A new method of using stone paper

GROUP 3

Motivation · Purpose

We learned about stone paper

- S
- ate
- .

We want to make it more popular!

→It is used as an alternative to natural paper.

Method A: improving its weak points

To make it more popular…

Strong points

A) Improving its weak points

- ✓ Water-resistant
- ✓ Color won't fade
- ✓ Tear-resistant
- ✓ We don't have to cut down trees.

B) Suggesting a new stone paper project

Weak points

- ✓ It deteriorates by UV.
- ✓ We can't use all glues.
- ✓ We need to use offset printing because it is weak against heat.
- ✓ It is heavier than paper made from pulp.

Method A: improving its weak points

Deterioration due to UV

improving

We may be able to use it outdoors.

TiO_2 coating can prevent stone paper from deteriorating.

What is a photo-catalyst?

- A material which works as a catalyst when exposed to light.
- It absorbs UV and self-cleans.

Hypothesis

It may block UV radiation
and prevent Stone Paper from deteriorating

Method A: method for the experiment

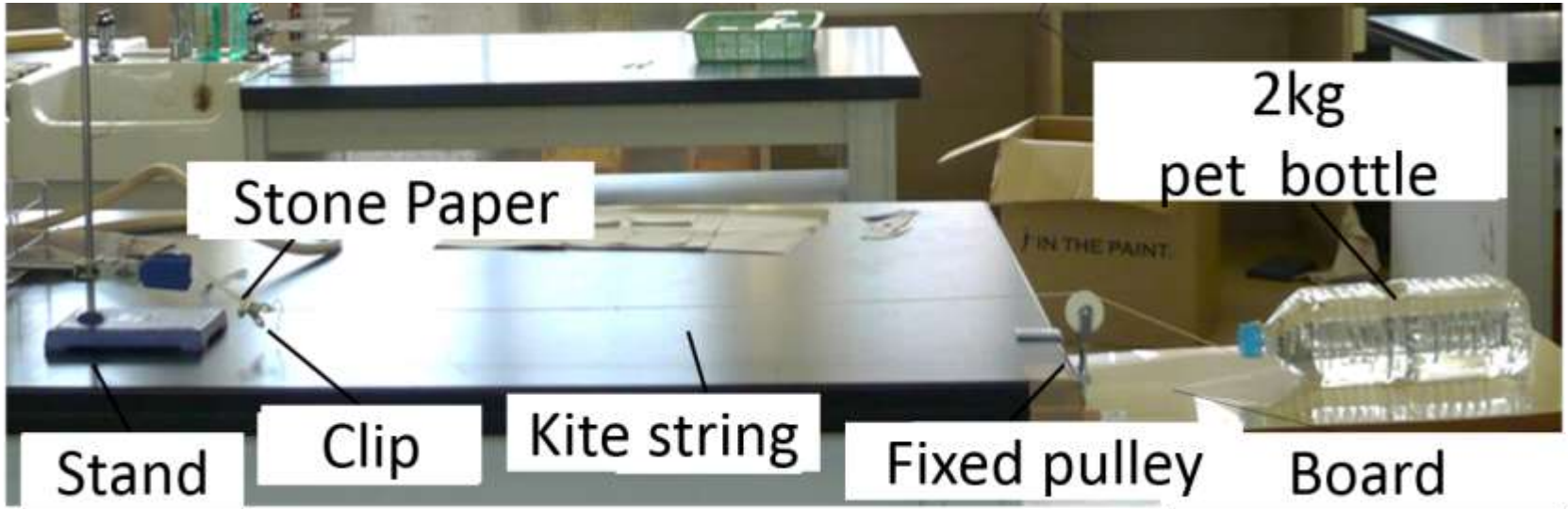
1. Prepare three kinds of the Stone Paper

   A : coated in TiO_2 , and exposed to UV

   B : not coated, but exposed to UV

   C : not coated, no UV

2. Measure paper strength



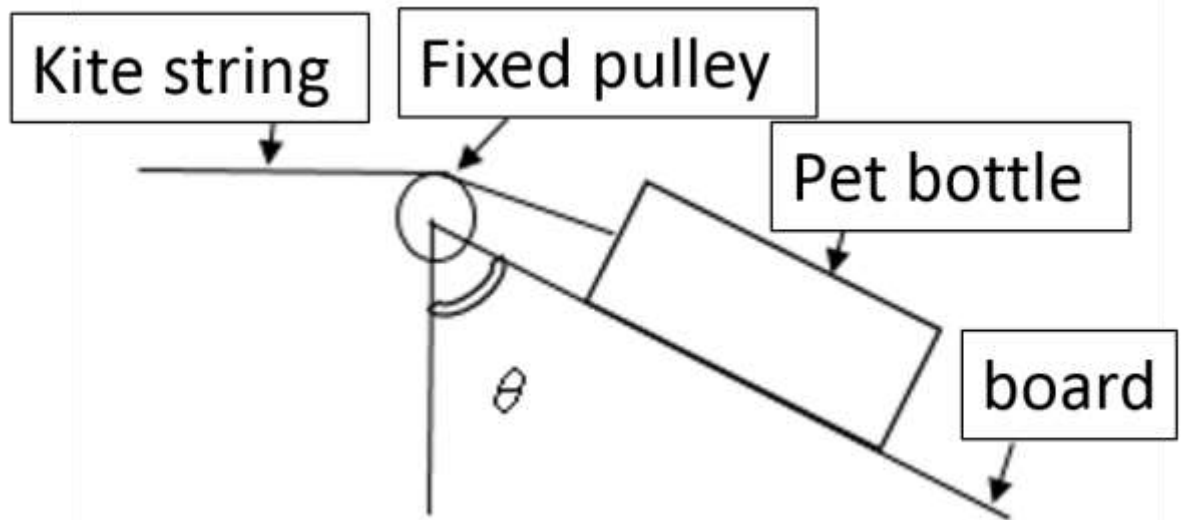
3. Incline the board with the pet bottle on it

