

# DRAFT REPORT

## Happy Watoto

Saifeddine Boujeddaine  
Kenza el Hassnaoui  
Dunya van Erve  
Sofia Errachidi

09/01/2022



cqland  
lyceum



# General information

In front of you is the Plan of Approach (PVA) that was written for client Elise Lufiting, volunteer at Happy Watoto. This PVA explains which steps are carried out in the project to arrive at the described end product.

## Authors:



Saifeddine Boujeddaine (captain): 15 years  
117880@calandlyceum.nl

### Goals:

- Decisiveness (EC): If it is necessary for the progress of a project, decisions are also made in which different interests are at stake.
- Listening Skills (BA): Let the other person finish speaking.



Kenza el Hassnaoui (teammember): 16 years  
117978@calandlyceum.nl

### Goals:

- Empathy (EA): Asks about the experiences, feelings, needs, and points of view of others.
- Result-oriented (DB): At the end of a meeting, states what the (SMART) agreements are or asks about them.



Dunya van Erve (teammember): 17 years  
117938@calandlyceum.nl

### Goals:

- Empathy (EC): Describes the other's discussion groups and checks whether they have been observed correctly.
- Judgment (FB): Considers the risks of harm (what will go wrong if things don't work out) and considers how they can be limited (what to do if things don't go well)



Sofia Errachidi (co-captain): 16 years  
117936@calandlyceum.nl

### Goals:

- Daring (FA): Does not hesitate to take unpopular measures.
- Conversational skills (FB): Takes into account differences in needs and interests in contacts of different levels.

# General information

## Client

Happy Watoto (Tanzania),  
Represented by Elise Lufting with many other volunteers  
E-mail: [info@happywatoto.nl](mailto:info@happywatoto.nl)  
Tel: +31 (0) 6 17 111 701  
Website: <https://happywatoto.nl/>



1: Elise Lufting | client

## Date

This project runs from October 08, 2021 till  
January 9, 2022

## Teachers

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## School

Calandlyceum  
Pieter Calandlaan 182, 1068 NT Amsterdam



2: A picture of the team  
(1: Dunya, 2: Saifeddine, 3: Kenza & 4: Sofia)

# 1. Summary

An assignment is being carried out for the NGO Happy Watoto. This organization helps vulnerable children (3-18 years) in the Arusha region, Tanzania, to build an independent life. The assignment is to design a sustainable and innovative library for the school and orphanage supported by this company.

The team has designed the cheapest possible library.

For this idea, the dining hall is multifunctional. This space can serve as a library and when it is necessary to eat, the books are shielded. If not, the library is accessible. The tables and chairs are used for not one but two things in this way!

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## 2. Introduction

The authors of this plan of approach are Saifeddine Boujeddaine, Sofia Errachidi, Dunya van Erve and Kenza el Hassnaoui of the Technasium at the Calandlyceum in Amsterdam. The Technasium is a science program in which the students follow the subject R&D (Research and Design). They do assignments for companies and organizations in which something needs to be researched or designed.

In this project, an assignment is carried out for an NGO, a non-governmental organization. These types of organizations are usually not focused on making a profit and use volunteers. The aim of this project is to have an NGO in a third world country that is sought and contact is made with the local population. An NGO, named Happy Watoto, has been chosen that focuses on Tanzania and operates from the Netherlands.



# Technasium

3: The logo of the Technasium



# 3. General section

## 3.1 Client

Our client is Elise Lufting. She studied economics and business administration. During that study she did volunteer work for three months in the children's homes of the foundation in Tanzania.

This experience touched her deeply and fueled her mission to make a major positive impact on society. As a result, she has gained broad experience in social and sustainable projects. She worked at the ING bank in Asia and London.

She then managed a private equity portfolio for the Dutch development bank. FMO, in Africa and Asia. At Deloitte, she was responsible for setting up a new team focused on enterprise windowing.



4: Elise Lufting



## 3.2 Mission

### Situation

Happy Watoto focuses on the future prospects for vulnerable children, by offering them a safe environment, education and help finding work. English-language education, from kindergarten to vocational training. That's what the kids need. According to the Education Inspectorate, it is mandatory to have a library that belongs to the school.

### Problem

The library cannot be created just like that. There is no space nor money available. But the library needs to be built.

### Expectation

The client expects an innovative\* solution for the library that must be present. This must be presented in such a way that it is attractive to potential sponsors. Furthermore, the library must be made as cheap as possible. The necessary information for this must be obtained by researching the materials. The final product is fully elaborated in a final end report.

The library must be built, this is essential for the development of the orphans!

\*Innovative refers to the application of new technologies in products, services and processes.

### 3.3 Preliminary investigation

*In order to find information about our project, we have done research into our client Elise Lufting, the company Happy Watoto and the country where Happy Watoto is active; Tanzania. We have formulated this information in the 5W and H-questions.*

#### **1) Who is the client?**

Our client is Elise lufting. She studied economics and business administration. During that study she did volunteer work for three months in the children's homes of the foundation in Tanzania; Happy Watoto.

#### **2) What is Happy Watoto and how did the company originate?**

Happy Watoto is an NGO company in the Netherlands that operates in the country of Tanzania.

At the end of 1998, Jan Willem ter Braak was sent to Tanzania for three years to privatize Kilimanjaro Airport. During that period, together with his wife Ida, he supported hospitals, schools and street children's projects. By chance, they ended up at an ailing orphanage in the village of Kikatiti. The building was in bad shape. Jan Willem and Ida decided to buy land and build a new house, which they financed by starting a fundraising campaign in the Netherlands. The foundation was established on 26 December 2000 to provide structural assistance.

Two years later, in October 2002, the new children's home, Kikatiti Happy Watoto Home, was opened. The foundation grew into a foundation with a clear mission and vision and a structured approach. In 2008 the board decided to open a kindergarten and in 2010 the primary school with associated living facilities was opened. Since 2013, we have been shaping the follow-up trajectory (secondary and vocational education). For this we work together with external educational institutions. All this with the aim of helping the children further on their way to an independent existence. And from 2020, that last phase has also entered and they annually guide the graduated children to work and thus to independence. Because only then they are done!

### 3.3 Preliminary investigation

#### 3) What does Happy Watoto do?

Happy Watoto helps vulnerable children (3-18 years old) in the Arusha region, Tanzania, to build an independent life. They do this by offering them a safe and healthy environment and access to quality education. During the entire process, attention is paid to developing general skills. Their approach thus substantially increases the employment opportunities for these children.

#### 4) Where is Happy Watoto active?

Happy Watoto is active in the developing country Tanzania. Tanzania is home to approximately 44 million people, which is one of the largest countries in Africa. Tanzania is a democratic country. The population consists of 62% Christians, 35% Muslims and 3% of the population has another religion. In Tanzania, most people live below the poverty line. There are as many as 12.7 million people living in Tanzania on 0.97 cents a day. That is because there is a large population growth that increases by 2.6 percent per year.

Tanzania is rich in a whole range of valuable raw materials. Among other things, 3,000 tons of copper are extracted annually, 10 tons of silver and more than 100,000 carats of diamonds. Initial tests show that there is a considerable amount of uranium at the foot of Mount Kilimanjaro, the highest mountain in Africa. Chinese have been granted licenses for a search for oil and gas.

And unique are the blue/purple Tanzanite gemstones that are mined in the north of the country. Things are gradually getting better in Tanzania. There is suddenly a lot of fertile soil. This is very useful for all companies. They can make a lot of money from that. They buy or rent a piece of land in a developing country for a long time. There is usually plenty of space there and foreign investment is more than welcome.



5: Children at the Happy Watoto school

### 3.3 Preliminary investigation

#### 5) Why was Happy Watoto founded?

Education is the key to the development of a child and of a society. A child who receives a good education is given opportunities for the future. That is why every child has the right to a good education. Anywhere, anytime.

Every child should be able to go to school. Children should be able to go to primary school for free. They should also be able to follow as much secondary and higher education as possible, if they want to. A teacher should not yell at a child, nor should a teacher hit or scold a child. Countries must help each other to ensure that every child can go to school.

A country must provide extra protection for a child who cannot live with his own family. Sometimes the best solution is to live in a completely different place. This is then a place where children in these situations are well cared for. For example, in a foster family or a shelter with other

Poverty. It means sleeping on the floor. Not having enough to eat. Own two pieces of worn, washed or torn clothing. Not being able to go to the doctor. Can't send children to school. Spend what you earn immediately, day after day. Having no choice, no perspective.

