

# Hwa Chong Institution

## Project Work

### Category 3 Inventions

## Log Book

Title of Project: The Book-Covering Bosses
Group Name: The Book-Covering Bosses
Group Members:  1) Aaron Ng  2) Joel Ong  3) Joshua Siau  4) Loke Yong Kang

## 1. Problem Finding (The beginning...)

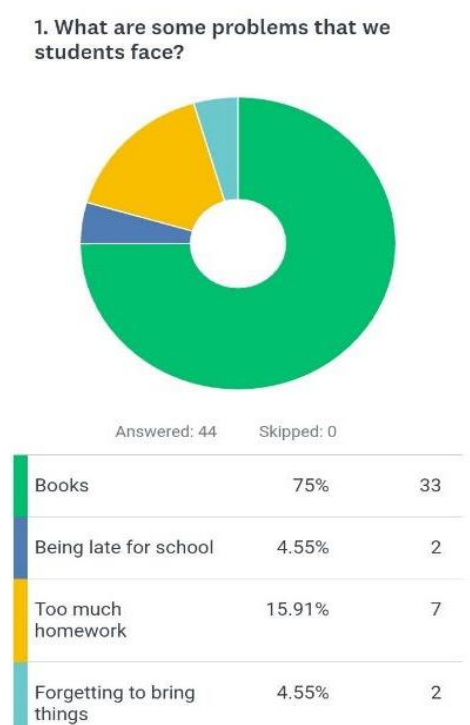
Many problems in the daily lives of students:

- Cannot wake up.
- Alarm spoil.
- Miss bus.
- Late for school.
- Forget to bring pencil case.
- Forget to bring homework.
- Lost wallet.
- Data use up.
- Don't have enough time to do homework.
- Books.

4 items on the list that were shortlisted after students were interviewed:

- Late for school.
- Don't have enough time to do homework.
- Forgot to bring pencil case.
- Books

Survey was created on SurveyMonkey about which problem was most frustrating.



The response was immediate the result was that 75% of the people saying that the problem of books was the most overwhelming.

1. What are some problems you face with your books



Answered: 53 Skipped: 0

Problem	Percentage	Count
Folded edges or covers	54.72%	29
Torn pages	13.21%	7
Heavy	32.08%	17

Students were surveyed on SurveyMonkey on three points:

- Folded edges or covers
- Heavy
- Torn pages

The response to the survey was that 54.72% of the people felt that the problem of folded edges and covers was most irritating. However, there are also other considerations that we thought of in the course of selecting

Considerations for Selection	Problems		
	Folded edges or covers	Heavy	Torn pages
“Popularity” (Significant problem)	4	2	1
Feasibility for an invention (Unrealistic)	4	1	3
Cost (from most expensive to cheapest) (more audience)	4	1	2
Total Score	12	4	6

(On a scale from 1-4)

## 2. Define the Problem

(This is one...)

The total enrolment in Singapore in 2018 is 436,425 students. Each student carries around 30 books. On average, each student spends around \$189.90 on these books. Based on personal experience and observation, the conclusion is that 90% of students' books have "doggy ears".

90% of the students' books get damaged, the total number of books damaged will be

$$= (30 \times 90\%) \times 436,425$$

$$= 27 \times 436,425$$

$$= 11,783,475$$

11,783,475 books are damaged each year.

90% of the students' books get damaged, the total value of books damaged will be

$$= (\$189.90 \times 90\%) \times 436,425$$

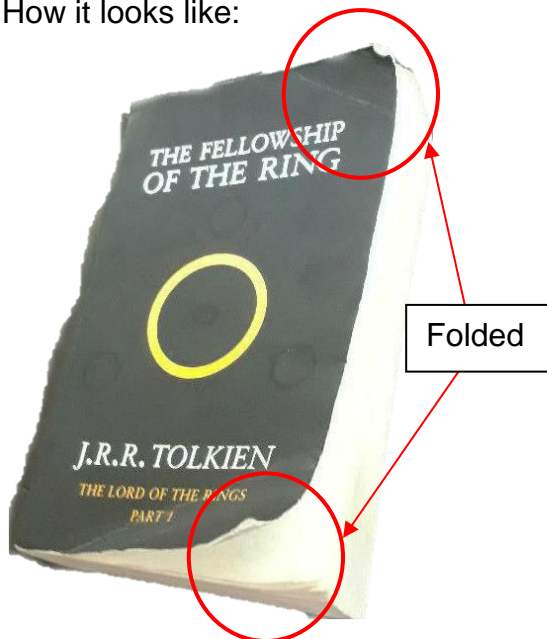
$$= \$170.82 \times 436,425$$

$$= \$75,550,118.50$$

\$75,550,118.50 worth of books are damaged each year.