&

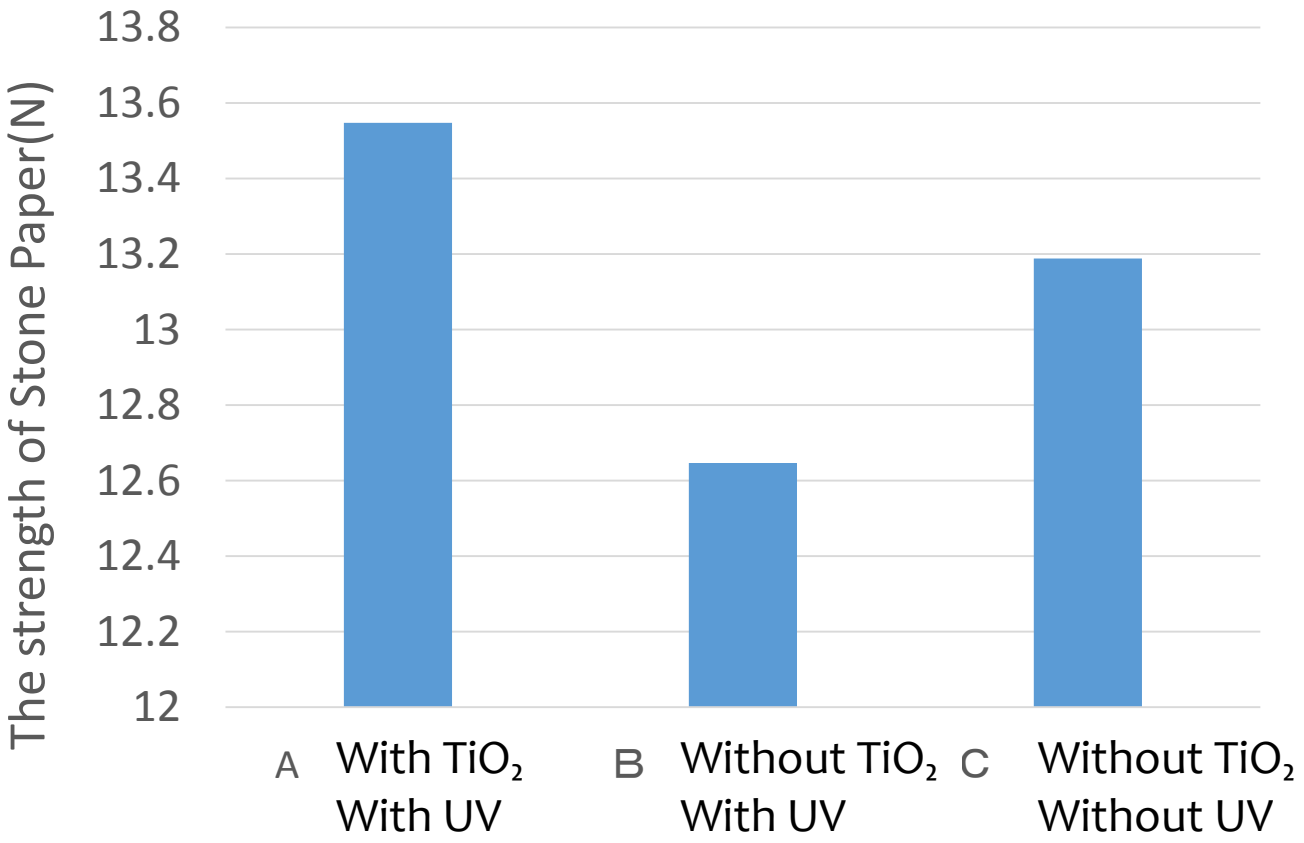
Check the angle when the paper tore

4. Calculate paper strength using this expression

$$9.8[m/s^2] \times 2.0[kg] \times \cos\theta - 0.0167 \times 9.8[m/s^2] \times 2.0[kg] \times \sin\theta \quad (N)$$



Method A: experimental results



- Stone Paper was degraded by UV exposure
- TiO_2 didn't prevent UV degradation by absorbing UV, but did make a film on the surface of stone paper.

Method A: additional experiment

We measured D's strength.

The TiO_2 coating

makes Stone Paper strong.

We can use it outdoors for a longer time.

With TiO_2
With UV

Without TiO_2
With UV

Without TiO_2
Without UV

With TiO_2
Without UV

Method B: Suggesting a new stone paper project

To make it more popular…

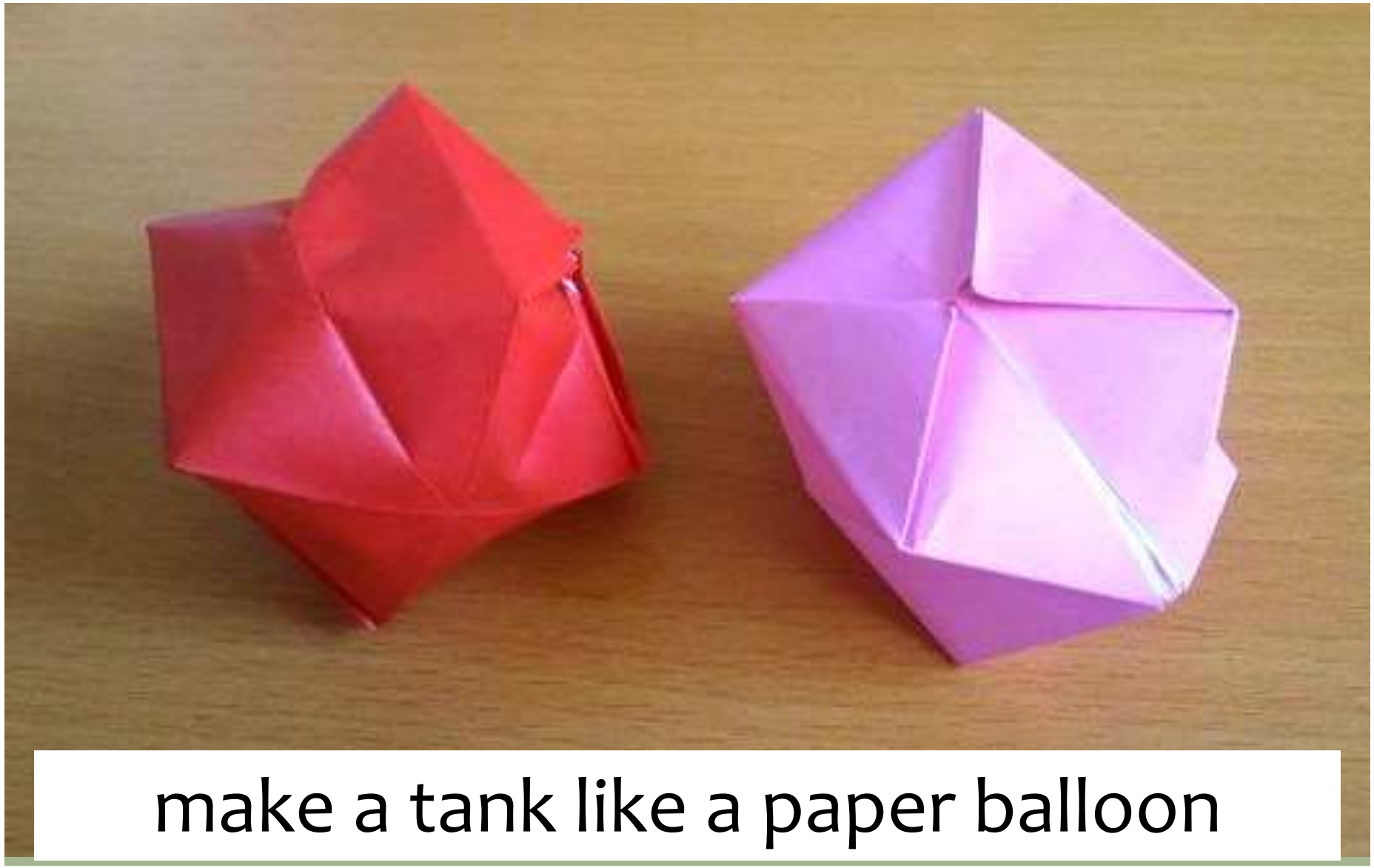
we found that a lack of water tanks is a problem.

