

Creativity in Distance Learning: Study Designing Art Furniture Based on Upcycling Concepts

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Abstract

The COVID-19 pandemic has lasted for over two years, revolutionizing offline learning in schools worldwide. Distance learning is one of the strategies employed by Indonesian schools and universities to ensure high-quality learning outcomes. However, apart from the technological issues associated with distance learning, there are challenges in implementing these learning outcomes effectively. Therefore, this study aims to examine how to respond to distance learning results. The study was conducted by Interior Architecture students through interior product design courses, utilizing post-use materials from residential homes or upcycling materials. Distance learning was conducted using a combination of synchronous and asynchronous techniques. The learning outcomes yielded 50 interior product concepts, predominantly based on regenerative design principles. These concepts include technical cycle items that can be assembled or incorporated into do-it-yourself (DIY) activities. The findings of this study have implications for fostering new forms of engagement and creativity by transforming waste materials derived from the production process into new art furniture designs.

Keywords: art furniture, upcycling, DIY (do it yourself), distance learning

Kreativitas Pembelajaran Jarak Jauh: Studi merancang Art Furniture berdasarkan Konsep Upcycling

Abstrak

Pandemi Covid 19 yang telah berlangsung selama dua tahun lebih telah mengubah tatanan proses belajar mengajar di semua sekolah di seluruh dunia. Salah satu upaya yang dilakukan oleh sekolah/kampus adalah dengan memberlakukan strategi pembelajaran jarak jauh, baik langsung maupun tidak langsung. Strategi tersebut dilakukan demi memastikan tetap tercapainya tujuan pembelajaran dengan kualitas yang tetap optimal meski wabah covid masih melanda. Terlepas dari permasalahan teknis yang muncul terkait pembelajaran jarak jauh, muncul suatu pertanyaan tentang bagaimana dengan implementasi atas hasil pembelajaran yang telah dilaksanakan. Penelitian ini mencoba memberikan gambaran bagaimana merespons hasil pembelajaran jarak jauh yang dilakukan oleh mahasiswa prodi interior arsitektur melalui mata kuliah perancangan produk interior dengan studi berbasis material limbah padat rumah tangga atau material upcycling. Hasil dari pembelajaran perancangan menghasilkan 50 konsep produk interior yang sebagian besar merupakan desain regenerative yang secara khusus mengarah pada technical cycle product dengan dominasi pada jenis artefak art furniture Implementasi hasil produk merujuk pada aktivitas swakriya atau "do it yourself" (DIY). Selain hasil akhir yang berwujud artefak desain, penelitian ini berimplikasi pada munculnya embrio entrepreneurial dalam bentuk interaksi antar anggota keluarga mahasiswa dalam mengembangkan serta menciptakan item baru melalui penggunaan sisa material limbah rumah tangga lain menjadi produk art furniture baru lainnya.

Kata kunci: art furniture, upcycling, DIY (do it yourself), distance learning

INTRODUCTION

The COVID-19 pandemic lasted over two years and spawned new types of activity has not been seen before. One emerging activity in the world of education is the new learning model. Conventional learning was carried out face-to-face, where the materials were issued by the teacher/lecturer directly in one place simultaneously, and students responded to it accordingly. The pandemic has brought drastic change, from conventional learning to distance learning, which utilizes online or wireless/internet-based learning tools (Annita & Susanto, 2021).

According to UNESCO data from 2020, more than 112 countries worldwide are shifting from face-to-face learning to online , implementing learning policies, or working from home. Through the Ministry of Education and Culture (Kemendikbudristek, 2020), the Indonesian Government has also issued legislation governing policies for implementing home-based or distance learning (Pembelajaran Jarak Jauh, 2020). The Ministry of Education and Culture released circulars 2,3, and 4 outlining basic rules for education emergencies caused by the COVID-19 virus. Circular letter Number 2 of 2020 concerning Prevention and management of Covid-19 in the Ministry of Education and Culture, 3 concerning the prevention of COVID-19, and 4 concerning the implementation of education policies during the COVID-19 period. Nineteen states, among others, provide direction on teaching and learning processes conducted at home or in distance learning systems (Kemendikbudristek, 2020). Two hundred and seventy-six (276) public and private universities in Indonesia have implemented online lectures (<https://www.kompas.id>).

