

Creating an Educational Cartoon About Tornado Safety

by

John McKeon

A thesis presented to the Honors College of Middle Tennessee State  
University in partial fulfillment of the requirements for graduation  
from the University Honors College.

Spring 2020

Creating an Educational Cartoon About Tornado Safety

by John McKeon

APPROVED:

---

Richard Lewis, Assistant Professor

Animation

---

Billy Pittard, Chair

Electronic Media Communication

---

Dr. John R. Vile, Dean

Honors College

## **ABSTRACT**

History and scientific research performed by preeminent entertainment analysts shows that an audio-visual production regarding the subject of twister safety will undoubtedly save the American population from cyclone related deaths and injuries just as it saved many from educational neglect and poverty in the mid-twentieth century. Thus, I intend to use my range of skills in design and computer animation to construct a solid concept for an animated educational short film using original anthropomorphic animal characters, creative scenescapes, and a fresh, fun storyline aimed at my youthful audience. Detailing each creational step, I will demonstrate what a successful educational children's cartoon for promoting scientific education and natural disaster awareness would look like.

## TABLE OF CONTENTS

LIST OF FIGURES .....	v
INTRODUCTION.....	1
THESIS STATEMENT .....	3
EDUCATING AMERICA ABOUT TORNADOES .....	4
CREATING EDUCATIONAL CONTENT FOR AMERICAN CHILDREN .....	10
TORNADO SAFETY COMES TO ANIMATED LIFE.....	13
DISTRIBUTING A TORNADO SAFETY FILM TO CHILDREN.....	16
APPROACHES/METHODS.....	21
WORK PLAN .....	24
CHARACTERS DESIGN: WHAT ARE THE ELEMENTS?.....	26
EDUCATIONAL CARTOON SCREENWRITING: WHAT ARE THE PRINCIPLES?.....	41
EDUCATIONAL CARTOON SCREENWRITING: PRINCIPLES IN PRACTICE .....	51
THE REVISIONS FLOOD IN .....	97
SUPPORTING THE SUPPORTING CAST .....	103
AUDIO: LOUD AND CLEAR .....	109
CHARACTER DESIGN: A CLEARER VISION .....	116
PRODUCTION RAMPS UP.....	121
VOICE ACTING.....	129
MODELING.....	133
AUDIO ENGINEERING .....	146
RIGGING: CHARACTERS IN MOTION .....	148
TIME CATCHES UP.....	169
CONCLUSIONS .....	174
WORKS CITED.....	176

## LIST OF FIGURES

Fig. 1 “Tornado Fortissimo” concept poster.....	32
Fig. 2. Initial concept sketches for "Tornado Fortissimo" protagonist, Felicity.....	34
Fig. 3. Felicity’s design as showcased through a four-perspective turnaround.....	34
Fig. 4. Andrew’s initial concept sketches.....	36
Fig. 5. Andrew’s final design as showcased in a turnaround.....	36
Fig. 6. Initial concept sketches created for villain, Terrence Mesocyclone.....	38
Fig. 7. Terrence shown in both villainous tornado design and baby cloud form.....	38
Fig. 8. Turnaround showing front and back views of Terrence Mesocyclone.....	39
Fig. 9. Character sheet for Terrence Mesocyclone.....	39
Fig. 10. The first “Tornado Fortissimo” screenplay.....	54
Fig. 11. Fourth tornado safety cartoon screenplay draft “Tornado Fortissimo: A Whirlwind of Adventure.”.....	63
Fig. 12. “Tornado Fortissimo” trailer screenplay, version one.....	105
Fig. 13. “Tornado Fortissimo” trailer screenplay, version two.....	112
Fig. 14. Felicity’s final, revised character design shown in full color.....	118
Fig. 15. Felicity’s final revised character design shown in silhouette.....	118
Fig. 16. Felicity’s final revised character design shown with linework only.....	120
Fig. 17. Andrew’s final revised design as shown in full color.....	122
Fig. 18. Andrew’s final revised design as shown in silhouette.....	122
Fig. 19. Steve’s final revised design as shown in full color.....	124
Fig. 20. Steve’s final revised design as shown in silhouette.....	124
Fig. 21. Esther’s final revised design as shown in full color.....	127
Fig. 22. Esther’s final revised design as shown in silhouette.....	127
Fig. 23. Esther’s final revised design as shown with linework only.....	128
Fig. 24. Screenshot showing Felicity’s rough head model as created in Sculpttris.....	135
Fig. 25. Screenshot of Felicity’s completed head model.....	137
Fig. 26. Screenshot of Steve’s completed head model.....	137
Fig. 27. Screenshot of Steve’s completed head model.....	138
Fig. 28. Screenshot of Esther’s completed head model.....	138
Fig. 29. Felicity, full body CG model.....	140
Fig. 30. Andrew, full body CG model.....	140
Fig. 31. Steve, full body CG model.....	141
Fig. 32. Esther, full body CG model.....	141
Fig. 33. Felicity, final textured and rendered images.....	144
Fig. 34. Andrew, final textured and rendered images.....	144
Fig. 35. Steve, final textured and rendered images.....	145
Fig. 36. Esther, final textured and rendered images.....	145

Fig. 37. Felicity, initial rigging attempt .....	149
Fig. 38. Felicity, early facial deformation tests .....	149
Fig. 39 Joint placement for Andrew’s plugin-assisted rigging process. ....	151
Fig. 40. Control systems created for Andrew’s body movement .....	153
Fig. 41. Base facial rig created for Felicity.....	155
Fig. 42. Specialized brow plane created for Felicity .....	157
Fig. 43. Felicity’s default eye rigging with extreme rotation issues.....	159
Fig. 44. Felicity’s eye rigging with manual corrections applied.....	159
Fig. 45. Felicity’s specialized skirt rig.....	161
Fig. 46. Esther’s specialized skirt rig.....	161
Fig. 47. Joint chain allowing for Esther’s tail movement. ....	162
Fig. 48. Extra rigging for Steve’s ears .....	162
Fig. 49. Marvin and Vicky initial concepts.....	166
Fig. 50 Marvin and Vicky shown together in silhouette.....	166
Fig. 51. Marvin’s final design shown in full color .....	167
Fig. 52. Marvin’s final design shown with linework only .....	167
Fig. 53. Vicky’s final design shown in full color .....	168
Fig. 54. Vicky’s final design shown with linework only.....	168
Fig. 55. Piano prop for “Tornado Fortissimo” .....	170
Fig. 56. Cabinet prop for “Tornado Fortissimo”.....	170
Fig. 57. Chalkboard prop for “Tornado Fortissimo” .....	171
Fig. 58. Gong prop for “Tornado Fortissimo” .....	171
Fig. 59. “Swimming with Sharks,” illustration featuring my two-dimensional style.....	172
Fig. 60. “Tornado Over Water,” illustration featuring my two-dimensional style.....	172
Fig. 61. “How can you stay safe?” Illustration featuring my two-dimensional style .....	173

## INTRODUCTION

The widespread distribution of tornado activity requires an extraordinary amount of people to understand safety measures when dangerous weather conditions arise. Every U.S. state including Alaska and Hawaii has experienced a tornado within recorded history (The Great Courses). Although most of these cyclones occur in the middle of the continental United States, the impressive spread of affected areas makes the task of promoting safety through education difficult. According to the National Oceanic and Atmospheric Administration (NOAA), tornadoes often cause hundreds and sometimes thousands of American deaths every year (“Weather Fatalities”). The total fatality count ranks higher than cold weather resulting in frostbite or devastating hurricanes that plague coastal areas. Meanwhile, injury statistics accrued from raging twisters achieve even higher numbers of devastation and can leave tornado victims impaired for life (“Be a Force of Nature”). Despite the atrocious damages inflicted by tornadoes, some researchers such as Joseph Ripberger, research scientist at the Cooperative Institute for Mesoscale Meteorological Studies and deputy director for research at the Center for Risk and Crisis Management, argue that humans can combat the untamed power of mother nature. In a 2015 study, he and his meteorology team found that civil unpreparedness is the leading cause for personal harm regarding tornadoes (Ripberger, Joseph, et al 45). During their investigation, the group’s central goal was to see if the National Weather Service (NWS) could boost the accuracy or effectiveness of their tornado warning system by upgrading storm-tracking equipment. However, Ripberger and his associates found the need for

storm-tracking upgrades minimal. Survey tests given to citizens from throughout the United States showed NWS warnings maintained high levels of accuracy. The team determined that in most tornadic events, more dangers stemmed from citizens' ineffective methods for heeding tornado warnings or from ignoring NWS advice altogether. Among the four thousand survey participants, safety preparedness proved directly proportional to age. Wherein, younger participants were deemed as less knowledgeable and less capable of following tornado safety measures.

From this low response rate, Ripberger and future analysts can gather that misconceptions and an overall lack of knowledge about tornadoes puts the United States at a heightened risk to twister threats (53). Ripberger concludes by declaring that "education and social reform" stand as the only ways to significantly increase public responsiveness to tornado warnings in the United States (Ripberger et al 55). Facts taken together, this trend of benightedness will continue to endanger the lives of innocent Americans unless our country implements substantially improved education techniques for tornado safety.



## **THESIS STATEMENT**

To solve America's perplexing twister safety awareness needs, I propose the creation of an animated audio-visual resource for use in America's vast public school system. Thus, I am using my time as an honors thesis minor to craft concepts for an instructive animated short film to teach children how they can combat tornadic hazards. The principles and techniques I explore will serve as a proof of concept for a natural disaster aimed video. Through research and experimentation, I intend to investigate detailed aspects of cartoon creation and its effectiveness as an entertaining form of childhood education.

## EDUCATING AMERICA ABOUT TORNADOES

For more than half a century, videos have shown their value in the education sector. Doctor Clarence Carpenter was one of the first individuals to academically study the effectiveness of videos within the classroom. Spanning from 1955 to 1958, his three-year investigation proved that college professors could teach an entire semester's course work through television broadcasts (Carpenter et al "An Investigation (...) Part One 81-83 and Carpenter et al "An Investigation (...) Part Two 69-86"). Moreover, the statistic results of this extensive experimentation showed that student success rates remained constant regardless of whether instructors directly addressed students or provided counsel by means of black and white video feeds. More recently a 2018 journal study conducted by Doctor Bemis Rhyannon furthered video learning science by discovering positive information retention trends in students who used television as an education medium (Rhyannon 183). Examining shows such as the Colbert Report and the Daily Show, two political commentary television shows, Rhyannon discovers the power of semantic memories and episodic memories. Bemis explains that semantic memories are vivid pieces of learned information accrued by a viewer. For instance, the Colbert Report episode "Who's Attacking Me Now?" teaches its watchers about the harmfulness of social media within a modern political climate and how masses of people can take short electronic messages out of context (Comedy Central and Rhyannon 183). Moreover, "Who's Attacking Me Now?" also appeals to episodic memory through its predictable and comedic skit storyline. Episodic memories refer to how an individual attains a fact or concept. As its name suggests, episodic memories rely on an educational resource's narrative and comedic

enrichments (Rhyannon 183). These added pieces of production value entertain and thereby activate larger portions of the human mind. Thus, when educational material is presented in a way that clearly corresponds to a given narrative sequence, the brain forms connections to these surrounding memories.

The central concept of semantic and episodic memories can be illustrated by means of photography. In one example, the subject of a portrait takes up the entire frame of an image. The focused photographer shows only the subject's face. Furthermore, he or she omits clothing, backgrounds, and props from the image. Unsurprisingly, a viewer seeing this photo for the first time would learn nothing about the pictured individual. No matter how long one stared, a lack of specific information would make the individual boring and unmemorable. To improve information depth, the photographer could show the subject standing with his or her friends on a serene mountain. Each friend sports a sleeping bag that is rolled up above their large backpacks. The group's thick coats shield them from the brisk mountain breeze that blows their hair in a single direction. Such information would tell viewers that the subject is friendly, enjoys the outdoors, and needs to battle the elements to reach his or her goals of tackling a high summit on foot. Just describing these two scenarios with words, one can easily see that the second option commands more attention.

Even still images have their limitations though. Static photography requires viewers to draw their own conclusions about the moments in a narrative they cannot see. However, videos bridge more of this episodic gap by presenting stories in a more life-like fashion. By presenting many images to the brain each second, the brain is tricked into thinking a series of inanimate pictures function the same as real-life motion.