Children living in poverty must be helped. Everyone agrees with this. That is why Happy Watoto offers a home and school to the Tanzanian children who live in poverty.

#### 6) How does Happy Watoto help the Tanzanian children?

Happy Watoto Foundation enables vulnerable Tanzanian children to build a better, independent future. They do this by creating a safe environment, in which solid education is central.

Their three pillars are:

1. Shelter: a safe shelter when there is no basic care or safe place at home.
2. Education: English-language education, from kindergarten to vocational training.
3. Career guidance: Guidance in finding a paid job, or setting up your own business.



6: The management of Happy Watoto

# 4. Preliminary investigation II

## 4.1. Materials

If the team wants to build a library, they will have to choose suitable materials for it. In order to find out more about the different types of materials, a study has been launched into the various materials and their advantages and disadvantages.

## 4.2 Concrete

Building with concrete has its advantages. You can work watertight with it, at least if you use the system with concrete formwork. Concrete is also very sturdy. And those are just two of the many advantages of building in concrete. A concrete construction is very sturdy and has a high load-bearing capacity, even if the walls are much thinner than traditional masonry. Concrete is fire-resistant up to 800°C. Concrete has a very good thermal inertia: thermal energy is stored and gradually released again by the concrete. Due to the high mass of concrete, it also offers a very good acoustic quality. The drawback of concrete is its high price. If you then opt for cheaper concrete, you will have to deal with the low quality of the concrete. You will notice that in the moisture problems.

## 4.3 Bricks

Bricks have many advantages. A brick quickly absorbs a lot of water, but releases it just as quickly. The latter is beneficial for insulation. A brick has little or no hindrance from shrinkage or expansion and can retain heat well and transfer it to its surroundings. Bricks retain their shape, which means that expansion joints are only required every 30 metres. But there are also many drawbacks. A brick is rough. Building with bricks requires a solid foundation (which entails more material and more costs). A brick usually has a width of ±10cm (variations between 9cm and 11cm). The wall - in combination with insulation and quick building block for the interior walls - quickly becomes fairly thick.

## 4. Preliminary investigation II

### 4.4 Wood

Wood is a natural product that has little impact on the environment. Not during extraction, production, nor during use. Wood offers an easy way to limit CO<sub>2</sub> emissions - the main cause of climate change - through the ability of forests and wood (products) to capture or retain carbon. The great thing about wood is that it is renewable. The government and municipalities are setting increasingly higher requirements in the field of sustainability, energy-neutral and ecological construction. Wood is the most logical choice as a building material. But in addition, building with wood offers many more advantages than may be known.

Wood insulates particularly well (15 x better than concrete, 400 x better than steel and 1770 x better than aluminum) and provides good acoustics. Wood is timeless, easy to maintain and comfortable. This natural product looks and feels pleasant and is free of hazardous substances: it certainly contributes to a healthy living environment. The disadvantage of wood is that the material cost is higher than that of traditional building materials. You have to count on a surcharge of 10% or more, depending on the system chosen and the types of wood used.

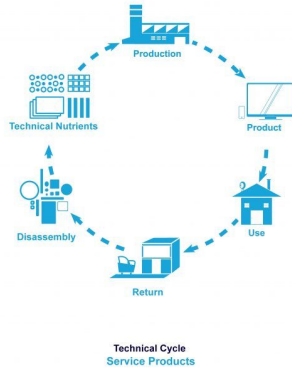
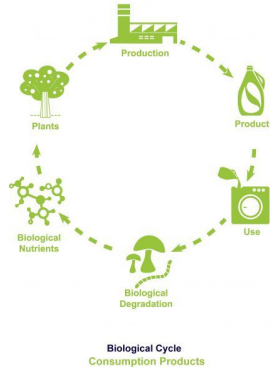
### 4.5 General

Local materials in Tanzania are wood, stone, sand and water. Other materials such as cement and concrete are very expensive and difficult to obtain. Flooding must be taken into account when building.

Tanzania is a country by the sea without dikes. Dar es Salaam is located right on the Indian Ocean, a city with more than four million inhabitants. The lower parts of the city are flooded every year, not yet due to sea level rise, but due to poor drainage of river water, poor water management and poor urban planning.

# 4. Preliminary investigation II

8: Cradle to Cradle cyclus



## 4.6 Durable

Cradle to Cradle (C2C) is actually a design philosophy conceived by German chemist Michael Braungart and American architect William McDonough. According to them, the principle of 'waste' actually equates to 'food'. This means that every raw material and every material that is used for a product must also be able to be reused. Of course, this is often also the case with recycling, but what gives C2C an extra dimension is the fact that the raw material must not lose value during reuse. It is therefore about 'upcycling' (making something even better or just as good) instead of 'downcycling' (giving something a second life with a different application).

After a lifetime, materials are used in one product as material in another product. Reuse and reprocessing are central to this.

Applying the Cradle to Cradle principle, industrial use of materials is brought into line with our ecosystem. In short, for the wood industry this means that wood has a high quality value as a construction material, for the production of paper, etc.

Wood waste can be processed into biomass. This is then used as fuel, after which the CO2 emissions feed our trees again and new wood grows in which CO2 has been stored for a long time. In this way, our forests provide biomass for sustainable energy. In doing so, we help to achieve the climate goals, which provide for the stimulation of the use of non-fossil energy.



9: Biomass

# 4. Preliminary investigation II

## 4.6 Most suitable wood

The different types of wood each have their own character. Not only in appearance, but also in firmness, moisture resistance and workability. In addition, they all come in different standard sizes. We compared a number of options with each other and then selected 1 type of wood:

Type	Price Netherlands 2500x1250x10 mm	Pros	Cons
chipboard	€ 24,95	<ul style="list-style-type: none"><li>- Cheap</li><li>- Easy to saw and screw</li></ul>	<ul style="list-style-type: none"><li>- Can't handle moisture well</li><li>- Not strong material</li><li>- Chunky build, causing splinters to form faster</li><li>- Difficult to paint</li></ul>
MDF	€ 32,00	<ul style="list-style-type: none"><li>- cheap</li><li>- Easy to edit</li><li>- Does not expand or contract</li><li>- High bending strength</li><li>- High wear resistance</li><li>- Easy to saw and screw</li></ul>	<ul style="list-style-type: none"><li>- Can't handle moisture well</li><li>- Low tensile strength, so heavy things cannot be screwed to it.</li><li>- Not fire resistant</li><li>- Must be primed beforehand to prevent warping.</li></ul>

[Click here for the complete document](#)



# 5. Program requirements

## Requirements

### Target audience:

1. A library that belongs to an orphanage in Tanzania.

### Product:

2. No new staff is needed to implement the product.
3. Room  
A new and effective way must be offered to provide an extra seat creating an 'extra learning environment'.
4. Durability  
All materials at the disposal of Tanzania must be used.

## Verification method

A document is sent by the client in which it is clearly indicated how many children are present.

You don't need someone to stay at the library all day.

A 3D drawing/model is created in which it is clearly shown to scale how much space can be freed up that can be used again for the end product.

A literature search is being conducted into all available resources in Tanzania that can be used for the project.

