



CARRIAGE LAMP

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TECH104

AT3



END USER PROFILE

End User Profile	
Who	The end users of my product are young girls who love fairy tales and Disney movies.
Age	2-16 or adults with an interest in fairy tales.
Living Circumstances	Children living at home where their bedrooms are their personal haven.
Income Level	Must be affordable and accessible to all incomes to ensure every child has the opportunity to experience the lamp.
Interests	Fairy tales, princess movies, and Disney.
Special Needs	Some users may require assistance with assembly.
Values	Imagination, creativity, and ability to immerse themselves in magical worlds.
Tastes, Aesthetics	A design with intricate details reminiscent of a magical carriage. Represents magic and fantasy through elegant, curved lines. The design should incorporate elements of fairytale charm, including delicate patterns and princess colours.

My individual purpose/function

To create a lamp that is in the shape of a carriage that provides decoration to a child's bedroom and provides an activity to put together. The lamp also needs to shine through the carriage to create a magical effect.

Project scope

Young girls and children who are interested in fairy tales and fantasy who would like to add personalisation to their room and a decoration they enjoy looking at as well as an activity to piece together the lamp, possibly with a parent to encourage bonding. The product needs to be able to have the lamp turn on and shine through the carriage to provide decoration which will bring joy and happiness to the user. It will primarily be used in children's bedrooms and can be used whenever the child is in the room or possibly as a nightlight. The product needs to incorporate the decorative lamp and the ability to construct it for an activity.



RESEARCH

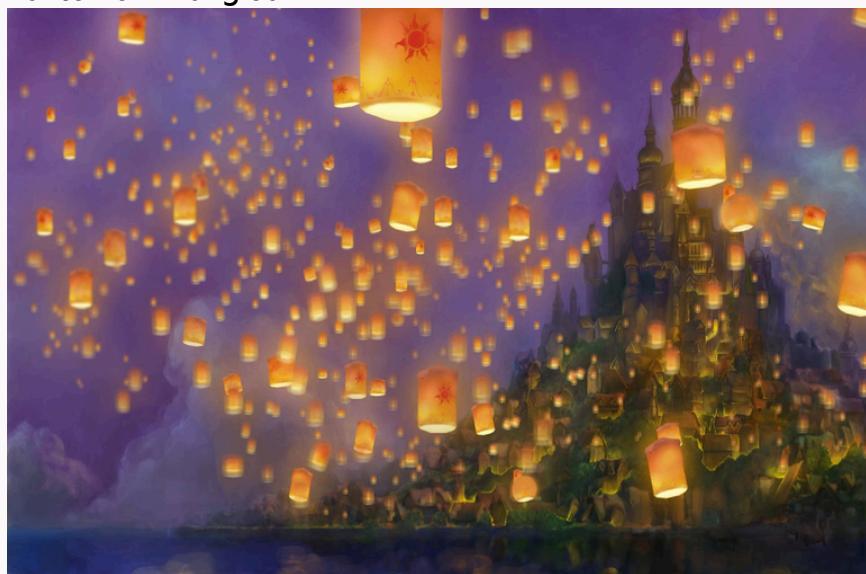
Inspiration and Design

I was initially inspired by the idea to create a lamp for children. Upon researching the interests of children, I recognised the enduring appeal of Disney movies and characters among young girls and some women. I discovered that in 2015, princess merchandise including "dolls, clothing, games, home décor, toys – [was] a \$5.5 billion enterprise" (Binkley, 2015), indicating a strong demand for princess-themed décor. Room décor also significantly impacts a child's mood and psychological development (Evans et al., 2001), making having a decorative lamp improve an individual's space and wellbeing.

Girls typically aged between 2-16, who are the primary users of the lamp, usually live at home. They might have their own bedrooms or share them with siblings, and they often personalise these rooms with décor that reflect their interests. Depending on their age, they could be looked after at home, attend preschool, or attend primary or high school. Given that most purchases will be made by their parents, it's essential for the lamp to be accessible for all income levels. Gunter and Furnham (1998) discovered that parents prioritise both functionality and aesthetics when purchasing items for their children, thus creating a lamp that combines both design factors can prove a stronger choice for purchasing.

Upon observing existing lamp designs, I found that most Disney or princess-themed lamps are table lamps with fabric shades decorated with patterns (Pinterest, n.d.). This sparked an idea, as I realised a market gap for lamps that serve the purpose of both lighting and interesting décor. I thought it would be more appropriate for the lamp to be used as a piece of décor or a night light rather than a primary light source. One of my initial inspirations was drawn from the Disney movie, Tangled (Howard & Greno, 2010), which is based on the story of Rapunzel. The film features a well-known scene where hundreds of lanterns are released into the sky (Figure 1). I contemplated recreating this lamp, considering that many girls may want a replica in their rooms. However, upon closer inspection of the lantern, I realised that replicating it with the available workshop resources would be quite challenging. Furthermore, I recognised that creating a replica might not sufficiently showcase creativity and originality.

Figure 1
Lanterns in Tangled



Note. Source: (Wallpapers.com, n.d.)



RESEARCH

The discovery of Cinderella's carriage (Disney, 1950) inspired further ideas. While the carriage's depiction in the movie primarily consists of simplistic metal bars, I thought it was best to just draw inspiration from it. Combining Cinderella's carriage with real-life carriages provided ideas for a design that not only housed the bulb but also illuminated the interior of the carriage, shining out of the windows.

Further exploration revealed the symbolic significance of carriages across various literary works such as Jane Austen's 'Pride and Prejudice' (Austen, 1813) and Laura Ingalls Wilder's children's book 'Little House on the Prairie' (Wilder, 1935). Beyond their function, carriages often represent status and wealth (Paquin, 2023), providing a glimpse into fantasy and escapism. By incorporating these elements into the lamp design, I aimed to transport children to a world of imagination and magic.

Figure 2

Carriage



Note. Source: (*Pinterest*, n.d.)

Design Considerations

My research into carriages offered me valuable insights into the essential components that make up most carriages such as a base with wheels, and an enclosed, slightly curved carriage with multiple windows. I also noticed many carriages had an antique Victorian, royalty vibe with intricate, curvaceous metalwork (Smith, 2018), similar to Victorian lamp posts. A common feature observed was the presence of larger back wheels and smaller front wheels, along with a curved base mirroring the carriage's overall shape.

