ID-J240475

Research on Recycle and innovation of Discarded desks and chairs

Li-Mei Chen
Department of Visual Communication Design, Tainan University of Technology, YongKang, Tainan, Taiwan. Department of Digital Media Design, Asia University, Taichung, Taiwan.
Corresponding author. Tel.: +886 6 2532106; Fax: +886 6 2540702
E-mail: tb0076@mail.tut.edu.tw
Cheng-Jia Chuang
Department of Industrial Design, National Yunlin University of Science and Technology, Yunlin, Taiwan.

ABSTRACT: Taiwan is currently facing a severe declination of birthrate as well as replacement of old desks and chairs, resulting in many discarded wooden desks and chairs accumulating in the corner of elementary and junior high school campuses, to reuse wooden material and reduce the need of logging to produce products, this research utilize the method of Action research. Firstly, conduct literature review and field investigation to carry out current situation survey, to understand the processing method for recycling of discarded wooden material as well as desks and chairs. Secondly, conduct test and experiments using desks and chair to redesign and repur-pose, developing a project that integrates both forest conservation education and the recycling of reusable mate-rials called “Action story box”, the remaining wood shaving are then use to produce ”Forest paper” and “Action story box” products, which contain action story box, innovative notebook and pencil , further incorporating them into school and involving students in the creative redesign of discarded desks and chairs, the learning and design outcomes of the students not only enable the reuse of discarded desks and chairs but also inspire children towards creative reuse of waste and raise awareness about forest conservation. The established “Recycling for creative design of discard-ed desks and chairs” can be applied to related issues.

1 THE PURPOSE

(1) Understand the current situation of discarded desks and chairs as well as the p rocessing methods for recycling waste wooden material.
(2) Develop a story and interactive reading strategy with a focus on forest conservation.
(3) Develop an "Action Story Box" that combines education with waste mate rial innovative and recycling.
(4) Establish “Recycling for creative design of discarded desks and chairs”.

2 RESEARCH METHODS AND PROCEDURES

The method proceeds through four stages of progress
Stage One: Problem and Situation Investigation
Stage Two: Plan and Strategy Formulation
Stage Three: Product Development and Testing
Stage Four: Implementation in Campus and Innovative Design

Table 1. Experimental and Testing Steps for Wood Recycling in "Action Story Box" and Paper Making from Waste Materi-als After Wood Recycling.

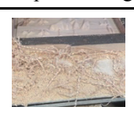
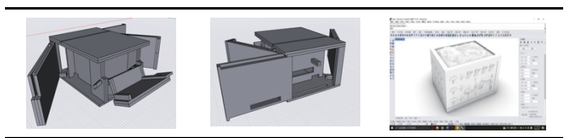
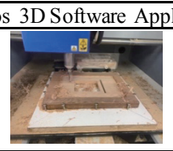
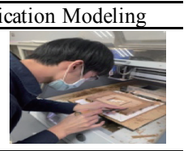
"Action Story Box" Testing	Paper Making Testing
 1.Collect discarded desks and chairs.	 1.collects wood shavings from workshop that cut raw wood
 2.Dismantle the desks and chairs with a hammer, and remove nails.	 2.Sieve the larger particles of wood shavings to facilitate better paper manufacturing during the papermaking process.
 3.Adjust the values for the log and the Z-axis.	
 4.Apply moisture-resistant wood paint.	 3.Test the pulp composition and disperse the pulp for a certain period of time.

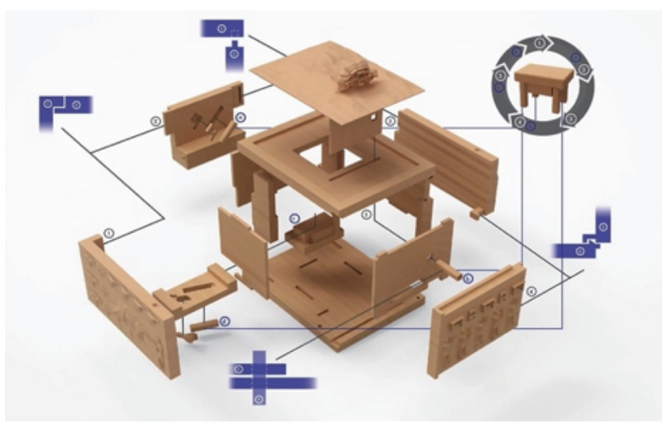
Table 2. Production Process and Finished Product of the "Ac-tion Story Box"



Shapr3D Rhinoceros 3D Software Application Modeling		
		
Using a saw table with homemade tools to vertically cut the tabletop	CNC machining	Hand planed the edges
		