# 5. Program requirements

## Requirements

5. Books  
All books must be able to be included in the design

### **Budget:**

6. The budget is discussed with the client and adjusted to the income.

### **Time constraint:**

7. It must be possible to realize the end product at the end of this project.

## Wishes

8. The product has been designed as sustainably as possible and the materials for the construction come from Tanzania.

2. The design shows an innovative view.

3. The product features the school and orphanage together.

## Verification method

Calculations show that all books fit in it

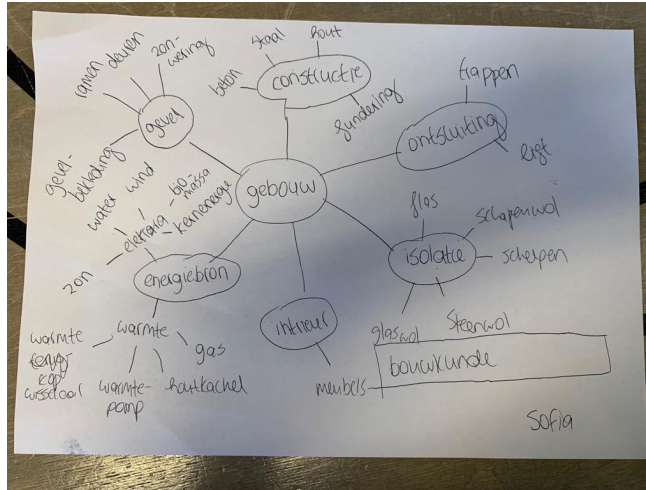
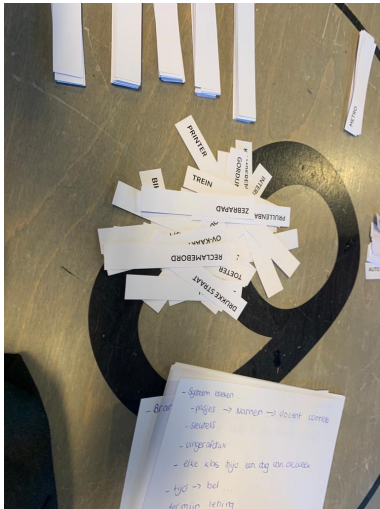
Does not apply.

The project was completed on January 10, 2021. After delivery, our library can in principle be sent directly to the company that can produce it.

# 6. Idea Generation

When people brainstorm, they often come up with the same kind of ideas. That's because they're stuck in their standard mindset. That is not strange. On the contrary, it is completely normal: most people take the easiest route to solve a problem. Unfortunately, this route usually leads to boring and ineffective solutions.

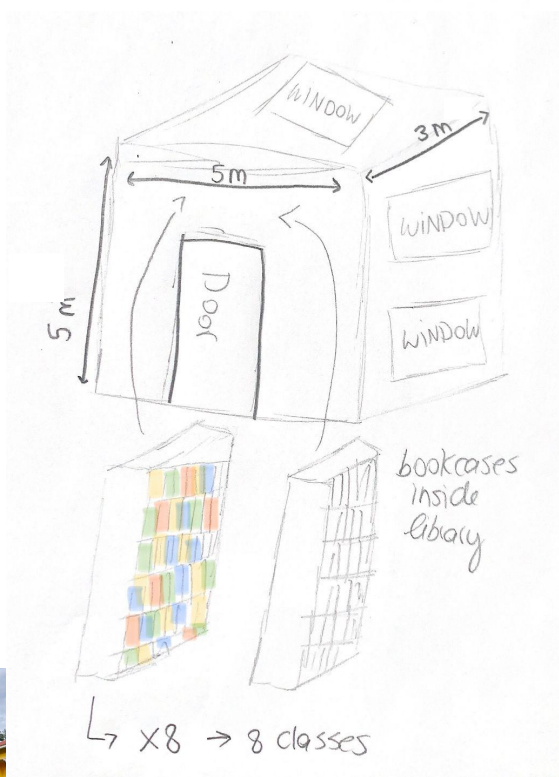
To be able to expand our thinking pattern and then come up with creative solutions, we used the brainstorming technique 'the card game'. This game means that during the brainstorming session we call every idea that comes into our mind at the word that is on the card. In this way we started looking for creative ideas in an effective way.



10, 11 and 12: Pictures of the brainstorm session

# 7. Drafts: 1

Ultimately, three ideas emerged from the brainstorming sessions.  
This is the first draft.



13: sketch of draft 1

# 7. Drafts: 2

The second idea is aimed at reusing the dining hall and creating a new library in the most sustainable way possible.

## IDEA 2: MOVING LIBRARY

€90 - €130 per cabinet  
(import costs not included)

Easy: cabinets can be imported from China

In the dining hall: no new building needed

Library is open at set times; provides structure and clarity

cheap

When using the library, cabinets can be slid to the right side

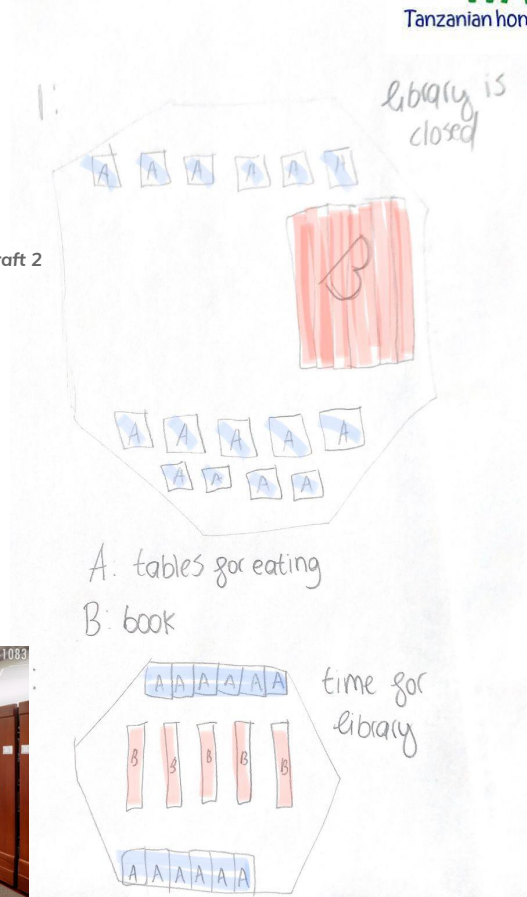
Cabinets can be rolled to 1 place: space is saved

Dining hall can be used for multi-purpose

15: picture of the moving shelves

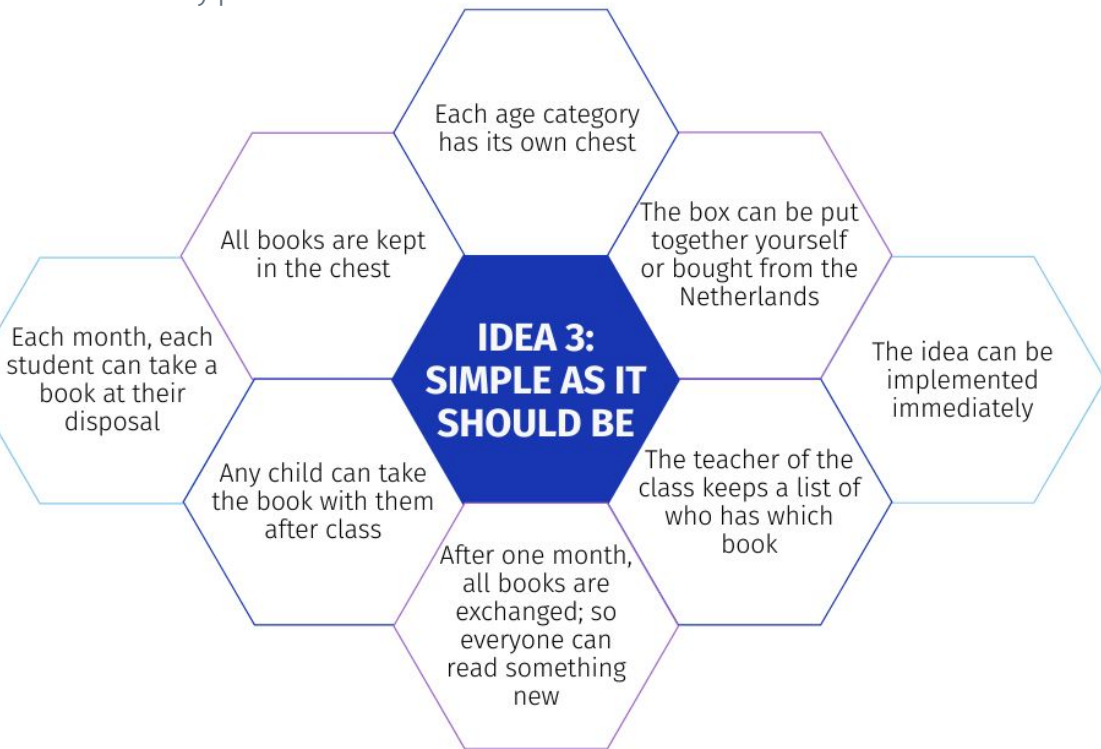


14: sketch of draft 2



## 7. Drafts: 3

The last idea is simple but certainly not weak. It is the cheapest and fastest way possible



16: the chest in which the books are kept

# 8. Concept choice

Meets the requirement

Partly meets the requirement

Does not meet the requirement

## Requirements / wishes

### Target audience:

1. A library that belongs to an orphanage in Tanzania.

## Badgesbuilding

This idea satisfies this requirement. The idea is aimed at all children of the school.