Beyond visual illusion, videos can also include vocal and musical elements that increase the educational capacities of videos. Science shows that sound plays a vital role in human life and development. According to Ori Lavi-Rotbain and Inbal Arnon, researchers at the Hebrew University of Jerusalem, human infants start out with acutely proficient sound processing and auditory recognition spaces in their brains (Lavi-Rotbain and Inbal Arnon 618). During childhood, however, the visual regions of the brain grow larger and eventually overtake sound processing by priority. Still, the early development of auditory senses demonstrates that visual cues and sound go hand and hand throughout life. Consequently, the separation of sight from hearing subtracts from a cognitive learning experience. Beneficially, the ability to mix both senses into a harmonious blend makes videos a compelling educational method.

To further draw a correlation between visual, episodic, and auditory educational studies, onlookers must take a deeper look at the human brain's methods for gathering, processing, and storing information. In their studies of visual and auditory perceptions, Bemis Rhyannon, Ori Lavi-Rotbain, and Inbal Arnon all describe the sensory process known broadly as "working memory" (Rhyannon 183 and Lavi-Rotbain and Inbal Arnon 618). Cynthia Brame of Vanderbilt University's Center for Teaching says that working memory is just a piece of a larger puzzle (Brame). In fact, working memory only accounts for a third of the brain's cognitive learning assembly line. To fully understand how a fact or concept becomes engrafted in the mind, one must explore each step in the process.

Memory-making begins the moment one of the body's sensory receptors detects an assigned stimulant. For vision, cone cells at the back of the eye transmit messages describing how red, green, or blue an object is ("Cones and Color Vision"). Meanwhile,

rod cells tell the brain how much light the subject is reflecting back into the eye (“Functional Specialization of the Rod and Cone Systems”). Similarly, the auditory system first senses sound through vibrations that pulse the smallest bone in the body (“The Discovery of Stapes”). One can compare this initial information-gathering phase to the first step of preparing produce for market. For instance, ACME Farms grows thousands of vine-ripened tomatoes each year. When these delicious fruits reach maturity, they are picked and shipped off in mass quantity before spoiling. In like manner, the body’s five senses of vision, sound, touch, taste, and smell package all the raw data they collect and send it straight to their corresponding parts of the brain.

Moving forward, each processing region prioritizes incoming data. ACME Farms prefers to produce their tomatoes organically. Unfortunately, their natural approach to fungi, weeds, and pest control is far less effective than synthetic preventatives. To ensure that only their best quality produce reaches the supermarket, a processing plant washes the tomatoes and disposes of any infected specimens. As with produce processing plants, working memory is only used to sort and filter information. Its purpose in the learning pathway is one of temporary storage for sensory data.

After the processing sections have flushed away input deemed unnecessary, the long-term memory springs into action. Long-term memory represents the final stage of memory collection. For sensory information, entering this Arcadian database promises indefinite storage alongside all the important memories created throughout the host individual’s life. From the perspective of the processed tomatoes, ACME Farms’ most perfect fruit has finally reached a supermarket where customers will decide what produce they want to buy. Unfortunately for ACME Farms, several other commercial food chains

also sell their tomatoes at this location. Thus, to compete and ensure the success of their brand, ACME Farms also markets peaches and apples to this store. This multi-product business strategy mathematically triples the odds that one of ACME's products will walk out with a paying customer. The connection between supermarkets and their customers functions similarly to the human brain's long-term memory bank. Although long-term memory facilitates near limitless storage capacity, the resident librarian brain cells budget information they deem of the highest priority and disregard the rest (Brame). Typically, sensory input that the working memory deemed highly positive or highly negative will make the top spots. In contrast, weak sensory inputs that failed to evoke strong positive or negative feelings will be deemed unimpactful and un-useful moving forward.

The same positive, negative, and middle-ground rule holds true when dealing with produce. If a customer takes a juicy red tomato home and enjoys the flavor, they will have a higher likelihood of buying more tomatoes in the future. In the case that a buyer purchases a rotten piece of produce, such a consumer may avoid buying tomatoes for a while or for life. However, a tomato perceived as neither good or bad, simply dull in flavor and color, will not likely affect the purchasing habits of the unfortunate buyer.

For my purposes in digital media education, the long-term memory's intricate data storage selection process thoroughly demonstrates why a high-quality video with appealing motion graphics and appropriate sound accompaniment will achieve better learning outcomes when compared with cheap-looking productions, or a video phrased and formatted in a way that its intended audience cannot understand its message. From start to end, a close examination of the human brain's three-step information collecting procedure shows why using a multi-sensory instructive method such as educational short films stands

as the most effective way to boost tornado safety awareness in the United States of America.

## CREATING EDUCATIONAL CONTENT FOR AMERICAN CHILDREN

To secure the best success rate for my youth-aimed video, I look to the early, experimental days of educational programming for kids. With the rise of television in the 1950s, some people thought of the small screen as a way to overcome social injustice concerning race and poverty (Cain 592). Throughout the 1950s and 1960s, the Ford Fund provided monetary means to produce a collection of instructional television programs and place television sets in low-income schools throughout the nation.

The technological innovation received a short-lived period of success. By the mid-1960s, the bland district-produced television shows that once interested students had become dated. The commercial sector started producing entertaining content such as “Rocky and Bullwinkle and Friends,” “Mister Magoo,” and “The Jetsons” (“The Bullwinkle Show,” “Mister Magoo” and “The Jetsons”). These shows included witty humor, colorful characters, exotic locations, and outrageous storylines that only fictional characters could perpetuate.

With fierce competition stepping up, educators decided it was time to push boundaries and create some enduring media content (Cain 592). Public and government concerns with television’s inadequacy were quelled by the 1966 Coleman Report (Cain 593). In this study by James Samuel Coleman, researchers showed that previous attempts at televised childhood education had failed because they relied on child audiences solely at school. Coleman argued that learning experiences needed to reach beyond the four walls of a classroom. Coleman’s findings reignited widespread interest in televised education as



people realized that past programming attempts failed because they were only distributed to schools. Many Americans now owned personal entertainment systems. Instead of bringing people to school, virtual classrooms would now become a part of the American home.

In 1969, an anticipated show called *Sesame Street* was released. Tensions rose high. If this eight-million-dollar preschool project turned into a bust, it could spell the end of educational video forever (594-595). The program's creator, Joan Ganz Cooney had pushed to create the highest quality production possible. She based presentation methodology used in the show on episodic elements of quick pacing and narrative structure found in *Batman*, advertising campaigns, and other popular entertainment at the time. Furthermore, the team hired famed puppeteer Jim Henson to bring some unforgettable marionette characters to the show.

Upon *Sesame Street's* debut, thousands of phone calls, thousands of letters, and nine pages in *TIME* magazine sounded words of praise. Many perceived *Sesame Street* as the spark igniting a revolution in children's education. ETS, a major academic testing service, found that show viewers could learn concepts of letter and number recognition, shape, color, and more in a faster and more effective way by watching *Sesame Street* than students who learned the same concepts in school without the added visual aid. Altogether, *Sesame Street* showed the world that fast and exciting audio-visual content can reach beyond socioeconomic backgrounds, racial barriers, and hectic livelihoods to achieve largely positive results. Following the inspiration of *Sesame Street*, I believe that mass-marketed videos still hold immense value in the education sector. Technology has moved forward by leaps and bounds since the 1960s and 1970s, but by copying elements of bright

color, pace, setting, and arching narrative structure my film will work to evoke the same intrigue that left viewers impressed by the first widely successful children's educational television franchise.

## **TORNADO SAFETY COMES TO ANIMATED LIFE**

Now that I have shown why an energetic, audio-visual short film will provide the most powerful means for solving tornado safety issues in America, I will lay out my plans for marketing my creation specifically to elementary school children. As established in the previous section, the brain's visual processing functions surpass the capacity of auditory channels. Therefore, to increase learning potential to its fullest, I will focus my attention on making impressive imagery before worrying about audio production values. To achieve a more enticing look for my film, I will use computer-animated characters to maintain child interest levels during the educational narrative. I will also show why releasing my animated film on a free digital streaming service represents the most efficient means of mass-distributing an audio-visual teaching tool.

Through the use of original animated characters, my tornado safety short film will hold the attention of its youthful audience and ensure the memory of my video's information remains with viewers for life. To see the effectiveness of animated characters on the masses of America's population, one needs to talk about another type of natural disaster (Ballard). As with other environmental phenomena, wildfires began ravaging the United States long before the arrival of European settlers. However, many humans share a burning obsession to tame the many powers of nature. So, in 1910, the American government started discussing the negative roles of humans in instituting wildfires by carelessness, but educational measures also showed how people could prevent major blazes ("About the Campaign"). Nevertheless, Americans remained unconcerned about forest

fires until 1942, when several Japanese war submarines surfaced near Santa Barbara California and fired shells at the mainland, setting an oil field on fire.

This militaristic strike on US soil quickly faded into obscurity after the Second World War as it was not strategically important to combatant efforts. Still, civilian residents of the Western United States feared that another blow from the Japanese could set Pacific Coast forests on fire. Thus, the temporary Cooperative Forest Fire Prevention (CFFP) program was started. The government operation received extra support that year from the release of Disney's "Bambi." Unintentionally, the blood-hungry hunters who killed Bambi's mother became an animated example of Japanese brutality and readiness to slaughter all American's if given the chance. Although stories were vastly skewed to fit the ideas of their time, children's cartoon characters quickly became a means of American war propaganda. During these intense times, Disney allowed the CFFP to use Bambi and his forest friends on a wildfire prevention poster. The poster showed the positive effects of employing stylized animal characters for forest fire education.

In 1944, officials extended their target demographic to include more school children. The introduction of a cartoon bear with jeans, a forest service hat, and a shovel signaled the start of a fire-prevention movement separate from that of previous ventures. From then onwards, Smokey served as the mascot for the United States Forest Service, the National Association of State Foresters, and the Ad Council. Today, many people can quote the character's catchphrase "Remember... Only YOU Can Prevent Forest Fires." Furthermore, Smokey's outreach has become so acclaimed through the years that he and his forest fire message now stand as the longest-running public service advertising campaign the United States has ever seen. Smokey has evolved into many adaptations

through the years. Regardless of his character stylization or medium of presentation, Smokey's goal to minimize wildfires, avert property damage, and save human lives remains unchanged. Altogether, the immense success of Smokey the Bear demonstrates why my tornado safety video will reap far more influence by including anthropomorphic animated characters rather than relying on live-action moderators.

## **DISTRIBUTING A TORNADO SAFETY FILM TO CHILDREN**

With the reasons for creating animated characters for my twister safety exposition established, I will now demonstrate why a digital streaming application, would stand as the most effective distribution medium for my educational resource. My distribution explanations will further illustrate why a cartoon represents an excellent form of public educational material in the Digital Age. From the silent silver screen to the present day, video artists have always pushed for more effective means of distribution media. When motion pictures first became popular in the early 1900s, the industry required expensive projection systems for visual output and often a live orchestra to fill theaters with a magical soundtrack (Mertz et al). While the phonograph and record players were marketed to the private sector before the latter part of the Nineteenth Century, the concept for home video took much longer to catch on. The technology necessary to record and display moving pictures required a much longer period of experimentation to become mainstream. Nevertheless, the infant concepts of personal video display devices began to materialize in the 1950s. Black and white televisions started pouring into American homes. The 60s brought color CRTs that showed men walking on the moon. The 1970s ushered in the era of video cassette tapes or VCRs (“Video Format Timeline”). For the first time, people enjoyed the freedom of watching movies whenever they wanted.

Home movie options further increased in the late 1990s with the introduction of digital video discs or DVDs. Unlike their tape-winding predecessors, viewers could play DVDs an indefinite number of times. Video quality and user satisfaction could be maintained for thousands of blissful hours. DVDs even saved movie consumers the two-

minute to five-minute hassle of rewinding their VHS tapes. However, time eventually highlighted the flaws of this new media form. While DVDs were designed to play forever, their structure proved highly susceptible to scratches which would cause their associated read devices to freeze on a single frame during a movie (Wilson).

The read error inconveniences of first-generation DVDs inspired the creation of the HD DVD and Blu-ray disc. The HD DVD ultimately failed because it required an expensive read device while the Blu-ray disc was created to work with PlayStation, an already popular gaming system that many people had lying around their homes. As is common with sponsorships, film distributors stopped making content for the HD DVD opting to invest solely in the most successful format. Both disc systems accomplished to same goals, sporting heavier scratch resistance and more data capacity. Still, the final designs represented a mere reboot of the original 1990s DVD.

Nearly twenty years later, the entertainment world is now looking toward a new medium altogether (Cooper). While physical media has remained virtually untouched for two decades, the Internet has served as fresh experiment ground for technological entrepreneurs. Among the creations of these inventors sits the online streaming service. The “streaming” section of the name comes from the technology’s ability to allow a computer to play a video posted online without loading its content entirely. Thus, a video can play almost instantly and provide the same constant flow of a physical video medium. Matching the DVD for speed and video output quality, digital streaming will likely carry the home entertainment industry’s quest for advancing technology into the third decade of the twenty-first century.

