Discovery, The Student Journal of Dale Bumpers College of Agricultural, Food and Life Sciences

Volume 18 Article 15

2017

Eco-cosplay: Upcycling as a Sustainable Method of Costume Construction

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Abstract

This research addresses sustainability in the apparel industry from the specific perspective of repurposing materials for use in costume development. Repurposing discarded materials, also referred to as upcycling, is examined as a viable approach to waste management and evaluated for its impact on sustainability in apparel and textile production, especially in relation to costume development. Current issues in sustainability in the apparel industry that are a focus for this research include waste from production as well as post-consumer waste. The project includes the design and construction of two costume pieces based on a style of costume known as cosplay. Cosplay is a subculture of costume enthusiasts that dress up to resemble one or more characters from a fan universe. The rise of popularity in cosplay contiguous to upcycling is one reason the project combines the two concepts. Secondly, cosplay costume development can repurpose materials beyond textiles, such as plastics, glass, metal, and wood. Finally, many cosplay hobbyists may have budget constraints that can be resolved by purchasing materials to upcycle from resale stores. Resale stores are a source of materials because the maintenance of the discarded materials removes a portion of cleaning from the project. Results of the research are the established efficacy of upcycling in costume development as an approach to waste management, the determination of acceptable aesthetic quality of upcycled costumes, and general guidance for cosplay participants to follow with the intention to utilize as much repurposed or upcycled materials as individual skills allow.

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Meet the Student-Author

Sarah West

I am from Russellville, Arkansas and graduated from Russellville High School with highest honors in 2013. In May 2017, I graduated from the Dale Bumpers College of Agricultural, Food and Life Sciences in the School of Human Environmental Sciences with a degree in Apparel Merchandising and Product Development. I was a recipient of the Chancellors and Distinguished Governor's scholarships throughout my degree and grants from the Honors College and Bumpers College for my undergraduate research. I completed a study tour in Las Vegas at the MAGIC tradeshow and was a summer intern at Material Concepts in Fayetteville. I am pursuing a Master's degree from the Apparel Merchandising and Product Development program where I plan to continue research that enriches and improves daily life.

I would like to thank Dr. Kathleen Smith for her guidance and influence as my faculty mentor. Her encouragement expanded the audience and funding for my research. I would like to thank my committee members Dr. Laurie Apple, Lance Cheramie, and Stephanie Hubert for their time and support. Lastly, I would like to thank my husband, Michael Sacco, for all his help, including serving as a model.

Introduction

Between 2011 and 2016, the terms "upcycling" and "cosplay" have separately had an increase of more than 60% in Google searches (Google trends, 2016). While both rise in popularity, it is possible that the individuals interested in upcycling will also have interest in cosplay. The words are distinct in their definitions and range. Upcycling refers to reusing or repurposing discarded material to create a valuable product, and cosplay refers to dressing in costume as a character (Bond, 2012).

Participants in cosplay have shown an affinity for repurposed material. If cosplay culture were to embrace an environmental mindset, such as embodied in fashion upcycling, the current strategy for management of textile waste would extend into other recyclable materials, such as plastics, glass, and wood, with a growing population of participants. Cosplay is often built with materials beyond textiles, such as plastics, glass, metal, and wood. Compared to the practice of upcycling, which mostly repurposes textile waste, cosplay participants would be repurposing a wider breadth of post-consumer waste categories. As the population of cosplay participants grows, upcycled cosplay costumes could potentially present a viable approach to waste management. The creative work of this project is the building of two cosplay style costumes. One goal of this project is to provide a description of the development of the costumes for cosplay participants to follow with the intention to utilize as much repurposed or upcycled materials as individual skills allow.

To represent the plausibility and efficacy of upcycling in cosplay costume building, this project will consist of two full costume designs that will encompass popular, but challenging, components found in cosplay pieces. The cosplay costumes will be created from source material that is mostly repurposed or recycled. The costumes will be demonstrative of the possible results upcycling and cosplay could yield. The process of building the costumes will provide guidance and suggestions for early adopters. Cosplay participants are likely to embrace upcycling as a primary material source due to the lower price of used materials and the creativity needed for the challenge. The practice of upcycling in cosplay likely stems from budget constraints, as cosplay is most often practiced as a hobby and therefore funded by an individual's discretionary budget (Donellen, 2014). When given the choice to buy a completed cosplay piece for $50, or replicate the piece for $5, a cosplayer with limited funds would likely opt for the cheaper option that requires more effort.