## Moving library

This idea satisfies this requirement. The idea is aimed at all children of the school.

## As simple as it should be

This idea satisfies this requirement. The idea is aimed at all children of the school.

### Product

2. No new staff is needed to implement the product.

This idea goes by class, so the teachers pay attention to their own class. No new staff is needed.

This idea goes by class, so the teachers pay attention to their own class. No new staff is needed.

This idea goes by class, so the teachers pay attention to their own class. No new staff is needed.

# 8. Concept choice

### 3. Room

A new and effective way must be offered to provide an extra seat creating an 'extra learning environment'.

For this idea no seat is created. The children can only read their book in class.

For this idea, the dining tables can also be used as a seat to read a book. The library is located in the dining hall and is screened off during dinner. Books may only be borrowed before/after dinner. In this way the tables and chairs can be used for two things.

For this idea, no seat is created. The children, on the other hand, can sit wherever they want.

### 4. Durability

All materials at the disposal of Tanzania must be used.

For this idea, a completely new building is being built, for which many materials can be used in Tanzania, but we also use materials from other countries.

For this idea, the bookcases are bought from abroad, so the materials are not from Tanzania

For this idea, the wooden boxes are assembled with the materials in Tanzania.

### 5. Budget

The budget is discussed with the client and adjusted to the income. But as low as possible is the aim.

This idea consists of building a small building in the schoolyard. The costs are on the high side for this idea.

For this idea bookcases have to be ordered, these are not too expensive but still cost some money.

The costs are very low with this idea. the boxes are put together themselves and for the rest the exchange system is in operation.



# 8. Concept choice

## Time constraint:

6. It must be possible to realize the end product at the end of this project.

This idea may be feasible, but there is a long and difficult process behind it.	This idea is feasible.	This idea is feasible.
---	------------------------	------------------------

## Wishes

7. The product has been designed as sustainably as possible and the materials for the construction come from Tanzania.

This idea is not sustainable, when building the building the environment is affected.	It is not sustainable, because importing the material will damage the environment.	This idea is sustainable.
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# 8. Concept choice

8. The design shows an innovative view.

This idea is innovative and solves the problem of not having a library very well.

This idea is innovative and solves the problem of not having a library very well.

The idea is innovative, but too simple. The intention was really a place for the books. This is just a system for distributing the books.

9. The product features the school and orphanage together.

There is no connection with the orphanage, it is entirely devoted to the school.

There is a connection with the orphanage.

You can take the book to the orphanage.

Based on this table it is obvious to go for idea three. But after consultation with our client, we have come to the conclusion to go for idea two and to develop this idea further. This idea is the most creative and has the most potential. In the next chapter we will try to make all the red cells green using the design cycle.

# 9. Elaboration concept

To come up with our ideas, we used the design cycle. The design cycle is a method to design the perfect final design. The design cycle consists of 6 steps.

1. Analyze and describe: the chosen problem is described globally. What does the client want? What should we deliver?

2. Drawing up a program of requirements: what are the requirements of the client? Which requirements do we want to add?

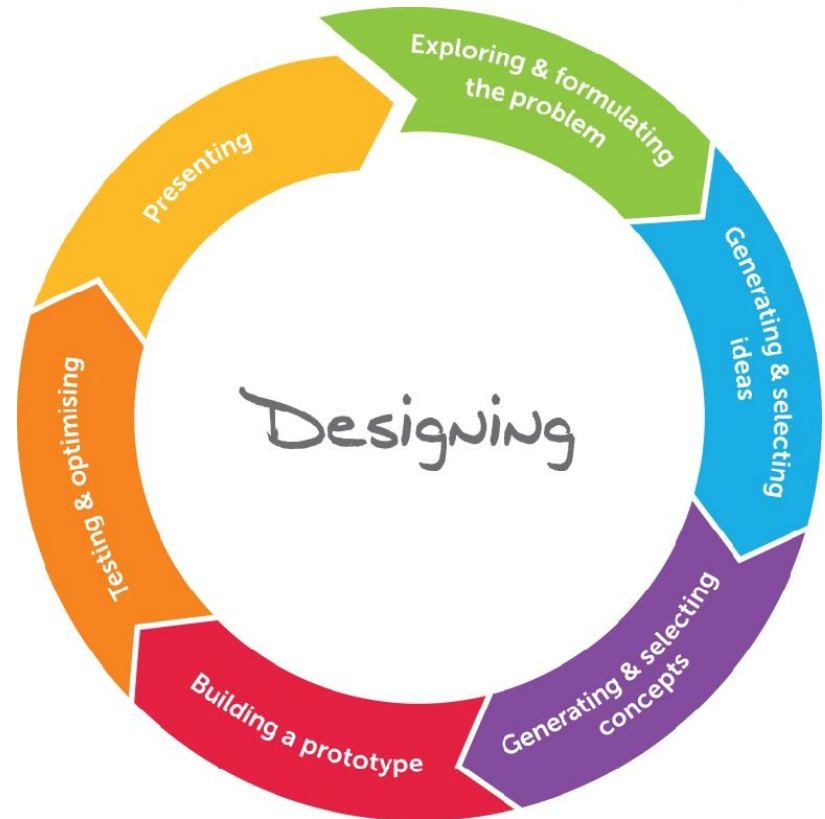
3. Devise elaborations: elaborations are made on the basis of the requirements. We came up with the ideas with the help of each other, creativity and brainstorming.

4. Formulate a design proposal: choose the best combination of elaborations.

5. Realize the design: how is the design realised?

6. Evaluate and test: make an evaluation; what are the pros and cons? Do the requirements really meet?

The steps 1 to 5 have been completed after the concept selection. Step 6 is the phase we have now reached. Design 1 can be improved by looking at the weaknesses of the chosen concept. Design 2 then follows.



17: the design cycle

# 9. Elaboration concept

This is the phase in which the chosen concept is improved. We look at the requirements and what best fits the need with regard to the idea. In this way, every point is improved and a new design is created. Below you can see what grade each part has and based on that the design cycle is rerun. The numbers are from 1-5 where 1 is bad and 5 is excellent.

## Draft 1: moving library

<b>Target audience:</b>		<b>4. Durability</b>		<b>Wishes</b>	
1. A library that belongs to an orphanage in Tanzania.	5	All materials at the disposal of Tanzania must be used.	2	7. The product has been designed as sustainably as possible and the materials for the construction come from Tanzania.	1
<b>Product</b>		<b>Budget:</b>			
2. No new staff is needed to implement the product.	5	5. the budget is discussed with the client and adjusted to the income. But as low as possible is the aim.	3	8. The design shows an innovative view.	4
3. Room A new and effective way must be offered to provide an extra seat creating an 'extra learning environment'.	4			9. The product features the school and orphanage together.	5
		<b>Time constraint:</b>			
		6. It must be possible to realize the end product at the end of this project.	3		

## 9. Elaboration concept

On this page you will find an explanation of the figures given in draft 1 and how this can be improved.



18: Children of the orphanage are getting ready to eat in the dining hall

- 1. A library that belongs to an orphanage in Tanzania: 5**  
The library is located in the dining hall. This is on the same grounds as the orphanage.  
→ no improvement needed
- 2. No new staff is needed to implement the product: 5**  
The children go to the library in class. Each class has its own teacher who will help with the library.  
The children go to the library in class. Each class has its own teacher who will help with the library  
→ no improvement needed
- 3. A new and effective way must be offered to provide an extra seat creating an 'extra learning environment': 4**  
Because you can move the cabinets, you create extra space. But if you have to move the cabinets every time, it takes a lot of effort.  
→ If you place the cabinets in the corners of the room, you will save a lot of space as they are now empty. They do not have to be moved every time, but they do have wheels in case they have to be moved.

# 9. Elaboration concept

On this page you will find an explanation of the figures given in draft 1 and how this can be improved.