In addition to giving computer users the same general viewing experience as a DVD, online streaming services provide several key perks that make them more practical than any prior video medium. First, one does not have to store or lug around discs to watch their favorite movie. Second, online streaming now provides a wide selection of programming that analogously competes with both digital discs and television. From do-it-yourself videos to Emmy Award-winning television shows, users are virtually unlimited in their viewing choices. Third, much like the Blu-ray player winning out over the HD DVD, most users in the United States already have Internet-compatible devices. While television subscribers often consider their cable bill optional, the Internet remains a necessity to communicate with the outside world. And lastly, Internet streaming services are extremely convenient. While physical media requires special equipment that usually stays in a fixed location, people can now access online streaming applications from anywhere using mobile devices. Scaling video watching technology down from a bulky television set, DVD player, and digital disc collection to a hand-held machine fitting into a pocket, online streaming services showcase a new age of convenience and practicality for screen junkies.

Aided by significant advancements in technology, I go forward with my efforts made much easier and more effective than those put forth by television pioneers such as Joan Cooney, creator of Sesame Street. While these first comers had to jump through hoops just to present their work before the public eye, the world of online video now allows for easy distribution to children through age-based ad marketing. Although I am producing my single short film with a Tennessean audience in mind, the enhancement of digital-streaming would allow prospective private investors, state governments, or national governments to



broadcast a full collection of completed videos from anywhere in the world. Compared to the syndication restrictions of traditional television, the ability to cross the physical borders of countries gives Internet content a major advantage over televised commercials. For instance, if my shows were funded and produced by Public Safety Canada, a government agency tasked with protecting Canadian citizens from natural disasters, cartoon episodes would be uploaded to the “Public Safety Canada” YouTube channel where any American or Canadian resident with Internet access could find them in seconds (“Emergency Management”). Thus, online streaming would allow my videos to protect children around the world from tornadoes and other natural disaster threats.

Seeing that online streaming will soon overtake other media sectors, I believe that YouTube, a free streaming application operated by Google, will serve as a strong platform wherewith to distribute a tornado safety animation to America and abroad while eliminating dissemination costs for the taxpayer. To compare YouTube’s educational capacities to worthy competition, The National Center for Education Statistics estimates that a total of 35.6 million children are currently enrolled in prekindergarten through eighth-grade classes here in the United States (“Fast Facts”). This approximation includes public, private, and charter schools. While these individuals do represent the most socially and educationally accessible target audience for a tornado safety animation, their population size is dwarfed by the nearly two billion viewers who browse through YouTube each month (“YouTube for the Press”). These watchers all have their own YouTube accounts which the online streaming giant allows people to make for free. Offering its versatile platform to 91 countries, YouTube estimates that its content reaches 95% of the world’s Internet users. Moreover, choosing YouTube as a distribution medium will boost

rather than isolate primary school audiences. Posting my animation on YouTube will simply allow more people to access it as a publicly available resource. For traditional classroom purposes, teachers will be able to access the video with a hyperlink dispersed via email by both national and state school systems. Heretofore, YouTube or a similar digital streaming application would enable my animated short film to effectively reach individuals both here in the United States and abroad.

## **APPROACHES/METHODS**

My academic component will involve looking at research performed by video analysts. Such experts often give in-depth expositions on how to make an audio-visual resource as engaging as possible. Entertainment industry professionals will go so far as breaking a few seconds of filmography down into scores of separate data points. Hence, including the guidance of entertainment field professionals ensures that each minor aspect of my film, whether visual or audio related, will receive intense attention to research-based detail. Meanwhile employing the advice of industry-renowned peers also enables me to make comparisons between my own technical decisions and creative choices made on acclaimed television series and major motion pictures. Because my animation aims to educate while absorbing the attention of its audience, I will also consult experts on child and adult learning. The information I plan to obtain through college and youth education research will include reasoning for making my film a certain length, why a video represents the best way to reach the American public, and explain the logic behind the human brain's memory system. Onlookers should note that I am grouping psychologists and educators together for the purpose of this exposition. When dealing with the learning process, studies by mental physicians and the accounts of teachers go hand and hand. Without first understanding the mind, teaching becomes ever more tedious as information retention rates plummet. And if one tries to push apprehension and understanding on a student in an impersonal manner, the intention and discernment of a message may still be lost.

Heretofore, I will bring the science of the psychologist and the experience of the educator together for a common goal of providing the longest lasting memories of twister

safety tips. Meteorologists represent the last major source I will draw from for my animated short film. Talking about weather safety is a difficult task without a background in storm-tracking. Thankfully, years of effort put forth by researchers have compiled many solid facts about tornadoes and how individuals should react when confronted by them. From funnel clouds to roaring freight trains, my tornado safety animation will build on the firm foundations that these atmospheric researchers have assembled.

In addition to writing my accompanying honors thesis paper, my creative project will involve me building my actual short film piece by piece. Bringing my tornado safety exposition to life will require a collection of regimented steps. Before drawing a single frame, the subset of pre-production begins. For my purposes, pre-production will concern every aspect of a film addressed prior to the animation stage. This initial phase comprises writing a storyline, composing that storyline into a film-script format, crafting characters, puppet rigs, and set designs to fit the style of the narrative, and recording character voiceovers.

Character identities and fictional apologue attained, the daunting task of setting my story in motion will begin. After a discussion with my thesis advisor, I have decided to have my story take place in a two-dimensional cartoony world instead of a three-dimensional one aimed at photorealism. Artistically, such an appearance is better obtained through a traditional-looking medium. However, expressive two-dimensional animation requires twelve to twenty-four unique drawings per second of screen-time. To avoid hand drawing eight hundred images by myself, I will use digital animation software to mimic the aesthetic of a traditional cartoon. Working in a three-dimensional design suite will allow me to use complex puppet rigging to animate character movements and to tweak

complex mannerisms as if my figures were physical marionettes. Collectively, the aid of digital animation software will allow me to reach my production goals regarding quality and deadline-essential speed.

When I have completed every scene in the animation, the magical process of post-production will initiate. As the name suggests, post-production is the final step in a film's creative pipeline. Working inside Adobe Premiere Pro, a digital editing software, I will be able to compile all my work into a pitch-ready project. Here, countless sound files will come together. Live-action reference footage will serve as preliminary character movement visuals. Lastly, voice acting, sound effects, and music will be added to form an intricate cinematic soundscape. Thus, I intend to complete each of these essential stages to present my vision for a solid youth-aimed tornado safety animation.

## WORK PLAN

Moving beyond the technical descriptions of what I wish to accomplish during the duration of my honor's thesis project, I will now lay out a general timeline guide. Pre-production serves as an animated film's foundation. Failing to capture interest and present my purpose clearly in these early steps will undoubtedly result in a weaker movie overall. Because of this grave importance, I am devoting a large proportion of my time to the pre-production stage. Creative setup will start with a Maymester class in character design. This three-credit load will keep me fully occupied for three weeks, but I am planning to design my animation's characters during this course. I will also be plotting very short ideas for my final script.

From this rough development, I will move into full-time pre-production using the first three weeks of June to write a professionally-formatted screenplay, develop storyboards that picture the events and dialogue described in the screenplay, create a moving storyboard or animatic to base my final animation's timing off of, and record voiceovers. Furthermore, I am enrolled in a screenwriting course that I believe will aid me in making my storyline more enjoyable and engaging, both on paper and in animated form.

By the last week of June 2019, I hope to be in a comfy office chair physically animating. With my puppet rigs already crafted in pre-production, most of this section will be devoted to background painting, modeling props necessary to convey the story, and meticulously crafting each shot to provide the original script with the best visual representation possible. As many know, animation is a time absorbing process. Because

visuals require such ornate attention to detail, I am giving myself until New Year's Day, January 1, 2020, to have all my three-dimensional motion graphics in order. Nearly every film asset complete, I will have the finished product composited, musically scored, and posted on YouTube before the honors thesis defense in the spring of 2020.

I write this proposal lobbying for the chance to make the world a better place. Through means of digital animation, I can use my privileges as an honors college student and animation major to educate American children and youth abroad about the intense dangers associated with natural disasters. By employing proven animation production techniques and expanding my own skills to places yet unknown, I can take the initiative to illustrate a satisfactory concept of public safety through children's media.

## CHARACTERS DESIGN: WHAT ARE THE ELEMENTS?

Whether discussing cartoon shorts from the 1920s or modern children's films with budgets exceeding one hundred million dollars, the appearance of a cast can spell success or disaster for an animated property. Suitable character designs will serve as a storytelling element. Unsuitable character designs will say nothing about the character they visually represent and may even distract the audience from a story altogether. To understand what artistic character design is best described as and what makes a character design successful, I am stepping a few thousand years backward. Animation is a new medium within the broad scheme of human history, and most of the elements of character design that modern creators use existed prior to its creation. Broadening evaluation of character design beyond the realms of modern sources allows the ancient artists of antiquity to join the discussion and to show where current design processes originated.

From the towering Sphinx to the Valley of the Kings, Egypt is both literally and metaphorically filled with character design gold. Ancient Egyptians were obsessed with creating god-like depictions of themselves to showcase their wealth and power. One of the ways they accomplished this goal was by combining human body parts with those of recognizable animals. For instance, the Sphinx sports the head of Khafre, one of Egypt's most successful kings who commissioned the construction of the monument along with the Great Pyramid of Giza. The enormous limestone head sits atop an even larger feline body. Egyptians saw lions as powerful beasts and by combining the elements of a mighty cat with the head of a king, the artists aimed to illustrate Khafre's strength as a ruler (Calvert). Meanwhile, the feline body is scaled up significantly in comparison to head size, this use



of scale further emphasizes physical power. The large body also raises the creature's eye level high above the surrounding landscape showing Khafre's wisdom and ability to reign over all Egypt. While the head touts' large amounts of detail, including the crown of a pharaoh, more character design mysteries can be unlocked within the creature's bodily form. When dealing with cartoon characters, designs will always be based on circles, triangles, or squares. All other shapes artists depict on-screen are mere derivatives of these primitives. The principle of these geometric shapes is highly evident to the trained eye. Looking back at the Sphinx reveals a huge cube comprises most of the figure. A three-dimensional combination of six squares, this cube is disguised in a more curvy and organic looking feline body, but the overall blocky aesthetic remains. Modern character designers agree that squares symbolize strength in a character. Following the pattern Egyptian artists already applied to proportions and creature combinations, one can conclude that the creators intentionally carved the Sphinx using this boxy form. All three elements taken together, along with the extensive fame the Sphinx has received from historians, tourists, and media through the years show that the Egyptian artists achieved a successful character design that highlighted the power and wisdom of their monarchical ruler.

Whether talking about Egypt or other major civilizations of antiquity, authoritarian rulers have always aimed to portray themselves as strong. But the Greeks are famous for further expanding upon what makes a mighty character. Pushing beyond the blocky form common in art from prior civilizations, the Greeks heavily pushed the factor of realism. Pushing aside mere qualitative descriptions of the natural world, the Greeks decided to add math to character design. Through observation, they discovered that the average human measured six-and-a-half to seven heads tall (Harris). But Greek artists wanted to

craft more than average portrayals of the human body. Thus, began an official tradition of shrinking head size in correlation with body mass in order to depict strong characters in a more realistic looking fashion. Greek artists also studied muscles and placed pumped versions of these sinews over the top of their idealistic character designs. Artists still use these exaggerated proportions to depict modern superheroes for comic books and animated filmography. Conversely, inverting the quantitative ratio allows illustrators and animators to increase head size in correlation to body mass. The smaller body is perceived as weak, while the larger head often becomes a sign of child-like youth and innocence.

The American Revolution marked a major turning point for character illustration. While art once served as a means for representing wealthy royals as powerful and just leaders, rebellion against what many perceived as tyrannical rulers led to a more diverse implementation of stereotypes. Where once the wealthy had been portrayed as near-divine beings, newspapers for the common citizen showcased corruption among the elite. Features such as huge chins and insanely long noses found their way into figure depiction. Beyond bodily distortion, clothing became more exaggerated. Black and white engravings from the period demonstrate how the Egyptian's geometric shapes found their way back into mainstream character design. A famous work from the time titled "Poor old England endeavoring to reclaim his wicked American children" exemplifies the militaristic struggle ("Poor old England"). Five colonists comprised of circular shapes stand on one side of the Atlantic Ocean. Some colonists sport hats fashionable of the time, but even these signs of status and power are constructed from circles. The softness of these characters shows their innocence in the conflict. Following a series of strings hooked to the colonist's noses, a creepy fisherman-like figure stands on the opposite side of the Atlantic. His hand tugs on

the fishing strings. He takes up almost as much space as the other five individuals combined. Everything from his hat to his legs looks pointy and aggressive. The man's coat fans out with a cape-like appearance that one might confuse for Dracula at a Halloween party. Facially, the character sports an oversized chin and nose. These scary protrusions combined with the addition of wrinkles give the man a stereotypical witch head. Ever ready to fight the disrespectful Americans, the embodiment of Great Brittan stands on a leg made from a sword. The triangles define this character's as a villainous role.