A) Improving its weak points

Let's make a simple water tank

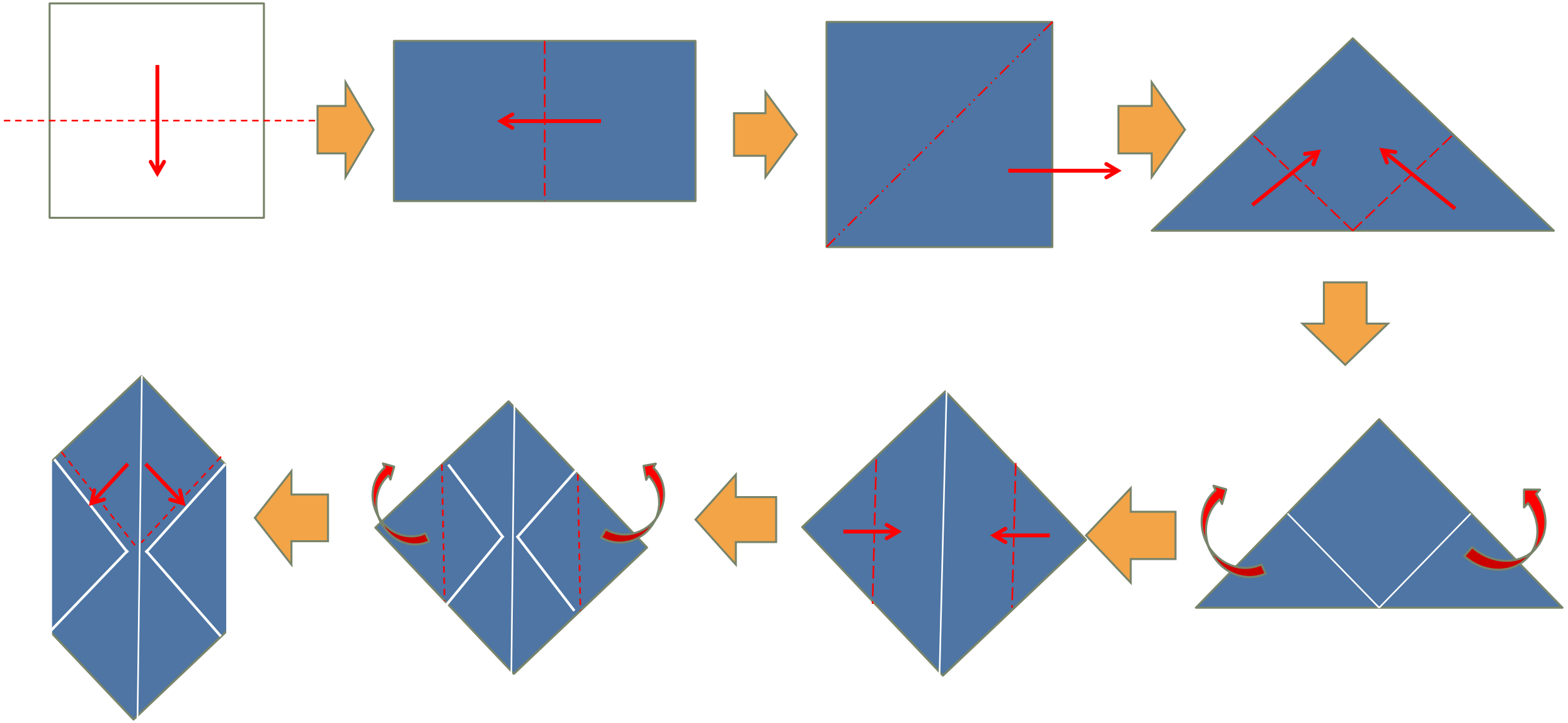
B) Suggesting a new stone paper project taking advantage of the strong points of foldable Stone Paper!