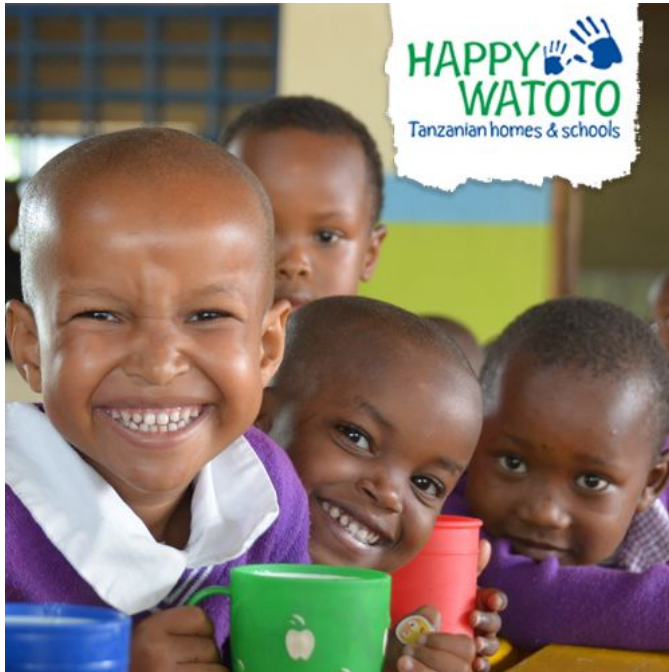


19: Children are eating in the Dining Hall

4. **Durability: 2**  
We would first import the materials, so this did not meet the requirement.  
→ We will now build the cabinet with the help of our manual and products from tanzania.
5. **Budget: 3**  
In the original idea we would import the materials, this is why the budget was on the high side  
→ Now we are going to assemble the bookcase ourselves with available materials, so the costs are low.
6. **Time constraint: 3**  
This idea is feasible. The materials are available, with the help of our manual the library can be built quickly. So the idea is a creative and effective way of incorporating a library into a school with limited space.  
→ no improvement needed

# 9. Elaboration concept

On this page you will find an explanation of the figures given in draft 1 and how this can be improved.



18: Children of the orphanage

7. **Sustainably as possible: 1**  
Not sustainable, the environment is not thought of at all. Importing pollutes the environment.  
→ By using the materials in Tanzania, the environment is not affected.  
So the idea has become sustainable.
  
8. **The design shows an innovative view: 4**  
This idea is innovative and solves the problem of not having a library very well.  
→ no improvement needed
  
9. **Connects the school to the orphanage: 5**  
There is a connection with the orphanage.  
→ no improvement needed

## Summary of the new idea

So the new idea is a library in the dining hall. This library is open before and after dinner. The books are shielded during the meal. The teachers go with their classes to their bookcases. Each class has its own closet. The cabinets are assembled using our manual and the materials in Tanzania.

# 9. Elaboration concept

This is the phase in which the chosen concept is improved. We look at the requirements and what best fits the need with regard to the idea. In this way, every point is improved and a new design is created. Below you can see what grade each part has and based on that the design cycle is rerun. The numbers are from 1-5 where 1 is bad and 5 is excellent.

## Draft 2: moving library

<b>Target audience:</b>		<b>4. Durability</b>		<b>Wishes</b>	
1. A library that belongs to an orphanage in Tanzania.	5	All materials at the disposal of Tanzania must be used.	5	7. The product has been designed as sustainably as possible and the materials for the construction come from Tanzania.	5
		<b>Budget:</b>			
<b>Product</b>		5. The budget is discussed with the client and adjusted to the income. But as low as possible is the aim.	5	8. The design shows an innovative view.	4
2. No new staff is needed to implement the product.	5				
3. Room		<b>Time constraint:</b>			
A new and effective way must be offered to provide an extra seat creating an 'extra learning environment'.	4	6. It must be possible to realize the end product at the end of this project.	5	9. The product features the school and orphanage together.	5



## 9. Elaboration concept

In the table beneath here, our first option is shown in prices. In this budget, the wood type Poplar plywood is mainly used. This type of wood provides a lot of protection against, among other things, water and fire safety. Ultimately, you arrive at a price of €337,456. In addition, wheels are also needed that are incorporated in the design. The price is about €35.03. In total you are talking about a price of €372,486,- in the Netherlands.

Object	Characteristic	Amount	Material	Measurements	Prices in Holland
Beam	Back cabinet	1	Poplar plywood	5cm (d) x 170cm (h) x 300cm (l)	1 m <sup>3</sup> = €736,- Total: €187,68,-
Beam	Cabinet bottom	1	Poplar plywood	2/3 cm (d) x 50 cm (b) x 300 cm (l)	1 m <sup>3</sup> = €736,- Total: €22,08,-
Beam	Cabinet sides	2	Poplar plywood	2/3 cm (d) x 50 cm (l) x 170 cm (b)	1 m <sup>3</sup> = €736,- Total: €12,512,-
Beam	Top cabinet	1	Poplar plywood	2/3 cm (d) x 50 cm (b) x 300 cm (l)	1 m <sup>3</sup> = €736,- Total: €22,08,-
Beam	Shelves in closet	2	Poplar plywood	5cm (d) x 50cm (b) x 300cm (l)	1 m <sup>3</sup> = €736,- Total: €55,20,-

## 9. Elaboration concept

Beam	Spacers on a shelf for the drawers	6	Poplar plywood	2/3 cm (d) x 50 cm (b) x 50 cm (l)	1 m <sup>3</sup> = €736,- Total: €3,68,-
Beam	Rolling carts in the drawers	4	Poplar plywood	2/3 cm (d) x 50 cm (b) x 135 cm (l)	1 m <sup>3</sup> = €736,- Total: €9,936,-
Beam	Door for bottom drawer	1	Poplar plywood	2/3 cm (d) x 25 cm (h) x 300 cm (l)	1 m <sup>3</sup> = €736,- Total: €11,04,-
Beam	Door for the top drawers	4	Poplar plywood	2/3 cm (d) x 60 cm (h) x 150 cm (l)	1 m <sup>3</sup> = €736,- Total: €13,248,-
				Total:	€337,456,-
Doorknob	Door knobs for the doors of the drawers	5	Steel	1 cm (d) x 1 cm (h)	Per Unit = €0,67,- Total: €3,35,-
wheels	Wheels for trolleys in drawers	16	Synthetic	1 cm (d) x 1 cm (h)	Per Unit = €0,77 Total: €12,32
(Wheel case)	Wheels for under the cabinet to move the cabinet with front brake	8	Synthetic	3,5 cm (l) x 3,5 (h)	Per Unit = €2, 42 Total: €19,36
				Total:	€35,03,-
				Total price:	€372,486,-

## 9. Elaboration concept

Our second option is shown in prices in the table. In this budget, the wood species Pine wood is mainly used. This type of wood provides protection against, among other things, water and fire safety, but not as much as Poplar plywood. In the end you arrive at a price of €293.44. This indicates that Pine wood is a lot cheaper than Poplar plywood. In addition, wheels are also needed that are incorporated in the design. The price is also about €35.03. In total you are talking about a price of €328.47 in the Netherlands.

Object	Characteristic	Amount	Material	Measurements	Prices in Holland
Beam	Back cabinet	1	Pinewood	5cm (d) x 170cm (h) x 300cm (l)	1 m <sup>3</sup> = €640,- Total: €163,20,-
Beam	Cabinet bottom	1	Pinewood	2/3 cm (d) x 50 cm (b) x 300 cm (l)	1 m <sup>3</sup> = €640,- Total: €19,20,-
Beam	Cabinet sides	2	Pinewood	2/3 cm (d) x 50 cm (l) x 170 cm (b)	1 m <sup>3</sup> = €640,- Total: €10,88,-
Beam	Top cabinet	1	Pinewood	2/3 cm (d) x 50 cm (b) x 300 cm (l)	1 m <sup>3</sup> = €640,- Total: €19,20,-
Beam	Shelves in closet	2	Pinewood	5cm (d) x 50cm (b) x 300cm (l)	1 m <sup>3</sup> = €640,- Total: €48,00,-
Beam	Spacers on a shelf for the drawers	6	Pinewood	2/3 cm (d) x 50 cm (b) x 50 cm (l)	1 m <sup>3</sup> = €640,- Total: €3,20,-