When considering the lamp, I envisioned it as a DIY construction kit, utilising laser-cut wood and 3D printing. This approach would simplify assembly, requiring only glue and offering an engaging activity for children and parents. This would provide entertainment and bonding as well as leave the child with a sense of accomplishment upon completion. However, considerations must be taken to ensure ease of completion for individuals of all skill levels. Additionally, providing a DIY project for children can benefit fine motor skill development, proving another positive (Hamidi & Baljko, 2014).

While initially considering the provided E14 Ikea Strala Lamp (IKEA, n.d.), further research led me to conclude that it did not align with the lamp's aesthetic due to the white, cool light. Looking at alternatives on websites like Kmart (Kmart Australia, n.d.) and Amazon (Amazon, n.d.), as well as antique and vintage lamps, I found that incandescent light bulbs (Electrical Products Australia, n.d.) were more fitting. Their association with the Edison bulb (Edison Light Globes, n.d.) gives off a timeless, aged look and emits a warm, comforting glow ideal for a child's bedroom. Moreover, the amber hue emitted by these bulbs is perfect for promoting sleep (BenQ, 2022), making them ideal for nighttime use as a night light.



RESEARCH

Opting to design the lamp on Fusion 360 (Autodesk, n.d.) to allow for enhanced design freedom, I decided to incorporate engraved designs into the wood rather than holes. Inspired by ancient oil lamps (Figure 3) with intricate engravings in stone and clay (Milwaukee Public Museum, n.d.), I aimed to include interesting shapes and patterns. By paying homage to these timeless design elements, I wanted to instil a sense of appreciation for the craft's history and expertise while incorporating my own touch.

Primary research

In the beginning stage of the design process, I began by observing previous lamp designs (Maddock, 2024) and became intrigued by the idea of laser-cut designs. One design caught my eye, a hanging lamp made for a child's bedroom. Interested in the idea, I was inspired to create a lamp that would perfectly fit a child's bedroom. While most of the observed lamps were created by hand, I recognised the limitations this posed in achieving the intricate designs I imagined. This led me to contemplate the potential of laser cutting to achieve greater detail.

Furthermore, I noted the absence of 3D printing in the designs, sparking the idea of utilising 3D printing to introduce interesting design elements and diversify the range of materials used. Additionally, I observed that many existing lamps prioritised functionality over aesthetics, for example, the addition of book holders. Inspired to create something fun for a child's bedroom, I aimed to design a lamp that not only illuminated a space but also provided a sense of interest and enjoyment.

Figure 3

Ancient Oil Lamps



Note. Source: (*Times of Israel*, 2020)

CONSTRAINTS AND CONSIDERATIONS

Budget	The cost limit must be low in order to allow the lamp to be affordable and accessible to most. An appropriate cost limit for construction would be \$30 including the light bulb and socket. Using materials like laser-cut wood and 3D printing will help the project stay within the budget due to its cost-effectiveness. If the product were to be sold, the use of laser cutting and 3D printing would be extremely cost-effective in terms of labour.
Time Frame	Completion date: 22nd May
Age	2-16 or adults with an interest in fairy tales.
Function	To provide decoration – The lamp should feature intricate details that resemble that of an elegant, antique carriage that highlights the fantasy, magical essence. To provide a small source of light – The lamp should emit a gentle, warm light suitable for a child's bedroom. The amber bulb should also be able to be used for a nightlight. The light bulb should not touch any material inside the carriage to reduce the risk of fires. To provide an activity to do for constructing the lamp – The lamp should be designed for easy assembly, requiring only glue and basic skills. It gives children and adults an entertaining activity as well as a chance for children to gain fine motor skills and construction skills.
End user considerations	<ul style="list-style-type: none">The lamp must look appealing and evoke a sense of fantasy through delicate, curved details and a magical colour palette.The lamp should become a central part of the room.
Aesthetics	<ul style="list-style-type: none">Choosing colours that fit the magical, fantasy theme is crucial. These include white, gold, pink, purple, and silver.The lamp must have a cohesive design throughout with each element flowing into the next and staying on the same theme with the same vision.
Ethical considerations	<ul style="list-style-type: none">Needs to be made of recyclable materials like wood or some plastics, or eco-friendly materials.Must be able to be easily disassembled and recycled at the end of life to maintain minimal environmental harm.Ensuring all off cuts are recycled.
Quality	<ul style="list-style-type: none">The lamp should be made from high-quality materials that can withstand knocks and falls, ensuring all components remain in place.Must be good enough quality to be in a child's bedroom and safe enough that if a child were to touch it or play with it, it would be ok.The lamp should be able to last for many years to provide better value.Created with a design that allows for bulb changes to be easy and cleaning.