Method B: Suggesting a new stone paper project

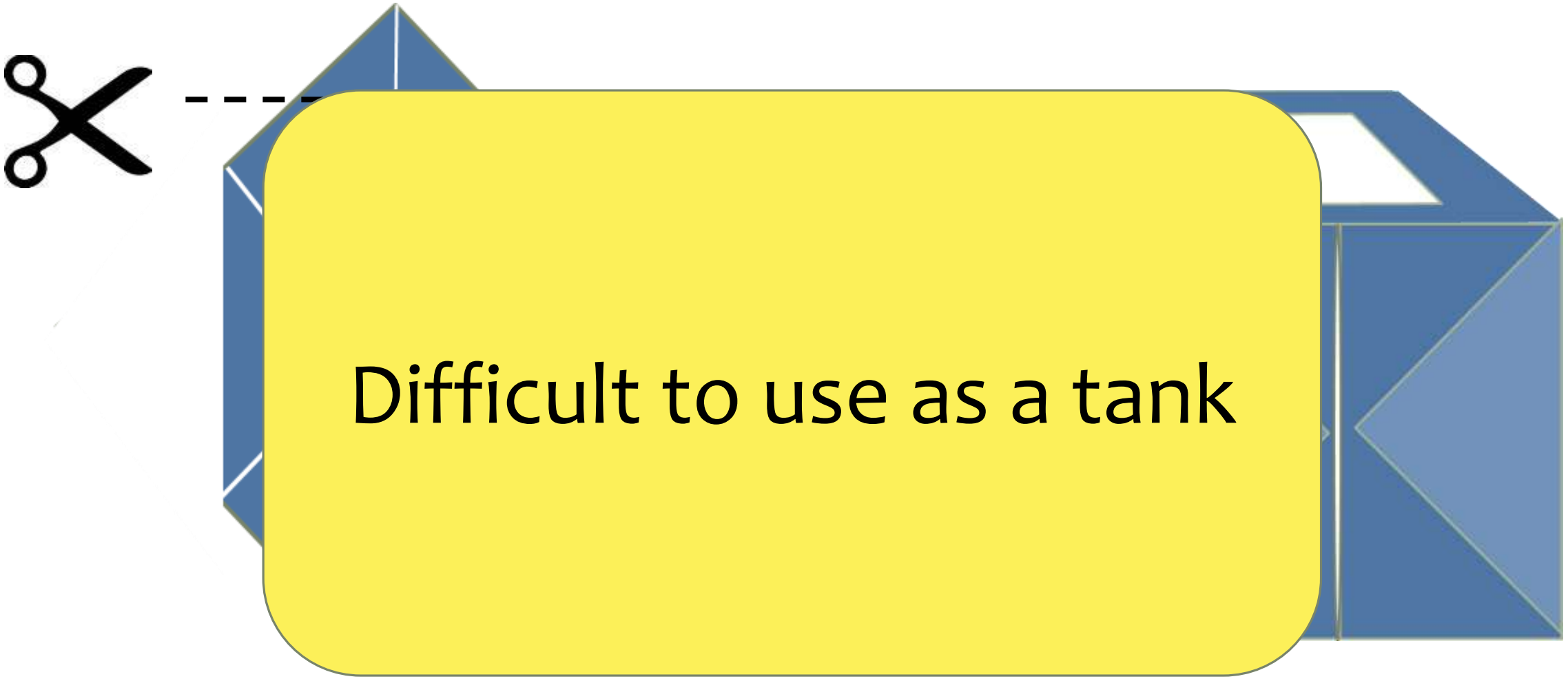


make a tank like a paper balloon

Method B: Suggesting a new stone paper project



Method B: Suggesting a new stone paper project stone paper



Difficult to use as a tank

Method B: Suggesting a new stone paper project

1. The shape of paper
2. The size of the opening
3. Where the “wings” are
4. Handles

1. The shape of paper
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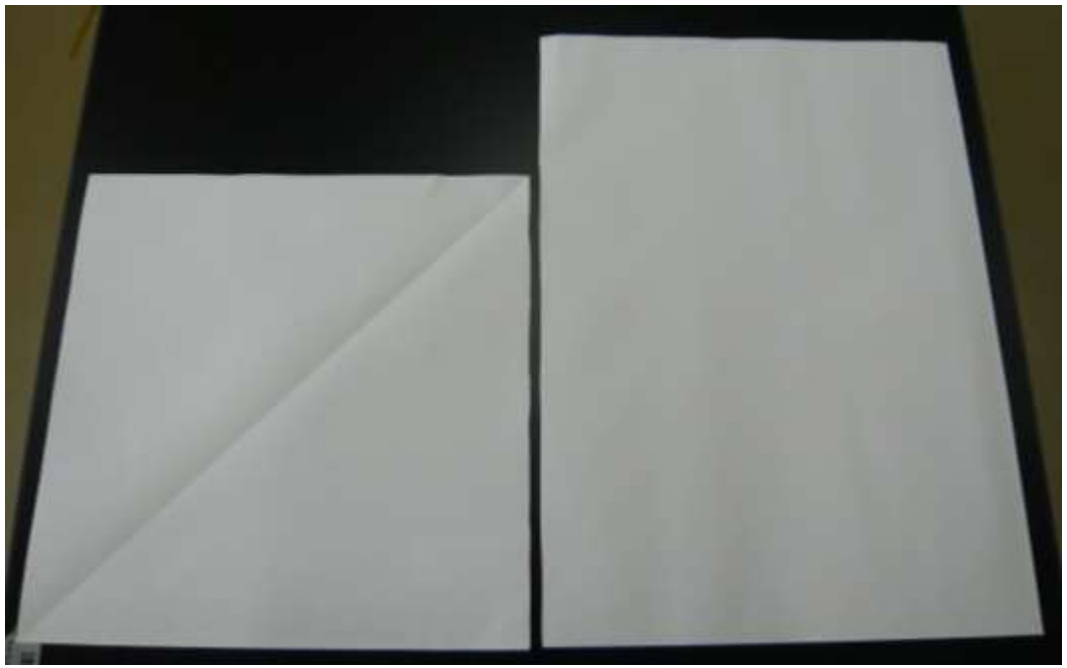
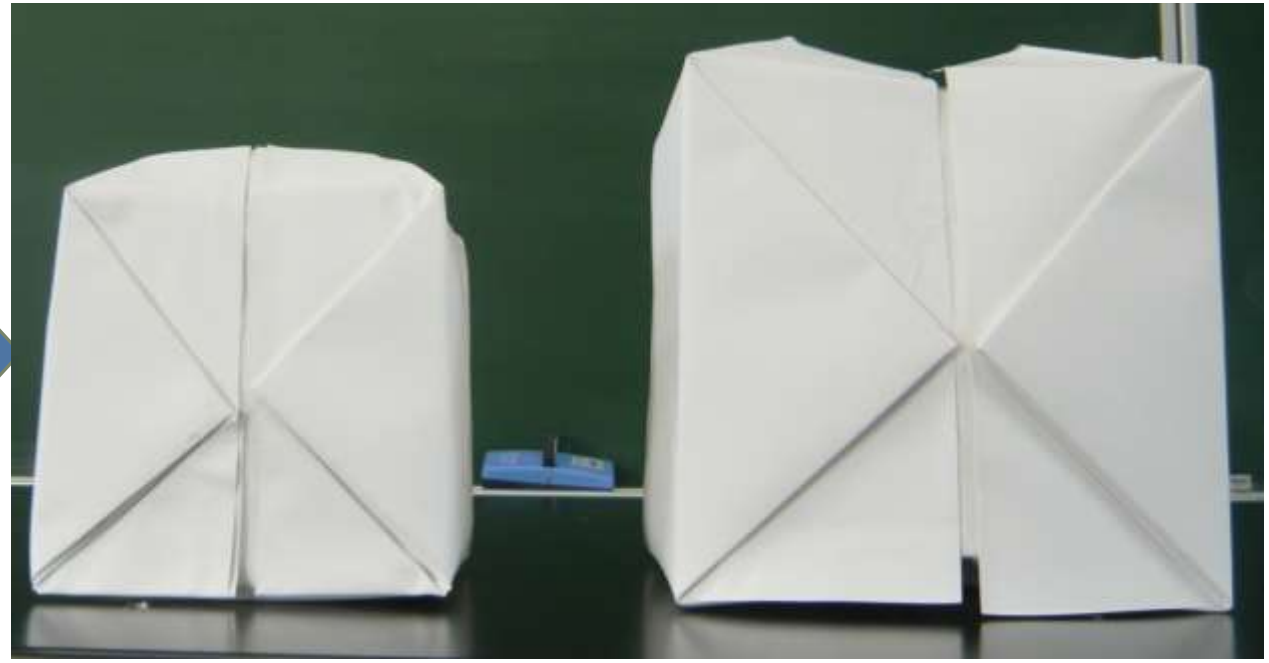
Method B: 1 The shape of paper