Our problem statement: After surveys and interviews with students, the problem of folded corners of books seems most prevalent. Current solutions do not help to solve the issue, according to our market analysis and surveys. Thus, our proposed solution is a book corner protector that uses plastic corner pieces to protect the book from developing "Doggy Ears".

How it looks like:



Books with folded edges or covers are a problem because they look unpresentable and give people a bad impression of you. And if you intend to sell the book second-hand, with such a bad condition, its value will drop.

This happens because of four main reasons: Firstly, the owner might stuff the book into his/her bag in a rush. Secondly, the owner might mistreat the book by throwing it for fun. Thirdly, the book might be dropped accidentally. Lastly, when placing the book into the shelf, the friction between the books causes the corners to bend.

Some items currently in the market:

- Adjustable book covers (plastic)
- Reusable book covers (fabric)
- Premium leather covering (leather)
- Book protector (paper)
- Homemade
- Briefcase
- Backpack with compartments

Criteria for comparison:

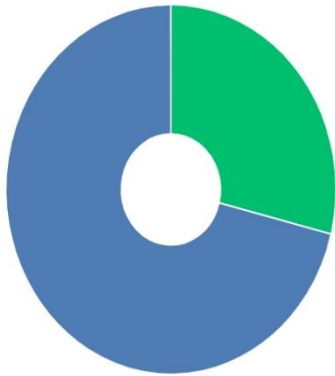
- Price: Low cost would make the product more attractive for buyers.
- Adjustability: The one book cover can fit many sizes, so that people do not need to buy other book covers of a different size.
- Weight: Our books are already quite heavy so the book cover does not add significant weight.
- Strength: To reduce repeated purchase of book covers because of wear and tear, a strong book cover can protect and last for a long period of time.

A survey was conducted to also determine the criteria of comparison. ~28.8% of the respondents chose functionality; ~24.4% of the respondents chose price; ~17.7% of the respondents chose weight; ~15.5 % of the respondents chose strength and adjustability each.

<b>Items</b>	<b>Price</b>	<b>Adjustability (on a scale of 1-10)</b>	<b>Weight</b>	<b>Strength (on a scale of 1-10)</b>	<b>Functionality (on a scale of 1-10)</b>
Adjustable book covers (plastic) (A4 Clear Strong Plastic Protective Exercise Book Slip on Cover Jackets x 3 by Range Wholesale Amazon)	\$1.94	1	~2g	3	2
Premium leather covering (leather) (Steurer & Jacoby® Personalized Leather Journal Composition Book Cover, Refillable Executive Notebook, Natural Leather, Leather Gifts Etsy)	\$89.74	1	-	5	3
Homemade	\$0	1	-	1	1
Briefcase (Quality Black Leather Effect PU Briefcase/Attached Case with expandable fold (6900) Amazon)	\$38.10	4	2kg (Boxed-product)	8	6

Backpacks with compartments (Hynes Eagle Travel Backpack 40L Flight Approved Carry on Backpack Blue 2018 Amazon)	\$99.01	4	748.4274g	9	5
<b>Our solution</b>	<b>\$1-\$10</b>	<b>9</b>	<b>1.5g-10g</b>	<b>9</b>	<b>9</b>

