beam to flood type lighting.

Methods and types of switching to allow flexibility in terms of type of switch, including dimmer, and two way switching (with switches at different locations).

Another area for consideration is the adjustment of the direction of light and physical movement of the light or lamp around the room (portability).

Importantly, when and who uses the light or lamp must be considered.

Research areas: -

- ☺ When and who
- ☺ Types of switch
- ☺ Types of bulbs and lamps
- ☺ Types of lighting
- ☺ Existing lamps

Economics

As mentioned under materials this lamp does not have a long life normally so people will not want to pay too much. This means that the cost relating to materials and manufacture has to be considered.

Manufacturers and shops need to make a profit for the product to be viable so mass production methods of manufacture and therefore low cost is crucial. Another way of reducing costs is to use standard components especially in the electrical fittings. This would also be economical in satisfying safety regulations (BSI and CE).

As far as overall cost is concerned it is necessary to compare the prices in the market of like products to make sure that the product can be competitive.

Research areas: -

- ☺ Materials costs
- ☺ Manufacture methods
- ☺ Price of similar products

RESEARCH - 1

Hand dimensions - grip circumference

Male			
Age	Mean	5%ile	95%ile
6	9.0	8.1	10.3
7	9.5	8.3	10.5
8	10.0	8.8	10.8
9	10.5	9.0	11.5
10	11.0	9.5	12.0
11	11.3	9.5	13.0
12	12.0	10.5	13.0
13	13.0	10.9	14.6
14	13.5	11.0	15.2
Female			
6	8.9	8.1	10.3
7	9.5	8.3	10.5
8	10.0	8.8	10.8
9	10.5	9.0	11.5
10	11.0	9.5	12.0
11	11.3	9.5	12.3
12	11.8	10.6	13.0
13	12.5	10.7	14.2
14	12.5	10.8	14.6

Reach

Male			
Age	Mean	5%ile	95%ile
6	51.0	45.5	56.5
7	54.0	48.5	59.5
8	56.5	51.5	61.5
9	58.5	53.0	64.0
10	61.0	54.0	68.0
11	63.0	56.0	70.0
12	66.5	60.0	73.0
13	69.5	62.0	77.0
14	73.5	66.0	81.0
Female			
6	49.5	43.0	56.0
7	52.2	47.0	58.0
8	55.5	49.5	61.5
9	57.5	50.0	65.0
10	59.0	52.0	66.0
11	63.0	55.5	70.5
12	66.0	57.5	74.5
13	68.0	60.5	75.5
14	70.0	64.0	76.0

Anthropometrics

This set of anthropometric data tables taken from the DTI CHILDATA handbook highlight two main issues: -
Hand grip circumference and reach.

The grip dimensions are important where a child wants to move or adjust a lamp.
I need to make sure that the smallest and the largest children can operate and move the lamp.

This means a range of: -

9 to 13 cm

The reach is important so that the child can operate the lamp from bed especially turning it on/off at night.

The range taken from the table is:-

50 to 74 cm

Other various hand dimensions are available including index finger size.

Age range	Index finger diameter
6.5 - 7.5	11.7
7.5 - 8.5	11.9
8.5 - 9.5	12.2
9.5 - 10.5	12.6
10.5 - 11.5	13.0
11.5 - 12.5	13.2
12.5 - 13.5	13.8
13.5 - 14.5	14.1

The small table above shows index finger diameter range of: - 11.7 to 14.1 mm

Physiology

This set data also comes from DTI CHILDATA handbook.

I have considered two important physiological data sets; -

- 1) Pull strength which is important in adjusting a lamp and
- 2) Lifting strength for moving the lamp

Both of these sets of data are limited to an age group of 6 to 11 which is a good sample as older children will cope easily.

Lifting Force N

Male		
Age	Mean	5%ile
6	135.0	69.0
7	212.0	125.0
8	246.0	176.0
9	308.0	182.0
10	326.0	160.0
11	502.0	382.0
Female		
6	119.0	40.0
7	148.0	88.0
8	186.0	91.0
9	232.0	101.0
10	262.0	130.0
11	363.0	261.0

Pulling Force N

Male		
Age	Mean	5%ile
6	143.0	69.0
7	159.0	89.0
8	201.0	141.0
9	242.0	146.0
10	234.0	92.0
11	394.0	289.0
Female		
6	117.0	54.0
7	152.0	78.0
8	152.0	79.0
9	198.0	100.0
10	189.0	64.0
11	246.0	113.0

As you can see there are some anomalies in the figures especially at age 10 however if we work towards the lower end then we find that: -

A maximum lamp lifting force of 40N which is equal to 4 Kg.

A maximum adjustment force of 54N

RESEARCH - 2

Function

There are many options for lighting in a children's bedroom. To find the optimum type of lighting I undertook a quick survey.

I asked 6 different people in the age range what they thought of the different types of lamps in terms of the best for the situation in the picture.








The survey shows that the lighting preferred is one that is functional as a bedside lamp either a wall or table type lamp although the colour of the ceiling light seemed to attract interest.

Question: - Look at the bedroom situation in the picture then look at the types of lamps below.

Task:- Rate each of the lamps in a 1 to 5 scale where 5 is best in terms of functionality.