comparison





Left: square (46.95cm per side)

Right: rectangular (63.6cm × 46.95cm)

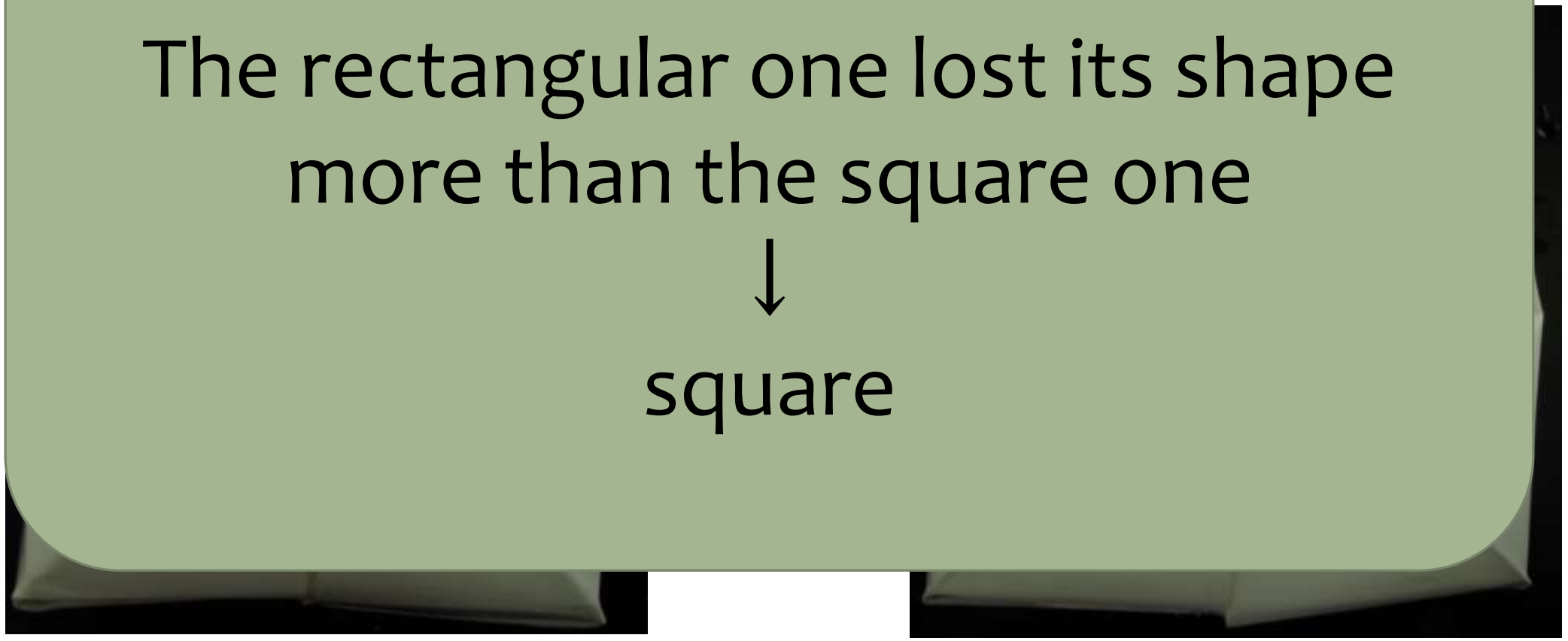
point

- Whether they lose their shape

The rectangular one lost its shape more than the square one

↓

square



Method B: 2 The size of the opening

1. The shape of paper
2. The size of the opening
3. Where the “wings” are
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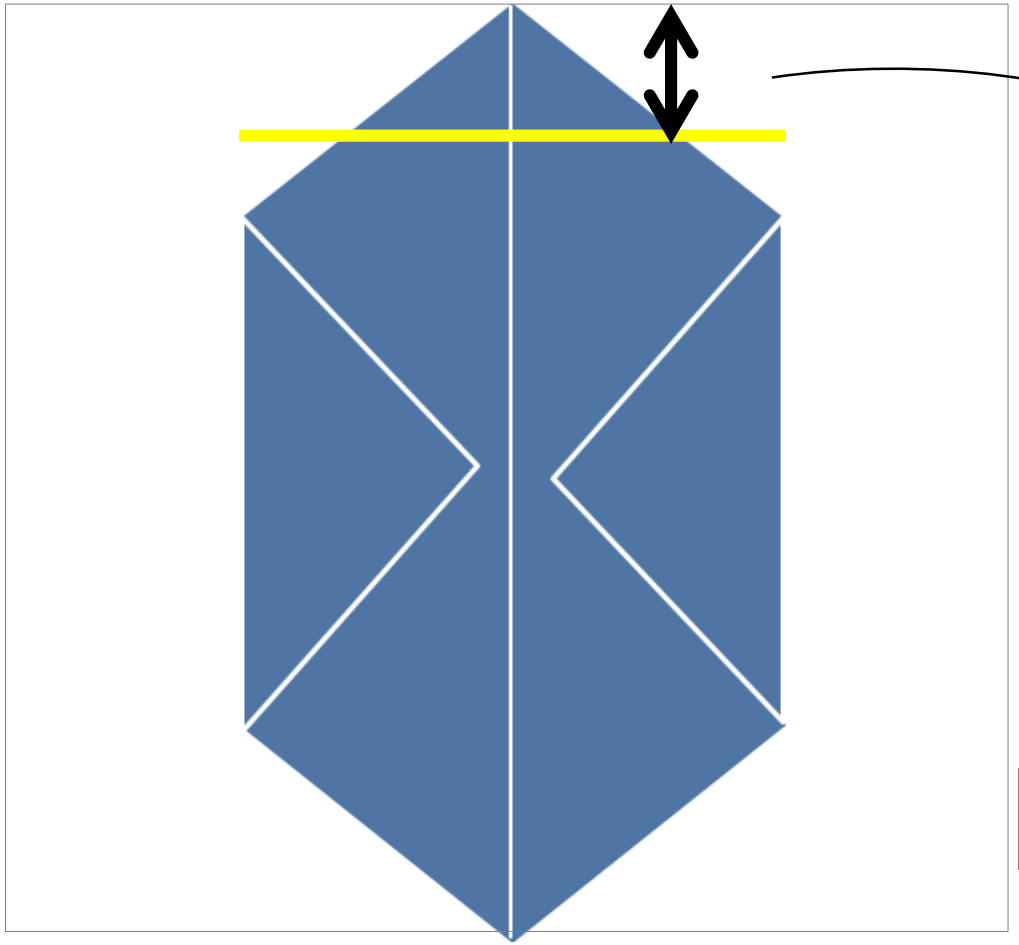
Method B: 2 The size of the opening