1. Do you think current items in the market help to protect books?



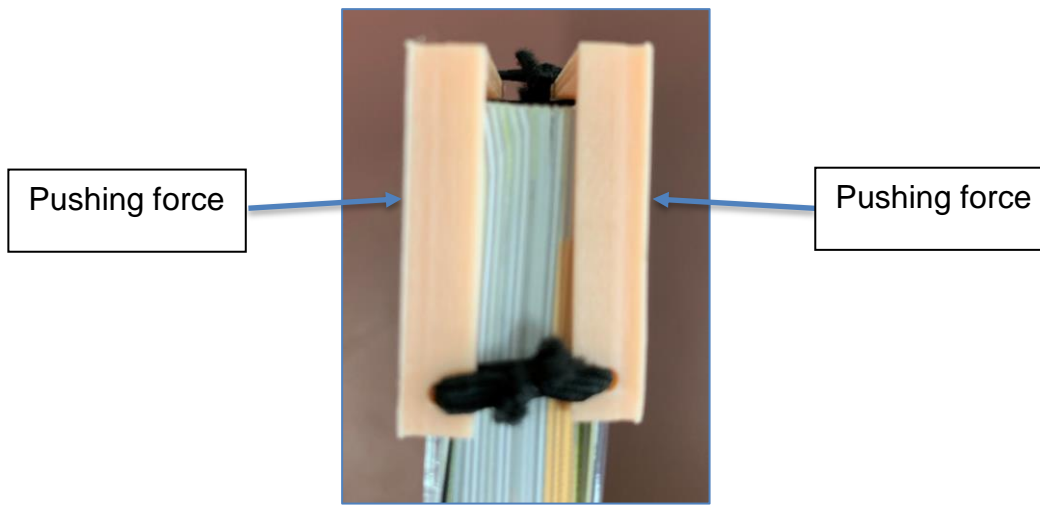
A survey was created to gain feedback on whether the public felt that existing products solve the problem. 70% of the respondents felt that existing products did not solve the problem.

Answered: 45 Skipped: 0

Yes	28.89%	13
No	71.11%	32

### 3. Your BIG IDEA (Developing the idea....)

The invention is a book cover that is cheap, hardy, small, lightweight and flexible (able to fit many book sizes).



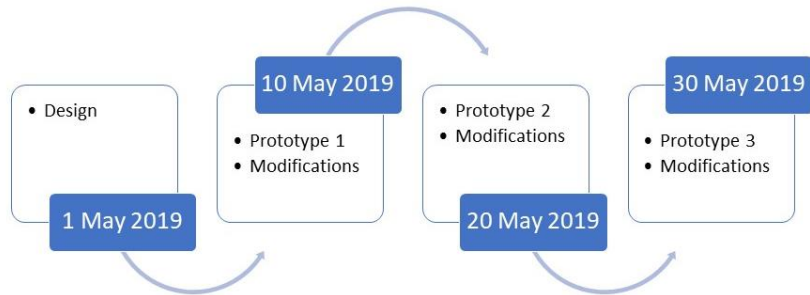
The target audience is mainly students but it can be used by anyone who uses books. The purpose is to prevent books from being damaged when the corners and edges of the books are folded. Its perceived impact on the targeted community is that their books will not get damaged as their corners or edges get folded.

The price of the book cover will be affordable as opposed to its many functions. It will be durable so that the cover can last for a long time. It is also better as it can change the size to fit many books so that if one wants to change the book which has a different size, one does not need to purchase a new cover and use money unnecessarily. Finally, it will be lightweight so that the user need not carry redundant weight.

Significantly, the book cover is expandable and completely eliminates the probability of the book covers and edges from being bent.

There are definitely going to be many setbacks such as:

- The materials used.
- The mechanism for the expandable part.
- The trial of the prototypes.



#### 4. Construction or Modelling Process\* (This first... then that...)

The criteria for the corner pieces of the invention is:

- Strength: As the device needs to protect the corners of the book.
- Weight: The device should be as light as possible so the users need not carry the load.
- Flexibility: The corner pieces should be in between as if it is too stiff, it might damage the book, but if it is so flimsy, it would not protect the book.
- Price: Majority of the people can afford it.

Materials	Paper	Wood	Plastic (assuming it is the flimsy type)	Metal
Strength	1	7	7	9
Weight	1	3	1	6
Flexibility	9	0	4	2
Price	5	7	3	7

(On a scale of 1-10)

The criteria for the elastic strip of the invention is:

- Elasticity: So that it the device can fit many book sizes.
- Price: Majority of the people can afford it.
- Durability: So that it can last for a long time.

Elastic material	Normal rubber bands	Elastic bands
Elasticity	6	3
Price	3	5



Durability	3	7
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(On a scale of 1-10)

Plastic was chosen to be used for the corner edges of our cover as plastic is cheap, has the right flexibility and is strong. Plastic is durable for the book protector to be able to last for a long amount of time. Elastic bands were chosen to rubber bands as they are more durable and serve the same function.