Apart from the technical constraints inherent in distance learning, Ciputra University Surabaya implements this approach through synchronous and asynchronous models or combining both blended or hybrid learning. All courses, particularly application-based, such as interior architecture and product design, incorporate learning. Therefore, this case study aims to investigate post-use materials derived from residential waste collected in the immediate environment where students' families live.

Data from the National Waste Management Information System (sipn) of the Indonesia Ministry of Environment and Forestry in 2021 noted that 40.9% came from residential waste, far above the 19.5% commercial waste and 6.7 percent from offices. %. Meanwhile, based on the type of post used solid waste, plastic materials contributed at least 15.6%, wood 7.8%, metal and the like 6.7%, the rest in the form of food waste and cloth and paper (<https://sipn.menlhk.go.id>). The learning method in this post-use material-based design uses the concepts and principles of upcycling products.

The design method is based on upcycling products' concepts and principles. This process resulted in various prototypes for new interior products made of

different materials and types. Fifty (50) works of upcycling product design produced through distance learning by previous 4th-semester interior architecture students were examined (during the 2020/2021 odd period).

LIERATURE REVIEW AND METHOD

Upcycling Concept

Upcycling or creative reuse entails transforming waste materials or post-used products that cannot be reused or are damaged into new products of higher quality, economic and environmental worth, such as art. The term ‘upcycling’ was coined in 1994 by a German engineer named Reiner Pilz. His statement was reported in a UK journalist Thomton Kay (1994), *SalvoNEWS* no 99 dated 11 October 1994. Thomton describes Pilz comment regarding up cycling as a form of recycling or as downcycling, where obsolete product materials are processed and transformed or the extraction of materials to create new products with altered ingredients. Downcycling and upcycling are concepts included in the recycling process. Upcycling is the practice of reusing recycled materials by limiting the usage of new materials and waste while maintaining or boosting product quality instead of reducing it in the second life cycle (Sung, 2017). While the downcycling process involves repurposing materials and products, the result is often of poor quality (Luis & Moncayo, 2015). Regardless of the end product results, the purpose (recycling) is to avoid material wastage with new product materials by reusing potential materials. Along with minimizing the use of fresh raw materials, this approach can reduce energy use, air, and water pollution and minimize greenhouse gas emissions during manufacturing and post-production (Cohen, 1998; McDonough & Braungart, 2002; Richardson, 2010; Richardson et al., 2010)

The upcycling concept is often associated with materials’ life cycles used to manufacture products. Cradle-to-cradle design, also known as 2CC2, C2C, or regenerative design, is used to define this life cycle.

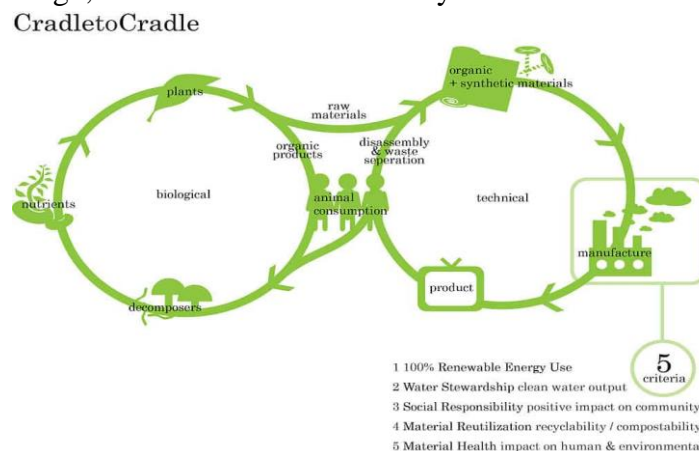


Figure 1. Upcycling product life cycle
Source: McDonough & Braungart, 2002

Zero Waste Design Principle

Household solid waste is critical to Industrial Design, as many of its products end up as waste after serving their purpose. To achieve zero-waste design, products reused, either by restoring their original value or introducing new ones, should not become waste or generate new waste during processing (Richardson, 2010). The challenge for designers is to produce reusable products at every stage of the life cycle. It delivers positive value better than ever before, which is the ultimate goal of cradle-to-cradle manufacturing (see McDonough & Braungart, 2002). This will necessitate fundamental changes in design and manufacturing techniques, material processing and construction, packaging and distribution, reusing components and materials from earlier products, and environmentally sound disposal at approved places.