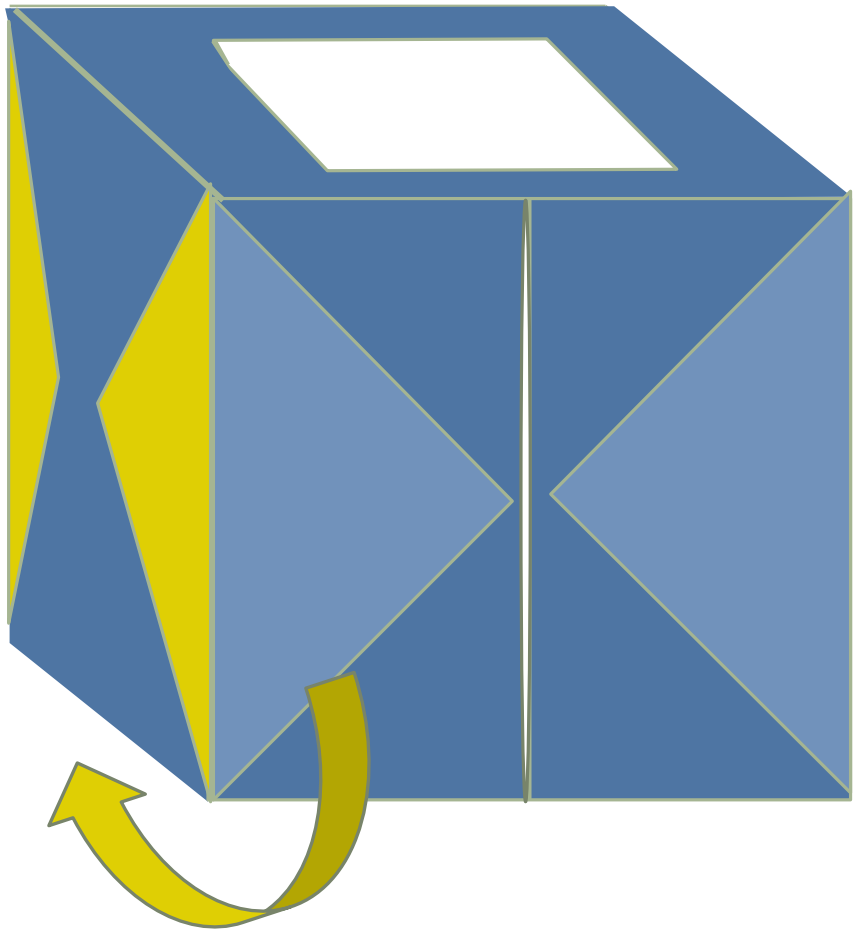
We changed this length
in 0.5 cm increments

The best length is 3.5cm

Method B: 3 Where the “wings” are

1. The shape of paper
2. The size of the opening
3. Where the “wings” are
4. Handles

Method B: 3 Where the “wings” are



Fold back

The sides are liable to

lose their shape

Folded the back and stuck

“wings” to the sides

Method B: 3 Where the “wings” are

Results

- There was not a big difference in shape
- The problem of tank deformation was solved