Seeing what purposes character designs have served throughout the past millennia, one can thoughtfully and thoroughly define character design. As all three examples have shown, character design involves the artistic distortion of natural elements to convey a personality and associated traits of the source material. What makes these adaptations successful depends on how well the final design captures the artistic intentions of personality and trait. For the Egyptian's Sphinx, personality comes from the square-based form of strength. While the addition of a lion's body likens Khafre to a raging beast who could leave his sitting position at any moment to devour opponents of his rulership. Hellenistic Greeks continued the pursuit of strength and perfection in their hyper-realistic depictions of the human body. Rather than combining human elements with those of animals, they created protagonist characters akin to modern superheroes. They pushed human signs of strength such as bulging muscles. And bodies grew huge in comparison to head size. All of these changes point to characters who sought glory and adventure, embarking on epic journeys and fighting intense battles with demonic creatures of the underworld. American illustrators turned their people into meager individuals banding

together to defend their homeland from the control of an evil English witch and the tea-tax curse.

Wildly different art styles and various techniques make each of these examples seem unrelated. Yet one pattern emerges throughout. Observing a character should reveal an associated story. Contrastingly, if a character can only be described from the most literal and unimaginative viewpoint, then their design is a flop. Think about the men and women of history who Hollywood directors have featured in movies. Try imagining Thomas Edison without thinking of electricity and the lightbulbs illuminating the space around you. Remove Harriet Tubman from a dangerous setting of slave rescue. Never say Neil Armstrong's name in the same sentence as "the moon" or "space" again. Strong characters of reality and fiction remain forever inseparable from their stories.

The ancient artists leaving such a large legacy of character design, I felt very nervous coming onto the creative scene. I feared my character design work would never match the quality past experts had spent thousands of years honing. I have now taken both a college character design class and a figure drawing class. In these courses, I practiced the aforementioned techniques heavily. Despite the extra skill honing, my concern of somehow shaming the historic masters of character design still holds legitimate weight. But the important thing for any training artist to remember is that their life work should only draw from the past. Creations themselves should be the work of their respective artist's imagination. Unless the artist specializes in replicas or counterfeiting of course. As such, I sought only to apply the techniques of these early character designers to my animated property. With this simple goal in mind, I moved forward into full preproduction mode. Needing a story to place my characters in, I developed a short synopsis of the extensive

script I would later write for the property. I also applied several working titles to the animation before settling on “Tornado Fortissimo” (fig. 1). The name took inspiration from the protagonist character I had written about in the synopsis, her personality being one of dedication, and her primary trait that she studied as a music student at an elementary school. Fortissimo is a Latin term used by musicians to mark a phrase of music that should be played loudly or forcefully. Since tornadoes are known for sounding like freight trains, I decided to use the combination of both words to show off two things that would take up a sizable portion of the screenplay, tornadoes, and music. To add a point of interest for my child audience, I decided to comprise the main cast out of adorable anthropomorphic animals instead of human characters. I made my protagonist a groundhog, playing off the irony that groundhogs would normally be safe from tornadoes since they live underground. But in this cartoony world, they must combat the danger of twisters in a similar way to humans. Groundhogs also have very small ears, which connect to the story’s core educational concept of learning to listen.



Fig. 1 “Tornado Fortissimo” concept poster

The work of depicting my musically gifted groundhog began with similar tools to those used in ancient times. But rather than employing a scroll of papyrus, I started out by sketching concepts on modern copy paper (fig. 2). I personally prefer ballpoint ink pens over graphite pencils, as the point of initial sketching is to lay out as many ideas as possible in as short a time as necessary. Using a more permanent marking medium forces an artist to commit to what they put on paper instead of nitpicking details. More finalized designs can then be drawn from a larger stack of concepts. For my protagonist, Felicity, I created a more finalized design by combining the head style found in one of my sketches, with a

body style found in another sketch, and then adding a hat based on one of several head-gear studies. To emphasize her young age, I inverted the Greek mathematic proportions, making her head nearly half the total height of her body (fig. 3). The friendly, child hero of her own story, I mainly crafted Felicity from circular shapes. Much like the colonists of the Revolutionary War engraving, soft edges depict her innocence. Meanwhile, similar to the English witch man's pointy protrusions and a vampire-like cape, I used pointy areas on Felicity's skirt, hat, and ears to indicate her personality flaw. While her torso is constructed from a cube, denoting strength through polished musical talent. The occasional hard edges show that this hero still needs to learn an important lesson over the course of her story. In Felicity's case, she is so obsessed with musical perfection that she blocks out the world around her, even in emergency situations like tornado warnings. And over the course of her character arc, she must learn that there are times when you need to drop whatever important things you are doing and pay some attention to the world around you.

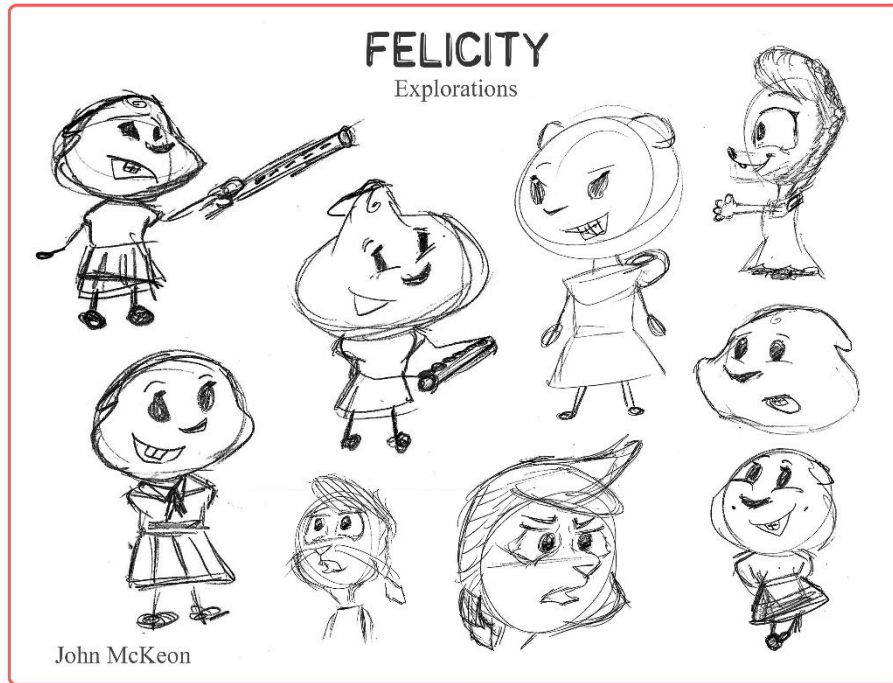


Fig. 2. Initial concept sketches for "Tornado Fortissimo" protagonist, Felicity.

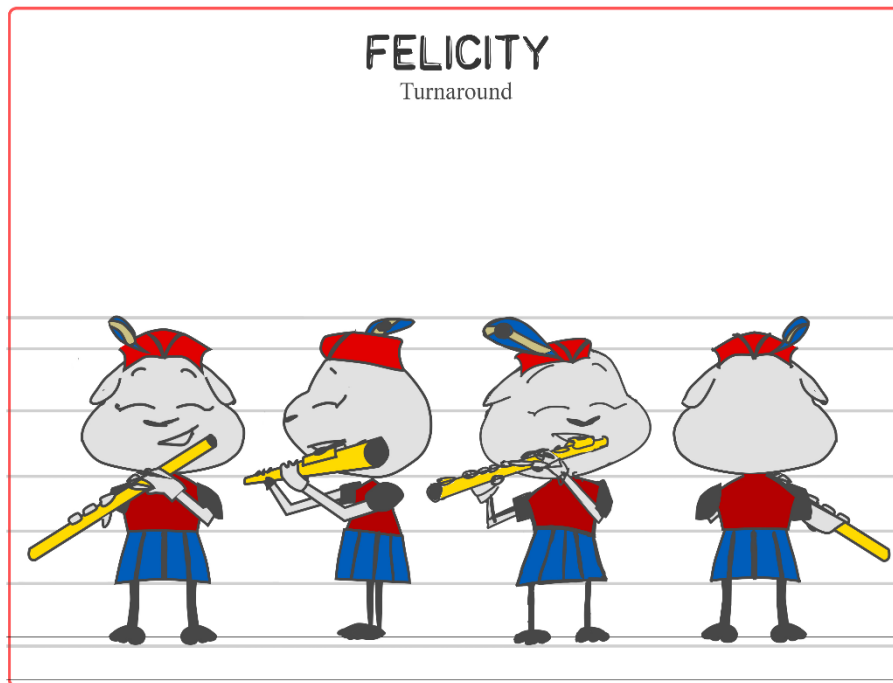


Fig. 3. Felicity's design as showcased through a four-perspective turnaround



Keeping with the theme of listening, I created Andrew, Felicity's older brother who blocks out the world in order to focus on video games. Much like Felicity, Andrew incorporates rounded shapes (fig. 4 and fig. 5). Since he also has trouble listening to others, I incorporated triangular form into Andrew's shoulders, ears, and cheeks. I completely omitted square shapes from Andrew's design as he is meant to seem weaker than his sister. Even though Andrew is older than his sister, he chooses to obsess over an unproductive activity. Thus, Andrew shows his lack of listening abilities and an absence of time management skills.

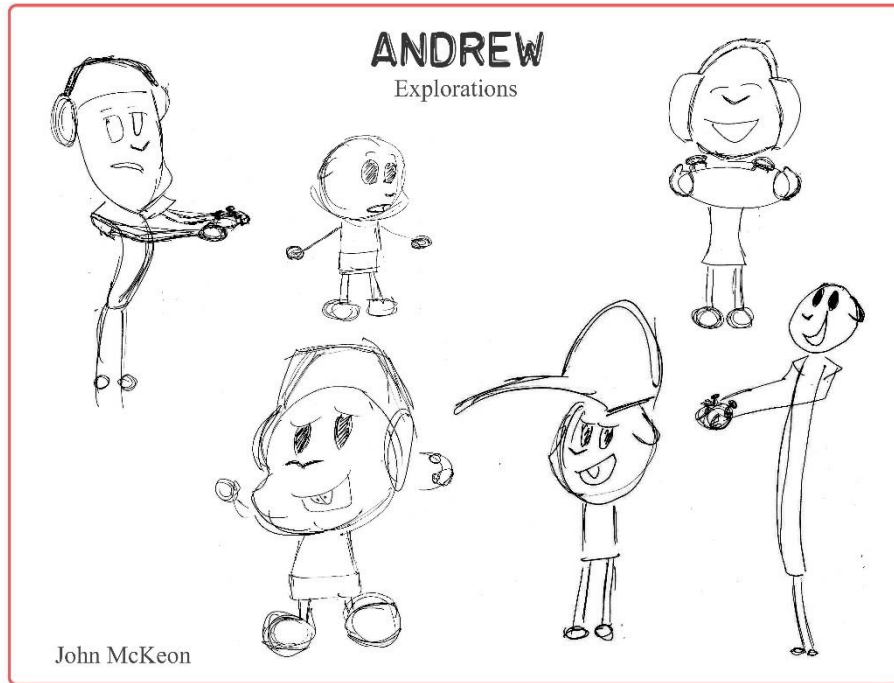


Fig. 4. Andrew's initial concept sketches

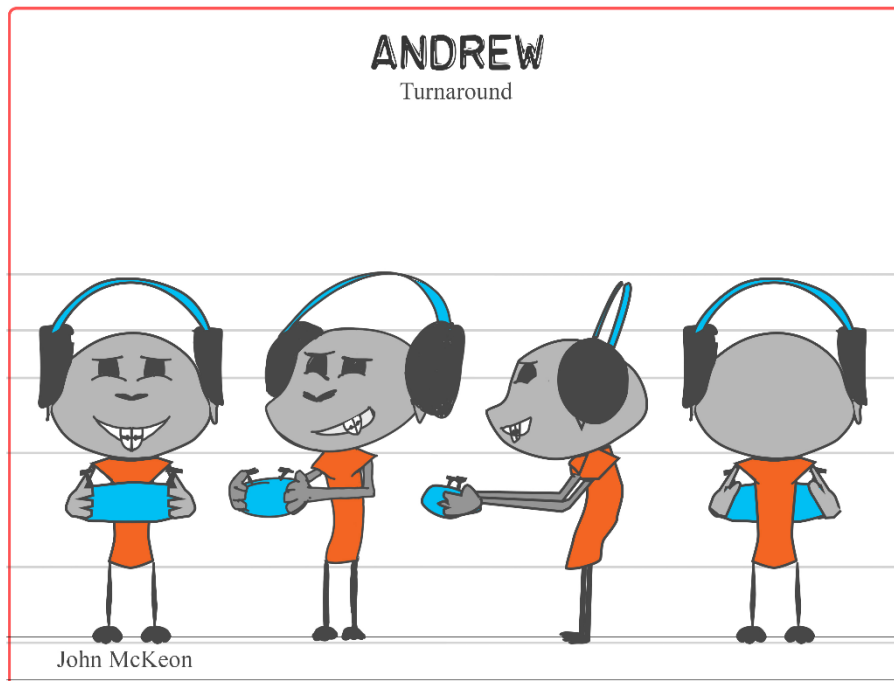


Fig. 5. Andrew's final design as showcased in a turnaround.