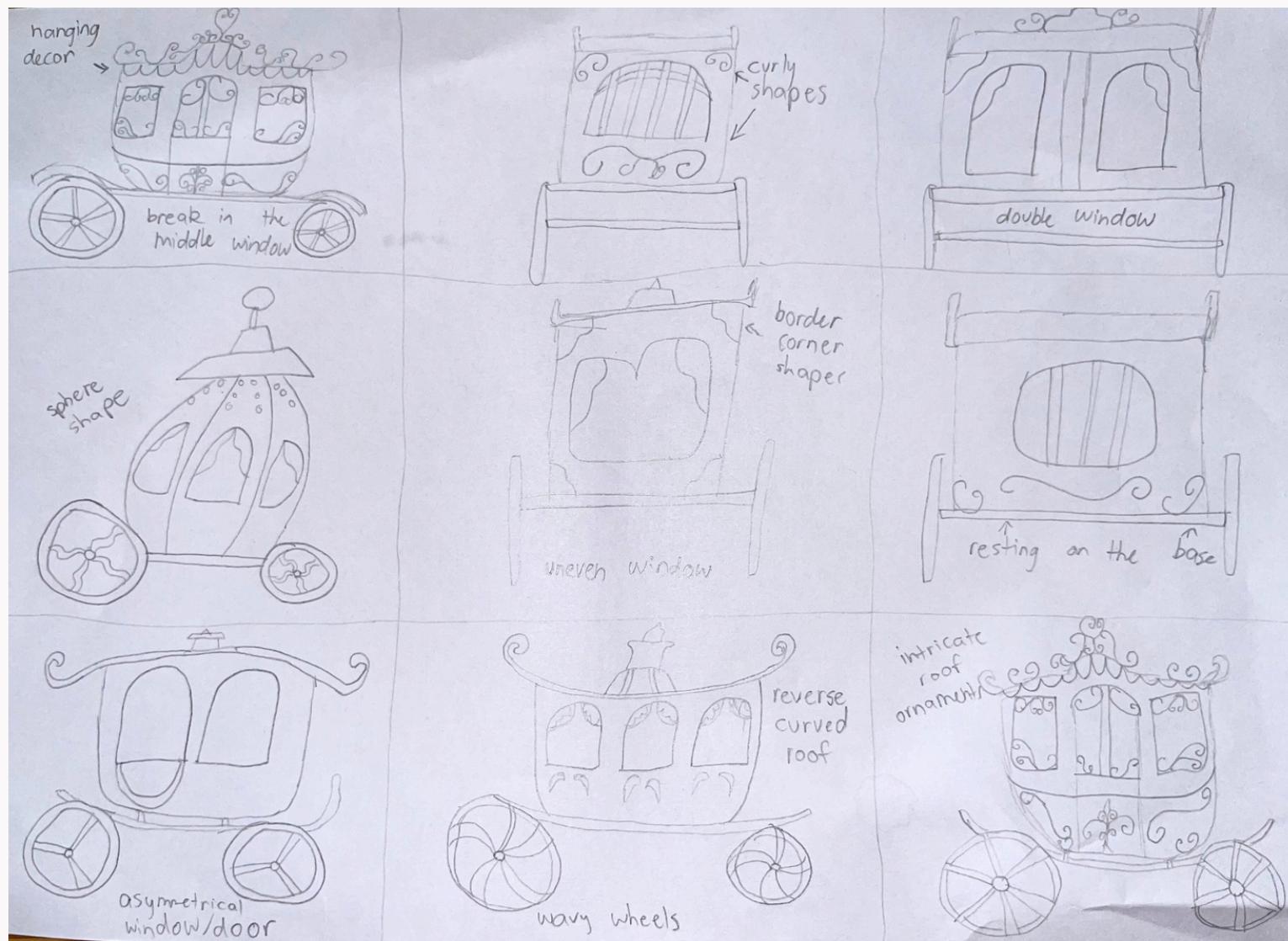
EVALUATION CRITERIA

- Does the product cost less than \$30?
- Can the product be, or have they been, finished by the end of May deadline?
- Have a fantasy/magical colour scheme in the product?
- Is the lamp aesthetically pleasing and visually appealing to the target audience?
- Will it withstand typical handling and usage in a child's room?
- Is the design timeless, ensuring it remains relevant and appealing for years to come?
- Do all components of the lamp sit securely in place?
- Can the lamp support its own weight and not fall over?
- Is the lamp stable when placed on different surfaces?
- Are there any sharp edges or protruding parts that could pose as a safety risk?
- Have materials been chosen to maximise recyclability and durability?
- Will it provide a nice lighting experience without causing glare?
- Is the design timeless?
- Does the lamp fulfill its purpose of providing decoration and lighting?
- Is the lamp's design user-friendly and relatively easy to assemble?

MOOD BOARD



SKETCHES

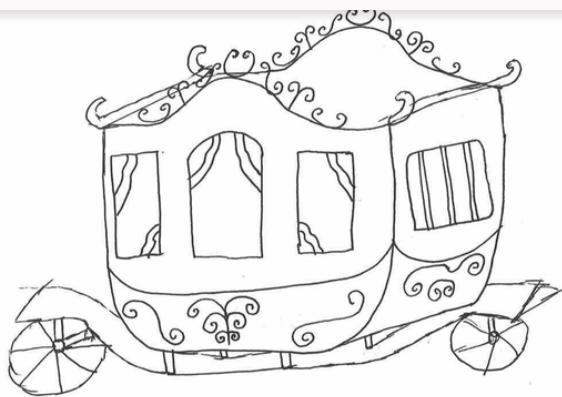


PMI TABLES

Plus	Minus	Interesting
Base bars give a more realistic look	The base bars might detract from the streamlined look of the carriage	The vertical bars on the front and back windows enhance the vintage and antique feel of the carriage
Differentiated designs in the windows adds variety and prevents the design from becoming monotonous	The top of the roof may appear too simplistic	The hanging design off the roofs gives a cute, aesthetic look and provides a way for the roof to stay secure
Different wheel sizes mimics real carriages, adding a touch of realism	Wheels look disproportionate which can throw off the balance of the design	The engraved line on the side of the carriage helps break up the design between the window and bottom detail to reduce a gap in the design without overloading the design.
The base bars are not just decorative but help accommodate the cord	The designs on the window may be too delicate and intricate for the laser cutter.	



PMI TABLES



Plus	Minus	Interesting
The streamlined base conforms well to the shape of the carriage	The bottom of the front and sides are too replicated, making the design less unique	The intricate roof design is intriguing and adheres to the traditional fairy tale carriage style
The overall design is well-balanced and the unity of the design elements creates a cohesive appearance	The details on the windows are too similar and don't offer much variety	The bars on the front not only adds to the aesthetic but also an aspect of realism
The curly, antique motif is consistent throughout the design	The single-panelled base may pose challenges for mounting the lamp and accommodating the cord	
	While the roof details enhance aesthetics, they may be too delicate to be effectively 3D printed or laser cut	



Plus	Minus	Interesting
The overall shape of the carriage is straightforward, making it easier for consumers to construct	The side of the carriage looks unsymmetrical due to the placement of one window and a door	The front window has a unique shape
The roof's simple curved shape reduces complexities	The singular curly design under the side window is an odd shape and does not go with the rest of the design	
Placing the wheels in front of the carriage allows for a more balanced design	The shape and design of the roof does not align well with the theme of the carriage	

