



AN INVESTIGATION INTO TECHNIQUES AND DESIGNS THAT WILL IMPROVE SUSTAINABILITY WITHIN PUPPETRY



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Independent Project ADPA6000/C

Generative AI Statement

In line with the university's *AI in Assessment* document (University of Wales Trinity Saint David, 2025, pp.36-38), I confirm the statement below.

For this assessment I have used Generative AI to check my 'text/creation for grammatical and syntactical mistakes'. I have used *Microsoft Word's* 'spelling and grammar' tool throughout the creation of this written element for my independent project.

Apart from *Microsoft Word's* 'spelling and grammar' tool I confirm that I have not used any AI tools in the research and creation of this assignment. I confirm that I have not presented any AI generated materials as my own work. I confirm I have copies of my drafts, notes and other resources I used, which I may be asked to provide in evidence.

Introduction

This independent project will be an investigation into techniques and designs that can improve sustainability within puppetry with a focus on answering the question ‘Is it possible to create reusable puppet components that can be transformed into multiple forms?’ The practical output is to create a reusable/adaptable puppet skeleton that can be transformed into multiple forms. This will aid sustainability as it will mean that less materials are needed to produce a puppet. This design will also be collapsable to reduce the amount of storage needed.

Lack of storage is a huge problem in the theatre industry which leads to physical materials being discarded, this impacts material waste and emissions from transporting to landfills.

An article by Ellie Johnson (Johnson, 2025) states:

“the performing arts of face a growing environmental challenge; the materials that support each production often have short lifespans and limited reuse options. From elaborate costumes to crew uniforms and scenic textiles, much of what’s used on stage is discarded once the show ends”.

Later in the article Johnson (Johnson, 2025) also states:

“Whether it’s touring production or local playhouse, the cycle of creation and disposal is relentless”. And “Without a system for responsible disposal or reuse, the creative process becomes a contributor to material waste, one that’s repeated across hundreds of venues and productions each year”.

This report highlights the problems with the continuous cycle of creating new shows when you don’t have a plan to discard/reuse materials sustainably.

I will also be investigating different materials to see if there are more sustainable options that can be developed to be reuseable/adaptable.

“The greenest way to do theatre is to immediately stop producing theatre; short of that the best way to protect the environment is to invest in doing things in a more sustainable manner” (Donnay, n.d.).

I have chosen puppetry and sustainability as my intended professional goals include working as a puppet designer/maker in a fully sustainable way. I will be successful in reaching my independent project goals when I have a fully reusable/adaptable skeleton, an in-depth knowledge of how to help improve sustainability within the industry and a developed set of transferable skills I can take forward into my future career.

Why Puppetry and Sustainability?

I was inspired to pursue puppetry watching Life of Pi at the Wales Millennium Centre. I was amazed at how you could make a puppet so realistic. I knew from this performance that puppetry is a powerful storytelling tool that deserved to be explored.

Penny Francis (Francis, 2012 p.22) an author and puppetry advocate states that "we imbue the puppets with our imagination and experience a deceptive empathy, deceptive because empathy assumes feeling in the recipient. The puppet only mimics feeling through attitude and movement". Whilst this is true, the realism of the animals crafted for Life of Pi made them seem real and I found myself having as strong emotional connections to the animal puppets as I did the actors.

I went to watch Life of Pi feeling sceptical, I had previously thought that puppets were children's entertainment, and that having operators on stage would be distracting. Francis (Francis, 2012b, p.24) states "In successful puppet play the audience cooperates actively and will afterwards swear that this or that figure changed expression, that it grew taller during the action, or that it effected a range of movement, all impossible" and this describes how I felt and how I wanted to use puppetry to make other people feel.

Puppets are beneficial for storytelling as they make the impossible possible. They can be manipulated in ways that a living being cannot and can be used in all genres, for all ages.

As well as puppetry being used for storytelling it has been an effective tool for education. For example, Arbor the Tree produced by Smoking Apples (Smoking Apples, 2024) is used to educate children about deforestation and Debbie the Curlew made by Nico Venables (Venables, 2024) is used to educate children about conservation.

From a management point of view puppetry also has benefits. Puppets don't need payment or breaks which could save smaller productions money however, for larger productions employing multiple puppeteers and captains, it might not be as financially beneficial.

Improving sustainability in the theatre industry is the focus of my independent project as the planet is in a climate crisis and everyone needs to change their practices to help the overall improvement of the environment. "expected, worsening predictions for climate change in 2026 will not be the pique of global warming misery. As long as we continue to emit extreme amounts of greenhouse gas and carbon dioxide emissions into the atmosphere, climate change will continue to worsen"(Safdie, 2023). There are no current statistics about material waste specifically from the theatre industry but **"The UK generated 191.2 million tonnes of total waste in 2020**, with England responsible for 85% (162.8 million tonnes) of the UK total". (Department for Environment Food & Rural Affairs, 2024)

Fortunately, the Arts are making improvements already and have implemented systems like The Theatre Green Book and Albert.

“Theatre has always been a mirror to society, reflecting our joys, struggles, and now, our environmental responsibilities. With global temperatures rising and audiences demanding more conscious entertainment, productions are adapting in exciting ways”.(Appleton, 2025)

To gain advice about sustainability in the theatre industry/puppetry, I contacted a range of industry professionals. The main advice given was to reuse as much as material as possible and that the most sustainable method is to use recycled materials rather than buying new sustainable materials.

I spoke to Matt Lloyd, co-artistic director and set/puppet designer at Smoking Apples (Lloyd, 2026) and Nico Venables Puppet Designer/Maker and Operator (Venables, 2026) for advice about constructing sustainably.

Lloyd advised me to use construction techniques like screws/bolts so you can take elements apart instead of glue which is permanent and makes recyclable materials unrecyclable. This will help with the reusability aspect of my design. He also advised that when reusing previous sets you need to check copyright/intellectual property regulations unless you are fully deconstructing otherwise you didn't build the set from scratch.

Lloyd said he has had problems before when a client wants a specific or polished look so recycled materials are not an option. In this case it's better to use local materials to reduce emissions from transport. However a lot of people are open to using more sustainable materials when you explain the benefits and schemes like the Theatre Green Book.

Lloyd and Venables both shared how they have reused puppets. Smoking apples have a pile where used puppets go and are then used for puppetry workshops. Venables uses old puppets including Debbie the Curlew to run educational workshops.

Both Lloyd and Venables recycle materials and gave me advice on how to reuse materials repeatedly. That also advised trying to adapt your designs to the materials you already have available to reduce waste and cost.

Research

History of puppetry

The origin of puppetry is debated by historians to this day. With the vast number of styles of puppetry and the locations, it is hard to narrow down the origin to one point. Although the exact origin is unclear, the reason for their creation is reported in multiple sources as a storytelling tool used in religious ceremonies.

In *Puppetry: A Reader in Theatre Practice* (Francis, 2012b) it is reported that puppetry dates back to Animism, which was a belief system that existed before humans believed in different organised religions. Animism is the belief that every object has its own spirit or soul and is alive. It is also the belief that objects have the power to influence humans negatively or positively.

In *Puppetry and Puppets: An Illustrated World Survey* (Blumenthal, 2005) it states there is evidence of puppetry as far back as 30,000 to 21,000 B.C.E. In the chapter 'the origin of the species' (Blumenthal, 2005, pp.11–36) it tells the reader that mini figures resembling humans have been found from that time period and that they had been carved out of animal bones and stones. According to this book, these figures are believed to be the earliest example of humans making copies of themselves. It is believed that these miniatures were made to aid fertility as it appears they depicted pregnant women.

According to papers written by Keith Rawlings (Rawlings, 2004) (Rawlings, 2023) the earliest example of puppetry dates back to an ancient articulated figure discovered in Brno, Czechoslovakia nicknamed "the marionette". This figure is estimated to be over 26,000 years old. This figure is believed to be made out of a mammoth's tusks and has holes where the limbs could be tied together.

As you can see from the examples above there are many opinions about the origin of puppetry but from my research, I can deduce that they have been in existence a long time and that they have continued to develop and are still doing so.

What is puppetry?

Puppetry is an art form which has evolved over hundreds of years in different cultures/genres. Due to continuous development of different methods, materials and styles it does not have one official definition. "The enigma of the puppet is not captured by such literal definitions" (Handspring Puppet Company, 2009, p.19)

The Cambridge Advanced Learner's Dictionary & Thesaurus defines a puppet as "a type of toy that looks like a person or animal and is moved by a person using strings or putting a hand inside it" (Cambridge Dictionary, 2012)

Similarly, the Oxford Advanced Learner's Dictionary defines a puppet as "a model of a person or an animal that can be made to move, for example by pulling strings attached to parts of its body or by putting your hand inside it" (Oxford Advanced Learner's Dictionary, 2020)

There are several contradictions to these definitions I have discovered through extensive research. The operating of a puppet is described as either a hand inside or being controlled by strings, but this excludes several styles of puppetry including shadow and life sized/giant puppets.

A puppet is described as being in human or animal form however there are puppets which take other forms including Arbor the Tree, a 17ft tall tree puppet produced by Smoking Apples for Derby Festé, in 2017.

I have seen the impact of puppetry as a storytelling and education tool and due to this I believe the description of a puppet as a 'toy' is an oversimplification and does not do puppetry justice as a complex/imaginative art form. "it is definitely not a doll. When somebody plays with a doll, it involves an intimate action which never extends past the two of them" (Baird, 1965).