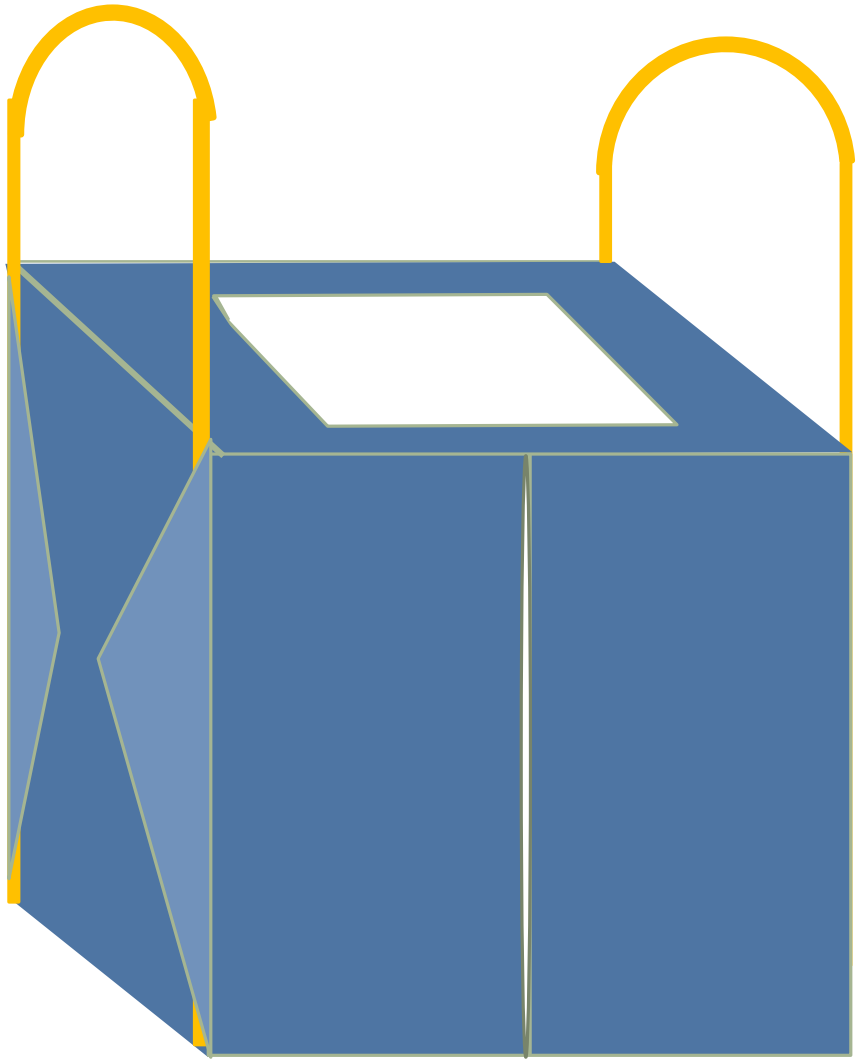
Fold back and stick “wings” to the sides

Method B: 4 Handles

1. The shape of paper
2. The size of the opening
3. Where the “wings” are
4. Handles

Method B: 4 Handles

Install handles on the tanks to make them easy to carry.

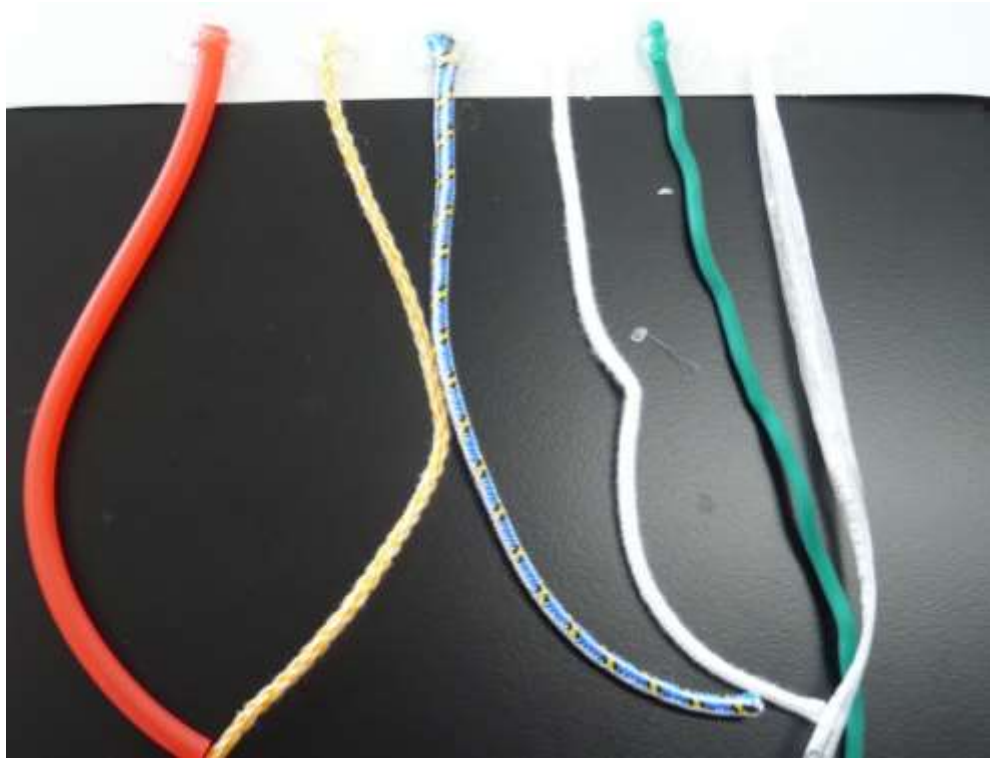


stitch string

between the sides and wings

Method B: 4 Handles

Six kinds of strings



- Red training tube（rubber)
- Orange KP rope （PE＆vinylon）
- Blue string for bike rack（rubber)
- White versatile string（vinylon）
- Green soft belt for gardening （wire & rubber)
- Plastic plastic rope（PP）