Thrift stores are retail locations that exclusively sell products that have been used then donated, often as an alternative to trashing the items. The cosplay community is one group of creative hobbyists that may purchase materials from thrift stores because of the lower cost. Though it cannot be determined what purchasers do with products from thrift or resale stores, revenue in the U.S. of $16 billion (NARTS, 2016) from such stores suggests that it is a mainstream market. Evidence of fashion upcycling for casual wear can be found on internet blogs and websites like Pinterest. Bloggers who redesign clothes purchased from thrift stores or repurpose items from their home are

becoming popular, with one such blog maintaining over 300,000 followers on social media (Recycled Crafts, 2016).

The phrase "fashion repeats itself" can now describe a revolutionary wave of repurposed fashion. In the U.S., about 5% of municipal waste is post-consumer textile waste (PCTW), with a projected 35.4 billion pounds to be sent to landfills in the year 2019 according to the Council for Textile Recycling (CTR, 2009). Cosplay costume building could remove waste from textiles, but also plastics, metal, glass, and cardboard paper waste. This means that up to half of the materials in the U.S. considered waste could be reconsidered as supplies for costumes. The average American consumes 70 pounds of textiles a year, and discards all but 10 pounds (CTR, 2009). Costume building could repurpose the excess weight, plus other municipal waste.

To create cotton, a natural fiber, there is an immense amount of water needed; more than 200,000 liters for enough cotton to make a t-shirt and a pair of jeans (Claudio, 2007). Agricultural chemicals are potential sources of pollution for any fiber generated from a crop, which can ruin a water supply. The loss of topsoil associated with modern farming practices is another form of environmental degradation. Organic fibers are exposed to pesticides while being processed as raw material, and these pesticides can be toxic to both the ecosystem and workers processing the fiber (Gardetti and Torres, 2013). Agriculture production in the United States is regulated by the United States Department of Agriculture and complies with environmental standards. However, the United Nations Environment Programme, UNEP, states that persistent consequences of textile production are freshwater consumption, water pollution, and air pollution (UNEP, 2012). Repurposing of existing textiles reduces environmental impact of textile production. As the cosplay community grows, so can the practice of upcycling and repurposing materials. As more materials are recycled rather than discarded, the landfills will be smaller and the need for manufacturing new textile products reduced.

Cosplay is a combination of the two words: costume and play. Most often, cosplay describes either a costume piece or the act of portraying a character while in costume. Costume pieces titled cosplay are usually representations of a character from popular culture, most popularly comic books and movies based on comic books. For this reason, cosplay participants, called cosplayers, will most often cosplay at comic book conventions. As the number of participants expanded, the conventions broadened to accommodate the varying interests of attendees. Therefore, the scope of this project is presently expanding.

Due to the present lack of scholarly references to cosplay, information and conclusions about cosplay are based on personal attendance to comic book conventions and participation in the cosplay community. As cosplay continues to gain western popularity, more academic sources are likely to become available. All descriptions below are based on anecdotal experience; however, the inferences are necessary to understand the purpose of the project.

Materials and Methods

To address the challenges that building cosplay with repurposed material presents, two original costume designs were created to avoid copyright and trademark issues. One men's and one women's costume were designed based on a review of popular cosplay, including emergent themes that would be perceived as difficult to replicate with repurposed materials. These designs were broken down into flat technical drawings and drafted as flat patterns. Following completion, designs were evaluated for potential materials and important key features, such as color.

Themes that appeared most popular and visibly distinct in cosplay are apocalyptic, horror, medieval or Renaissance, realistic, science fiction, superhuman, such as superheroes, and Victorian inspired design. Since some popular women's cosplay calls for large skirting, corset style bodices, and decorative accessories while other women's cosplay calls for body contouring items and armor, the design was created to accommodate significant aspects of as many styles as possible while remaining cohesive (Fig. 1). The men's cosplay design includes a large proportion of armor with a base layer to represent cosplay without emphasis on armor (Fig. 2). The men's cosplay is intended to be a combination of multiple styles as well (see https://discoverymag.uark.edu/issues/ for color versions of figures).