The zero-waste design prioritizes reusing components from previous products (Gerber et al., 2010; Kopnina, 2011). Such designs represent an intelligent approach to environmental improvement. Practices and efforts to manufacture zero-waste goods include Reducing, Reusing, Recycling, eliminating carbon waste emissions, sustainably reusing materials, and minimizing energy expenditure in the production cycle (Braungart, 2013; Kopnina, 2018). These considerations contribute to the development of a dematerialization culture, defined as the process of manufacturing or processing cleaner materials resulting in less material in the final disposal. Dematerialization can be accomplished in several ways, including the following:

- Producing long-lasting, high-quality items that can be repaired, reused, and manufactured repeatedly (Gerber et al., 2010; McDonough & Braungart, 2010).
- Using biodegradable, non-toxic, and low-impact materials or products that are environmentally neutral after being disposed of in a landfill (McDonough & Braungart, 2002)
- Developing a robust system of reuse, whether through recycling or repair (Kopnina, 2018)

Regenerative Design Principles

Upcycling product design incorporates fundamental design principles as product limits, referred to as regenerative designs. According to Jiang Xu and Ping Gu (2015) and Utomo, Kusumarini, et al. (2021), regenerative design is based on five principles mentioned below:

- ***Value enhancing principle***; the principle of maximizing the product's potential value through in-depth exploration of the material used to compose and shape the design.

- ***Making the most use of the waste principle***; maximizing waste usage by minimizing waste or avoiding new waste during production (zero waste).
- ***The durable and environmental principle***; seeks to reduce the environmental impact of manufacturing processes. Additionally, maintain and improve product quality to the maximum possible extent even when used material is a post-use waste.
- ***Cost control principles***; mainly consider cost-effectiveness and minimization as a result of the design process.
- ***Populace's aesthetic principles***; are paying attention to popular tastes in the community and avoiding excessive idealism from designers.
- These five principles serve as a minimum guideline and foundation for designing items manufactured from post-use materials.

METHOD

The method used was qualitative, employing an analytical descriptive narrative, which aimed to analyze the prior results of distance learning. The results are in prototype designs that have been grouped based on supervisor/Tutor instructions. The prototype design is analyzed using the regenerative principle approach. Analysis results are presented in recommended products to be manufactured following upcycling product standards (Gerber et al., 2010; Xu & Gu, 2015).

The processes involved in creating the final product are concerned with formalistic components of product design (Andrews, 2015; Indrawan et al., 2019). Below are the stages of a two-phase study, however, the focus is on the second phase since the first one has been completed.