Francis states in 'Puppetry: A Reader in Theatre Practice' (Francis, 2012b) that puppets "can be any thing, any object, if brought to imagined life through the agency of a human player who inspires it and controls it directly."

This description is more open and therefore more inclusive as it does not describe specific mechanisms or styles of puppetry. It highlights the importance of imagination and creativity associated with the art form. However, whilst this definition is more accurate the words 'controls it directly' opens up debates about how much interaction is needed to classify something as a puppet.

Automata causes debates between puppeteers to this day. Automata is similar to puppetry but the subject is controlled mechanically rather than by a puppeteer. Automata was developed to make the audience believe that an object was moving by itself and gave the illusion of magic from the absence physical manipulation by puppeteers. The first examples of this art form date back to mathematicians/inventors from Greek mythology however Automata became most popular in the 19th century where it was used as entertainment in science fairs and carnivals. With the advances in technology, traditional Automata in the 21st century is used to create modern art pieces rather than being used by inventors or engineers. However, it's believed that popular machines like computers would not exist today if their roots were not developed by automata.

The arguments for including Automata as a style of puppetry are based on the belief that you are still giving life to an inanimate object. The argument against is the fact that movements are preprogrammed and can't be altered once it's started on its course. For example, an object that follows a track on the stage floor can only stay on that track even if you change the start point or direction. Similarly, having moving parts of a puppet e.g. a hand waving or mouth moving still only allows the object to complete the movements it has been preprogrammed to do even if you change the order of the commands.

As a reflection based on my research, I believe that having preprogrammed elements takes away the spiritual and emotional connection between a puppet and its operator and therefore limits its personality. A great puppeteer is able to read the audience and adapt the puppet accordingly and this element is removed if you have preprogrammed instructions. Due to this I will not be using Automata in my sustainable puppet design.

Masks date back to ancient Greece and were first created as tools to pay respect to gods in religious ceremonies similar to the origin of puppetry. They evolved into story-telling tools to enhance theatre performances. Masks were used for showing exaggerated emotions which helped the audience further away understand the story, helping the actors to convey a story through movement instead of relying on dialogue and if crafted correctly they could amplify sound in large arenas. Masks also evolved based on the ancient Greek 'three-actor rule' (developed by tragedians like Aeschylus and Sophocles) which states that only 3 actors can be

in a play even if there are more characters and the use of masks allowed actors to portray multiple roles. The arguments for including masks as a style of puppetry are that masks, when used in a similar way, aid the actor to no longer be themselves but become the character of the mask. The mask will influence their voice/movements as would a puppet however I would argue that costumes/props can also have the same effect on an actor. Therefore, I believe that masks should not be categorised as puppets and will not be including them in my practical output.

Types of Puppetry

Hand and Glove Puppets

Hand and glove puppets are very similar in the fact that they are both operated by the puppet being placed over the hand of the puppeteer and operated from the inside. Although the mechanisms are simple they have beneficial features for effective storytelling. They can be used for quick reactions as you can do this as quickly as you can move your hand; “the direct connection between operator and puppet makes the manipulation fluid and spontaneous, enabling subtle expression and rapid movement” (Davey, n.d.).

They can be operated with the puppeteer visible and hidden from the audience. For example, whilst operating hand puppets Jeff Dunham (comedian/ventriloquist) operates his puppets in front of the audience whereas the puppet ‘Hacker T Dog’ is operated by Phil Fletcher off screen. In glove puppets, Punch and Judy are the most well-known example, and these are normally operated from inside of a booth. Sometimes booths have a hidden window that the puppeteer can look through, this is beneficial as the puppeteer can adapt the performance based on audience interaction. Due to the small size and easy setup, hand and glove puppets became popular as they were often used for traveling shows.

There are differences between hand and glove puppets for example hand puppets like The Muppets often have added mechanisms like arm rods. In terms of construction the glove puppet is often made in 2 separate parts. The head is made of something solid like wood whereas the body is made of a soft material like fabric which is used to hide the puppeteer’s hand. Hand puppets are normally made using the same material throughout which is normally a type of foam.

In hand puppets you are able to operate the mouth to lip-sync to what the puppet is saying, and you can adjust the size of the mouth to fit individual hands. In contrast when operating glove puppets, you only move the whole head and not individual fingers. Glove puppets are normally operated with the index finger inside the head and the thumb and middle finger operating either arm, this allows glove puppets to appear to be picking up and object which is an element used in puppets like punch to comedic effect.

The definition of hand puppets has evolved to include puppets that are actual hands with features added to them e.g. eyes. An example of this style of puppetry is the TV show Oobi which has several characters that are human hands/feet with eyes and accessories added.

Whilst most glove puppets have simple mechanisms and are considered a beginner puppetry style, the Chinese glove puppets (also called palm puppets) are very detailed and complex. They have tiny mechanisms in their hands which allow them to hold objects e.g. a sword and often perform fast and complex tricks and fighting scenes. Puppeteers often operate 2 at a time meaning they need to be extremely coordinated and training to master this art form can take

years. Unfortunately, due to the time it takes to master the skill the number people who can perform this type of puppetry is declining.

Rod Puppets

The simplest way to explain the mechanisms of Rod puppetry is that the puppet is constructed around a central rod that the puppeteer holds to support the puppet whilst operating it. This puppet is normally operated from below, the same way as the hand/glove puppet. Depending on the size of the rod puppet and how many limbs need operating, it can either be operated by one person or multiple people. The central rod can have additional mechanisms that allow the puppeteer to move features; an example of this is José Jalapeño created and operated by Jeff Dunham (Dunham, 2025) who has a mechanism to open and close his mouth for lip-syncing.

As is natural with puppetry as an art form, the traditional rod puppet has evolved; an example of this is the development of the Arm and Rod puppet. This first example of this puppet was Kermit the Frog made by Jim Henson.

Whilst researching rod puppetry I found a book called Rod Puppets & Table Top Puppets (Fettig, 1997) which contained information about the construction materials and mechanisms of crafting an animal rod puppet. Whilst describing the mechanisms for a hare puppet the author describes designing the internal mechanism based on how the animal behaves; this is advice I will consider when it comes to designing my puppet as this will help with realism.

This book also says that their productions have different versions of the same puppets but with different mechanisms. This is used to give the appearance that the animal is running. Having identical puppets with 2 different mechanisms allows you to focus on the look of the puppet and not over crowd with too many controls.

Bunraku

This style of puppetry was originally called Ningyō Jōruri which translates to ‘puppets and storytelling’. Bunraku is a Japanese form of puppetry that dates back to the 1680’s. Bunraku was created in the Takemoto-za puppet theatre and any puppetry performance using this method should be referred to as Bunraku-style rather than just Bunraku if it’s not performed in the original theatre. Traditionally Bunraku-style is performed by 3 puppeteers, the most experience of these will control the head and the other 2 will control the limbs, which limbs depends on experience and puppet construction. It takes years of experience to progress to the head position “Tradition has it that one spends ten years on the feet and ten more for the left arm before assuming the stature of a head manipulator” (World Encyclopedia of Puppetry Arts and Tschudin, 2013). The puppeteers in Bunraku-style are normally visible to the audience, but their full body is dressed in black including a mask worn over the face.

Large Scale Puppets

Whilst researching puppets I have discovered that there is not one specific name to describe the giant/life sized puppets featured in performances like War Horse or Life of Pi. Different companies use different words to describe their style of puppets.

Handspring Puppet Company and Animus Puppetry describe their puppets as Life Sized puppets. The Chicago International Puppet Theater Festival describes puppets of this scale as Spectacle puppets and Animal Cracker Conspiracy describe their puppets as Giant puppets or Giant effigy figures. Although there is not one specific term to describe these large puppets

designs for War Horse and Life of Pi took inspiration from Bunraku-style and used the three-person operator system. As there is not a specific name I will be referring to these puppets as large scale puppets for the purpose of this paper.

To develop my knowledge, I looked into specific puppets that were considered groundbreaking and innovative in the industry to learn about different operating techniques, mechanisms and materials.

Joey is a horse puppet, created by Handspring Puppet Company for the 2007 National Theatre production of War Horse. This production of War Horse was the “most successful play in the history of the National Theatre” (Handspring Puppet Company, n.d.) and won multiple awards including the 2008 Laurence Olivier Award for Best Set Design and a 2011 Special Tony Award for puppetry achievement for Handspring Puppet Company. Joey is operated by 3 puppeteers who each take on a specific role which contributes to the overall movement of the puppet. These 3 sections are the ‘hind’ (which includes the back legs and tail); the ‘heart’ (which includes the front legs and the breathing) and the ‘head’ (which includes head/neck movements and ear controls). Several interviews with the designers and operators of Joey highlight the importance of all 3 puppeteers working in sync to make the performance realistic. This is vital for elements such as the gait, weight and emotions of the character which would be seen throughout the whole horse. One challenge when working on the puppets movement is that the ‘heart’ puppeteer can’t see the ‘hind’ puppeteer. Because of this the ‘hind’ puppeteer must match the pace set by the ‘heart’ puppeteer.

Several interviews with the puppeteers for War Horse and other productions highlight the importance of performing the puppets breathing and weight. “first thing that we have to think about is really the breath and where we are emotionally and that starts day one of rehearsals and it continues all the way through” (Heller, Green and Piers, 2012). The breathing of the puppet needs to be evident and in sync throughout the whole form to make the puppet seem alive. “An actor struggles to die onstage, but a puppet has to struggle to live. And in a way that's a metaphor for life”. (Jones and Kohler, 2011).