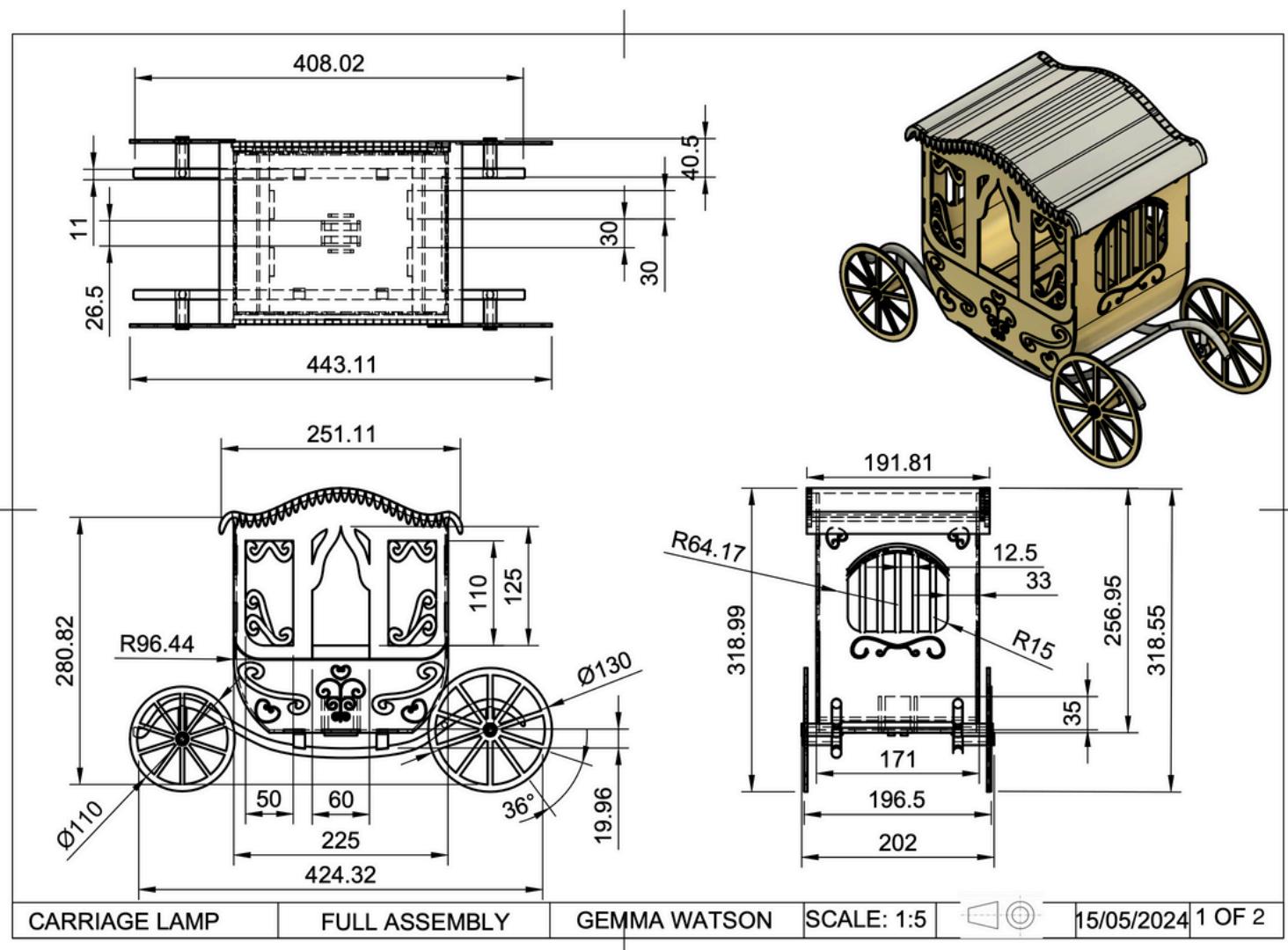


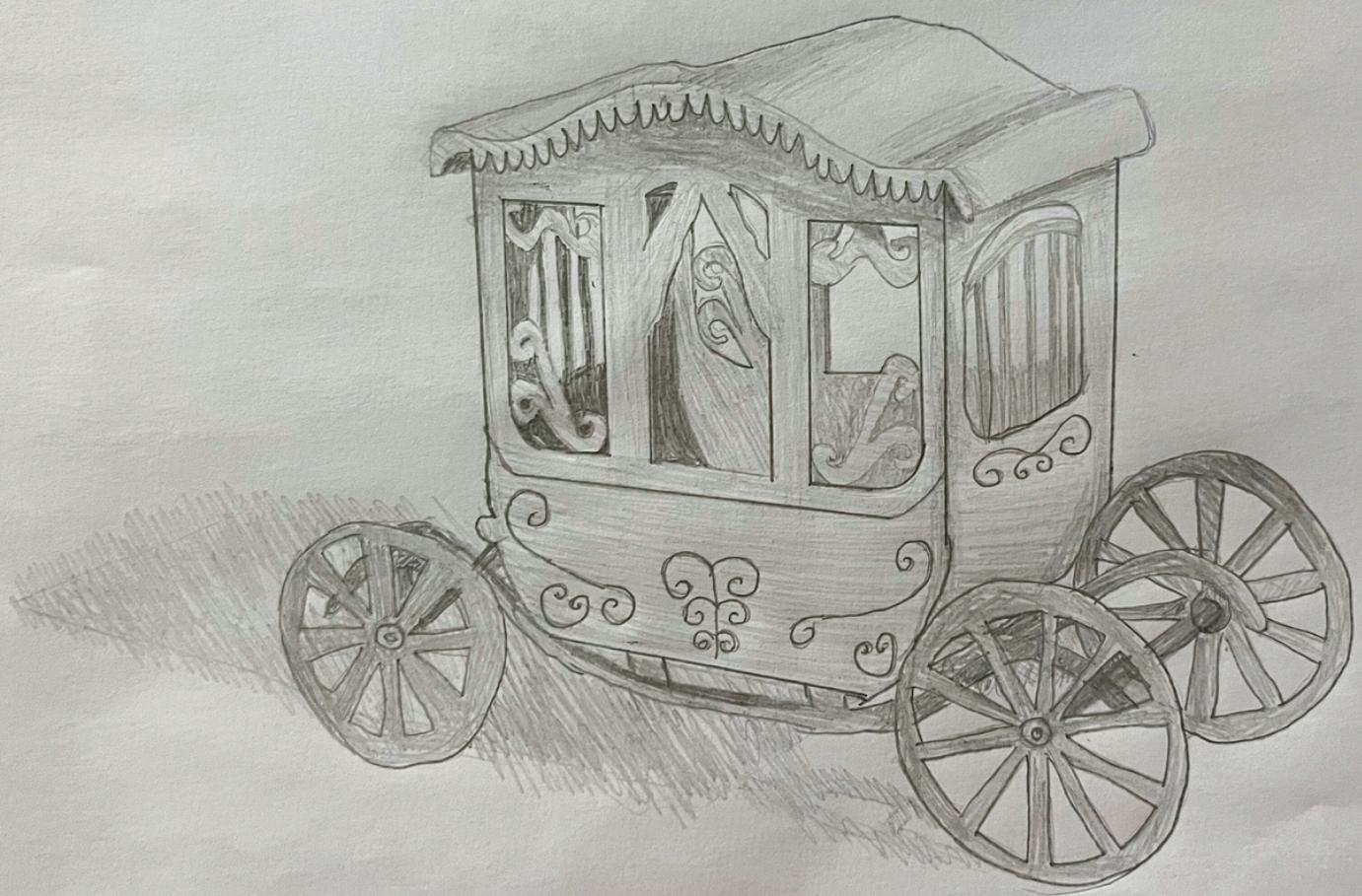
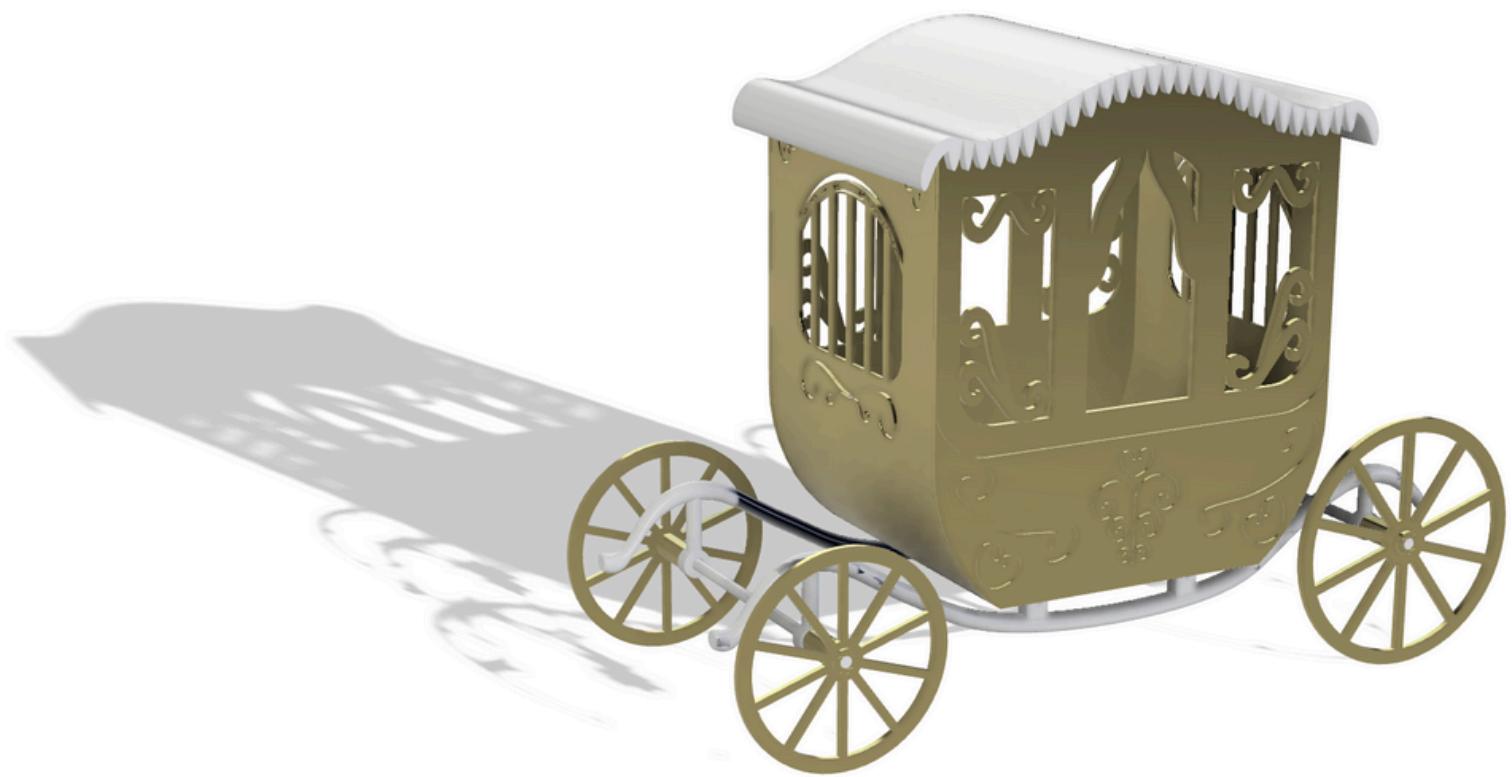
Plus	Minus	Interesting
The carriage's shape is reminiscent of Cinderella's carriage	The carriage may be challenging to piece together due to the curvy nature of it	The design on the roof mirrors the pumpkin's stem in Cinderella that was then turned into a carriage
The engraved lines on the carriage's side accentuate its elegant curves	The curved, round shape of the carriage does not match well with the rigid nature of the bottom bars	
The round shape of the carriage resembles the roundness of a light bulb	The curved front and back curved sections, particularly with the windows, may be too challenging to create.	

DESIGN AND CONSTRUCTION PROCESS

After completing my research, I began the design process by sketching various concepts of the carriage. I created PMI tables to evaluate and choose the best design. I spent many hours on Fusion 360, carefully determining dimensions and utilising various features, such as the spline tool to create the free-hand curves that complemented the carriage's aesthetics.