Terrence Mesocyclone, the cartoon's villain, furthers the listening lesson by teaching the groundhog siblings the true value of listening. Stereotypically, Terrence represents the product of indifferent parenting. During his early "cloudhood," his mother did not agree with his passion for spreading happiness and cheer through natural phenomena. His attempts to change the weather contradict his cirrus cloud heritage. In real life, cirrus clouds are not supposed to precipitate. But Terrence artistically delights in making flowing snowdrifts, peaceful brooks, and rainbows. Terrence tries to validate his artistic inclinations. But the lack of listening by his mother eventually drives his personality from one of delight and positivity to that of an attention-craving bully. Thus, morphing Terrence from his soft and puffy cloud form into a fierce tornado (fig. 6, fig. 7, fig 8, and fig 9). Some of Terrence's circular appearance survives the transformation, but sharp triangular areas highlight his new evil state. A thirst for chaos and destruction overcomes his inclinations of creativity.

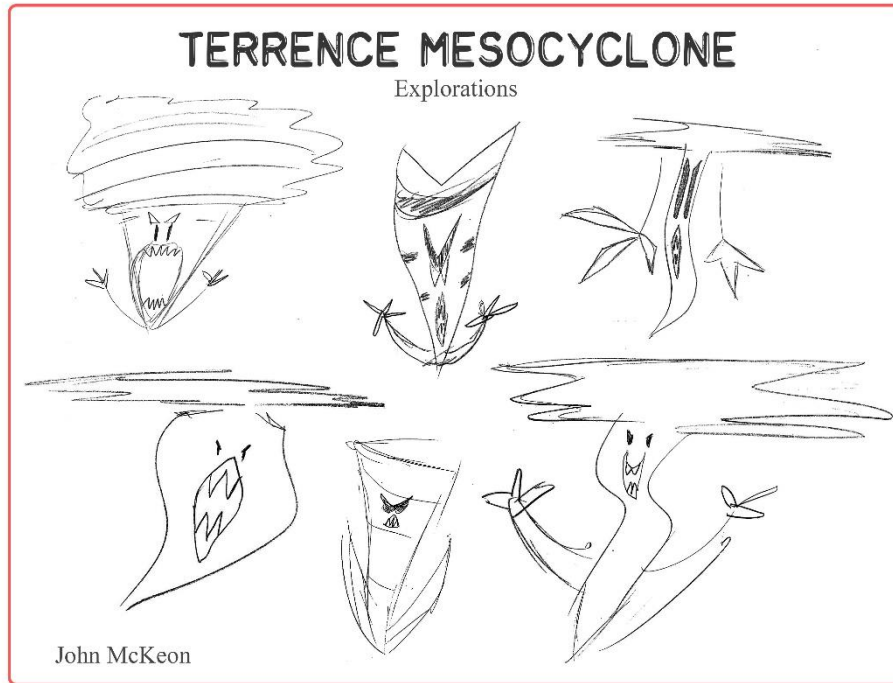


Fig. 6. Initial concept sketches created for villain, Terrence Mesocyclone

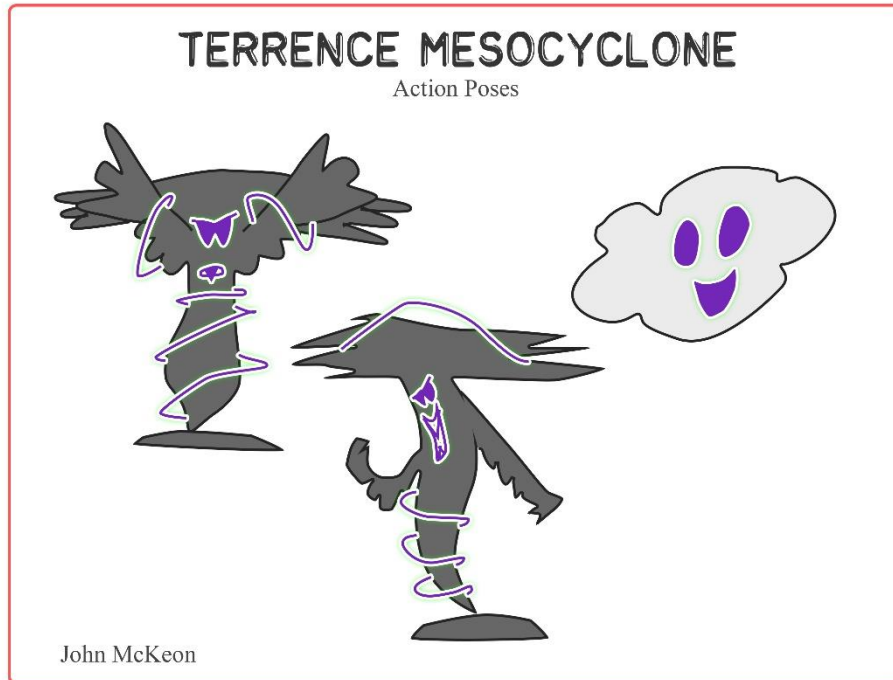


Fig. 7. Terrence shown in both villainous tornado design and baby cloud form

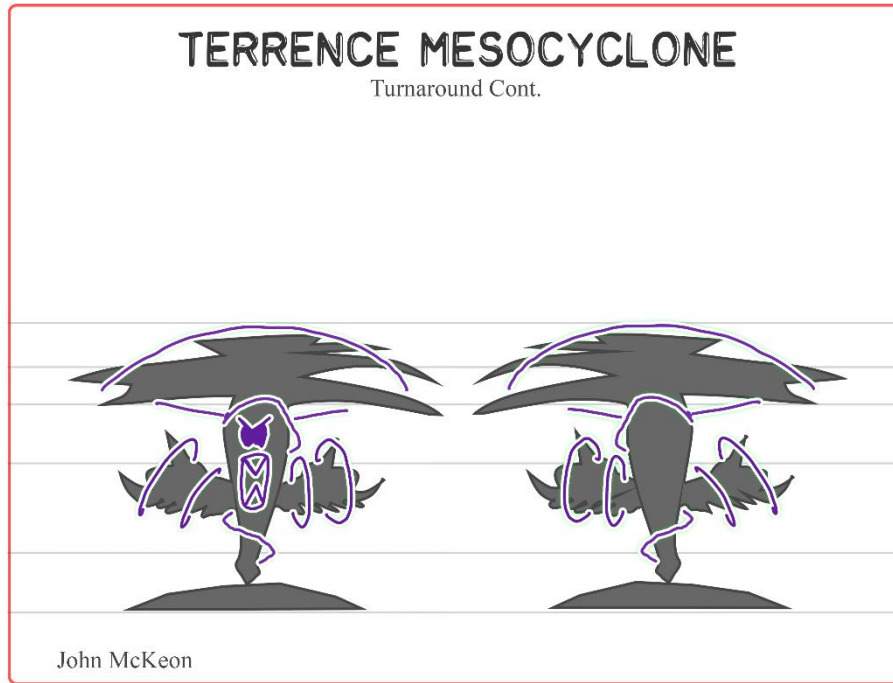


Fig. 8. Turnaround showing front and back views of Terrence Mesocyclone

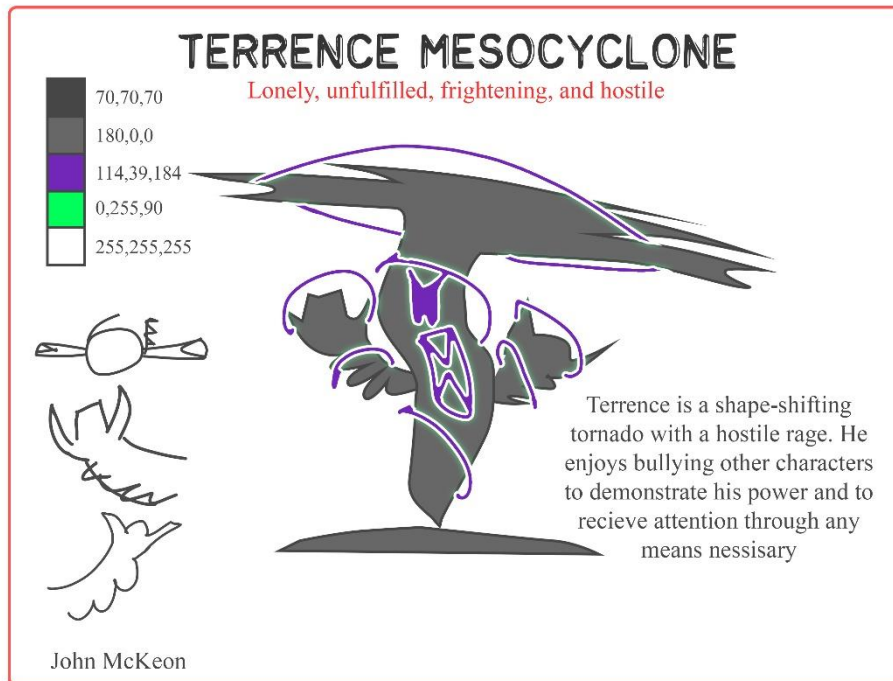


Fig. 9. Character sheet for Terrence Mesocyclone

Throughout the character design stage, one can see the artistic techniques instituted thousands of years ago still help modern artists. Characters need human-like personalities for audiences to relate to them. By using elements of shape and height, cartoon characters take on unique forms. Soft edges highlight friendliness. Squares can promote leadership by emphasizing strength and boldness. And triangles display insecurity, weakness, or harmfulness. Offsetting body and head size ratios can also define a difference between strength and weakness, threatening presence, or a sign of childlike innocence. No matter the story, no matter the character, no matter the role, principles created by the ancient Egyptians, Greeks, and even American Patriots remain a steadfast influence on modern character design. And animators of the twenty-first century will continue to adapt their legacy to tell new stories now and into the foreseeable future of cartoon creation.

## **EDUCATIONAL CARTOON SCREENWRITING: WHAT ARE THE PRINCIPLES?**

Crafting an engaging screenplay for a children's cartoon presents more challenges than one might expect. When someone hears the words "writing" and "children" together in the same sentence, they probably start thinking of cheesy rhymes and six-page picture books that contain fewer words than a Facebook cat meme. However, screenplays are a type of script specially designed for media displayed on a screen. And they are very complex beasts. A functional screenplay contains instructions clear enough that all content creators in an associated production pipeline can read it, understand it, and execute its given directives. Before a single frame is animated or a second of an actor's performance captured on camera, all actions and dialogue must be written in the screenplay first. Its importance cannot be understated. It is the filmmaking equivalent of biological DNA.

Just like DNA existed for extreme expanses of time before humans discovered it, screenplays find their roots long before the invention of cathode ray tubes and thirty-five-millimeter film. The life-giving element that made theater, television, and digital streaming a reality evolved from a much older ancestor. Before the days of crowded couches and popcorn movie nights, we humans watched live people. And the concept of a script first found a home among the creators of paper itself (Zabel). Egyptian writings describe religious pageants held to honor the gods. These ceremonies lacked elements of drama. And according to foreign onlookers, their entertainment values were mundane at best. Yet the Egyptians provided a thorough description allowing future keepers of their religion to repeat the sacred display.