During the TED2011 event (Jones and Kohler, 2011), Basil Jones and Adrian Kohler (Co-founders of Handspring Puppet Company) described materials used when creating Joey. The skin of the horse was made with a see-through nylon mesh to allow the puppeteer to look out from inside the puppet and so its appearance can be manipulated by the light which gives the puppet a solid or translucent appearance. Tyvek was used for the mane and the tail as it is lightweight, tear resistant and strong. A foam substance was originally considered but was a fire hazard. I wanted to experiment with Tyvek as an option for the skin of my puppet however I did not want to order new materials until I had seen if this is a viable option. I spoke to a previous graduate of our course, and he recommended using Plastic wallets instead. I had damaged plastic wallets, so I experimented with these to create the puppet skin and although they made an effective reptile skin paint did not adhere to them well.

The Elephantom

Another interesting puppet that I discovered is the ‘Elephantom’ designed by Toby Olié for the 2013 National Theatre production of The Elephantom. The challenge when creating this puppet was to make it move like a phantom but to have enough control over the puppet to show what it is feeling/thinking. To achieve these design requirements the body and head were made separately. The head is made from plastazote which is a strong but lightweight foam; it allows

the puppeteer full control of the head movements. “If the head had a sort of vague floaty quality, you'd never really know where its attention was, you'd never really feel like it was engaged with you” (Caldwell and Olié, 2014)

The body was made from a lightweight/strong/tear resistant fabric material called Ripstop as it could be inflated but would also let some air escape which gave the puppet its floating appearance. Ripstop was effective as it allowed the puppet to “get intention and focus from the puppet whilst at the same time giving it this massive fluid ghostly quality” (Caldwell and Olié, 2014) “The mechanics of bringing a weightless Elephantom to life were never going to be simple. The idea of using untested inflatable technology seemed instinctively right but riddled with potential problems. But, right from day one, there he was, larger than life, flexible, floatable and magical”. (Collins, 2014)

Life of Pi

I found the puppets design for Life of Pi interesting as they are designed to look like driftwood but also be instantly recognisable as a specific animal. “The puppets are lifelike, but not entirely naturalistic — the puppeteers are visible beneath missing bits and pieces of the animals' anatomy, similar to how a boat breaks apart during a wreck” (Russo, 2023).

I wondered if I could use a design like this for the skin of my puppet. Constructing my design in an abstract way without worrying about a perfect copy would allow me to use sustainable materials but still create a recognisable dragon. In an interview about their puppet, Robin O'Connor Lowe (O'Connor Lowe, 2025) states “I love puppetry, because it can lend itself easily to working sustainably, especially on smaller scale theatre. because the audience already are 'suspending their disbelief' by believing that moving bits of wood and fabric are definitely a real dog, you can get away with using less realistic-looking materials”.

The puppets in Life of Pi start out as a block of plastazote which is then carved by hand into the correct shape. “you take a lump of Plastazote and you turn it into something else and with it, you put love and you make a puppet which hopefully can carry a story which has great meaning” (National Theatre, 2023a) In an interview Caroline Bowman, Associate Puppet Designer for Life of Pi, states that they use Plastazote to form the body as it can be carved to look like wood but is much lighter. She says that it is more important to think about how the animal will move rather than having it look identical, using a lightweight material allows more freedom in the movement. (Bowman, 2019)

I decided to experiment with plastazote as a material for my puppet as I was inspired by the way it was used to create animal skin in Life of Pi. Using plastazote would allow me to develop the knowledge/skills I gained from my second-year module ‘production project’. As we completed a project using plastazote previously I knew we had surplus plastazote, paint and glue I could experiment with without having to buy new materials. I experimented with priming/painting, adding texture and attaching different clips for the removable panels. I was collaborating with Ashling Ryan, and we were both experimenting with different sustainable materials, so I asked for recommendations of texturing materials. She gave me surplus Tapio paper and I used this to create scales.

From my research into large scale puppets, I believe this is the best genre for me to develop into the reusable/adaptable skeleton. A large-scale design will allow me to create a skeleton big enough to test and see if it will actually help with reducing storage. A large-scale puppet will also have multiple mechanisms that I will have to adapt to my design and will give me the

chance to explore a range of materials and develop new methods for puppetry and working sustainably.

Reusability

As the focus for my independent project is to create a reusable/changeable puppet skeleton, I researched current puppets with similar mechanisms for inspiration. I discovered examples of how some elements of puppets could be changed/reused however could not find any evidence of a full reusable/adaptable puppet skeleton. I have conflicting feelings about how this research will impact my design. It is unfortunate to not have current examples of a skeleton as this would have given me a starting point that I could evolve and develop. However, being the first person to experiment with this is beneficial as it allows me to create something that is truly unique and something that will hopefully make an impact in the industry. It has allowed me the opportunity to experiment with multiple ideas for materials, mechanisms and methods.

Whilst researching reusable and adaptable puppets I discovered a type of puppet which is called an Anything Muppet or a Whatnot Puppet. These are puppets with blank bodies (usually human bodies) that you can attach various features to including eyes, noses and hair. The idea is that these puppets can then become any character you need for a scene.

The first example of the use of Anything Muppets on television was the first episode of Sesame Street (Sesame Street - 'Gordon introduces Sally to Sesame Street', 1969). In this episode the presenter 'Gordon' adapts several anything puppets into what they ask to be for example a little girl or a father. The main benefit of using Anything Muppets is that it reduces costs by changing the features of a puppet rather than having to build a new one. It is also beneficial as you can test characters to get audiences opinions before you spend time and money making a full puppet. From researching the design of Anything Muppets/Whatnot puppets I believe that I can develop the idea of having features that are added to and use this to improve sustainability. Making a base skeleton and having parts that can attach/be removed to form different animals need to use less materials and therefore would improve sustainability by reducing material waste. This would also save time and money as you wouldn't need to recreate a large skeleton for every puppet so this would be appealing to the theatre industry.

Chad from WonderSpark puppets (WonderSpark Puppets, 2021) created a video that showed how to make a puppet with a rotating head that has various emotions. Using the mechanism to turn the head allows a different emotion to be shown to the audience. The puppet in this video was designed for children to make so wasn't made out professional materials however I felt that the design of this mechanism could be adapted to create a specialised theatre puppet.

In a video with Adam Savage, Jimmy Young a senior model maker for Aardman shared behind the scenes footage of their mechanical system which he referred to as the 'Mouth plate system' (Savage, 2018). This is a system designed by engineers at Aardman that allows you to remove the mouth of a stop motion model and replace it with a different one. Young explains that they created this system as the silicone used to create the features can get damaged due to the high heat caused by filming so they needed a quick way to replace the damaged area. Although this design was made to replace damaged pieces Young stated that they can use this for multiple different mouth pieces. This gave me the idea that I could design my adaptable skeleton to come apart and be replaced by another element. For example, as I would like to adapt my skeleton into several animals I could have panels designed for different animals that detach/reattach to the skeleton base.

Collaboration

I am collaborating with 6 of my peers to produce a short film that will showcase elements of each of our independent projects; my role for this collaboration is to produce a puppet which will interact with the set and performer. This collaboration benefits my independent project as it gives me the opportunity to observe/film my puppet in a professional environment and to develop my skills as a puppet director/operator. Making a puppet for screen is a new challenge for me and will require me to develop a new skill set.

A major difference between puppets constructed for the screen vs stage is the level of detail visible to the audience. In theatre, puppets are seen from further away which means small details like glue/stitching won't be seen. However, in film/tv when the puppets are viewed from close up, all the fine details will be visible and emphasis needs to be placed on clean/precise construction. Audience visibility will affect construction; in theatre you need to ensure that your puppets actions/expressions can be seen from the back of the audience so you may have exaggerated features and movements. On screen having exaggerated features could be distracting and effect perspective and the smallest movement can be overpowering close up on camera.

Sean and Patrick Johnson of 'Swazzle Puppet Studio' recommended using a puppet monitor when producing screen productions as this will help puppeteers to 'keep their head out of shot, keep the puppet in the correct position with a proper eye line, ease communication with the director as they can see the same image' (Johnson and Johnson, 2025)

Due to the equipment being used and the small set, a dedicated monitor for puppetry is not possible for this production. To ensure that we still cover the details above we will allocate plenty of time for rehearsal. I will then watch the videos as we film so I can observe the puppet and make changes to the way it is operated if needed.

As a group of 6 practitioners, each with a different exploration for their independent project, it was decided that a fantasy genre would be the most effective option to combine all of our practical output goals. To ensure my puppet would fit in the fantasy world it was decided it would also be a fantasy creature. As a collective we agreed that a dragon would be the best choice as dragons are subjective to each person and culture. Everyone has a different interpretation of what a dragon looks like and what it represents to them. This would allow me to design a dragon in collaboration with the performer to enhance the movement piece and aid storytelling.

To ensure cohesiveness for the design of our film I collaborated with Ashling Ryan who was the Prop designer/maker for this production. The prop to be featured most prominently in the film was an Aztec stone tablet. We collaboratively decided to design my puppet with influence from Aztec dragons and then Ryan would replicate the design of the final dragon onto the stone tablet.