Throughout the design phase, I encountered numerous challenges and engaged in extensive trial and error. One major issue was deciding which components should be constructed from laser-cut wood and which should be 3D printed. The curved nature of the front and back sections, along with the connecting joints, proved too complex for laser-cut plywood. Therefore, I opted to 3D print these parts, along with the roof and base.





DESIGN AND CONSTRUCTION PROCESS

Initially, the roof design included several intricate ornaments to enhance its realistic appearance. However, I realised that these details were too fine and intricate for the 3D printer to handle effectively. Additionally, the roof details cluttered the design, detracting from the simplicity and elegance of royal carriages. I decided to remove the roof ornaments and instead added a hanging design that resembled draping fabric, which maintained a regal aesthetic.

Another challenge was ensuring the stability of the light bulb socket and preventing it from moving within the carriage. To address this, I added pieces of plywood to secure the light bulb, ensuring it remained upright and stable. I also added two pieces to the underside of the floor once the light bulb socket was threaded through to ensure it did not fall out.

During the construction process, I encountered several challenges, particularly with the rafts and supports from the 3D printing. Removing these supports was time-consuming (Figure 4), and in the process, I accidentally broke off a piece of the back of the carriage. This issue was partly due to the component's delicate nature and insufficient support. It was also challenging to remove the excess PLA fibres.

Figure 4

Front and Back and Roof after 3D Printing



I did not anticipate the overall process to take as long as it did, mainly because of the time for painting. Due to the lamp's size, I had to spray paint in two batches, facing difficulties in maintaining an even coverage.

When assembling the lamp, fitting the pieces together was challenging, as the layers of paint made the joints tighter. Some pieces couldn't be glued flush, and others had to be shaved down to properly fit.

In conclusion, the design and construction process included extensive creativity and problem-solving, with challenges with 3D printing, painting, and assembly. Despite setbacks, these experiences refined my techniques and resulted in a functional and visually appealing lamp.

EQUIPMENT AND MATERIALS



- **3D printer** – A machine that utilises additive manufacturing to place sequential layers of materials based on a digital file to create an object (Ashtari, 2022). This was done using plastic PLA and was printed into the shapes of the front and back, base, and roof.
- **Laser cutter** – A machine that undergoes a thermal separation process with a laser to cut or engrave material. The pieces of plywood were cut and engraved with the laser cutter.
- **Fusion 360** – A computer-aided design software by Autodesk (Autodesk, n.d.) that was used to create the design of the carriage.
- **3mm plywood** – A sheet material constructed from layers of bonded wood veneer. Used to create the sides, floor, wheels, light bulb holders, and axle caps.
- **6mm dowel** – A cylindric shape of wood was used as the axles for the wheels to attach to and as a support structure for the carriage.
- **Utility knife** – A small scalpel-like knife that was used to cut the rafts off the plastic and clean up the sides and edges.
- **Primer paint** – A white primer spray paint that is used to provide a base coat to the materials and prime the surface for subsequent coats of paint.
- **Spray paint** – Gold spray paint was used on the body of the carriage and axle caps to provide colour.
- **Super glue** – Super glue, formally known as cyanoacrylate undergoes polymerisation to create an adhesive bond where moisture is present. This was used to glue the components together.
- **Light cord** – A 5V USB to E14 socket, 2 metres with an on and off switch.
- **Light bulb** – E14 LED bulbs, 5-6V E10 bright LED bulbs, 2700K, warm white.

Material	Use	Benefit	Properties	Why Chosen
Plywood	Sides, floor, wheels, light bulb holders, and axle caps	<ul style="list-style-type: none"> • Cost effective and fast • Precise, clean cuts 	<ul style="list-style-type: none"> • High strength • Stability • High impact resistance • Flexibility • Fire, and moisture resistance • Uses phenol-formaldehyde or urea-formaldehyde resins which create emissions 	<ul style="list-style-type: none"> • Can create intricate, precise cuts and engraving without the need of removing rafts • Smoother than PLA and has the wooden charm
PLA (Polylactic Acid)	Front and back, roof, base	<ul style="list-style-type: none"> • Create curved shapes 	<ul style="list-style-type: none"> • High stiffness and tensile strength • Grease and oil resistance • Biodegradable • Durability • Moisture absorption • Polyester derived from lactic acid 	<ul style="list-style-type: none"> • Can create the curved shapes that laser cutting cannot without the need for holes and bending • Doesn't have to conform to 3mm thickness

BILL OF MATERIALS

Estimates from Amazon (n.d.) and Bunnings (n.d.)

Material	Unit Cost	Quantity	Total Cost
3mm Plywood (800mm x 3mm x 430mm)	\$18	0.353	\$6.36
PLA	\$19.95	429.69g	\$8.56
Primer	\$20	0.2	\$4
Gold Paint	\$25	0.3	\$7.5
Light Cord	\$10	1	\$10
Light Bulb	\$5	1	\$5
Super Glue	\$4.90	0.05	\$0.245
Total			\$42



CONSTRUCTION PROCESS

1. Design the carriage in Fusion 360.
2. Export the components into Adobe Illustrator or FlashPrint respectively.
3. 3D print the front and back, base, and roof.
4. Laser cut the remaining pieces.
5. Remove the rafts and excess from the 3D-printed components.
6. Cut out two 6mm dowels for the axles.
7. Prime the pieces with white spray paint primer (Figure 5).
8. Spray paint the front and back, sides, bulb holders, and axle caps with gold paint (Figure 6).
9. Superglue the pieces together using a knife to expand the joints if necessary (Figures 7 & 8).
10. Thread the light cord through the hole in the floor.
11. Screw in the light bulb.