Building something closer to the modern script, the Greeks added tension to their visual narratives. These new tragedy plays originated sometime around 500 B.C.E. Renown poets Aeschylus and Sophocles skillfully adapted these performances from Greek myths (Cartwright). As their name suggests, tragedy plays concluded with a hero dying or failing their mission in some way do to a weakness. Theater quickly gained ground as a form of entertainment since the Greek public could enjoy such venues for free. However, this meant production staff had to craft tragedy plays on the cheap. Meaning that ancient script artists had to find ways to cut costs. To make their productions as low budget as possible, Greek tragedy writers composed their plays in a fashion allowing one actor to play every role. Modern screenwriters still try to limit characters today, but when producing for film, television, or streaming media performances only need to happen perfect once. The expenses of actors and casting directors end after performances are captured on camera. For a cartoon creation crew, however, keeping cast counts to a minimum remains an essential part of making animation affordable. Finding extras for your movie or short film, is not as easy as a Facebook shout out. Trained artists must design every character used in an animated property from scratch. Unless a team has a budget exceeding one-hundred million dollars, crowd scenes featuring hundreds of characters will quickly bankrupt a project. Thus, screenplays written for the animation industry mimic the small cast method introduced by Greek tragedies.

Structured story arcs represent another element introduced to scriptwriting by the Greeks. Writers arranged tragedies using what today's screenwriters refer to as the three-act structure (Cartwright). Separated into the setup, confrontation, and resolution, the three-act structure represents the main parts of any story. In Greek theater, the setup usually



involves an audience's introduction to a mythical hero and a mission he needs to pursue. Confrontation raises drama levels. Here the hero faces challenges, either physical or mental. The challenges raise in levels of difficulty until the story reaches its climax, the point of highest tension. In the resolution, the hero fails his hardest test and dies. One may feel this ending is harsh for a fictional character designed for someone to have a connection to. The loss of a human-like connection can feel akin to losing a close friend. Plus, most humans prefer a feeling of positivity to one of misery, death, and other negative consequences.

Such opinions are not isolated. Audiences showed disapproval of negativity during the Classical period just like we do nowadays. To reduce negative sentiments toward tragic endings, fictional Greek death scenes always happened off-screen (Cartwright). Yet unhappy endings remained a tradition for hundreds of years. Radical thinkers have since widely overhauled this custom. Able to write screenplays for new content, modern screenwriters now use an adapted version of the three-part structure. In this alternate screenplay universe, artists swap the resolution's tragic implications for one that brings the protagonist a sense of joy or fulfillment. Concurrently sustaining an audience's connection to the protagonist and giving them a feeling of reward when their favorite character finds happiness at the end of the story. Death can still exist in this idyllic universe, as it does in many children's films. However, it will often take place off-screen and will almost always happen in the first two acts of a story. Thereby allowing the audience to celebrate when the hero overcomes the grieving challenges placed in their way.

One could stop adding elements here. If screenplays described a video game, written scripts explaining what happens in a story following the adjusted three-act model

would suffice. However, professional-grade screenwriters use a few more important rules that describe how to fill the three-act structure. While some game designers understand how to spruce up narratives, video games overall tend to lack the necessity for complex and engaging stories. One can usually describe their premise in a single sentence. For instance, “Mario Bros.” and its home entertainment successor “Super Mario Bros.” consist of a plumber named Mario and his brother Luigi traveling across a fairytale land known as the Mushroom Kingdom to rescue Princess Toadstool from Bowser, the bad guy in a shell (“Super Mario Bros: Electronic”). Japanese game design giant Nintendo received enormous praise for crafting what legacy game enthusiasts still refer to as the best video game ever created.

Trying to cash in on this success, a *Super Mario Bros.* movie was released in 1993 (“Super Mario Bros.”). The wave of criticism this feature aroused contradicted its inspiration in every way. Besides relying on cheap live-action visuals, rather than animated ones that reflected the original game characters, the film suffered heavily thanks to lousy writing. Screenwriters could not figure out how to use a single sentence story to fill a one-hour and forty-minute movie. To their credit, these writers did use some creative freedoms to meet runtime goals. However, their additions highly detracted from any remaining appeal the film might have had. The setting was changed from a magical and color-filled fairytale kingdom to a dark, dystopian version of New York City. The reason for such a change is unknown. Instead of a snapping turtle with spikes on his shell, writers turned the story’s villain into a figure resembling Adolf Hitler with spiked gel hair. Because hair gel is cheaper than a turtle costume apparently. The list continues endlessly the more one

surveys the movie, but a four-star rating out of ten stars on IMDb shows an overall trend of dislike for these changes.

To avoid such poor film reputations, screenwriters need to educate themselves on the pitfall made by the *Super Mario Bros.* screenwriting team. These creators understood that they needed more material than the original game to give their narrative enough length. Their critical mistake, however, was making these adjustments and additions without establishing a purpose that would improve upon the original story. Concurrently, all creative artists must ask themselves; “Why?” Why should a bird character be blue instead of red? Perhaps he is appearing in an animated music video where the background is predominantly red. If the bird remains the same color, it will be hard for the audience to spot on the screen. However, if the answer to such a questionnaire is just that the artist likes blue as a color more than red such a change will likely not benefit the music video. Broadly, love for a certain color, shape, plant, car, etc. is subjective. Straight and simple for screenwriters, write from the heart, write what you know, but avoid adding ideas to a story for the sole reason that you like them.

Major marks that quality screenwriters aim for in their work often include comedy, subjects familiar to their audience, and an anchored connection to the human experience. None of these points were addressed in the *Super Mario Bros.* film and reactions fell flat as a result. In the original video game, achieving a human connection came much easier. In video games, outcomes depend on how a gamer plays. A gamer’s care for a title’s protagonist automatically arises. If the protagonist fails or achieves their goals in a video game, it affects the player directly. The main avatar literally represents them within the

fictional realm. A death for the character equals a death for the gamer. A boss-battle victory for the hero sparks a spirit of celebration in the player.

In traditional video creation, screenwriters must work much harder to make an audience care about outcomes. Variables disappear. The story will always play out the same way every time one watches it. Thus, the story needs to hold enough interest on its own to intrigue audiences and to make them feel connections to their cast of characters.

Simple reason suggests that the number one requirement for entertainment industry employees involves bringing audiences a feeling of enjoyment. As much as people like to think they control what they like or dislike, decisions about what shows to watch, what food to eat, and what shirt to wear depend on subconscious neuroscience. Opinions sway in favor of something while disregarding something else through a process of chemical reward pathways (Henderson). At the most basic level, our brains function on a principle bearing similarity to a dog's relationship to a bag of delicious canine treats. A trainer calls for the canine to complete a certain task. The dog receives a treat when he obediently follows the command. Over time, the dog begins to associate a mundane task with the pleasurable flavor of beagle biscuits.

Despite our larger brains, we still make decisions in much the same way canines do. Resultingly, substances such as nicotine still present problems for portions of the populace ("Cigarettes and Other"). People often claim they can quit smoking whenever they want. In some cases, this argument holds true. Cigarettes only create addictive cravings because of the nicotine they contain. As with other stimulants ranging from cocaine to table sugar, nicotine triggers the release of dopamine. We all feel the buzz this

neurochemical gives us after polishing off a container of ice cream. However, the amount of buzz a person feels and the need for a persistent feeling of pleasure varies from person to person. Thankfully, harmful and unhealthy substances are not the only things that release dopamine. The brain's reward pathway was designed to help humans seek out nutritious foods and to enjoy personal health. For a person living a balanced life, adventure, affection, and comedy represent more sustainable forms of enjoyment that benefit cognitive behavior.

Clearly a screenplay's entertainment factors improve with the addition of humor and interesting events. But to a further point of exploration, a question arises. Can one repurpose dopamine, a neurochemical abused by negatively impactful products such as cigarettes and street drugs, as a beneficial tool for child education and self-betterment? John Hopkins' cognitive learning specialist Sarah Henderson believes laughter holds the answer. She explains that quality humor increases dopamine release (Henderson). However, humor must have a connection to the educational material a humorous instructor presents for memory retention rates to increase. Irrelevant or inappropriate humor leaves learning retention quantities unaffected. This leaves cartoon screenwriters in a good place. Since its inception, animation has worked in a fashion favorable to comedy. Unlike live-action productions that rely on dialogue for most of their comedy. Cartoons feature exaggerated visuals with memorable characters, unique settings, and actions that would never happen in real life.

These exclusive advantages allow animation screenwriters to achieve situationally specific humor. If you need to illustrate that Napoleon Bonaparte was short, draw a character two feet high who wears a giant hat to make himself feel taller while attending a Great Dane dog show. Care to demonstrate how the food chain works, create an alternate

version of Pac-Man where larger species in a food web eat smaller Pac-Man caricatures based on real plants and animals. The largest Pac-Man in the chain grows a long beard and turns to dust that the smallest Pac-Man eats starting the cycle all over again. Such a detailed analysis shows that cartoons can use humor to boost entertainment and educational values. Screenwriters just need to ensure that the laughs they write into scripts relate to the central lesson for enjoyment levels and memory retention trends to prosper.

Continuing the discussion of keeping screenplays on task, successful screenwriters understand that they need to relate actions to primary subjects and themes in their scripts. Some of us fluff our pillows a certain way out of habit. Some of us signed up for martial arts classes as kids. Maybe we acquired our bed-making skills from our mothers. Maybe a bully beat us up in the locker room. In physics, experts say that all actions have a reaction of like and equal force. The rules of reactive forces follow us everywhere. Quality screenwriters understand this principle of connection. When writing for fictional cartoon universes, screenwriters become like conspiracy theorists. Suddenly, every glowing speck of dust on the ground and every flash of light in the sky propagates some connection to Martians. Of course, screenwriters use their imaginations to dream up more things than extra-terrestrials. But whatever ideas they put to paper, skillful screenwriters ensure that an action described in one part of their script correlates to something else. For instance, a character who looks down at their watch constantly may overcome a disposition of impatience by the point of their story's resolution.

In contrast, bad screenwriting is often plagued with insane sums of actions that take place without connection to the main narrative. A certain character may yell at a friend for using their hairdryer without permission. A good screenwriter will give the hairdryer some

form of symbolism in the story, the object could be a family heirloom or represent this character's vain obsession with outward beauty. But in this unfortunate case, the hairdryer is just a hairdryer. The lack of information provided by the screenwriter makes the existence of the device bland and inconsequential to the story, and the actions surrounding the prop lose their impactful meanings. Such scenes waste the time of their audience members and lead people to states of boredom.

To avoid such dismal occurrences, screenwriters identify anchor points for their stories early on, two of the most important anchors are subject and theme. A subject describes what a story is about but does not describe the narrative's plot. In Pixar's *Toy Story*, the subject is easily identifiable, the film's narrative centers around a bunch of toys who value the attention of their child owner that plays with them (*Toy Story*). Throughout *Toy Story* and its sequels, play and child-toy interactions remain an important subject. For a children's animated film, this choice of subject matter makes perfect sense. Real children also enjoy playing with toys. So, they can see a reflection of their own experiences in such a familiar dynamic. However, Pixar films are also adored by adults who do not share an immediate connection to the experiences represented in *Toy Story*.

Some might question how such a broad age range can enjoy the same content. Presenting themes, a special screenwriting ingredient more magical than Pixi Dust. Themes are broad topics that venture beyond the background of a child. They address complexities experienced by all humanity. In *Toy Story*, a factor of jealousy arises in Sheriff Woody when his owner starts spending more time with his new action figure, Buzz Lightyear (*Toy Story*). This is a scenario familiar to everyone. A classmate receives a golden star for their impressive kindergarten art skills while you barely handle the operation of a tape dispenser

or a coworker receives a huge promotion and a new office at work, leaving you stuck at your dimly lit cubicle. We humans dislike exclusivity when we stand on the low end of the totem pole. Our desires may be for material wealth, beauty, or just someone's attention. Whatever we wish for, seeing someone else get their wish first can wrench at our emotions. We may start to blame someone's success for our discomfort. Unchecked by positivity and thoughts of the blessings we still have, jealousy makes us prank the smarter kid in class, blackmail our boss, and push a new favorite toy out the window to his death. Indeed, the side effects of jealousy render an unhealthy personality. This problem persists in all of us. Thus, we feel a connection to fictional characters like cowboy dolls when we see them struggle with our own pain. And recognizing such characters as a representation of ourselves, we feel extensive satisfaction when these themed conflicts meet a resolution. Through this means, indispensable anchors such as subject and theme work together to keep screenwriters focused. By ensuring that actions contained in a screenplay point back to the central conflict, stories remain fastened to the human experience. And conversely, viewers remain fastened to the child-oriented narrative that speaks to their inner selves. Thus, to write an effective and focused screenplay for children's cartoons, one should follow these three simple steps: write humorously, write humanly, and always have a point.