Results

	1	2	3	4	5
Table lamp			X X X	X X X	
Ceiling lamp		X	X X X	X X	
Mixed up wall lights		X	X X	X	
Adjustable table lamp				X X	X X X X
Wall light		X	X X	X X X	

RESEARCH - 3

Aesthetics

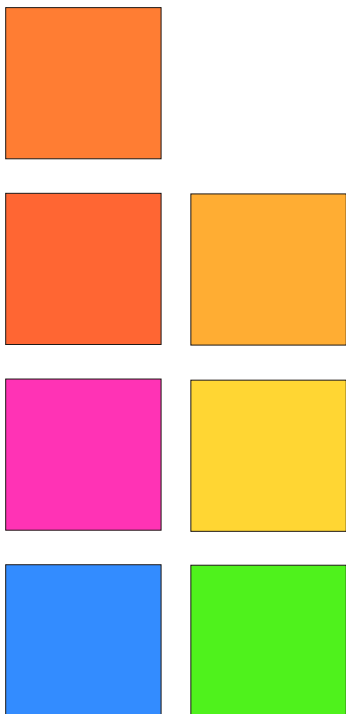
I have decided to try two different research types; colour and style.

Style

For style I carried out a simple survey using six different people across the range to judge how different lamp styles fitted in with the situation.

Colour

The turquoise colour is the most striking in the bedroom of the brief.
I investigated suitable colours that would match or contrast using the colour wheel and a computer program ColorSchemer. The results of this are shown below.








Complimentary

Analogous

Question: - Look at the bedroom situation in the picture then look at the types of lamps below.

Task:- Rate each of the lamps in a 1 to 5 scale where 5 is best in terms of style.

Results

		1	2	3	4	5
A			X X	X X	X X	
B		X	X X	X	X X	
C			X	X X	X X	X
D				X	X X	X X X
E				X	X X X	X X

Conclusion: - It seems that the preferred style is a modern that can be adjusted (D and E).
Whe questioned why people replied that it fitted best into the room, especially th bunkbeds.

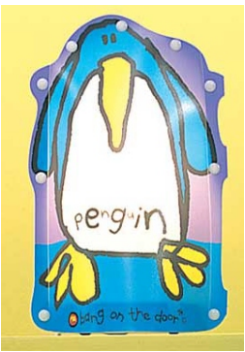
RESEARCH - 4

Competition Costs

I have researched some prices to test the market.



£14.00
IKEA



£14.97
B&Q



£59.50
Lighting Direct



£19.99
Argos



£18.99
John Lewis



£14.99
Argos



£64.00
Express
Lighting



£49.97
B&Q



£19.99
Argos



£49.00
Heal's



£22.00
John Lewis



£6.00
IKEA



£119.00
Prezzybox.com



£15.00
IKEA

It is fairly obvious that most of these lamps fall into two categories: inexpensive lamps up to around £20 and then novelty or special lights about £50 upwards. As the target market is not specialised then my lamp will be looking at the £20 maximum price.

RESEARCH - 5

Safety

Two areas of safety need researching; -

- ☺ Electrical Safety and
- ☺ Danger from heat

Products sold in Britain are required to pass two standards in regard to safety; BSI and CE.

BSI - British Standards Institute

All electric components in a lamp must have passed the relevant standard i.e. BS EN 50285. Many companies get their components tested and certified by BSI and have a kitemark to prove this.

CE - Confromite Européenne

The CE mark is a mandatory European marking for certain product groups to indicate conformity with the essential health and safety requirements set out in European Directive 93/68/EEC. There are companies (on the internet) who are qualified to test any new product.



Danger form Heat

To reduce the problem of a child getting a burn from a lamp the type of bulb and materials used to make the shade have to be considered. Perhaps we should look at using low temperature bulbs like energy efficient or LED ones.



Low-energyg



LED

The materials used for the shade should be resistant to conducting heat if a normal bulb is used but these materials tend to be expensive so why not stick to cheaper materials to keep down costs and children should learn that lamps and bulbs should not be touched when on.

Materials & Manufacturing

Materials

This is a difficult area for research. The materials costs for anything more than basic materials is practically impossible to find accurately. Most companies want to give a quote based on the amount and type of the materials. Any special or new materials would have to be investigated as the design of the final product emerges. It is clear that coated steel is much cheaper than stainless steel and acrylic sheet is cheaper than some of the more advanced plastics such as heat resistant PVC.

Manufacturing

As with materials this is a difficult area to research at this stage. However there are two important aspects: -

Standard Components

The use of standard components in a product like a child's bedroom lamp can keep the cost down. Buying in electric components means that the safety aspects will be taken care of by the manufacturer and supplier.

Mass Production

To keep production costs down parts should be manufactured in bulk using processes like extrusion and injection moulding.

DESIGN SPECIFICATION

From my research I have put together the following specification:

1. The lighting must be suitable for use for children from ages 6 to 14. This means that the users must be able to reach the switch from a reclined position in bed (both bunks). From the anthropometric data this means the switch must be within 50 cm. Any adjustment must take into account a minimal grip size of 9cm.
2. From my research, the lamp must be able to be used as a bedside lamp, fully adjustable and movable by even the youngest in the age range. Maximum weight of 4Kg with a maximum adjustment force of 54N.
3. The switching for the lighting should be easy to operate by the full range of children and by an adult. Any switching must be easy to find and operate in the dark.
4. The lamp must conform to relevant BSI standards and have the CE safety mark. This is to safeguard the safety of the children using the lamp or light.
5. The colour of the lamp must contrast and compliment the existing colour scheme notably the turquoise of the bunkbed panels.
6. The style of the lamp should be modern with some type of flexible adjustment (shown in survey).
7. The amount of light given out by the lamp or light must be good enough for general play and for nighttime reading. It should offer flexibility in levels of light and in operation. Ideally the lights should be operated by a master switch at the door.
8. The product must be of comparable quality and price of the competition otherwise it will fail. The consumer price should be under £20. This is not a niche market, the product will be for the wider market.