Using a scroll saw machine to cut the remaining waste wood	Smoothing the edges	Completing the semi-three-dimensional story cover

3 RESULTS

(1) Production and Gameplay Settings of the "Action Story Box". (fig.1-fig.2 & table 3)
(2) The Production of Promotional Items and Tools from Remaining Wood Shavings After Wood Carving.(fig.3)
(3) Establish “Recycling for creative design of discarded desks and chairs”. (fig.9)



Each chapter of the story utilizes wood carving to create a semi-three-dimensional cover. Upon opening the cover, the story unfolds in the form of foldout pages. The story depicts Taiwan's forests being heavily deforested in the past, leaving many forestdwelling animals homeless, such as Russet Passer cinnamomeuss. Additionally, due to declining birth rates, a large number of desks and chairs face disposal.

Figure 1. Overall Story and Desk Assembly Association Dia-gram for Each Chap

Figure 2. Complete assembly of the "Action Story Box"

Figure 3. "Innovative Notebook", Introduction, and Pencils

Table 3. Story and Interactive Strategies for the "Action Story Box"

Story Outline Content and Interaction Linking Strategy	Illustration
Chapter One: Silent Lament (Reasons for Deforestation) Synopsis: Trees in the forest are being cut down, causing Russet Passer cin-namomeuss to leave their habitat. The wood is then transported to be made into desks and chairs. Interaction: After reading Chapter Five, students can assemble the com-ponents from Chapter One, including table legs, Passer cinnamomeuss, and the "Voice of the Forest" team logo.	 Figure 4. Illustration for Chapter One "Silent Lament" - 6-fold horizontal right-pull page
Chapter Two: That Night, the Mud Flowed (Conse-quences of Deforestation) Synopsis: Deforestation causes soil erosion and mudslides, carrying away remnants of trees. Interaction: After reading Chapter Two, students can flip open the assembly kit containing table legs and Passer cinnamomeus nest box components for assem-bly.	 Figure 5. Illustration for Chapter Two "That Night, The Mud flowed " - 5-page 4-fold downward pull page
Chapter Three: Melodic Harmony (Human Utilization of Wood for Forest Eco-Restoration) Synopsis: A bird enthusiast picks up a piece of driftwood and crafts it into an artificial nest for Russet Passer cin-namomeuss, which is then tied to a utility pole. Interaction: Students can insert the Passer cinna-momeus nest box from Chapter Two onto a corner utility pole and wait for the return of the Passer cinnamomeuss.	 Figure 6. Illustration for Chapter Three "Melodic Harmony" - 4-page 3-fold horizontal right-pull page
Chapter Four: Crackling Flames (Humans Burning Wood) Synopsis: The neighboring elementary school replaced its desks and chairs, and the discarded ones were gathered for burning. Interaction: After reading, the students pulled out the table legs that were not yet burnt in the flames.	 Figure 7. Illustration for Chapter Four "Crackling Flames" - Single-page with flip-down text
Chapter Five: Memories of the Bell Synopsis: The desks and chairs in the bonfire are burned, and the days of joyfully accompanying students in their studies are now shattered in the flames. Memories of the cheerful atmosphere in the classroom come flooding back, inspiring a desire to continue contributing to education (thus, utilizing the desks and chairs again, allowing the discarded items to return to education once more...). Interaction: Pulling out the top pangolin assembly board, the back features illustrations of children studying in class. Next, pull out the assembly board for the first chapter and assemble it, forming the mission of reintegrating the wood back into education.	 Figure 8. Illustration for Chapter Five " Memories of the Bell " - Single-page illustration

4 CONCLUSION

Early in Taiwan's history, forests were cut down to create wooden desks and chairs, which over time be-came worn and destined for disposal. This research aims to effectively utilize these discarded desks and chairs by developing the "Action Story Box," which integrates environmental education and the recycling of waste materials. The goal is to see a mountain of discarded desks and chairs from elementary schools reused through the "Action Story Box" and to gradu-ally instill in students an awareness of forest conser-vation as they engage in manual reading with the box. Students are encouraged to unleash their creativity by designing the discarded desks and chairs, and the team implements the production of student-designed products.

Figure 9. The "Circular Design Mechanism"

While there are limitations to mass-producing the "Action Story Box," the team can replicate several units and introduce them to different schools at differ-ent times. By combining storytelling and symbolism in the "Action Story Box," children can learn about the current environmental challenges and the im-portance of conserving ecosys-tems while having fun. This initiative aims to build awareness that simple ac-tions and thinking can contribute to forest conserva-tion, empowering individuals to take part in environ-mental protection.