## **EDUCATIONAL CARTOON SCREENWRITING: PRINCIPLES IN PRACTICE**

With the key features of a quality screenplay identified, I can now talk about my integration of these techniques in my tornado safety project. First and foremost, I understood my narrative needed to achieve its story goals without showing unnecessary characters. My thirty-page screenplay made to fill thirty-minutes of screen time included a mere six cast members. Many scenes only focused on two characters at once. Thereby keeping costs for crafting the full property lower than a screenplay calling for large crowd shots if the story was ever animated to length. Although I had a goal of simplistic casting from the beginning of my project, I found it hard to stay focused on the actions of such a small group. Composing about six versions of my story before settling on the final specimen, I found myself constantly writing around characters to force random ideas into the screenplay.

Despite plot confusion, the three-act structure remained a guide throughout the writing process. I wrote beginnings, middles, and endings for my screenplays. However, after writing two parts of the structure I would immediately drop my idea. If I created a beginning and a middle, I would put myself in a corner where I lacked an ending that clearly resolved the established conflicts. When starting in the middle of my screenplays, I would achieve some actions for my characters to do. However, these actions seemed very dry and boring. Neither entertainment values nor educational factors improved.

With the longest act in my cartoon's story turning out so flat, I was discouraged to continue writing on my concept ideas further. But I had deadlines to meet. Facing a ticking

clock, I brushed off my moment of screenwriting self-doubt. I looked at what I had written. Following the model of adapted screenplays, I understood my conclusion needed to settle conflicts in a positive and fulfilling way. I found my strongest ending was the first one I created. This piece would still require heavy rewriting, but I determined had potential. I also looked at the introductions I had crafted. In the fashion of Greek myths, my introduction needed to give characters an identity. This key act would also have to establish conflict and a goal for the characters to achieve. Comparing all my introductions, I noticed that the music-themed wakeup scene at the Groundhog Residence remained constant. I decided that this scene successfully established the character identity my protagonist required. Meanwhile, all introduction scenes sequentially following this brother-sister interaction failed to convey convincing conflicts and goals. So, I determined this part of the introduction would need revision or something new altogether.

Reviews of my screenplay's second act revealed an absolute train wreck of story writing where boxcars sat on sidings awaiting a locomotive. Lacking a genuine sense of conflict or point for the characters to do anything made interactions painful to read. Evermore painful at the time, I pronounced a death sentence on my story's middle. The largest part of my cartoon's screenplay would receive a complete overhaul.

Examining my past attempts to bridge the story arc, I ascertained that my elements of subject and theme felt inflated. Before entering the screenwriting stage, the idea for *Tornado Fortissimo* existed as a five-minute skit involving just my protagonist character Felicity, her music-teacher mentor Miss Taylor, and villain Terrence Mesocyclone (fig. 10). In this brainstormed concept, I established my subjects of tornado safety and weather

science. I also focused on a theme of learning to listen. The skit played out by having Miss Taylor's music class end. Disinterested in the subject being taught, these students, present in sound effects only, drop their assignments all over the classroom, and run out the door. Contrasting this lack of academic interest, Miss Taylor discovers that Felicity remains at her seat taking careful notes concerning her assignment. Miss Taylor shows her appreciation for Felicity taking her class so seriously. But a tornado siren rings and the two must leave the room right away. Caught up in her work, Felicity initially argues with Miss Taylor. All at once, Miss Taylor explains the danger of the approaching mesocyclone. The two characters run towards a centrally located restroom. Felicity remembers that she left her golden flute in the music classroom and runs back to grab it. My anthropomorphized tornado, Terrence Mesocyclone, causes a window's glass to shatter. The glass shards fly towards Felicity, but Miss Taylor saves her by using a double-bass cello as a shield. The two finally make it to the restroom and ride out the storm.

Fig. 10. The first “Tornado Fortissimo” screenplay

INT. SCHOOL PRACTICE ROOM - NOON

A bell rings. A mass of students exit the room in a frenzy. Miss Taylor, CHARACTER DESCRIPTION, begins reorganizing the messy room. She picks up some discarded sheet music. Miss Taylor sees that each handout on the floor is from the current day. She sighs and reads the names of the students in the header of the document. Miss Taylor sets the papers to the side. Light flashes through a window. Miss Taylor grabs a music stand, along with a multicolored xylophone. As she turns, a voice calls out through the silence.

FELICITY

Excuse me Miss Taylor, could I make use of the stand for a few minutes longer?

MISS TAYLOR

Felicity, class ended twenty minutes ago.

Miss Taylor places the music stand back.

FELICITY

Oh I know, I just wanted to make notes of the breath marks we talked about in class. Flutes don't play without air.

Felicity marks her page and plays a three-note arpeggio.

MISS TAYLOR

Beautiful

Suddenly, a tornado warning siren sounds. Miss Taylor looks down at her smartphone, it displays a visual warning message.

MISS TAYLOR (CONT'D)

That's not good. We need to get out of here. Large rooms with huge windows are the worst place to be during a tornado strike.

FELICITY

Right now, but I'm trying to mark these pages.

MISS TAYLOR

And right now there's a mesocyclone spinning three times faster than your parent's car on the Interstate.

FELICITY

But we don't even know if a tornado is coming.

MISS TAYLOR

Oh yes we do. Unlike Tornado watches, tornado warnings are only issued when a vortex is spotted on weather radar. You may not be able to see it, but the spinning column of air is as sure as the treble clef on your sheet music. Let's go!

Lights flicker as Miss Taylor ushers Felicity out through a double set of doors. The two walk briskly down the hall towards a central safe room. Felicity stops suddenly. Her flute remains in the practice hall. Without a word, Felicity runs back to retrieve her instrument.

EXT. SCHOOL NEIGHBORHOOD - CONTINUOUS

Terrence Mesocyclone grows large and approaches the school yard.

INT. SCHOOL PRACTICE ROOM - CONTINUOUS

Felicity finds her flute and smiles with a look of relief. She plays a three-note arpeggio again.

Felicity stops playing, but the tone crescendos louder and louder. Felicity looks up. A window shatters. Glass shards fly in all directions. Felicity screams and clamps her eyes shut. The sound of glass breaking resonates throughout the room. Felicity's scream stops.

Miss Taylor stands tall. She holds a Double-Bass Cello in her hand. She spins the large instrument around revealing several sizable glass shards embedded in the wood.

FELICITY  
(Excitedly)  
Miss Taylor!

Felicity hugs Miss Taylor's legs.

MISS TAYLOR  
It sounds like a freight train  
wants to join the ensemble. Ten  
points for dynamics, too bad he  
can't play well with others.

The two leave the music room together again. They hide in a restroom where other students and teachers have gathered.

EXT. SCHOOL SKYLINE - CONTINUOUS

Terrence passes overhead ripping off chunks of roofing and overturning school buses. Clouds roll by and sunlight peers down on the the elementary school.

EXT. SCHOOL COURTYARD - AFTERNOON

Firefighters scan through debris and find the group sitting happily in their place of refuge. Walking away from the wreckage, Felicity thanks Miss Taylor for rescuing her.

FELICITY  
Miss Taylor

MISS TAYLOR  
Yes Felicity

FELICITY  
I'm sorry for not listening  
earlier. I should have dropped what  
I was doing and followed your  
instructions.

MISS TAYLOR

Don't take it personally Felicity,  
Tornado warning response rates are  
low across the entire United  
States. But there are ways to  
improve. Maybe next class I'll ahve  
to write some safety tips in your  
music book.

FELICITY

Nah, after this adventure, I'm  
committed to memorizing my tornado  
safety rules.

While straight to the point, this version of the “Tornado Fortissimo” concept script failed in crucial aspects. For one thing, Miss Taylor serves as more of a hero and a better protagonist than the main character. One can hope that Felicity learns her lesson about listening, but she never physically demonstrates what she learns in the story. Having a character come to terms and acknowledgment that they did the wrong thing is positive. But actions speak louder than words. Given the visual aspect of cartoons, it would be much more meaningful to see her lesson impact her way of thinking, and intern, have Felicity’s lesson change the whole story’s course. Also, humans learn through means of repetition. Whether practicing an instrument, improving academic writing skills, or learning about tornadoes, dumping an entire school lesson into about twenty seconds of runtime will not benefit eager ears.

With this first attempt at a tornado safety cartoon screenplay, my simplistic theme of listening, which relates to how people often ignore tornado warnings, seemed to hold up fine. But subject matter wise, I faced the challenge of making tornadoes both fun and educational. Juggling these two goals perplexed me in every one of my preliminary screenplay creation attempts.

To use the power of repetition throughout the episode and to give Felicity time to learn. I changed my approach to expanding upon my characters and their world. I stretched out my length goals to thirty pages of screenplay, the approximate equivalent of thirty minutes worth of runtime and a common length for full-form animated content. Terrence Mesocyclone would remain the film's villain, but he would now show up at the story's climax. Here is where the second act problems started. With the biggest conflict occurring at the end of my narrative, a huge gap of space involved Felicity sitting around her elementary school. Leaving viewers to await the arrival of a heavily foreshadowed tornado. Felicity's brother Andrew first appeared as a character here. I toyed around with the concept of having a real bully whose character mirrored that of Terrence, but this led me too far down the track of bullying prevention. Hitting severe writer's block and realizing the major flaws of this adaption, I stopped writing until better inspiration arose.

My story involved tornadoes, and I needed to spend my screen time sticking to those weather-related facts. The first solution that came to mind once again involved Felicity sitting in a classroom learning about tornadoes in a mundane fashion. This defeated the purpose of animating the cartoon, as the actions taking place could have been captured



with live-action production equipment from the 1950s. Nothing interesting occurred on-screen. For the third time, I tossed my story aside.

My writing train stuck dead in its tracks and running short on steam, I minimized my screenwriting software and started researching tornadoes like mad. Browsing the internet, I found a solution to my writer's block, two relatives of the tornado known as dust devils and waterspouts. Creative passion flooded my mind for the first time in a week. I would now compose my second act in the familiar fashion of a simple three-point thesis. First, my characters would travel to the desert and learn about dust devils, vortexes that form as a result of hot air near the ground. Then they would travel to a wet and tropical location to encounter waterspouts, vortexes that form as a result of hot air near the water. Through my characters' escapades with these first two tornado likenesses, they would learn about tornado safety. And thereby, have an established preparedness when Terrence Mesocyclone arrived at the climax.

Keeping music and listening as important subjects and themes within the narrative, I devised a motivation for all these events to happen. I created my own fictional adaption of an African myth to introduce a sense of mystery and adventure (Mazzucco, Roberta). I based would base a fictional golden tou tou figure off a special tou tou bird from the traditional African story of "Sa and Alatangana." In an adventurous, Indiana-Jones like fashion, the characters would search for this bird that legend claimed had excellent singing abilities (fig. 11). Miss Taylor would still make it into the script. But I wanted to draw focus to the main cast of four gifted young musicians. The established groundhogs, Felicity and Andrew, along with a pair of mice named David and Esther. After writing this

screenplay, I would later change David's name to Steve. This story also paints the two as siblings, a relationship that I would later drop.

The student's love for music now formed a connection with their motivation for traveling to an African desert. According to my version of the tou tou myth. The tou tou figure possesses magical properties that grant musicians the power to control the weather. For educational purposes, I debunk this belief held by the statue's creators as pure fiction towards the end of the cartoon. But the wishes of my music student characters to have such power is enough for them to leave the comforts of their classroom and teleport via loosely explained music-powered teleportation. The students also point out that the forecast for their town of Mammalboro will involve rain all day long. The idea of traveling to a sunny desert instantly gains favor compared with staying in a schoolroom surrounded by inclement weather. While in the desert, Felicity encounters a dust devil because she refuses to listen to Miss Taylor's safety instructions.

In similar fashion to the adapted tou tou myth, I created the explorer character, Julio Mousez, based off of Spanish conquistadores. He swipes the tou tou from the sands of Africa hundreds of years before Felicity and her musician friends rediscover the statue's hiding place. Mousez leaves a note telling future explorers they have arrived too late. But historical records show that the intrepid adventurer lost the treasure in a shipwreck occurring in the Gulf of Mexico sometime in the 1500s. This lures the cast to a wet, tropical location to continue searching out the golden treasure. Felicity and her brother Andrew nearly meet their match with a waterspout, once again because of Felicity ignoring Miss Taylor's safety instructions. The vortex pulls them high into the sky. They then plummet

towards the water. Miss Taylor along with Felicity's classmates, David and Esther, manages to save the two siblings from certain doom with an inflatable bouncy slide.