## 9. Elaboration concept

Beam	Rolling carts in the drawers	4	Pinewood	2/3 cm (d) x 50 cm (b) x 135 cm (l)	1 m <sup>3</sup> = €640,- Total: €8,64,-
Beam	Door for bottom drawer	1	Pinewood	2/3 cm (d) x 25 cm (h) x 300 cm (l)	1 m <sup>3</sup> = €640,- Total: €9,60,-
Beam	Door for the top drawers	4	Pinewood	2/3 cm (d) x 60 cm (h) x 150 cm (l)	1 m <sup>3</sup> = €640,- Total: €11,52,-
				Total:	€293,44,-
Doorknob	Door knobs for the doors of the drawers	5	Steel	1 cm (d) x 1 cm (h)	Per Unit = €0,67,- Total: €3,35,-
Wheels	Wheels for trolleys in drawers	16	Synthetic	1 cm (d) x 1 cm (h)	Per Unit = €0,77 Total: €12,32
(Wheel case)	Wheels for under the cabinet to move the cabinet with front brake	8	Synthetic	3,5 cm (l) x 3,5 (h)	Per Unit = €2, 42 Total: €19,36
				Total:	€35,03,-
				Total price:	€328,47,-

## 9. Elaboration concept

Our last option is shown in prices in the table. We recommend this budget, because in this budget the protection is maximized at the lowest possible price. With this budget, the wood type Poplar plywood is mainly used for the outside, because it provides the most protection against, among other things, water and fire safety. Pine wood is mainly used for the beams inside the design, because this still provides enough protection, while it is a lot cheaper than Poplar plywood. Ultimately, you arrive at a price of €328.48. In addition, wheels are also needed that are incorporated in the design. The price here is about €35.03. In total you are talking about a price of €363.51,- in the Netherlands.

Object	Characteristic	Amount	Material	Measurements	Prices in Holland
Beam	Back cabinet	1	Poplar plywood	5cm (d) x 170cm (h) x 300cm (l)	1 m <sup>3</sup> = €736,- Total: €187,68,-
Beam	Cabinet bottom	1	Poplar plywood	2/3 cm (d) x 50 cm (b) x 300 cm (l)	1 m <sup>3</sup> = €736,- Total: €22,08,-
Beam	Cabinet sides	2	Poplar plywood	2/3 cm (d) x 50 cm (l) x 170 cm (b)	1 m <sup>3</sup> = €736,- Total: €12,512,-
Beam	Top cabinet	1	Poplar plywood	2/3 cm (d) x 50 cm (b) x 300 cm (l)	1 m <sup>3</sup> = €736,- Total: €22,08,-
Beam	Shelves in closet	2	Pinewood	5cm (d) x 50cm (b) x 300cm (l)	1 m <sup>3</sup> = €640,- Total: €48,00,-
Beam	Spacers on a shelf for the drawers	6	Pinewood	2/3 cm (d) x 50 cm (b) x 50 cm (l)	1 m <sup>3</sup> = €640,- Total: €3,20,-

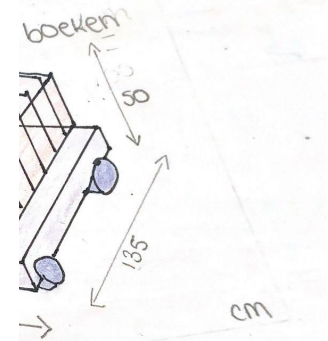
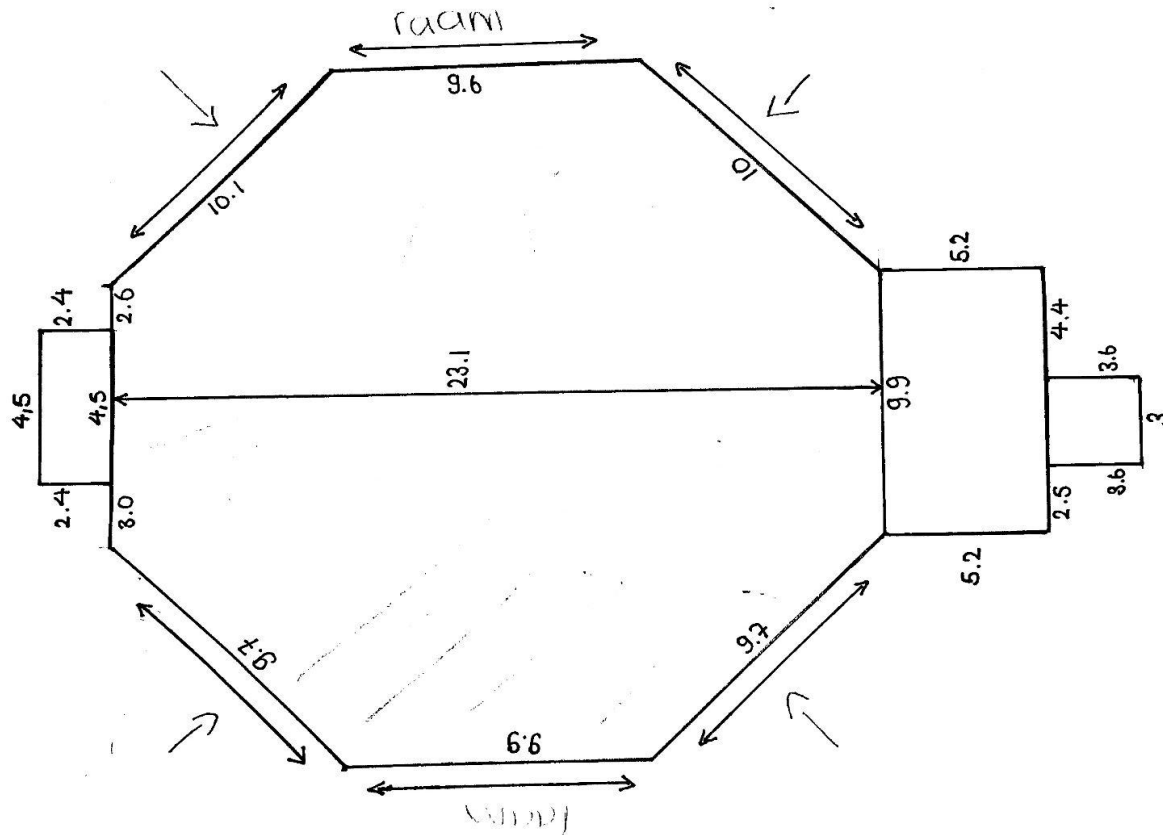
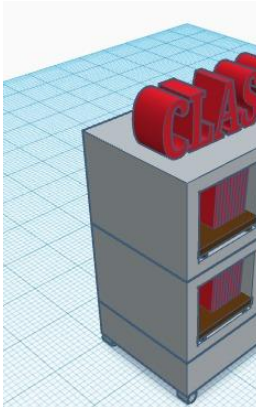
## 9. Elaboration concept

Beam	Rolling carts in the drawers	4	Pinewood	2/3 cm (d) x 50 cm (b) x 135 cm (l)	1 m <sup>3</sup> = €640,- Total: €8,64,-
Beam	Door for bottom drawer	1	Poplar plywood	2/3 cm (d) x 25 cm (h) x 300 cm (l)	1 m <sup>3</sup> = €736,- Total: €11,04,-
Beam	Door for the top drawers	4	Poplar plywood	2/3 cm (d) x 60 cm (h) x 150 cm (l)	1 m <sup>3</sup> = €736,- Total: €13,248,-
				Total:	€328,48,-
Doorknob	Door knobs for the doors of the drawers	5	Steel	1 cm (d) x 1 cm (h)	Per Unit = €0,67,- Total: €3,35,-
wheels	Wheels for trolleys in drawers	16	Synthetic	1 cm (d) x 1 cm (h)	Per Unit = €0,77 Total: €12,32
(Wheel case)	Wheels for under the cabinet to move the cabinet with front brake	8	Synthetic	3,5 cm (l) x 3,5 (h)	Per Unit = €2, 42 Total: €19,36
				Total:	€35,03,-
				Total price:	€363,51,-

# 10. Presentation final design

Here are sketches of the idea's location:

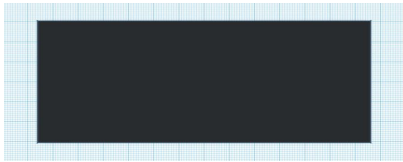
- 1) The dining hall
- 2) The bookcase
- 3) The wheels



ets. The rows point. 00 cm wide. ey can

# 10. Presentation final design

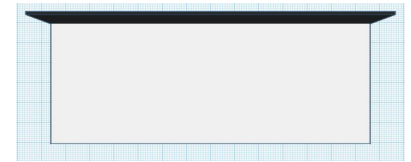
To keep the idea cheap and simple, we researched how the cabinet can best be put together. See the manual below for an explanation of this.