Aztec is a modern term used to describe 3 indigenous groups of people who lived between the 1300's and the mid 1500's. The dragon most associated with the Aztec Culture is the Quetzalcoatl also known as the 'Feathered Serpent' and was worshiped as a god in the Aztec Religion. However, the Quetzalcoatl was believed in before the Aztecs even existed; dating back to between 1200 to 400 B.C and the first known depiction was from a stone carving from the Olmec period called La Venta Monument 19. Depending on which religions representation and

time period you research the Quetzalcoatl has various forms including a human form which has different versions of headdresses, weapons and masks.

The origin of the name Quetzalcoatl comes from the Nahuatl language and is in two parts. The first half comes from the word Quetzalli which means green feather and the second half Coatl means serpent. It is also believed to be based on the Resplendent Quetzal bird. Whilst the Quetzalcoatl is named as a giant snake rather than a dragon his winged serpent form is associated with a dragon.

“A dragon is a legendary creature that appears in the myths and folklore of cultures throughout the world. A dragon's physical characteristics vary depending on its place of origin, but most dragons have reptilian or serpent-like features and wings”(Richard, 2022)

From doing this research I developed key design decisions that influenced my final design.

The Resplendent Quetzal bird that inspired the Quetzalcoatl was also worshiped by the Aztecs and their feathers were used in headdresses worn by the powerful and wealthy. Due to the Resplendent Quetzal bird and the description/depictions of the Quetzalcoatl as a ‘feathered serpent’ I decided to explore adding feathers to my puppet design. I am aware the damage that feathers do to the environment e.g. the chemicals used for dying feathers make them non-biodegradable and toxic chemicals are used to clean them, so for my puppet I looked into sustainable alternatives.

“The vast majority of decorative feathers used by the industry come from ostriches exploited and killed in the same supply chains in which they are skinned. Policies banning wild animal skins are rooted in the premise that it is not acceptable to kill these animals for fashion. Feather use is inconsistent with this premise”. (Collective Fashion Justice, 2024)

Stella McCartney released an alternative to feathers called ‘FEVVERS’ in 2025. These feather replacements are made from dried grass and natural dyes and are designed with “the lightness and texture of real plumage while remaining entirely cruelty-free” (Chiorando and Smith, 2025)

Similarly the brand ‘Made For A Woman’ (Made For a Woman, 2019) have created an effect with the same visual appearance as feathers by weaving a leaf called Raphia. Unfortunately, due to the tight timescale and budget I am working with I will not be able to use plant-based feathers for this design.

I looked into alternative options and Nicklas Skovgaard (a designer based in Denmark) has started to use ribbons instead of feathers which is a material I have available. He cuts, frays and attaches the ribbons so they give the visual appearance of feathers. He states this allows him to “think more creatively”, as it “encourages innovation and allows me to approach each piece in a more experimental and personal way.” (Hakansson, 2023)

An adaptation I felt was important for my independent project was to add legs to the design. Traditionally the Quetzalcoatl doesn’t have them but to showcase the reusability of my skeleton I needed more elements to experiment with. After a design meeting with Ryan and a further team production meeting a final design for the dragon was approved and I started more in-depth construction research.

Construction

After researching and analysing materials used in large scale puppets, I was able to select the main materials that would form the skeleton and the skin of my puppet.

I decided to build the skeleton frame out PVC Pipes. I considered other materials used in large scale puppets including Aluminium, Plywood and Cane (used in the puppets for War Horse and Life of Pi). After analysing them based on their reusability and adaptability I decided that plywood would be too heavy and that cane would be complex/fragile to take apart, adapt and put back together. I thought that Aluminium could work however it could require specialist metal working tools e.g. drill bits/welding and this is not something that all people would have access to.

PVC pipes are my best option. They are lightweight, strong, easy to source and available in a range of sizes. I have surplus PVC pipes left from a previous puppet meaning I can experiment with them without wasting new material. In my personal communications Flints, Smoking Apples and Sea Legs Puppet Theatre all recommended the use of PVC pipes. Rachael Himes (Simply Rachael Studios, 2020) states “PVC pipe is one of the most versatile things you can work with in cosplay it's basically just plastic and it's super cheap”

PVC is a material that I think is important to try to make more sustainable as it is damaging to the environment when it is made. According to FRONT “the process releases toxic chemicals like dioxins, harming the environment and human health. These dioxins can persist in the environment for years, contaminating air, water, and soil”. FRONT also reports “82% of global PVC waste goes to landfill, 15% is incinerated. Only 3% is recycled” (FRONT, 2024). I am hoping that as my skeleton will be reusable it will help to reduce the amount of PVC needed for future puppets.

Edit: after doing further research I have decided to use PP pipes instead of PVC. PP pipes are more flexible and are better in high temperatures which will aid construction. They are also lighter which will help the puppeteers especially as the frame is so large. The research I have done on PVC pipe construction can still be applied to PP pipes.

I have decided to use plastazote to form the panels of my puppet. I decided on plastazote as it is strong, lightweight and comes in a range of lengths/thicknesses and it will hold its shape. I have surplus plastazote from previous projects meaning I can experiment without purchasing new materials. I have conflicting feelings about the use of plastazote as it is not a sustainable material. Foam Engineers (Foam Engineers, n.d.) have a range of Eco Foam made out of recycled materials and others made from wood pulp and cornstarch that I will remember for a future project however with the budget I am working to I cannot afford these for this project.

A vital thing I have learnt from researching puppetry is that the most important element to make a puppet look real is the movement. “A slight wiggle in the hips, shifting weight from one foot to another, a turn of the head as if hearing a sound. Subtle gestures taking a puppet from an inanimate object to an uncannily real character”. (Jordan and WIRED, 2023)

To make my dragon move as realistically as possible, I researched the anatomy of dragons and similar animals. I found a video by Artist Mark Smith, (Mark Liam Smith, 2024) where he describes how to draw animal legs, particularly useful. This video explains how a human leg operates and where key bones/joints are in comparison to where these would be on different animals. His video focused on mammals rather than reptiles which are a closer species to dragons however this video helped me with breaking down my dragon skeleton into pieces and knowing where the joints should be.

A video made by SEKAI Sub from the point of view of a person walking around a CGI Dragon Zoo was particularly useful. It had a vast number of dragons with different anatomies which helped

me to visualise how I could adapt the Quetzalcoatl body to include 4 legs as well as the wings. This video contained dragons of assorted sizes walking, sitting, flying and lying down which allowed me to analyse different movements. If I was making a puppet based on a real animal, I would avoid unofficial CGI replications however, for making a fantasy animal I have found the animated and CGI versions like Game of Thrones and How to Train Your Dragon have been useful.

As well as researching dragons I researched into dinosaur and reptile movements as I felt this would aid me create realistic movements. I looked into 4-legged reptiles like crocodile, lizards and giant tortoises but found the Komodo dragon to be the closest match to what I wanted to create. In a video by the Australian Reptile Park (Australian Reptile Park, 2021), they take a Komodo dragon for a walk and explain how he walks, climbs and his speed and other key parts of his anatomy. Analysing this video, I was able to see the way his joints move so that I could adapt my designs to match.

I then started my design process and took the advice of Puppet Designer/Director Toby Olié. Olié states that he does extensive research into the animal he is creating and then draws multiple sketches of ideas. Olié says that the sketches are not exact designs because he is “a firm believer that you need to try ideas out in 3d with puppets” (Olié, 2022)

I started by drawing simple sketches and making images in Photoshop demonstrate my ideas/designs. I then made a 1:25 scale model of my design which helped me work out the positions of the joints I would need. It also helped me to work out the number of joints and additional materials I would need for areas like the skin.

After making a scale model the next step was to make a full-sized prototype of my design to test if it would work before ordering materials and risking waste from incorrect purchases. I used recycled cardboard purchased from a local scrap store to make my prototype and crafted joints using recycled cardboard tubes and string. The inspiration for the prototype joints came from a video by Philip Stephens (PhilipStephens007, 2014) where he demonstrates how you keep pieces of PVC attached together using elastic so that when collapse your frame each piece is still connected. I experimented with this design in the prototype however I found that with my puppet skeleton that needs joints at multiple angles it was not strong enough to support the frame.

The finished prototype allowed me to accurately work out the number of pipes, joints and plastazote I would need for construction. My next step was to source my materials, and I tried to do this in the most sustainable way possible. I combined what online orders I could with my collaboration group so that we were sharing delivery and we made a joint trip to get our physical materials to reduce our carbon footprint again. Unfortunately, with specialized materials like plastazote I had to place my own orders, but this is unavoidable when you are working on a project independently.

As the prototype joints were not successful, I looked into alternative methods. Rachel De Barros (Rachel De Barros, 2023) created a video that shows different but simple ways of making hinges/joints for PVC pipes. She demonstrates how to make joints like a ‘Ball-and-Socket Joint’ (ideal for a shoulder) made from a ball of PVC. Whilst this video has interesting techniques, I need my joints to be reusable and adaptable, so I need a design that is stronger and easy to detach/reattach.

I researched 3d printing specific joints for my puppet. 3d printing is a construction method which is debated in terms of sustainability and environmental impact. Some people including Shannon from 3D PrintSmith (3D PrintSmith, 2025) claim that it reduces material waste as you only print what you need rather than wasting materials and energy in mass production. However, others including Perch Energy (Perch Energy, 2024) claim that 3d printing requires a lot of energy to print detailed objects and that you also need to account for the extra energy used for the warming and cooling periods for the printer. Another area for debate is that fact that 3d printers still use plastic which is a material which causes lasting damage to the environment as it is not biodegradable. I spoke with Venables and he advised me to research plant-based filament. I discovered a type of filament called PLA is used which is made from biodegradable materials including starch however these need to be broken down in a specific industrial composting facility which uses a lot of energy.