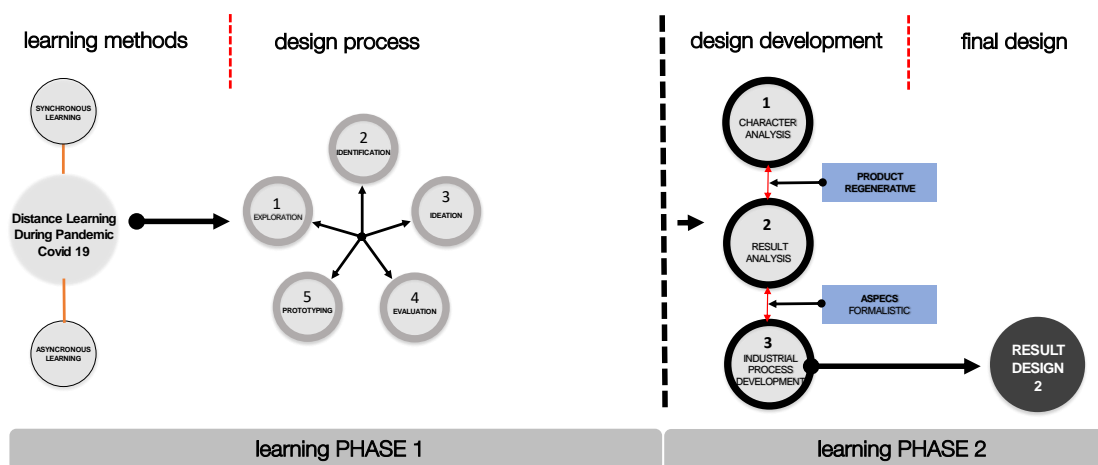


Figure 2 Phase 2 study process
Source: Utomo Documentation, 2022

Generally, the method employed in the implementation of this study refers to applied methods. This method is carried out in phase 2, which develops the final design and production process in collaboration with the industry (Kopnina & Blewitt, 2018; Murray et al., 2017).

RESULTS

Distance learning delivered via a synchronous and asynchronous blended learning model has implications for creating new relationships as a result of student activities in their environment. Furthermore, the interaction results are similar to activity theory (Barab et al., 2004). The new form of interaction is called "Co-Help," meaning mutual assistance or unselfish assistance in achieving learning goals (Utomo, Risanti, et al., 2021)

Activities to assist one other can be energy support or product development ideas implemented between students and their environment to foster beneficial collaborations. Collaboration is also possible amongst family members who visit during a pandemic. Furthermore, the immensity of regular interactions enables cooperative activities that benefit family members. Support from other people can also be in the form of resources offered, such as post-use products belonging to family members that can be upcycled into design products, or collaboration form, such as joint discussions on problem-solving during the prototype phase. This form of collaboration can bridge perceived obstacles to visualizing the material being applied when the tutor or supervisor cannot perform this function directly.

Another implication of distance learning is that it provides students with new experiences. This is because, before the pandemic, most activities took place between students and lecturers on campus. Students have many opportunities to interact and learn directly with their closest family, resulting in multiple designs that are on target and truly meet the family's needs. For example, Fico Taniel's "Credenza" work reconstructs an unused storage area at home by processing forms and supporting materials to create myriad functions and models.

Other learning outcomes generate new creative stimuli by developing components from the previous product to build new products with better values (Gerber et al., 2010). The primary component in Ria Risanti's "SPD Coffee table" is a bicycle rim used as a table. The other components of the used bicycle have been redesigned, including a clothes rack and a unique seat design.

The following is a development of the "SPD coffee table" design stimuli:

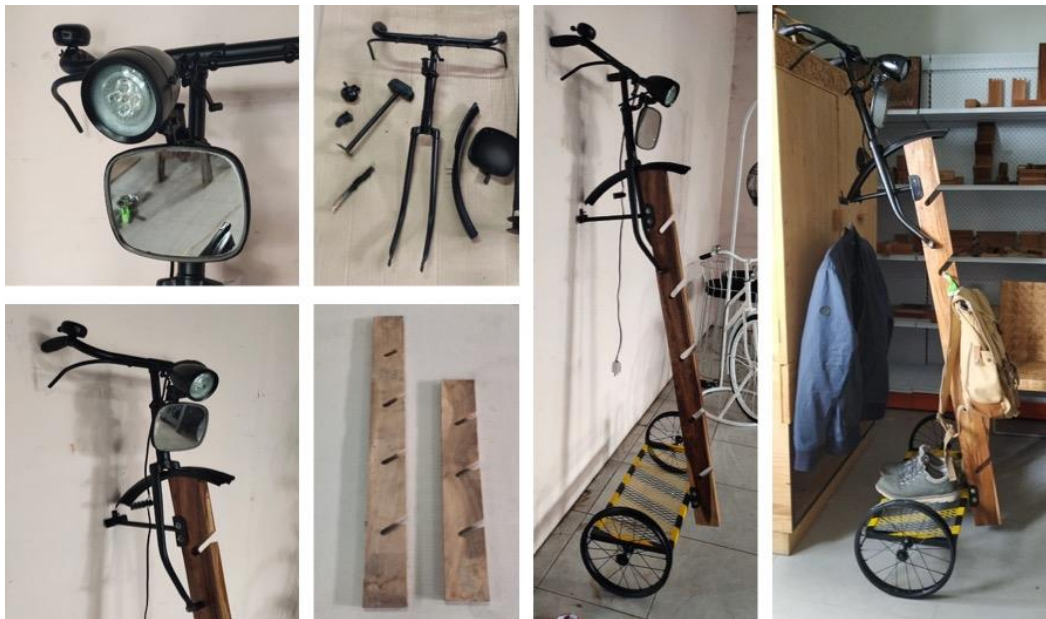


Figure 3. Development of ideas from the design of "SPD Coffee table" for upcycling products
Source: Utomo, 2022