Figure 5

Primer



Figure 6

Gold Spray Paint

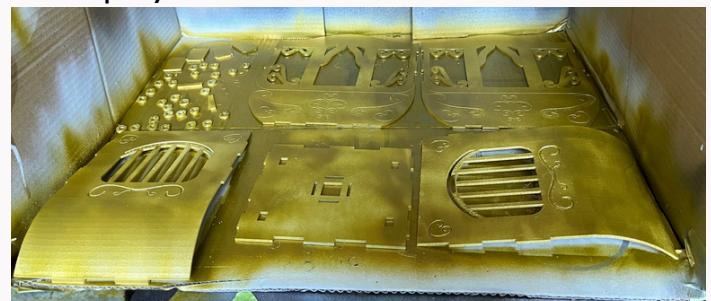


Figure 7

Attaching the walls of the carriage



Figure 8

Attaching the base of the carriage



FINISHED LAMP



EVALUATION

Criteria	Evaluation Method	Data Collected	Feedback
Cost: Does the product cost less than \$30?	Compare production cost to budget allocation	Cost analysis	Product cost not within budgetary constraints. Exceeded by \$12.
Deadline: Can the product be finished by the end of May?	Track project progress and completion status	Project timeline	Product completed within specified timeframe
Colour Scheme: Does the product have a fantasy/magical theme?	Visual inspection	Visual assessment	Product features appropriate colour scheme of white and gold
Aesthetics: Is the lamp visually appealing to the target audience?	Visual inspection	Visual assessment	The design fits with the carriage designs from the mood board, therefore making it visually appealing.
Light Cord	\$10	1	\$10
Durability: Will the lamp withstand typical handling in a child's room?	Stress testing and user observation	Stress test results, user feedback	Lamp withstands typical handling of moving and tipping over without damage
Timelessness: Is the design timeless?	Inspection	Opinion	Due to the design of antique and children's lamps, as well as the theme of the design, this carriage lamp is timeless
Stability: Do all components of the lamp sit securely in place?	Physical inspection	Visual assessment	All components securely attached and stable with glue
Weight-bearing: Can the lamp support its own weight without falling over?	Stress testing and user observation	Stress test results, user feedback	Lamp able to support its weight without toppling
Surface Stability: Is the lamp stable when placed on different surfaces?	Placement on various surfaces and user feedback	Stability assessment, user feedback	Lamp remains stable when placed on different surfaces
Safety: Are there any sharp edges or protruding parts posing safety risks?	Safety inspection	Inspection results	Lamp free of sharp edges or protruding parts that may cause harm
Recyclability & Durability: Have materials been chosen for maximum recyclability and durability?	Material analysis	Material assessment	Materials of plywood and PLA maximise recyclability and durability

EVALUATION

Overall Evaluation

The carriage lamp designed for young girls who love fairy tales and Disney movies was intended to serve as both a decorative piece and a functional light source, while also providing an engaging activity to construct it. The overall performance of the product can be evaluated based on several criteria, including aesthetics, functionality, user engagement, safety, durability, and ease of assembly.

- Aesthetics:** The carriage lamp successfully embodies the fairy tale and fantasy theme, with its intricate designs and magical gold and white colour palette. The elegant, curved lines are reminiscent of a magical carriage, appealing to the target audience's love for princess movies and fairy tales. During the visual assessment, the light shone through the windows, illuminating a shadow, resembling the shape of the carriage. This level of detail was a positive surprise that added a further level of enchantment to the carriage and lamp. The visual assessment also aligns well with the design brief, creating a charming, cozy, and enchanting atmosphere in a child's bedroom.
- Functionality:** The lamp functions effectively as both a piece of décor, light source, and night light. The warm, amber glow emitted from the light bulb provides a comforting and sleep-promoting light, suitable for nighttime use. The light shines through the carriage, enhancing the ambience of the room. The lamp's design with the bulb holders ensures the bulb does not fall over or out however, the light bulb is still able to lean against the holders as they are not close enough, altering the light emitted and adding a possible fire/heat hazard.



- User Engagement:** The DIY assembly aspect of the lamp adds an interactive element, encouraging parent-child bonding and providing a sense of accomplishment for the child upon completion. The assembly process is designed to be straightforward, requiring only super glue and basic skills. This hands-on activity is not only entertaining but also benefits fine motor skill development.



- Safety and Durability:** The lamp is constructed from high-quality materials, including laser-cut plywood and 3D-printed PLA components, ensuring durability and stability. The design was tipped and pressed hard to test whether it would hold up with possible usage in a child's bedroom and passed the test. All components are securely attached, and there are no sharp edges or dangerous protruding parts, making it safe for children. The materials were also chosen for recyclability, contributing to the product's sustainability and environmentally friendly end-of-life solution.
- Ease of Assembly:** While the design aimed to simplify assembly, some challenges were encountered. The joints were tight due to the layers of paint, making it difficult to fit some pieces together. Additionally, the intricate details of the parts required careful handling and added complexity to the assembly of the carriage.

EVALUATION

6. Timeline: While the project was able to be completed by the due date, the construction process deviated from the timeline. I was required to attend the open workshop in week 12 to paint the pieces as I didn't have enough time in class. Additionally, the light bulb/cord didn't arrive on time to measure it, thus leading to only figuring out the floor dimensions a few days before the due date.

7. Budget: The lamp went over budget by \$12 due to the extensive amount of 3D printing, painting, and the cost of the light cord plus the light bulb.

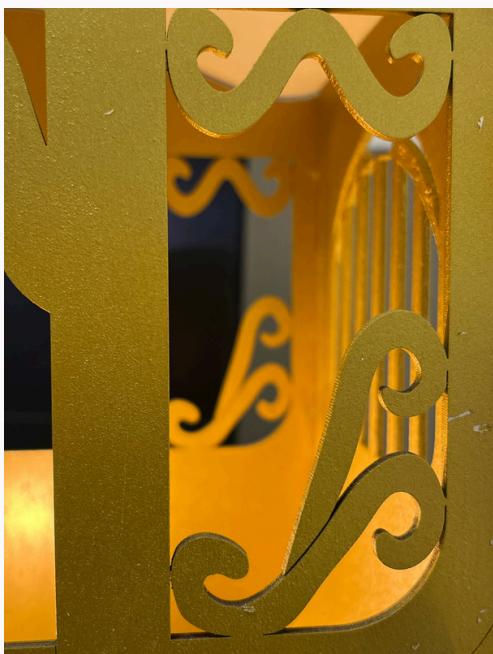
AREAS FOR IMPROVEMENT

For the Product

1. Assembly Process: The assembly process could be further refined to ensure that the joints fit more seamlessly without the need for excessive force or shaving. If the paint thickness is unable to be reduced, the carriage could be designed with slightly larger joint allowances.