Method B: 4 Handles

Method

We had ninety people lift them

and rate them as ○, △, or ×

- Comfort
- Stability
- How easy to grasp

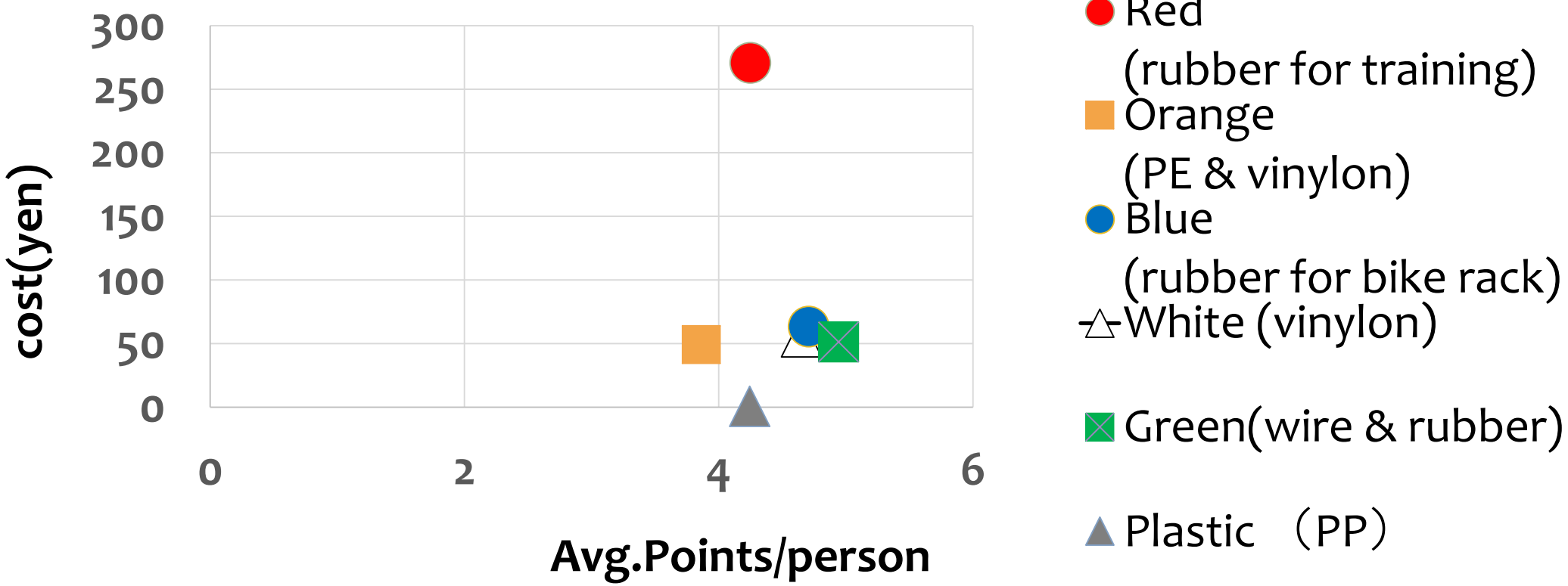
Results

Points ○: 2 points △: 1 point ×: 0 point

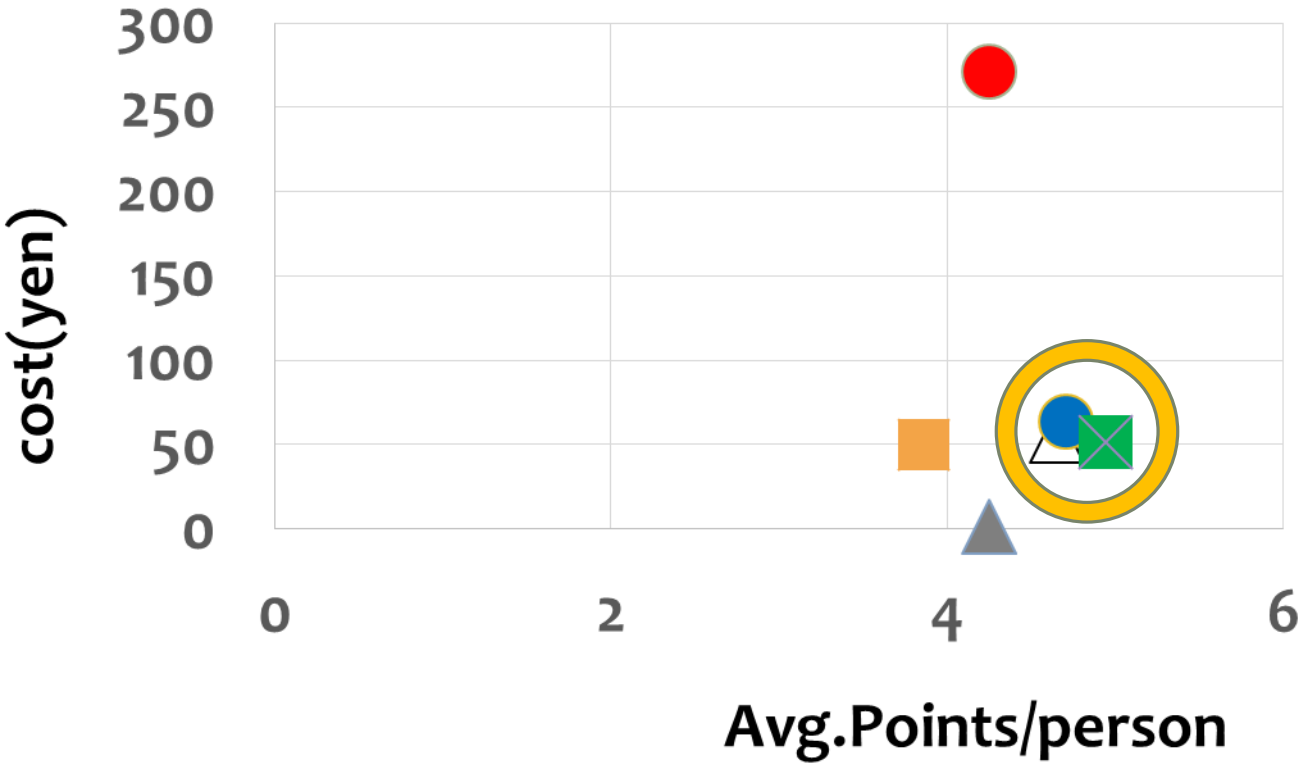
→We took the average

Cost

we checked the costs of strings per tank (126cm)



Method B: 4 Handles



Soft belt for gardening made of wire and rubber is the most suitable.

Method B:summary

1. The shape of paper	square
2. The size of the opening	3. 5cm from top
3. Where the “wings” are	side of tank
4. Handles	wire and rubber

Conclusion

Method A: method for the experiment

We can improve stone paper's strength and use it for a long time outside by applying TiO_2.

Method B: Suggesting a new stone paper project

We can make a folding water tank by applying the design of an origami balloon and improving upon it.

Method A: method for the experiment

- Checking whether stone paper's strength changes by applying TiO_2.
- Studying how long titanium dioxide keeps working.
- Making products from stone paper coated in TiO_2.

Our future works

Method B: Suggesting a new stone paper project

- Considering thickness and size of paper
- Considering the cost of tanks
- Increasing the variety of strings
- Considering if we can apply TiO_2 to our tank

References

1) Kamatani Paper Company HP
http://www.kamatani.jp

2)The association of photocatalyst industry
http://www.piaj.gr.jp/roller/contents/entry/200706118

3)Ltd.Vortex　Seychelle water purifier
http://safe-water.jp/user_data/water_contents.php

Throughout this study,

We have been advised by Mr. Kamatani Taizo, President

of Kamatani Paper Company.

We all would like to express our thanks

for his assistance.

Thank you for listening ！