The creativity demonstrated by students above involves forming and assembling post-use materials (solid waste) individually without professional assistance to create new product designs according to the self-employment framework (DIY/do-it-yourself concept) (Watson & Shove, 2005). Almost all of the design works consisting of 50 student ideas demonstrate the cradle to cradle design concept, referred to in the upcycling concept as the technical cycle product. A technical cycle product is an upcycling product design that involves exploiting and optimizing the usage of post-use materials or waste/garbage that may still be converted into new products while leaving minimal waste (Bakker et al., 2010; Braungart M. 2013).

DISCUSSION

This study was conducted during the COVID-19 pandemic, particularly during the even semester of 2021/2022, from September 2021 to January 2022. This also describes the process of developing the distance learning design that was undertaken in the previous phase when online learning in the enrichment product design course offered by the Ciputra University Surabaya Interior Architecture Study Program.

As an illustration of this first learning phase, the blended learning paradigm of synchronous and asynchronous learning is adopted. The first phase of design learning activities resulted in creating upcycling product concept designs: Result Design 1. Moreover, the first phase of learning generates 50 design concepts

grouped into 4 groups of 12-14 students, each guided by an assistant lecturer/tutor. The main objective of tutors or assistant lecturers is to ensure students stay on course with learning objectives.

During learning phase 2, the 50 design concepts were classified and identified based on the material properties. The following is an example of one of the identification results for group 1 material characteristics.

Student Name/ Product	Design Result	Raw Material	Description
Pranaram bagus /RAKTAGON/ 2020		 Used Plywood	Pieces of plywood material left over from furniture work around the student's residence are reused to make wall display shelves or as room dividers. The hexagon shape of the modular design is applied as a model that can be assembled into a single, functional and dynamic design.
Jefferson Albert/ Low sideboard/ 2020		 Used Plywood and glass	Plywood boards from old wardrobes that are no longer in use. The parts that still have an undamaged plane are chosen to be used again as the main component of the table design. The use of other supporting materials such as glass and wooden blocks is also taken from solid household waste.
Aditya Yuliantina Dewit/ FLEXIBLE BOOKCASE		 Solid wood planks and used kebaya fabric	Pallet wood boards and used kebaya clothes are the main ingredients in the design of the bookshelf. Pallet wood planks were found around the student housing area. While the bayu kebaya is the clothes of the parents of students who are no longer used. The function of the kebaya cloth is as a shelf cover and a shelf support leg, creates an aesthetic element that contrasts with the wooden planks painted in a white and black finish.
Shiela Sutanto/ Co Web (Conection Web)		 Used rack with modified yarn from knitted clothes	The "Co Web" shelf design is made from former wooden shelves that are modified on the inside (the shelves) with used clothing materials (knitted clothes material that is taken from the yarn and then knitted again in a net-like shape attached to the inside of the wooden shelf)
Parry Fernanda Wibawa/ GUDEN PANNEN		 Paperbag, wood palet, pipe steel	The "Guden Pannen" design uses upcycling materials from used wood planks for storage designs with drawer lids made from used paper bags which are tightly rolled up and glued together. For the legs of the table, use scrap metal pipes from the remaining pieces of the water channel at home.
Indra Rafly Lamanepa/ DE-RUM		 Used Drums	The design of the "De-Rum" bar table is made using the main material of a used drum that is split and made a cavity whose function is to store goods with pallets of wood. As for the table top, it uses pallet wood boards that are finished naturally with a pipe support on the bottom side of the table top.