Materials were purchased at thrift stores, yard sales, and by reclaiming disposed materials. Each item purchased or collected was recorded in a log including product description, price, location, intended use, fiber or material content, weight in ounces, waste category, and secondary waste. Secondary waste is the amount of discarded material that is not used in the construction of the costume. Using the initial weight and the weight of the secondary waste, repurposed weight was more accurately measured.

The method of construction was expected to include the use of safety equipment, a rotary tool and kit, a multiple-temperature setting glue gun and heat gun, an orbital sander, a wood burner tool, a hobby knife set, contact cement, multiple-use scissors, fabric scissors, pliers, an eyelet tool with eyelets, a riveter and rivets, and a significant amount of machine and hand sewing for altering and garment production.

The design of the costumes started with an industry method of creating a trend board. A trend board is created by collaging photographic inspiration including colors, silhouettes, and other images as the basis of a design or set of designs. One board was created for both costumes and consisted of cosplay and live-action roleplay costume im-

ages. Based on the trend board, the industry method of trend analysis followed, which is to draw conclusions and predict trends. Sketches were done in pencil then uploaded onto Adobe Illustrator and live-traced. A random color palette generated through Adobe color was used because the colors of cosplay costumes are often predetermined and not chosen by the cosplayer. Coloring was done in Adobe Photoshop. The final color sketches were used to create flat sketches in Illustrator, which were organized and paired with verbal and visual ideas for possible materials to purchase and repurpose. The color images and materials guides were printed and stapled in booklets to use while in thrift shops gathering materials (color versions available at: https://discoverymag.uark.edu/issues/).

Patterns were created before material purchases to determine the amount of fabric that would be needed. However, some pieces were best suited to be created from alteration, such as pants or simplistic shirts. When no item was found that could be altered, a pattern was drafted. Pattern pieces were cut out of the garments. If the structure was difficult to manipulate, the original garments were disassembled to lay flat. Pattern pieces that would not be dramatically changed visually were cut into smaller pieces to ease placement and use more of the available material. Throughout construction, plans were adjusted and most steps were a process of trial and error. Each step was taken carefully to reduce waste, and failures were addressed from a standpoint of conservation and adjustment rather than new attempts or restarting.

Fig. 1. Women's costume design. The original illustration used to create the women's costume.

Fig. 2. Men's costume design. The original illustration used to create the men's costume.

Results and Discussion

Both costumes were constructed in an order that would be difficult to recreate exactly. Repurposed source material makes the construction process vary greatly from one part of a costume to another as well as one project to the next. Since each step is partially taken with another, it is ineffective to provide a step-by-step guide. Instead, the process is described for each costume by an explanation of how each piece was created.

Men's Costume

The final costume (Fig. 3) shows the inclusion of armored themes and the base layer of a more fabric-based costume.

- *Shoulder pieces*: The plastic was cut from a flattened bin and laced together with polyester string. To contain the plastic, the shoulder guard piece has a leather side, with applique trim, and a lining side that is less visible.
- *Neck guard*: The raised portion of the shoulder is sewn with one side to the lining and one side to the leather, with plastic inserted and riveted to the outer piece, and the casing edgestitched closed.
- *Arm scales*: Four arm scales with a leather side and a lining side were sewn, right sides together with the top, and whip-stitched to a shoulder guard lining.
- *Chest pieces*: The back and front armor pieces were cut from the flattened plastic bin. The chest and back were edgestitched closed around the plastic.
- *Arm braces*: Forearm covers were created from leather, plastic from the flattened bin, and eyelets. Hand flaps were turned, stitched, and sewn to the arm braces.
- *Waist armor*: On the waist, two layers of skirting were basted on. The waist armor and trim were sewn to the lining and leather flaps were sewn to the edges of the front where the belt buckle and loop were attached with rivets.

Fig. 3. Men's costume. The completed costume on the model.

- *Boot covers*: Leg pieces were sewn with each scale turned and sewn then basted to the larger pieces.
- *Underneath the armor*: The undershirt was made from alteration. The center front was sewn closed, the cuffs removed, and the neck cut wide. The vest was altered to be slightly more fitted and shorter, with a wide neck and sleeves removed. Center front was altered to be an eyelet and leather lace closure. Another alteration was the pants, which were sewn to fit more like tights. Excess fabric from the pants was used to make a slip-on neck scarf.
- *Helmet*: A draped pattern for the helmet was cut, sewn, and simply glued to the plastic helmet pieces, with a face cover riveted to the leather.