I used websites including Printables (Printables, n.d.) and Thingiverse (Thingiverse.com, n.d.) to look for 3d joint options and used a software called Prusaslicer to adapt the designs to fit my skeleton.

From my research I have analysed that 3d printing seems to have as many negatives as positive impacts for the environment. As my project is focusing on the reusability of a design rather than individual materials, I believe that this is the best choice for me in terms of longevity, flexibility and reusability. The 3d joints that I have found/adapted for my design will allow the puppet to come apart easily which will make set ups quicker therefore saving money. The puppet will be easy to break up into small sections which will reduce storage and transport needed which is one of the main goals of my independent project. The 3d joints are also very strong which means they will last a long time and shouldn't need to be replaced therefore reducing material waste that comes from using poor quality materials. I was able to use a 3D printer at the UWTSO Swansea campus and arranged for a member of staff who regularly travels between the Carmarthen and Swansea site to collect the joints for me which meant I wasn't using any extra energy on transport.

Using the scale model I had made I cut to size and then numbered each piece of the PVC pipe to aid me when it came to assembling. Numbering each piece is a skill I learnt in our first-year construction lessons and it something I find extremely useful for planning and tracking what you have done which helps to avoid waste.

I began construction but unfortunately had a problem with my material order. I was sent pipes that were bigger than I had ordered which meant the joints I had 3d printed did not fit. I had to decide whether it was worth it in terms of sustainability and budget to reorder the pipes or to try and adapt my design to work. Ultimately, I decided to adapt my design as to replace the pipes would waste a lot of material and would delay the build of my project. To adapt the design, I used wooden disks that fit the new diameter of the pipes and attached the 3d joints to these instead. This worked well and actually made the design stronger. With the adjustments made to the joints I was able to start building my skeleton. I laid out each piece that I had previously labelled and began to assemble the skeleton. When it came to adding the joints, I found that I needed to go back to my research continuously to make sure I was adding them in the way that would allow the dragon to achieve the realistic movement I had designed.

The finished skeleton is now complete and when fully assembled is approximately 4 meters long. With the joints I 3d printed it can be fully taken apart, and the largest piece is 1 meter long meaning it should reduce the amount of storage needed by at least 50%. All of the legs have the

possibility to be half their size, and the body can divide into up to 4 pieces meaning you can make a much smaller animal like a dog. The main joints used are ball joints with a 360-degree rotation meaning you can detach/reattach them and they can still move in any direction. This allows you the flexibility to create animals whose joints work the opposite way. The fact that the skeleton comes apart means that if one part breaks you can just repair that therefore saving materials.

Unfortunately, due to the problems with the materials and the delay this caused me it meant that my puppet was not ready in time for the film with my collaboration group. As I had made a commitment to the group to I did not want to break to produce and operate a puppet for the film I adapted a previous puppet I had made. This puppet was a dog which was originally made for theatre, it was in a good condition however required some adjustments to make it ready for a film. Fortunately, I had already researched puppets designed for tv and film, so I knew that I needed to patch up any visible areas and make sure that I added extra fur to cover areas that aren't normally seen from a theatre audience like the mouth mechanism. We had already allowed time for plenty of rehearsal with the puppet so during filming I was able to observe the puppet and adjust the way I was operating it as needed. The dog fit much better into the space as it was smaller and this allowed a more intimate connection between the performer and the puppet.

Conclusion

Overall, I believe that the skeleton is successful in saving storage space and as it is strong enough to be used repeatedly which will decrease the number of materials needed. There are some definite areas of improvement I would make before I share this design professionally.

The delay in materials meant I did not have the time to make the panels for my puppet which were another adjustable element. However, I was able to design how they will be made and how they will connect and detach from the skeleton.

Firstly, seeing the size of the finished skeleton, I believe I need to change how it will be operated. I was originally going to attach handles and have 4 puppeteers operate it from the outside however I believe that to achieve the realistic movement I will need to have someone inside the puppet as well. This means attaching a type of backpack support similar to the ones used in War Horse and Life of Pi. Unfortunately, due to time restrictions I have not been able to test this yet however I will be continuing with this design in the future.

For the final skeleton I used 2 types of joints meaning that most of the skeleton can be detached and attached to any other of the same joint however I would change this in the future so that all the joints are the same which allows for more combinations to create different designs.

I feel now that I have a much deeper understanding of sustainability and sustainable materials and in the future I would like to develop these further. I have learnt that working sustainably can be overwhelming especially on a tight timeline and budget however I found this quote inspirational "For individuals - sustainability doesn't have to be perfect straight away - it's easy to get stuck if you think like this. Make a start, do it imperfectly and learn for next time. It's also very difficult to get away from the mentality and convenience of buying new all the time, but make a start with one item on the next project, and increase to two on the next one..." (O'Connor Lowe, 2025)

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Please see Appendices below

Spread sheet documenting the companies I contacted

Name of Company	Website	Email Address	Contacted	Response	Replied back	Usable information
Wales Millennium Centre	https://www.wmc.org.uk/en	Sustainability@wmc.org.uk	Yes	Yes	Yes	No
Chapter	https://www.chapter.org/	enquiry@chapter.org	Not Relevant - For Hire			
Theatrau Sir Gar	https://www.theatrausirgar.co.uk/	theatres@carmarthenshire.gov.uk	Yes			
Canaolfan a Theatr Soar	https://www.theatrsoar.cymru/en/index.html	cathyb@merthyrtdful.org	Yes			
Capitol Theatre	N/A	N/A	Not Relevant - Now Historical			
Congress Theatre	https://congresstheatre.co.uk/	info@congresstheatre.net	Yes			
Aberystwyth Arts Centre	https://aberystwythartscentre.co.uk/	atrstaff@aber.ac.uk	Yes			
Mwldan	https://www.mwldan.co.uk/		Not Relevant - For Hire			
Savoy Theatre	https://monmouth-savoy.co.uk/	info@monmouth-savoy.co.uk	Yes			
Grand Pavilion	https://awenboxoffice.com/venues/grand-pavilion-porthcawl/		Closed for Redevelopment			
Theatr Cymru	https://theatr.cymru/en/	helo@theatr.cymru	Yes			
Venue Cymru	https://www.venuecymru.co.uk/	info@venuecymru.co.uk	Yes	Yes	Yes	No
Venue Cymru	https://www.venuecymru.co.uk/	theatr.colwyn@conwy.gov.uk	Yes			
The Sherman	https://www.shermantheatre.co.uk/	box_office@shermantheatre.co.uk	Yes			
Cross Hands	https://crosshandshallandcinema.co.uk/		Not Relevant - For Hire			
Swansea Grand	https://www.swanseagrand.co.uk/	boxoffice@swansea.gov.uk	Yes			
Swansea Grand	https://www.swanseagrand.co.uk/	Swansea_GrandFrontOfHouse@swansea.gov.uk	Yes			
Pontardawe Arts Centre	https://pontardaweartscentre.com/	pontardawe.boxoffice@npt.gov.uk	Yes			
Dolman Theatre	https://www.dolmantheatre.co.uk/Default.aspx	manager@dolmantheatre.co.uk	Yes			
Dylan Thomas Centre	http://www.dylanthomas.com/		Not Relevant			
New Theatre	https://trafalgartickets.com/new-theatre-cardiff/en-GB	boxoffice@newtheatreCardiff.co.uk	Yes			
Gwent Theatre	https://www.theatre-wales.co.uk/companies/company_details.asp?ID=1	jenny@gwenttheatre.org.uk	Email bounced back			
Melville Centre	https://melvillecentre.org.uk/	events@melvillecentre.org.uk	Yes	Yes	Yes	Yes
Memo Arts Centre	https://memoartscentre.co.uk/	enquiries@memoartscentre.co.uk	Yes	Yes	Yes	No
WNO	https://wno.org.uk/	hello@wno.org.uk	Yes			
Theatre Felinfach	https://theatrefelinfach.cymru/eng/home.html	theatrefelinfach@ceredigion.gov.uk	Yes			
The Torch	https://www.torchtheatre.co.uk/	boxoffice@torchtheatre.co.uk	Yes			
National Theatre	https://www.nationaltheatre.org.uk/home/	boxoffice@nationaltheatre.org.uk	Yes			
Volcano	https://volcanotheatre.wales/	mail@volcanotheatre.co.uk	Yes			
Dylan Thomas Theatre	https://www.dylanthomastheatre.org.uk/contact/		Online Submission			
Theatre Trust	https://www.theatrustrust.org.uk/	info@theatrustrust.org.uk	Yes			
Arts Council Wales	https://arts.wales/		Online Submission	Yes	Yes	No
Theatr Lolo	https://www.theatriolo.com/	hello@theatriolo.com	Yes			
Creu Cymru	https://creucymru.com/	post@creucymru.com	Yes			
Theatre Na Nog	https://theatr-nanog.co.uk/	drama@theatr-nanog.co.uk	Yes			