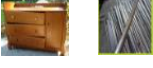






Sharen Wijaya/ MEJA SA'MBUNG		 Used table with particle board material and used cardboard	This console table design was made using particle board material from an old table that had been damaged (the outer layer peeled off) and cardboard for the outer layer. While the table support uses hollow iron additional material as a table leg.
Kezia Angelina/ MULTIPURPOSE SELF		 Unused plywood and some cast iron	This coffee table design is made from a combination of unused plywood boards with 0.5cm diameter cast iron which is refinished and cut to form the table structure. Finish plywood using a color that resembles natural solid wood.
Fico Thaniel/ CREDENZA		 Material by reconstructing the former cabinet with the addition of pipe iron	This credenza design was created by reconstructing used cabinets from particleboard material laminated with HPL which had been damaged due to use. To reconstruct it so that it has a stronger and more durable construction, iron pipe material is used as a supporting element.
Putu Kania/ JE-RAK		 The main material is used plastic water jerry cans	JE-RAK design which means Jerry Shelf, or a shelf for storing or displaying goods made from used plastic water jerry cans combined with supporting material of solid wood planks with a natural finish.
Andien Lufh/ JANG KABINET		 Unused baby cot material.	The design of this cabinet table is made by reconstructing a baby cot box that is no longer in use. With the addition of a wooden drawer and a glass top table, you have a different function.
Keneth Anderson/ RAK PAJANGAN		 Main Material Gallons of used water.	This Display Shelf is made of gallons of plastic water which is cut into several parts and the inside is given a balcony or wooden cover, so that it has a function as a place to display goods or a storage area.

Figure 4. Classification and identification example of design character group 1
Source: Utomo, 2022

Group 1 comprised 12 design concepts, classified and identified based on the upcycling material characteristics. The material characteristics study indicates that the product titled 'De-Rum' by Indra Rafly L was selected as the best since it satisfies the criteria of upcycling product design. The internal team also contributed to determining the best group results (main lecturers and industry).

The results of the characteristic analysis on groups 2, 3, and 4 selected were Qusia's work with a wardrobe design concept made of bamboo material from former chicken cages/coops "Chandang Klambi." Meanwhile, for group 3, Ria Risanti's work with a table design concept made of used bicycle wheel rim material called "SPD coffee table" was picked. The 4th group selected Michele Angela's work with a table design concept with upcycling material from bottle caps as the main ingredient of the tabletop, "Honey Comb." The four design concepts selected by each tutor group were analyzed from the regenerative design aspect. The following is the analysis:





Aspect analysis for Regenerative Design						
Groups	Selected Design & Material	Durability and Environmental	Value Material	Zero waste principle	Cost Control	Aesthetics
Group 1		Using the main material from iron drums makes the product has good strength and durability. Iron drum materials are quite difficult to decompose naturally and difficult to find a disposal site, the final solution is to re-melt them.	The availability of used drum materials in the market is quite limited and can only be found in special collectors so that this material has a fairly high value.	The design of a bar table from used drum materials is technically quite difficult to make yourself because its manufacture requires special skills to weld iron. In this design concept, the use of materials is not efficient enough because in certain parts it still leaves waste which is quite disturbing.	The cost of making a bar table made from used drum material is not too high in raw materials, but in terms of production and labor / iron welding experts the costs are quite high.	The design of this drum bar table from the material side is quite unique. Drum defects and paint finish paint that is left as is becomes an aesthetic visual appeal. However, this design is not easy enough if placed in a house with a small area.
Group 2		Using bamboo material made for chicken cages. In terms of durability and strength, this material has a short service life which reduces the durability and strength. Bamboo materials are found quite a lot and are environmentally friendly because they are easily decomposed by nature.	The availability of bamboo materials is quite a lot and the value of this design is on the use of natural materials with story telling of local wisdom (woven bamboo).	The design of the cabinet is technically produced with one chicken cage combined with other materials such as paralon pipes and iron. The chicken cage is split into two and arranged upside down, so that the use of bamboo material leaves no new waste.	Making cabinets from chicken coops does not incur high costs, but high costs arise from the labor side because it requires special skills, especially for bamboo material construction.	The use of natural materials (bamboo) naturally creates its own aesthetic (flexibility and strength) to the accompanying local wisdom (weaving, construction and functions and benefits).
Group 3		Using the main material from used bicycle rims makes the product has good strength and durability. Rim iron material is quite difficult to decompose naturally and difficult to find a disposal site, the final solution is to re-melt it.	The availability of used bicycle rim materials on the market is quite limited and can only be found at special collectors so that this material has a fairly high value.	The design of a coffee table from used bicycle rims is technically quite difficult to make yourself because its manufacture requires special skills to weld iron. This table design uses components from bicycle rims for the main material, the rest of the other components are used for different products so as to minimize new waste.	The cost of making a bar table made from used bicycle rim material is not too high, but in terms of production and labor / iron welding experts, the costs incurred are quite high.	The table design of this used bicycle rim is quite unique from the material side. Material defects that are left as they are become an aesthetic visual appeal. However, this design is quite easy if placed in a house with a small area.
Group 4		The table top uses the main material from a drink bottle cap. Metal bottle caps make the table top strong and durable. Many drink bottle cap materials are found in places to eat or stalls and are quite difficult to decompose by nature.	The material for used cans bottle caps is sufficient and easy to get and cheap. The value of this material is not only cheap, but if it is arranged in a color combination, it will increase the economic value and aesthetics of the product.	The coffee table design made from used bottle caps for table tops is technically quite easy to produce and does not create new waste, but the supporting materials such as legs and table tops require other materials which of course create new waste.	The production of a coffee table with a table top made of drink bottle caps does not create new waste costs, but for supporting materials such as table legs and table top coatings, the manufacture requires other new materials, thus creating additional costs.	The aesthetic that is formed on this table top is the color combination of the bottle caps arranged in a variety of harmonious shapes.