Women's Costume

The final women's costume (Fig. 4) successfully matched the trends of women's cosplay, including body contouring as well as large skirting. The women's costume was much simpler to construct because most of the steps were exclusively alteration or basic sewing.

- *Top*: The corset style shirt was created from a dress that was shortened, sleeves removed, and seams released at the bust.
- *Waist*: The hip belt was created using material from a purse for interfacing and a purple shirt. The buckle in the front is permanently connected through a cut plastic buckle to one side with a sewn fabric loop, and removable to the opposite side with a loop closed by hook and eye.
- *Skirt*: The skirting is attached to the stiff hip belt with a simple sewn channel through which drawstrings made from the purple shirt run. The skirting was part of a formal dress and the hem was left intact from the original garment.
- *Under skirt*: Underneath the skirting, the pants were created in two separate pieces to create the appearance of two separate garments.

Fig. 4. Women's costume. The completed costume on the model.

- *Leg pieces*: The leg covers have leather patches attached with an embroidery finish. At the bottom of the covers, there is beading that was hand-sewn with beads transferred from the bodice of the formal dress.
- *Sleeves*: The forearm portion of the sleeve was cut from the same material as the lower portion of the pants. At the hand, there is beading and a finger loop to hold the sleeve. Above the elbow, the elastic waist of a turquoise dress was used to create a puff sleeve cap. A shortened belt and belt cover is attached at the top of the sleeve to hold the sleeve up. The same strategy of sewing a cover and inserting a belt is used for the chest and shoulder accessory and the leg accessory.

Design Versus Product Comparison

The final costumes (Figs. 3 and 4) compared to the original designs (Figs. 1 and 2) can be evaluated as successful or unsuccessful based on fit and silhouette, which had to be reconciled between the body type of the design and body type of the model, color matching, and total material repurposed. Cosplay participants do not always have the same body proportions as the source material, and if the design is not original, there will need to be compromises to maintain an overall aesthetically appealing appearance. This is why the original designs were not based on a specific model, but rather sketched onto croquis, or basic fashion body drawings. Color is usually not something that would call for compromise; however, since this project had limited material resources, there was a challenging but infrequent need to compromise some color choices. I was encouraged to adjust within already constructed pieces rather than remake pieces due to the material repurposing weight being recorded, and so these choices resulted in imperfect appearances in some instances.

The men's final costume compared to the original design seems successful overall. The model has a wider and more muscular body than the design, and shorter legs and arms. The helmet also has a much rounder appearance than the design due to the helmet base being a youth baseball helmet. The mask has a different appearance as well to accommodate the shape of the helmet and the face and eyes of the model. Slight variations in the armor color, which is mostly uniform in the original design, is due to multiple leather jackets of different colors and color differences within single jackets. The colors match well, so the difference could pass as a design choice or at the least be considered acceptable variance. The color of the vest, skirting, pants, and neck scarf are visually very close in color and successful recreations. The undershirt is much whiter than the original design, but the color change is not a large enough compromise to negatively affect the complete costume. Repurposing for the men's costume had an average of 54% by weight, which is a considerable reduction in waste if the source material is defined as post-consumer waste (Table 1).

The comparison of the women's final costume (Fig. 4) to the original design (Fig. 1) shows a successful recreation. The model is again wider and has shorter proportions than the original design; however, the silhouette of the design is less affected by the difference than the men's costume. As mentioned, the proportions and aesthetics were reconciled by slight adjustments to less significant parts of the costume. The most obvious variations are the leg cover due to proportions, the headband due to available material, and the choice to keep two straps because of the model's

Table 1. Weight measurements throughout assembly and repurposing rates for upcycled items used in construction of men's costume.