- 1** **Needed: 5cm (d) x 170cm (h) x 300cm (l) beam**  
Make sure you have a precisely tailored bar with the readings listed above. This will be the back of the cabinet. Lay this bar in a lying position. This ensures that the drawers can be easily placed in the cabinet.



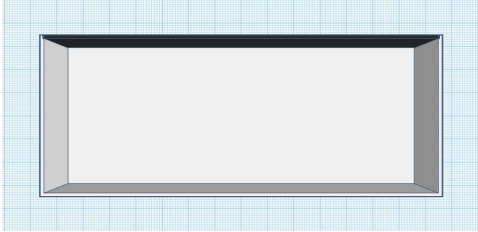
- 2** **Needed: 2/3 cm (d) x 50 cm (w) x 300 cm (l) beam**  
Make sure you have a precisely tailored bar with the readings listed above. This will be the bottom of the cabinet and therefore the beginning of the first drawer. You attach this to the end of the beam from step 1.



- 3** **Needed: Two 2/3 cm (d) x 50 cm (l) x 170 cm (w) beams**  
Make sure you have a precisely tailored bar with the readings listed above. These will be the sides of the cabinet. You attach these to the ends of the bottom beam from step 2.



# 10. Presentation final design



- 4** Needed: 2/3 cm (d) x 50 cm (w) x 300 cm (l) beam  
Make sure you have a precisely tailored bar with the readings listed above. This will be the top of the cabinet. You attach these to the open ends of the beams on the side of step 3.

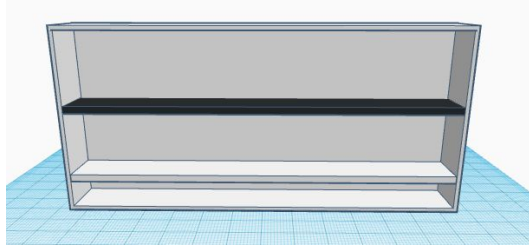


- 5** Now you have created the outer size of the cabinet.



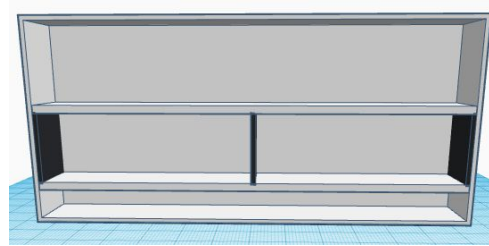
- 6** Needed: 5cm (d) x 50cm (w) x 300cm (l) beam  
Make sure you have a precisely tailored bar with the readings listed above. This will be one of the drawers of the cabinet. You attach this at a height of 20 cm, measured from the bottom shelf of step 2.

# 10. Presentation final design



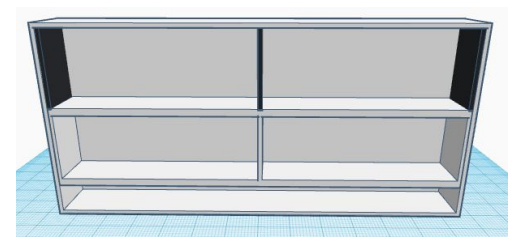
## 7 Needed: 5cm (d) x 50cm (w) x 300cm (l) beam

Make sure you have a precisely tailored bar with the readings listed above. This will be one of the drawers of the cabinet. You attach this at a height of 85 cm, measured from the bottom plank of step 2 (and 50 cm from the first plank of step 6).



## 8 Needed: Three beams measuring 2/3 cm (d) x 50 cm (w) x 50 cm (l)

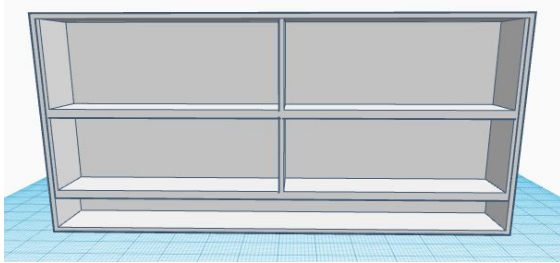
Make sure you have precisely tailored beams with the measurements indicated above. These will become the spaces between the 2 carts of the first drawer of the cabinet. You'll attach them between the first drawer and the second drawer from steps 6 and 7. The first on the far left side of the drawer, the second right in the middle of the drawer, and the third on the far right side of the drawer.



## 9 Needed: Three beams measuring 2/3 cm (d) x 50 cm (w) x 50 cm (l)

Make sure you have precisely tailored beams with the measurements indicated above. These will become the spaces between the 2 carts of the second drawer of the cabinet. You'll fasten them between the second drawer and the top of the cabinet from steps 4 and 7. The first on the far left side of the drawer, the second right in the middle of the drawer, and the third on the very right side of the drawer.

# 10. Presentation final design

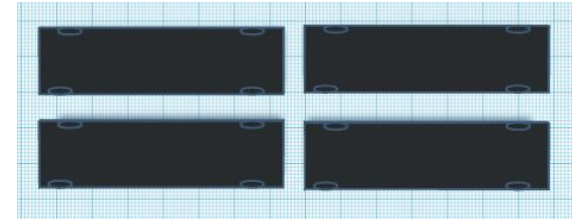


**10** This gives you the inner size of the cabinet.



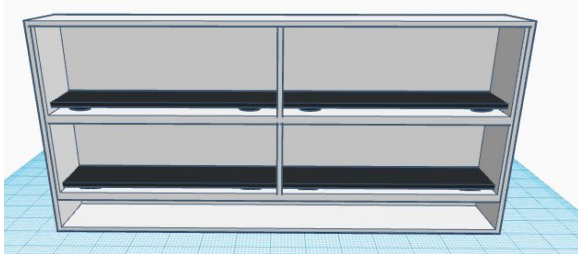
**11** Needed:  $2/3$  cm (D) x 50 cm (W) x 135 cm (L) beam and Four 1 cm (D) x 1 cm (H) wheels

Make sure you have precisely tailored beams and wheels with the measurements indicated above. Fasten the wheels to the beam; every wheel at every corner. This will give you a cart.

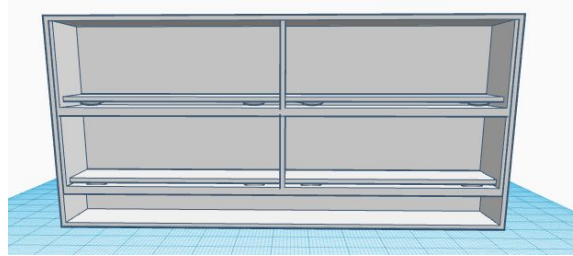


**12** Repeat step 11 3 more times, so that you get four carts for the books.

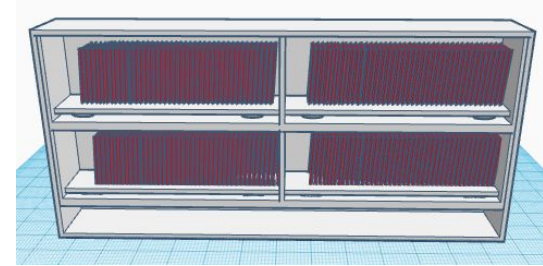
# 10. Presentation final design



- 13** The four top compartments each have a cart with books on it. Put 1 cart in 1 space, so that all four spaces now have a cart.



- 14** This gives you the complete inside of the cabinet. The drawers slide in and out for easy insertion and removal of the books on them.



- 15** Each cart holds approximately 100 books (max. 135). This gives about space for about 500 books.