Figure 5. Regenerative design analysis
 Source: Utomo, 2022

The analysis of the selected regenerative design aspect produced the work "SPD coffee table" by Ria Risanti.



Figure 6. Upcycling product of "SPD Coffee table" design
 Source: Utomo, 2022

The “SDP coffee table” design met the regenerative design principles best. Regarding durability, environment, and zero waste, the iron usage rim material from used bicycle parts allows this design to be structurally robust while also posing fewer environmental problems due to the production process's low waste output. In terms of material value and cost control, used bicycle rim material is easy to purchase at relatively low prices from used goods collectors. Although raw materials are inexpensive, they can have a higher economic value once transformed into an upcycling product with new functionalities. However, the drawback of this design may be the high cost of production. This is because manufacturing is more difficult if done alone without expertise in welding iron. From an aesthetic standpoint, the iron table from the bicycle rim can transform a bicycle component's prior purpose. Another advantage of this recycled bicycle rim table design is that additional bicycle parts such as handlebars and frames can be made into novel products with various shapes and functions.

CONCLUSION

Distance learning using synchronous and asynchronous modes is the best option when situations do not allow for face-to-face teaching and learning activities. Concurrently, the Government made the right decision while issuing distance learning regulations to limit direct interaction during the COVID-19 pandemic. They proceeded while allowing schools to use their learning strategies and ensuring that all teaching and learning activities continue without compromising its quality.

Distance learning creates a unique experience for all students, including:

- Teachers/supervisors/lecturers, and tutors have expertise in preparing lecture materials with methods and guidance to keep them on track with learning objectives without compromising quality. These materials and methods may be repurposed in case of a similar incident.
- While distance learning provides students with sufficient freedom of time to explore and discover learning materials, there are many technical obstacles, such as unstable internet networks, time zone differences between regions, and discipline management in regulating school activities.

A side from that, online learning may develop self-sufficient, adaptive individuals capable of adapting to new situations and generating new interactions and creativity that have not been previously exposed. These interactions include relationships to share energy, brainstorming design ideas, and providing direct support to closest family members, which were previously limited to interactions between students and lecturers/tutors during earlier offline lectures. New creativity is evident in the development of upcycling product designs during the learning

process (Kopnina, 2011, 2018). This promotes students to think critically about reusing materials without creating new waste. The final design concept encompasses the main and derivative products built from the remaining material components made into new products with new functions according to the regenerative design concept of upcycling products (Baik & Kim, 2014).

This study is expected to make recommendations to students and other stakeholders, such as Universities. This includes on how to create space for continued learning outcomes in the form of applied products and act as a catalyst for the birth of an entrepreneurial embryo using upcycling products as a sustainable product design business model (Kopnina & Blewitt, 2018).

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