**Version 1**



**Version 2**



**Version 3**



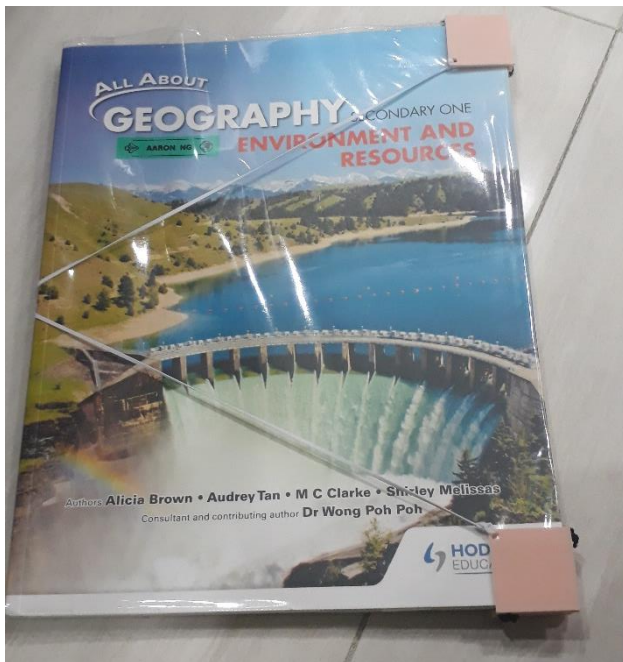
**Version 4**



Version 5



Version 6



Version 7

## 5. Modification and Evaluation

Test Iteration: Mark 1	Tick				Remarks
Test Date: 12 May 2019	Pass	Fail	Potential Failure	Room for improvement	
Cheap	✓				Prototype uses cardboard.
Strong		✓			Cardboard is very flimsy.
Lightweight	✓				The materials used are very light.
Adjustability			✓		We did not attach the elastic band as we focussed on the corners for this prototype.

Test Iteration: Mark 6	Tick				Remarks
Test Date: 29 May 2019	Pass	Fail	Potential Failure	Room for improvement	
Cheap	✓				Prototype uses cardboard.
Strong		✓			Cardboard is very flimsy.
Lightweight	✓				The materials used are very light.
Adjustability			✓		We did not attach the elastic band as we focussed on the corners for this prototype.

Test Iteration: Mark 16	Tick				Remarks
Test Date: 29 May 2019	Pass	Fail	Potential Failure	Room for improvement	
Cheap				✓	There are many available choices that we will explore to reduce cost.

Strong				✓	The plastic may not be as strong; thus the corners may bend still.
Lightweight	✓				The materials used are very light.
Adjustability			✓		The corners are fixed and thus they cannot expand.

Test Iteration: Mark 21	Tick				Remarks
Test Date: 29 May 2019	Pass	Fail	Potential Failure	Room for improvement	
Cheap				✓	There are many available choices that we will explore to reduce cost.
Strong				✓	The plastic may not be as strong; thus the corners may bend still.
Lightweight	✓				The materials used are very light.
Adjustability				✓	Mechanism works but still can't change size much.

Test Iteration: Mark 42	Tick				Remarks
Test Date: 29 May 2019	Pass	Fail	Potential Failure	Room for improvement	
Cheap				✓	There are many available choices that we will explore to reduce cost.
Strong				✓	The plastic may not be as strong; thus the corners may bend still.
Lightweight	✓				The materials used are very light.
Adjustability				✓	Mechanism works but still can't change size much.

Test iteration: Mark 47	Tick				Remarks
Test Date: 1 July 2019	Pass	Fail	Potential Failure	Room for improvement	

Cheap				✓	3d printing is not that cheap so it may not be that cheap.
Strong		✓			It is too thin (less than 0.5mm) so it is easily broken.
Lightweight	✓				The material is very light.
Adjustability			✓		If it is too flimsy and breaks easily, it cannot expand

Test iteration: Mark 50	Tick				Remarks
Test Date: 2 July 2019	Pass	Fail	Potential Failure	Room for improvement	
Cheap				✓	3d printing is not that cheap so it may not be that cheap.
Strong	✓				It is very thick (3mm) and sturdy.
Lightweight	✓				The material is very light.
Adjustability	✓				It is very strong do when pulled, it will not break.

## 6. References

Read <http://www.bibme.org/citation-guide/apa/> on how to cite references.

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