Name of Company	Website	Email Address	Contacted	Response	Replied back	Usable information
Small World Theatre	https://www.smallworld.org.uk/	info@smallworld.org.uk	Yes	Yes	Yes	Yes
Puppet Play	https://www.puppetplay.co.uk/	info@puppetplay.co.uk	Yes	Yes	Yes	Yes
Furri Fingers			Yes			
Sea Legs	https://www.sealegspuppets.com/	Online Form	Yes	Yes	Yes	Yes
Puppet Soup	https://www.puppetsoup.com/	info@puppetsoup.com	Yes			
Stiches and Glue	https://stitchesandglue.com/	mail@stitchesandglue.com	Yes			
Juggle Puppet	https://www.jugglepuppet.com/home	Info@jugglepuppet.com	Yes	Yes	Yes	Yes
Talk to the Hand	https://talktothehandpuppets.com/	hello@talktothehandpuppets.com	Yes	Yes	Yes	Yes
Smoking Apples	https://smokingapplestheatre.com/	mail@smokingapplestheatre.com	Yes	Yes	Yes	Yes
Hijinx	https://www.hijinx.org.uk/	Online Form	Yes	Yes	Yes	No
Picture to Puppet	https://picturetopuppet.co.uk/	team@picturetopuppet.co.uk	Yes			
Hand Spring	https://www.handspringpuppet.com/	Online Form	Yes			
Black Laboratory	https://blacklaboratory.co.uk/	Online Form	Yes			
EMILY MORUS-JONES	https://www.emilymorusjones.com/	emorusjones23@gmail.com	Yes			
Steve Allen		FB messaged	Yes			
Ruby Gibben	https://www.rubygibbenspuppetry.co.uk/	rubygibbenspuppetry@outlook.com	Yes			
Nico Conde	https://www.nicolasconde.info/	nicobconde@gmail.com	Yes			
Saskia Tomlinson	https://saskiatomlinson.co.uk/	saskiatomlinson@hotmail.com	Yes			
Katy Hoste	https://khostedesigns.co.uk/	Katy@khostedesigns.co.uk	Yes			
Nico Venable	https://www.nicovenablespuppetry.com/	nvenpuppetry@gmail.com	Yes	Yes	Yes	Yes
Robin	https://artisttherobin.portfolio.site/	r.belcher0192@gmail.com	Yes	Yes	Yes	Yes

Email from Puppet Play

Hi Sam,

An interesting dissertation theme!

I think that artists within the creative industries are becoming far more aware of the need to reduce material waste and reuse and recycle as much as possible.

This also decreases the costs involved in production of course. I think the lack of funding for smaller companies and individuals striving to make a living as a creative artist and the need to make as little as possible go as far as possible is actually of tremendous benefit! I have worked with large television companies and seen how much waste can be involved when there is a lot of money to spend on one production. Puppets and sets are built and then thrown away post production. Smaller companies and individuals such as myself, can re-use puppets again and again. I have puppets that I made twenty years ago still being touched up and reused again for new shows. I also have actually saved television puppets heading for the skip post production (which I find unbearable) and now reuse them in shows.

Throughout my career in puppetry I have naturally been drawn to the use of materials that are available cheaply and can be found in recycling centres and charity shops. The joy of puppetry for me has always involved the creation of puppets with simple materials - the emergence of a character for a new show, from simply shaping newspaper and wood glue and adding the finishing touches and paint, is at the heart of my work. I enjoy building up a puppet with papier mache rather than carving one out of wood. I have worked with puppet makers who are experts in wood carving and I enjoy using their creations in some of my shows.

I feel that puppets need to be created out of natural materials. I once went to a presentation in which we were shown a puppet being created using a 3D printer. I wasn't impressed with the plastic filaments being used and the puppet lacked personality and creative input from the artist. I think that a simpler puppet created from a bunch of old rags would have unleashed more effective story telling and would have delighted me and an audience far more.

A large part of my work involves facilitating puppet making workshops in schools, again using recycled materials. I especially enjoy offering shadow puppet workshops where the students create puppets out of cardboard and paper straws.

I also present shows which include themes of recycling and reusing. The current show, Heulwen's Hat, is all about a hat that is repurposed by different animals. It becomes a bed for a hedgehog, a nest for a bird, a boat for a scout mouse (to earn their sailing badge) and a horse feed bag. It even serves as a parachute for a cat stuck up in a tree. Educational puppet shows are a perfect way to promote the necessity to reduce, reuse and recycle.

I tend to use a lot of animal characters in my shows - after all, the impact of our unnecessary waste is felt by the natural environment and the creatures that inhabit it and children do tend to feel more empathy towards creatures in stories than people I think.

I hope this has been of some use to you. Thank you for looking at my website and complimenting my work. I 'm glad that you using your dissertation to address such an important theme within the puppet industry. Good luck in your final year!

Best wishes

Helyn Latimer

Email from talktothehandpuppets.com

Hi Samantha,

Thank you for your email.

How interesting that you are exploring this in your academic work.

We feel that the construction of puppets is already a very sustainable practice, in that they use up relatively small amounts of materials and resources to create a high quality item that then gets a lot of use.

We recommend talking to some artists and companies who might know more about this - Smoking Apples and Nico Conde would be good ones.

The components we already re-use from puppet to puppet include rods (which are removable), eyes, shutter release cables (which we use to control mechanisms), puppet stands, puppet boxes, glove linings, green and blue screen suits. Recently, we have started using waste foam scraps as a stuffing material.

In terms of sustainability of materials, there is a tension between using vegan materials such as fake fur which come from the petrochemical industry and biodegradable materials which might come from an animal such as feathers or real fur.

The foam which we use for puppets is made from natural latex which biodegrades after between 10 and 20 years. We also use natural latex although some people have an allergy to this.

Hope this is helpful information and we'd be interested to read your final dissertation in due course to see what discoveries you have made along the way.

Warm wishes,

Iestyn

Email from Juggle Puppet

Good morning Samantha,

Thank you very much for getting in touch — your project sounds thoughtful and very relevant.

To give a bit of honest context, I'm primarily a **Punch & Judy performer**, and while I do run workshops from time to time, my work is much more rooted in live performance than large-scale workshop delivery. That said, sustainability naturally comes into puppetry through longevity, reuse, and simplicity — especially in traditional forms like Punch & Judy, where many puppets are expected to last for years or even decades.

One of the core ideas I often share, particularly with schools, is that **anything can be a puppet**. The simplest and best example of this is a **sock puppet**. When I do suggest puppet-making activities, I usually encourage children to bring in their **oldest or favourite sock that's no longer usable**. Giving it a new life as a character is a really powerful and accessible way to introduce both puppetry and sustainability at the same time.

This approach reduces waste, removes the need for new materials, and shifts the focus away from “making something perfect” toward imagination, character, and performance. It also helps children understand that puppetry doesn't require specialist materials or expensive resources — storytelling and play come first.

From a traditional puppetry perspective, especially with Punch & Judy, sustainability also comes from **repair rather than replacement**. Puppets are constantly maintained, re-dressed, re-voiced, and adapted over time. Characters evolve without needing to be rebuilt from scratch, which naturally limits material waste.

I think your idea of reusable components aligns very well with this mindset — not just physically reusable parts, but reusable *characters, forms*, and *ideas*. Designing puppets that invite adaptation rather than disposal feels like a strong direction to explore.

I hope that's useful, and I'd be happy to answer any follow-up questions as your dissertation develops.

Best of luck with the project — it sounds like a meaningful piece of work.

Kind regards,

Cai White

JugglePuppet

Email from Sea Legs Puppet Company

Hi Sam

I'm not sure how qualified I am to answer your questions. All I can really do is tell you my process for puppet making. I should also say that although I do make puppets from time to time, I am first and foremost a puppeteer / performer so it is just a small part of what I do and is limited to the times we have a show in production.

Having said this, I always do try to make my art practice as sustainable as possible. With regards to this, the main material I use for sculpting heads, hands, even the occasional bits of theatre set is paper-mache. I use two different methods: what I call layering; using strips of paper and PVA glue to build up paper mache layers. The other method I use is papier mache pulp. I've used various recipes for this over the years but the one I've got the best results with for the past three productions is this

one: <https://www.youtube.com/watch?v=onmliQVQxaU>

For limbs, depending on the type of puppet, I use string, bungee, rope, plastic packing straps and bits of dowel hinged with leather or calico.

Over the years I have become less inclined to just collect materials because they look interesting and might come in useful someday etc. Rather I have a collection of basic materials: wire, dowel, beads, buttons, bits of wood, metal, string, tubing, a selection of papers, card, tissue, felts, fur, wool for hair etc. I work on the premise that if I require a specific and maybe quirky item, that I will source it when needed and that way I keep space used for storage to a minimum.

For fabrics and sewing bits and bobs: again I've got a small selection of fabrics that tend to get used most frequently - white calico, black cotton plus various colours and patterns etc. But for anything specific I use a local textile resource centre called Rose Tinted Rags.

I have all over the years used the odd scrap store to stock up on items.

I hope that this information is of some use to you. Please feel free to contact me again if you think I might be able to help.

I wish you all the very best with your dissertation.

Kind regards

Rob

I use pvc tubing sometimes but also use steel or aluminium. I've also used copper tubing as used in plumbing as well as cardboard of course. It really depends on what you're using it for. Sometimes the less sustainable products are unfortunately the most effective option - this is especially true when it comes to adhesives, some of which are probably not very good at all for the planet. Sometimes finding effective sustainable alternatives is a real challenge.

Email from Flints

Hi Sam,

That sounds like a really interesting project, sounds like you are long the right lines.

PVC pipes sound like a good idea, the PVC pipes have easily available connectors too so good for modular design. As it's easily available maybe you could source some second-hand pipes? Natural/renewable materials to substitute this would be bamboo as it's so lightweight and strong.

