Tetra Pak Carton Packages Recycling and 3-D Model Design by 4K1R

Community Partner :
Dr. Clifford Choy (School of Design, The Hong Kong Polytechnic University)

Teammates :

The Chinese University of Hong Kong	Chi Lok Him
The Education University of Hong Kong	Au Ka Man, Kwan Sin Yi, So Yan Tung
The Polytechnic University of Hong Kong	Ng Kam Tak

Participants :

Price Memorial Catholic Primary School	20 students from P.4-5
HKSKH Bishop Hall Secondary School	20 students from F.2

Aims of Project

- Remodeling recycled Tetra Pak carton packages into useful products
- Imparting recycling concept by recycling Tetra Pak carton packages
- Raising awareness and importance on being environmentally friendly

Limitations & Difficulties

3D Modeling

- Unnoticeable differences in format of different 3D modelling applications
- 3D modeler Rhino is complexed & difficult in use

3D Printing

- Error-prone and time-consuming printing process
- Imperfect quality of 3D printing machine

Workshop Design

- Not enough time for students to create their own products

Reflections

"I tried some parts that have not touched before such as teaching. Although I was anxious and felt helpless at first, I learnt many skills with the help of teachers and teammates. I realized my insufficient knowledge in building 3D models while the help of everyone led us to success. I think the most valuable thing is team spirit instead." *said Kasper.*

"This is a meaningful scheme. First, I am grateful that Dr. Choy provided various professional suggestions for us. Also, this scheme allows me to know some new friends. I have learnt some STEM-related applications and have opportunities to contact with students. These experiences have prepared me to become a professional teacher." *said Karmen.*

"This is a awesome experience to have deeper understanding on environmental and STEM-related education, which is beneficial for developing as a prospective teacher. With the cooperation of our helpful community-partner and teammates, we have gone through the project successfully." *said Kelly.*

"As a pre-service teacher, the programme provides me a precious opportunity to hold activities. I can learn delivering messages and increasing learning motivation of students effectively. Although we faced obstacles especially on making 3D models, we have tried our best. This helped training my adaptability to changes and strengthening my problem-solving skills." *said Kristy.*

"It is an interesting experience as I have learned different software for designing 3D models. Holding workshops can practice my communication and presentation skills, which are useful for my future. I feel delighted to work with my teammates as they are nice and have good teamwork." *said Ray.*

Evaluation on Goals & Expected Outcomes

KNOWLEDGE • Structure of Tetra Pak carton packages • Chemical process from cellulose to paper	ABILITY • Experiencing the recycling process of carton packages • Enhancing the craft and design skills • Using STEM-related software
ATTITUDE • Understanding resources are limited • Develop the habit of recycling • Boosting students' confidence	COLLABORATION WORKSHOP • Enhancing cooperation and communication skills • Developing leadership skill • Exploring ideas from different students

Conclusion

During the project, we successfully taught an innovative recycling method of Tetra Pak paper cartons packages to students, and spread the passion towards 3D modeling to them. We have learnt some brand new techniques such as skills of making new plans when the workshops cannot stick to the previous plan. These skills are not only beneficial for academic aspects, but lifelong career. Although we encountered many difficulties, we still figured out the solutions at last.

STEM Elements

SCIENCE
Structure of Tetra Pak carton packages
Chemical process from cellulose to paper
Scientific steps involved in paper recycling

TECHNOLOGY
Tinkercad for 3D models design
Rhino & Grasshopper for holes on 3D models

ENGINEERING
Modeling skills on product shapes
Concept of clamping pressure

MATHEMATICS
Calculating the amount of used carton packages
Estimating the dimension of proposed products

Contents of Project

- Holding 8 workshops for primary & secondary students
- Designing molds through Tinkercad
- Using 3-D printing techniques for molds
- Manufacturing products by Tetra Pak carton packages

Design Rationale – Workshop

- For students to design & make products with the material from Tetra Pak carton packages

Phase 1 :

- ✓ Primary students → designing the products
- ✓ Secondary students → modifying their designs
- ✓ A collaboration workshop is held → paper casting

Phase 2 :

- ✓ Secondary students → show their creativity by designing construction kit products

Teacher Workshop	Prior understanding on : • project procedures • operation of Tinkercad, Grasshopper & Rhino • Hands-on activity of paper casting	
	Primary Students	Secondary Students
Phase 1		
Workshop I	Project Introduction, Pre-test, Paper casting	
Workshop II	Design products by Tinkercad	Modifying the works from primary students by Tinkercad from 2D drawings to 3D models
Workshop III	Collaboration workshop: paper casting & sharing session	
Workshop IV	• Product decoration • Sharing session • Post-test	**Phase 2** • Preliminary design of products by construction kits
Workshop V	/	• Product decoration • Sharing session • Post-test

Design Rationale – Product

- **Product theme for primary students :**
  Protecting our environment
- **Product theme for secondary students :**
  No specific theme for developing their creativity freely

Recommendations & Follow-up Work

- Better time allocation for printing the 3D models
- Providing more resources in order to print more 3D models
- Presenting students' works at school to raise concern of being environmentally friendly
- Training participants to be student teachers of Tinkercad
- Encouraging peers to use the ways linked with stem concept to solve some daily problems and social issues