Product Description	Material Weight (oz)	Secondary Waste (oz)	Total Waste Repurposed (oz)	Repurposed (%)
brown leather jacket	40.35	26.45	13.90	34%
brown pants	17.30	2.15	15.15	88%
plastic bin	37.40	19.99	17.41	47%
red-brown leather jacket	35.05	23.75	11.30	32%
white shirt	13.12	2.90	10.22	78%
orange shirt	15.50	9.00	6.50	42%
brown jacket	19.70	14.75	4.95	25%
dark brown leather jacket	34.50	14.85	19.65	57%
youth baseball helmet	21.55	3.90	17.65	82%
2-inch belt	5.55	1.50	4.05	73%
plastic bin w/ lid	18.15	11.15	7.00	39%

body type. The colors are very well matched to the original design, although the medallions were matched with paint rather than selections from thrift shops. The one color that could be better is the fabric of the corset style shirt. The women's costume repurposing percentage had an average of 52%, with some items being totally repurposed with no secondary waste (Table 2). Complete upcycling is ideal and would contribute to a goal of zero waste, but further research and practice would be required to achieve this goal. The women's costume provides evidence that it is possible.

Both designs were realized in the costume to a recognizable level. Whether the final costume is satisfactory is dependent on the cosplay participant's personal preferences and intended use. For example, if the cosplay participant hopes to place in a cosplay costume contest, it may be less likely that they would be willing to upcycle. To this extent, opening a category within cosplay competitions for upcycled costumes could lend to an increased practice of upcycling in cosplay costumes. Since some of the material collection depends on skill and partly on probability and availability, individuals in metropolitan areas would likely be more successful with more options in resale shops and a higher volume of donated items. If donated items are considered to be post-consumer waste, 47% reuse by weight in this particular project is significant enough to consider repurposing and upcycling as a material source for cosplay costumes, but would require further investigation and a stronger development of repurposing skills.

Conclusions

The industry skills necessary to complete this project included trend analysis, pattern drafting, pattern draping, apparel production, garment alteration, and adept use of computer design. The designs were created using Adobe and inspired by trend analysis. Using technical sketches and model measurements, the patterns were created and cut from material. The pieces were then assembled or altered into garments and accessories. The skills unique to this project were discovered throughout the process and should be utilized by cosplay enthusiasts that would use repurposed materials to construct their costumes. When cutting pattern pieces from the fabric, disassembling the source garment was the easiest solution. This meant that items with few style seams, such as men's clothing, and large amounts of fabric, such as larger sizes, would be ideal purchases. Alternative or congruent strategies include opening darts that will not be used and hiding seams with overlying garments or applique. Another approach is to maintain symmetry in style lines, such as left and right pieces being cut in way that style lines are mirrored, so that the design seems intentional. To increase popularity of upcycling in cosplay, conventions and cosplay events could begin emphasizing the construction method by introducing a prize category or entire contests focused on upcycled material in costumes. Beyond cosplay participants utilizing these strategies, projects could include everyday cloth-

Table 2. Weight measurements throughout assembly and repurposing rates for upcycled items used in construction of women's costume.

Product Description	Material Weight (oz)	Secondary Waste (oz)	Total Waste Repurposed (oz)	Repurposed (%)
plastic bin w/ lid	18.15	11.15	7.00	39%
dark purple shirt	10.50	6.15	4.35	41%
turquoise dress	8.70	5.90	2.80	32%
1-inch belt, white	1.40	0.55	0.85	61%
1.5-inch belt, dark brown	1.80	0.40	1.40	78%
green dress, stretch	13.10	8.90	4.20	32%
green dress	8.25	6.85	1.40	17%
2-inch belt	6.90	1.10	5.80	84%
dark purple dress	14.95	4.70	10.25	69%
earrings	0.45	0.15	0.30	67%
feather necklace	0.25	0.20	0.05	20%
blue multi-strand necklace	2.55	1.45	1.10	43%
wood necklace	0.75	0.50	0.25	33%
green circle gem necklace	0.65	0.00	0.65	100%
turquoise beaded dress	17.35	6.25	11.10	64%
purse	13.65	10.30	3.35	25%
brown leather jacket	21.65	19.50	2.15	10%
1-inch belt, brown	1.35	0.15	1.20	89%
1-inch belt, graphic	2.00	0.20	1.80	90%

ing, formalwear, occupational clothing, and home goods. By expanding the range of participants in upcycling, and providing possible strategies, the viability of upcycling having a lasting effect increases by becoming applicable to more people and broader contexts.

Acknowledgements

This creative project was funded by an Honors College Research Grant. This paper was presented at the Pop Culture Association/American Culture Association National Conference 2017 in San Diego, and travel was funded by a Bumpers College Undergraduate Research Grant. Support also provided by the University of Arkansas System Division of Agriculture.

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