There are more sustainable versions of Plastazote out there that have varying levels of recycled or bio based plastic. We have tried to source this in volume but not something that has been viable for us. You could try contacting a few places online and tell them about your project, one of them might want to send you samples to try out.

Something that we have been looking into recently is rubberised coir (coconut husk) and rubberised horse hair. This is more like upholstery wadding and a traditional material but I have heard it being used in prop making. It's essentially just natural latex rubber mixed with coir (coconut husk fibres) or horse hair. Would have to use it in a different way but might have some application in puppetry.

We do have some more sustainable adhesives: [Sustainable Glues](#). But none of these have the ease of use of quick drying contact adhesive. I know that there are more sustainable options for glue sticks however. We don't do them (yet) but there are glue sticks out there with recycled plastic content/bio based that you could look into.

In terms of textures some of these might be of use: [Eco Textures and Materials](#). Would recommend looking at the Dekozel for fine texture but possibly looking at something paper based for the scales themselves.

Worth considering what you want with sustainable options also, as there are many factors to consider. Reusing/repurposing is often the best option, using all natural materials might not be the best option in terms of durability if parts are going to be used over and over again.

Email from Spontaneous Productions

Hi Samantha

Your email has been passed onto me from the Melville Theatre in Abergavenny.

I am an independent theatre production company and am happy to chat with you for your dissertation. I think it's a great subject to focus on, and I am sure that as with so many things in the world at the moment, there must be a huge amount of waste.

You will find that most theatres are dealing with independent companies coming in to the theatre for a couple of days, so reaching out to independent companies may give you more data.

From my point of view, I try to be very aware of the waste, and the plastics that I use. I have a container where my old sets and props are stored and I try as much as I can to reuse and 'cannibalise' my old pieces, from repainting set, repurposing props or taking large pieces apart to give a new look. But even though I do this, there will always be something new needed for each unique production, but I never throw anything away - unless it is totally useless (but I always recycle rubbish) I know from working in the industry for over 40 years that this is not always the case, and sometimes it is cheaper just to throw stuff away, or it takes too much effort.

I am also very happy to loan or support others, but this very rarely happens.

Aztec inspired Mood boards

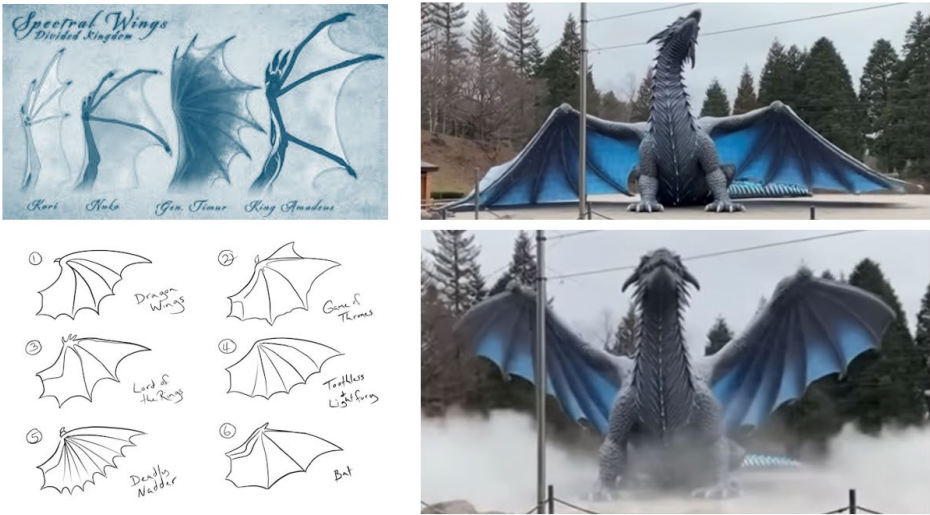
None of the pictures in any of the following Mood boards were taken by or belong to me and were used as design inspiration only.



Leg movement Mood board



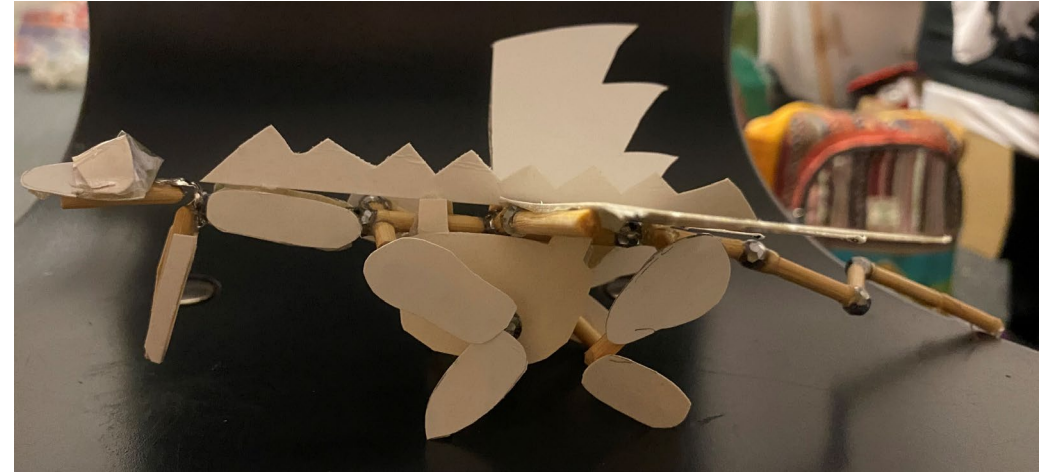
Wing movement Mood board



Construction

The following images are a record of my construction development and implementation

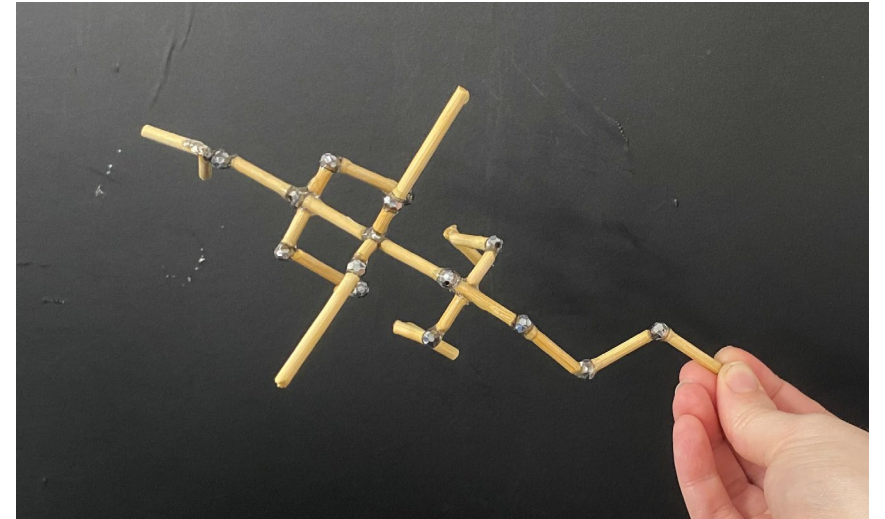
1:25 Scale Model of Skeleton Frame with the adjustable panels added