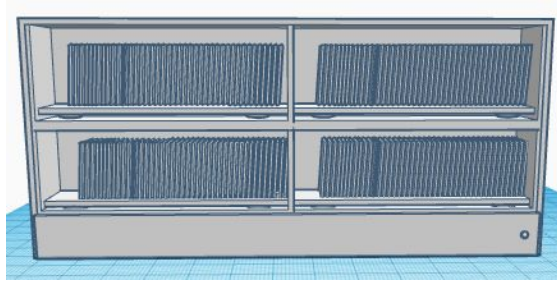
# 10. Presentation final design



16

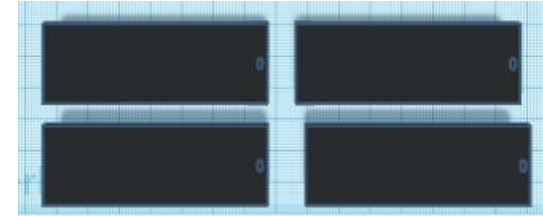
**Needed: 2/3 cm (d) x 25 cm (h) x 300 cm (l) beam and 1 cm (d) x 1 cm (h) doorknob**

Make sure you have precisely tailored beams and doorknob with the measurements indicated above. Fasten the doorknob to the beam at a height of approximately 12.5cm. This will give you a door for the bottom drawer.



17

Due to the made door, you get a protection for the bottom drawer.

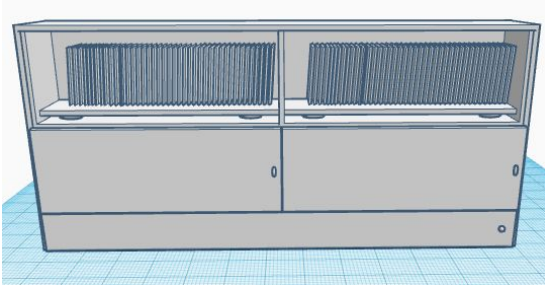


18

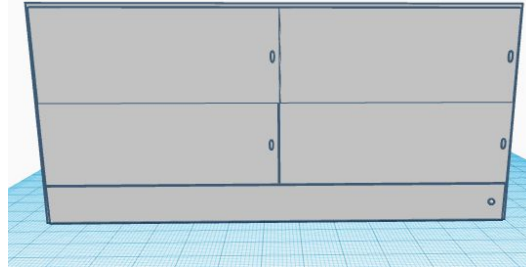
**Needed: Four 2/3 cm (D) x 60 cm (H) x 150 cm (L) beams and Four 1 cm (D) x 1 cm (H) doorknobs**

Make sure you have precisely tailored beams and doorknobs with the measurements indicated above. Fasten the doorknobs to the beams (1 doorknob on 1 beam) at a certain height of about 30 cm. This gives you four doors for the four top drawers.

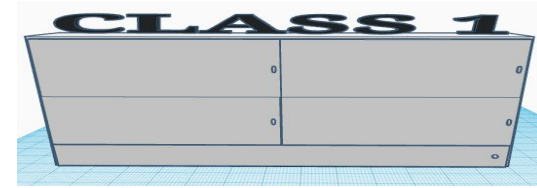
# 10. Presentation final design



- 19** Make 2 of the doors made in step 18 of the middle drawer of the cabinet. This gives you protection for 2 drawers.



- 20** Fasten the remaining doors to the top drawer of the cabinet, so that it also gets a protection.



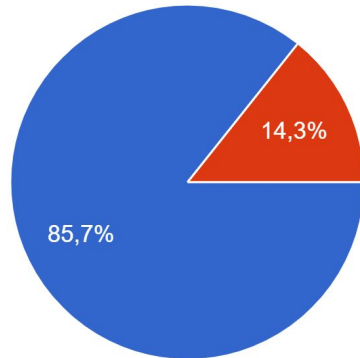
- 21** Make it clear to which class the cabinet belongs. Below is an example.

# 11. Final design evaluation

We conducted a survey in which we asked people for their opinion of the design we came up with. Of course we have the opinion of the client and that is the most important, but we were also curious about the opinion of the target group. We circulated a survey among our target group (4-18), but the survey was distributed among 10-18 year olds.

Would you visit the library?

21 antwoorden



19: Diagram of the results of the survey

## ***These are some of the benefits of the idea mentioned by those surveyed***

**Person 1:** 'The fact that they try to encourage young people and yet try to make it financially possible is a very nice initiative. I believe this idea is definitely feasible and will have an effect on the mental development of the target audience.'

**Person 2:** 'Teachers pay attention to the students, so it can't go wrong. I also think the idea that it takes place in the canteen is very excellent, because this creates an atmosphere that is sometimes missing in a library.'

**Person 3:** 'Very efficient because it is per class; it's nice to get and choose all the books together.'

**Person 4:** 'Good idea that the books can also be shielded while eating.'

**Person 5:** 'The idea is innovative.'

# 11. Final design evaluation

The design meets all the requirements stated in the Schedule of Requirements:

Target audience: the library is wholly owned by the school. The kids don't have to go to another location for books. The library is located on its own grounds. This allows the children to enjoy books and the inspection requirement to have a library is met.

Because a system is used whereby the library is visited per class, no new staff is needed. The teachers are responsible for their own class.

For this idea, the dining tables can also be used as a seat to read a book. The library is located in the dining hall and is screened off during dinner. Books may only be borrowed before/after dinner. In this way the tables and chairs can be used for two things.

We were going to import the materials from abroad. But we have adapted and improved the idea. The cabinet will now be assembled by ourselves using our self-made manual with materials from Tanzania.

The budget: We have made a cost calculation of three different options. We recommend idea 3, this is the most expensive of the three but also the most durable: €363.51.

[This the link to our budget](#)

This idea is feasible. The materials are available, with the help of our manual the library can be built quickly. So the idea is a creative and effective way of incorporating a library into a school with limited space.

Besides the fact that all requirements are met, all wishes are also met. This completes our idea. The wishes are that the materials come from Tanzania, that the library has a connection with the orphanage and that the idea is innovative.



# 12. Conclusions and recommendations

The team started the project with the aim of designing a library for the creatures of Tanzania: the Happy Watoto School. The idea meets all the wishes and requirements of the client. On top of that, a manual has also been added with the exact dimensions and steps. This makes the idea realistic and achievable.

The client has often been in conversation with the team. She made it clear what she wanted and gave continuous feedback. Everything that was missing or could be improved has been improved. The team and the client are of the opinion that this project went smoothly with a desired end result.  
So the mission the team started the assignment with is accomplished!

The client is recommended to conduct further research into 2 things:

1. How the books do not get damaged by moisture
2. What can be done to ensure that the books do not absorb food odors

These two points are difficult to investigate because it is not clear how high the humidity is in Tanzania and it is unclear what influence this has on the books. And because the team doesn't know how long the food odors linger (and how strong they are).

# 13. Afterword, evaluation, reflection

In the first weeks of this project, we started coming up with an idea for the client. We did this using the card game. This game involves calling every idea that comes to mind during the brainstorming session with the word on the card. It forms the basis for a design. After the brainstorming, the tasks were divided by Saifeddine, the team leader. The tasks were planned. Despite this special time in which we live, we have still done our best to deliver a top end result for the client. We have always offered each other help if someone did not understand something. The cooperation during this project went very well, this was because we always offered each other the necessary help and kept in touch.

At the start of the project, everyone made a POP (personal development plan). A PDP contains our learning objectives, learning objectives that we wanted to achieve during the project.

Saifeddine (team leader): 'Decisiveness (EC): If necessary for the progress of a project, decisions are also made where different interests are at stake' and 'Listening Skills (BA): Let the other person finish speaking.'

This project was complete different of what I was used to do and it gave me the possibility to act decisive in situations of distress. Eventually it all has been worked.

Kenza: Empathy: asking more often about the state of affairs in order to keep order. Result orientation: Requires more responsibilities for upcoming projects/assignments.

Sofia: Daring (FA): Does not hesitate to take unpopular measures: This did not require much action. We have thought a lot outside of the box and taken less obvious measures & Conversational skills (FB): Takes into account differences in needs and interests in contacts of different levels.

This project I put my personal interests aside. I have accepted that not everyone shares the same opinion and likes the same things. I see this as a victory and a step further towards my personal development.

Dunya: Empathy (EC): Describes the other's discussion groups and checks whether they have been observed correctly. There have been a number of discussions, so I have had many opportunities to develop in this area.

Judgment (FB): Considers the risks of harm (what will go wrong if things don't work out) and considers how they can be limited (what to do if things don't go well. This learning objective has minimized the damage from risks .

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# 15. Attachments

<https://my.matterport.com/show/?m=ephJXo7mwxM>

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These are 3D drawings of what the Happy Watoto school looks like in real life. These are used to create a realistic image and so that the idea can actually take place.