2. Material Considerations: While the current materials provide durability, exploring alternative materials or manufacturing techniques may be beneficial in creating more stable, intricate designs. Furthermore, materials that can use flexible, snap-joints could eliminate the need for glue and simplify the assembly process. Less paint could also be used.

3. Detailing and Finish: The intricate details on the 3D printed parts, while visually appealing, could be optimised for better printability and durability. Simplifying some of the more delicate details or enlarging them could reduce the risk of breakage during assembly and handling.



AREAS FOR IMPROVEMENT

Designing, Planning, and Producing

- 1. Prototyping:** Undertaking physical prototypes could help identify potential issues earlier in the design process.
- 2. Design:** Adding additional parts like the opportunity for different designed wheels or roofs could have increased the target market, accommodating a wider audience with different needs and visions.
- 3. Production Efficiency:** Optimising the production process, particularly the transition from digital design to physical product, could reduce production time and costs. Choosing another method of construction over 3D printing could decrease the time for component preparation.

Evaluation Process

- 1. Better Satisfaction for End User Needs:** The carriage could include further customisation options such as interchangeable decorative panels or light colours. This would allow children to personalise their lamps according to their favourite fairy tale or Disney princess. Additionally, creating the opportunity for children to paint their lamps could further allow for this. Incorporating educational features into the lamp such as more historical features could help children learn about history and broaden their knowledge. The design could also expand the functionality beyond décor and illumination by adding an aspect of storage or other sensory elements like sound effects.
- 2. Sustainability of Materials and Production:** More eco-friendly materials could have been used such as recycled wood or plastic. Using joining methods that don't require glue also enables the lamp to be easily recycled at the end of the product's life. Furthermore, choosing different production methods could also reduce material waste and energy consumption as 3D printing requires many hours of electrical usage.
- 3. Enhancement of Product Quality:** Quality control measures could have been implemented throughout the process to identify any defects. More understanding of the delicate nature of PLA could have reduced the damage done to the back of the carriage. The lamp could have also gone through more testing to determine the quality and durability of the design.

By addressing these areas for improvement, the carriage lamp can be refined to better meet the needs and expectations of the target audience.



REFERENCES

- Amazon. (n.d.). Retrieved from <https://www.amazon.com/>
- Ashtari, H. (n.d.). *What is 3D Printing?* Retrieved from
<https://www.spiceworks.com/tech/devops/articles/what-is-3d-printing/>
- Autodesk. (n.d.). Fusion 360. Retrieved from <https://www.autodesk.com/products/fusion-360>
- BenQ. (n.d.). *What LED Color Helps You Sleep?* Retrieved from <https://www.benq.com/en-us/knowledge-center/knowledge/what-led-color-helps-you-sleep.html#:~:text=The%20best%20night%20light%20colors,light%20spectrum%20stimulate%20melatonin%20production>
- Binkley, C. (2015, April 16). *Disney's \$5.5 Billion Princess: The Hidden Economic Power of the "Frozen" Franchise.* Bloomberg. <https://www.bloomberg.com/features/2015-disney-princess-hasbro/>
- Bunnings. (n.d.). *Home.* Retrieved from <https://www.bunnings.com.au/>
- Disney. (1950). *Cinderella* [Film]. Walt Disney Productions.
- Edison Light Globes. (n.d.). *LED Globes.* Retrieved from
<https://edisonlightglobes.com.au/product-category/globes/led-globes>
- Electrical Products Australia. (n.d.). *Incandescent Lamps.* Retrieved from
<https://electricalproducts.com.au/incandescent-lamps.html>
- Evans, G. W., Maxwell, L., & Hart, B. (2001). "Parental Behavior and Child Development in Environmental Settings." *Child Development*, 72(1), 151-172.
- Gunter, B., & Furnham, A. (1998). *Children as Consumers: A Psychological Analysis of the Young People's Market.* Routledge.
- Hamidi, F., & Baljko, M. (2014). "Creativity and Learning Through Making: The Case of Children with Autism." *International Journal of Child-Computer Interaction*, 2(1), 14-23.
- Howard, A., & Greno, N. (Directors). (2010). *Tangled* [Film]. Walt Disney Pictures.
- IKEA. (n.d.). *STRÅLA Cord Set, White.* Retrieved from <https://www.ikea.com/au/en/p/strala-cord-set-white-90371440/>
- Johnson, M. (2020). "Trends in Children's Room Decor: Balancing Function and Fantasy." *Journal of Interior Design*, 45(3), 35-47.
- Kmart Australia. (n.d.). Retrieved from <https://www.kmart.com.au/>
- Maddock, D. (2024). Assessment Task 3 [Lecture]. Australian Catholic University, Sydney, NSW. https://canvas.acu.edu.au/courses/17103/pages/7-dot-2-lecture-assessment-task-3?module_item_id=565506
- Milwaukee Public Museum. (n.d.). *Description and History of Oil Lamps.*
<https://www.mpm.edu/research-collections/anthropology/anthropology-collections-research/mediterranean-oil-lamps/description-and-history-oil-lamps>
- Paquin, A. (2023). Jane Austen's Literary Carriages: A Look at Their Importance in Early 19th-Century Life and in Her Novels. *Persuasions Online*, 44(1).
<https://jasna.org/publications-2/persuasions-online/volume-44-no-1/paquin/>
- Pinterest. (n.d.). Retrieved from <https://www.pinterest.com/>
- Smith, A. (2018). "Victorian Design Elements: Creating Luxury and Whimsy." *Design History Journal*, 29(2), 45-62.

LIST OF FIGURES

Pinterest. (n.d.). White Carriage [Image]. Pinterest.

<https://www.pinterest.com.au/pin/269301252691633456/>

Times of Israel. (2020). Ancient oil lamp workshop now at Israel Museum shows the way we once lit [Image]. Times of Israel. <https://www.timesofisrael.com/ancient-oil-lamp-workshop-now-at-israel-museum-shows-the-way-we-once-lit/>

Wallpapers.com. (n.d.). Rapunzel lantern kingdom [Photograph]. Wallpapers.com.

<https://wallpapers.com/wallpapers/rapunzel-lantern-kingdom-s4rj20esnhjeao7.html>