1:25 Scale Model of Skeleton Frame



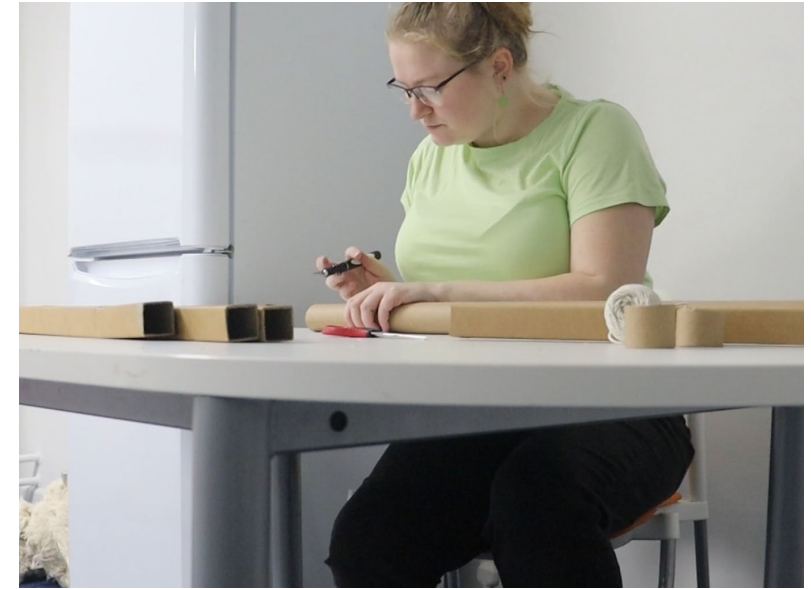
1:25 Scale Model of Skeleton Frame



Making Cardboard Prototype Joints



Making Cardboard Prototype Joints



Making Cardboard Prototype Joints



Making Cardboard Prototype Joints



Making Cardboard Prototype Joints



Attaching Cardboard Prototype Joints



Attaching Cardboard Prototype Joints



Attaching Cardboard Prototype Joints



Making Cardboard Prototype Panels



Making Cardboard Prototype Panels



Testing Head Mechanism in Cardboard Prototype



Testing Head Mechanism in Cardboard Prototype



Cardboard Prototype Skeleton Frame



Cardboard Prototype Skeleton Frame with added adjustable panels and tail idea



Final Head Construction



Cutting Pipes to Correct Length



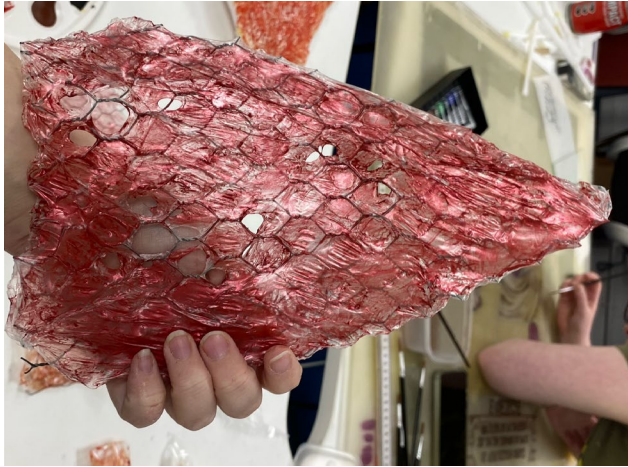
Labelling Pipes to aid Assembly



Full Skeleton laid out ready to assemble



Experimenting With Plastic Wallets and Chicken Wire for Wing Texture



Experimenting With Plastic Wallets and Chicken Wire for Wing Texture



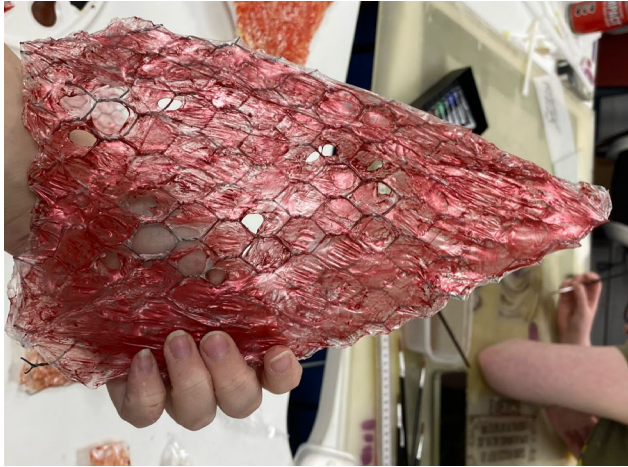
Experimenting With Plastic wallets for Skin Texture



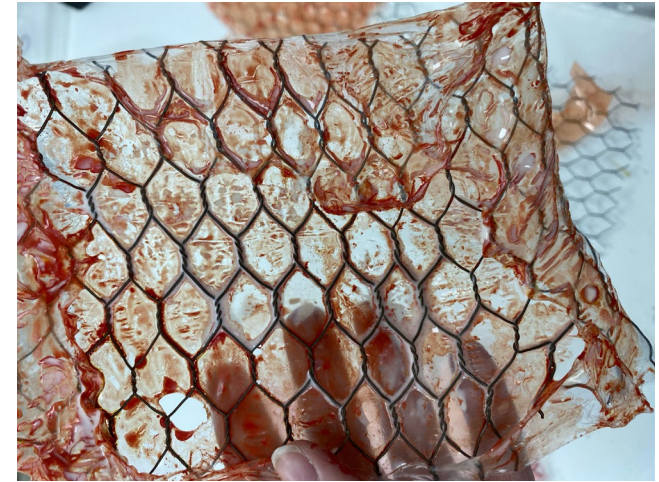
Experimenting with Different Textures on Plastazote



Experimenting With Plastic Wallets and Chicken Wire for Wing Texture



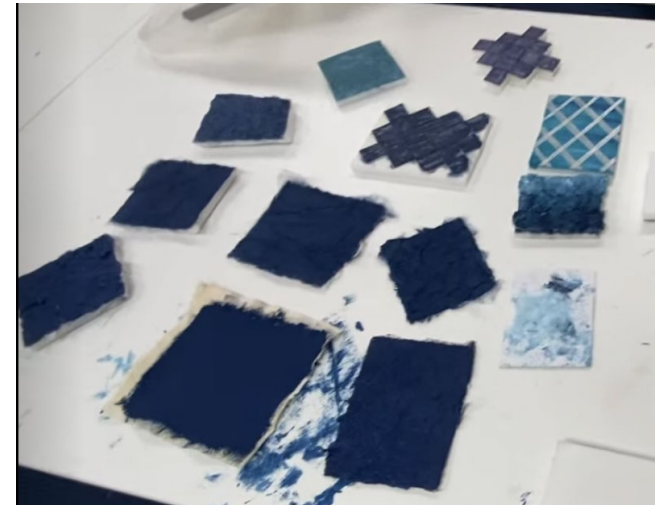
Experimenting With Plastic Wallets and Chicken Wire for Wing Texture



Experimenting With Plastic wallets for Skin Texture



Experimenting with Different Textures on Plastazote



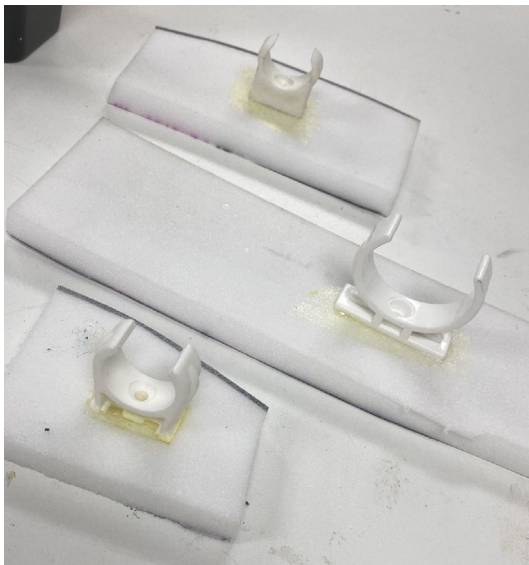
Testing Clips for Removable Panels



Testing Clips for Removable Panels



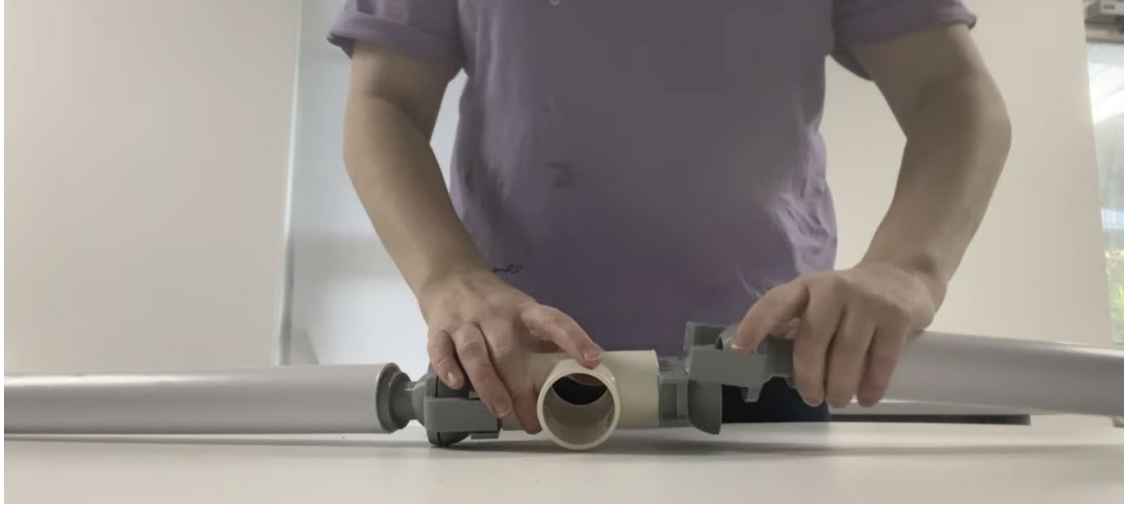
Testing Clips for Removable Panels



Getting Wooden Disks Ready to Fix 3D Joints



Building Wing Mechanism



Building Wing Mechanism



Testing Wing Mechanism



Building Wing Mechanism



Building Leg Mechanism



Testing Leg Mechanism



Bolts instead of Glue for Reusability/Adaptability



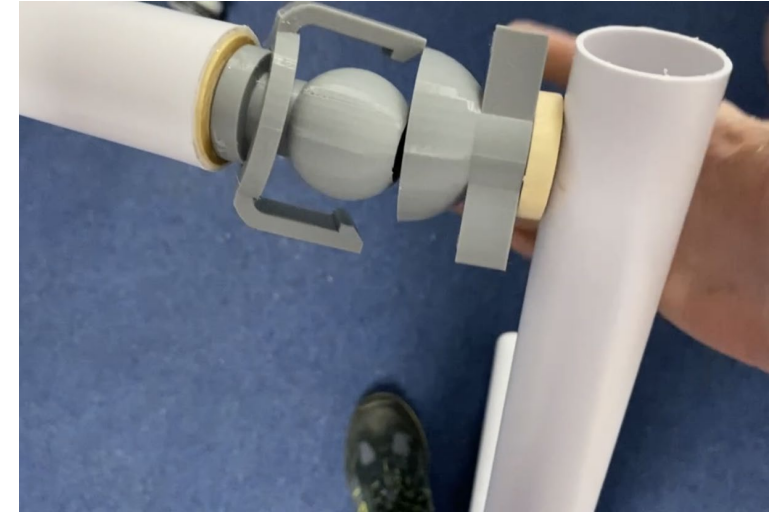
Drilling holes for Bolts for Reusability/Adaptability



Assembling Joints on final skeleton



Assembling Joints on final skeleton



Final Skeleton – Front half



Final Skeleton – Back half