Recognizing her mistake, Felicity apologizes for ignoring Miss Taylor's instructions the past two times. The team gives up on finding the golden tou tou, but the bouncy slide bumps into Mousez' ship anyways. Their quest to locate the tou tou complete, the musicians return home. Their regularly scheduled school day winding to a close, the group teleports back to the classroom with their instruments and bouncy slide. The weather looks just as bad outside as before. Suddenly, a tornado siren blares. Already comprehending the dangers of tornadoes by this point, everyone runs to a central restroom without hassle. While in the restroom, Miss Taylor explains why vortexes formed during thunderstorms present such a high danger compared to their fair-weather-forming cousins. The students listen to the sound of devastation outside and wish they could do something about the tornado flattening their town. They notice Andrew holding the tou tou figure and suggest using the magical properties of the statue to stop Terrence. Miss Taylor iterates that the story of the tou tou is just a myth, the statue itself bears no meteorological control properties.

An alternate solution comes from where Felicity never expected, Andrew suggests that the musicians put the bouncy slide in the school's freezer. Thereby chilling the compressed air inside. To buy time for thermodynamics to kick in, Andrew and Felicity distract Terrence by playing musical instruments. Drums assigned to Andrew and a golden flute for Felicity respectively. Being groundhogs, the siblings just burrow underground whenever Terrence tries to knab them. After a few minutes of distraction antics, Miss

Taylor, David, and Esther push a chilled down bouncy slide with icicles hanging off of it. The light object quickly gets sucked toward Terrence's funnel cloud. Felicity removes the feather from her hat and gives it a tiny blow. It also gets caught in Terrence's funnel cloud. The sharp quill point flies toward the inflatable slide. A puncture forms and icy air sprays everywhere. This destroys the warm updrafts feeding Terrence's strength. Following the principle of cartoon logic, Terrence turns into a harmless baby cloud. For his wrongs, he has to work a community service job watering plants. Concurrently, Felicity cleans the musician's many woodwind instruments for ignoring Miss Taylor's directives. Andrew sits with her and the two recall lessons learned and the craziness that ensued throughout the episode.

Fig. 11. Fourth tornado safety cartoon screenplay draft “Tornado Fortissimo: A Whirlwind of Adventure.”

Tornado Fortissimo: A Whirlwind of Adventure

written by

John McKeon

INT. GROUNDHOG RESIDENCE FELICITY'S BEDROOM - MORNING

Through pitch black darkness, a digital alarm clock shaped like a violin strikes six o'clock. The clock plays a classical music piece. Glow in the dark music symbols show through the darkness as Felicity, an eight-year-old groundhog clad in musical themed pajamas, pulls the chain on her bedside lamp. The illumination reveals that the lamp is fashioned in the shape of a saxophone.

Felicity rises to a sitting position. She turns off her alarm clock. The action stops a miniature bow from moving back and forth on the clock. Felicity opens a gigantic harp case where a selection of identical wardrobes sit on clothing hangers. She grabs one of the outfits.

INT. GROUNDHOG RESIDENCE HALLWAY - CONTINUOUS

From a hallway where tree roots stick out of dirt walls, Felicity excitedly scurries into the family bathroom. The bathroom's door closes quickly. Felicity emerges about two seconds later fully clad in her professional marching band attire. She strikes a heroic pose. Glancing up at her hat, she notices that it is crooked. Felicity straightens the imperfection and smiles wide.

Felicity's expression of assertion quickly fades to a look of disappointment as she gazes toward Andrew's bedroom door. Felicity grabs a huge French horn that is hanging on the wall. She loudly plays a military bugle call. Felicity then transitions to a majestic melody. Nothing happens.

FELICITY  
(assertively)

Andrew, wake up! It's time for  
school!

Felicity takes a guitar pick out of her pocket and uses it to pick the door's lock. She opens the door.

INT. GROUNDHOG RESIDENCE ANDREW'S BEDROOM - CONTINUOUS

Andrew, a ten-year-old groundhog, sits in a large gaming chair. His room is dark. The only significant form of lighting in the space comes from a video game player he is holding. He wears an orange sports shirt and a set of blue headphones. The opening door allows light to enter the space. Andrew rises from his seat without looking up. His posture looks worse than a hunch back. He mindlessly walks to the door.

INT. GROUNDHOG RESIDENCE HALLWAY - CONTINUOUS

Felicity scolds Andrew.

FELICITY  
Andrew, I told you to set your  
alarm!

Andrew remains fixated on his game.

FELICITY (CONT'D)  
Never mind, go get ready and I'll  
have breakfast waiting in the  
kitchen.

Felicity walks over to a plastic tube slide. She slides down the cylindrical tunnel.

INT. GROUNDHOG RESIDENCE KITCHEN - CONTINUOUS

A radio announcer talks about the weather forecasters are expecting later in the day. While the forecaster talks Felicity hums to herself and grabs two bowls from a cabinet.

RADIO ANNOUNCER (V.O.)  
Good morning Mammalboro. You're  
about to face greatest challenge  
known to rodents anywhere. Our  
forecasters expect severe  
thunderstorms to impact your little  
town throughout the day. Heavy  
rain, hail, and tornadoes are  
expected. Will you be caught  
unaware?... Don't be caught in the  
rain. You need a Zebra rain  
shield. Only Zebra rain shields  
can keep you dry and stylish...

Felicity turns the radio's dial off. Water drips down from the dirt ceiling onto a grand piano located in the middle of the kitchen. Felicity is angered by the moisture. She promptly wipes the water off with a handkerchief.

Felicity places the two bowls on the piano. Felicity turns the radio's dial off. Looking at the bowls she sees that one is cracked and dirty, the other bowl is clean looking. Flies buzz around the dirty bowl. Felicity gives a face of disgust and scoots the clean bowl away from the messy one. Felicity takes a can of insecticide out of her pocket and sprays the flies.

Felicity opens a refrigerator door that some sheet music is magnetically attached to.

She closes the refrigerator door and walks back to the grand piano with a carton of plant-based milk. Felicity comes back to the refrigerator with a long Alp horn. She uses the instrument to nudge a box of cereal off the top of the refrigerator. Catching the box with one hand she walks over to the piano again. Felicity pours cereal and milk into the bowls.

Andrew takes a seat and starts eating cereal with his right hand while operating his portable video game with his left. Felicity scoops her cereal with a big spoon in her left hand while loudly and quickly playing the "Spring" movement from "Vivaldi's Four Seasons" with her right hand.

While still playing, Felicity reaches up and pulls two carrots down from the ceiling. Dirt falls onto the clean piano top. She sets one carrot next to Andrew's cereal bowl. Felicity scrapes the dirt off the piano. She rubs her orange carrot clean and takes a bite. Andrew's left hand forages for the next course. He feels the carrot. Andrew pushes the carrot away from him. Felicity slides the carrot back. Andrew pushes the carrot away from him again. The two slide the carrot back and forth several more times. Andrew finally eats the carrot.

Felicity takes the bowls to the sink. She grabs a backpack with the insignia of a harp stitched on it. Andrew's hand shuffles for a backpack with a fire-breathing dragon illustration on it. A moldy sandwich hangs out of the bag's zipper.

Felicity approaches a framed picture. She lifts the picture up. A small safe sits behind the frame. Felicity opens the safe. Rays of blinding light shine from the deposit box as she pulls out a golden flute. She reaches in for the instrument's case and places the flute's pieces neatly inside. She zips the case in her backpack.

Felicity and Andrew enter an elevator. Inside, the elevator looks like a hamster exercise wheel. Felicity grabs a trombone and begins running vigorously. She loudly plays a victory song similar to the score from "Rocky's Run". Andrew sits on a stationary seat. Felicity's effort moves the elevator upwards.

EXT. GROUNDHOG RESIDENCE FRONT YARD - CONTINUOUS

An elevator level indicator swings clockwise. A bell rings as the elevator reaches the top floor. Elevator doors casually slide open as Felicity hangs the trombone to the side. Clouds line the sky. Rain pours down everywhere.



Andrew and Felicity race through the rain to a waiting school bus.

INT. SCHOOL MUSIC CLASSROOM - CONTINUOUS

Andrew and Felicity sit at school desks. Violins, cellos, saxophones, oboes, tubas, and many more musical instruments line the walls and borders of the room. Esther, a fluffy eight-year-old deer mouse, sings a graceful folk song about listening to your parents on a small stage located at the head of the classroom. David, a nine-year-old rabbit accompanies her vocals with soothing pedal harp music. Miss Taylor sits in a seat to the side of the stage. The piece ends and everyone claps.

MISS TAYLOR

Thank you Esther. Superb sustain.  
David your fingerings on the harp  
are looking much better...

David and Esther smile and give a thumbs up. They try to remove the harp from stage. David pushes while Esther pulls. The harp doesn't budge. David and Esther trade places. The harp remains still. They frown in frustration.

MISS TAYLOR (CONT'D)

Alright Felicity, how is your piece  
progressing?

Felicity effortlessly rolls a grand piano up a ramp on the side of the stage. David and Esther look down at the wheels on the bottom of the piano. They have an epiphany. They each hold a hand to their chins and smirk.

David and Esther roll an appliance dolly under the harp. They use leverage to apply upward pressure on the instrument. The dolly's steel toe plate breaks off. David and Esther scratch their heads. They give up and leave the harp on stage. Felicity plays an excerpt from "Beethoven's Fifth Symphony." Sound resonates so loudly that David, Esther, and Miss Taylor's fur blows backwards as if it were in a mighty gust of wind. They cover their heads as the room shakes and drywall falls from the ceiling.

ESTHER

(whispering to David)  
Wow... I didn't know fate was an  
earthquake.

MISS TAYLOR

Great... Hey, Felicity what do you say we try a slightly calmer piece next week... Perhaps a different composer.

FELICITY

You're right... Beethoven is getting old...

MISS TAYLOR

Perhaps a lullaby could...

FELICITY

A night-time theme. Exactly what I was thinking.

MISS TAYLOR

Really?

FELICITY

Of course... It's time for Mussorgsky's "Night on Bald Mountain."

Miss Taylor bears a look of surprise. David and Esther turn their heads in slow motion. Their hands press against their heads. Twitching and an open mouth accentuate an expression of fear. A frightful excerpt from Mussorgsky's "Night on Bald Mountain" plays. Lightning flashes in the windows.

DAVID AND ESTHER

Noooooooo...

FELICITY

No worries... Then it's settled. I'll play Mussorgsky nice and loud for you all to hear on Monday.

MISS TAYLOR

(sarcastically)

Hooray... Hey, Andrew could you give us some gentle background music while we start the lesson.

Andrew doesn't respond. Felicity taps him on the shoulder while heading back to her seat. Andrew sits down at the piano and continues playing his video game without striking a single note. Miss Taylor begins teaching the kids a geography lesson.

MISS TAYLOR (CONT'D)

Alright, history time kids.

David, Felicity, and Esther all grin with excitement.

MISS TAYLOR (CONT'D)

Today's ancient read is a creation  
myth from Africa.

Visual representations of Miss Taylor's narration show while  
she talks.

MISS TAYLOR

Once all of Africa was in darkness.  
Storm clouds covered the land. The  
inhabitants of the world tripped  
and fell often because they could  
not see anything. But a god named  
Alatang knew that music was the key  
to bringing light to the world. So,  
he taught a red tou tou bird to  
sing the notes that would summon  
the sun's light. But the tou tou  
didn't listen to Alatang at first.  
She tried to sing too loudly and  
strained her voice. Frustrated, the  
tou tou flew off into the darkness.  
Alatang was upset, he wanted to  
make the world safe for mankind. If  
only the tou tou would listen.

One day the tou tou returned. She  
had been practicing. Her voice  
could now sing both loudly and  
softly. With renewed heart, Alatang  
continued to train the tou tou and  
the tou tou listened to Alatang.  
One day, she sang the magic notes  
so beautifully that the dark clouds  
rolled away. The tou tou's vibrant  
voice brought sunshine to the  
Sahara.

The inhabitants of Africa were so  
pleased that they formed a golden  
tou tou statue that they believe  
can give any musician magical  
powers to part the clouds.

DAVID

Awesome!

FELICITY

I wish I had that statue.

ESTHER

I bet it's really shiny.

David looks up a picture of the statue on his phone.

DAVID

How come there are no pictures of the statue online? It seems like it would be pretty important to African culture.

MISS TAYLOR

The tou tou figure has never been found. Some people question whether it even exists. Only one adventurous explorer, Spanish conquistador Julio Mousez, has ever attempted to find the treasure. But the figure never made its way back to Spain... Leaving some to think that the magical tou tou of gold cast is still somewhere in this isolated dot of the Sahara.

FELICITY

Guys we have to go look for this thing!

ESTHER

Please Miss Taylor!

DAVID

We'd only be leaving this stormy weather behind.

Andrew points toward the window to the clouds and rain billowing outside. Miss Taylor puts her hand to her ears.

MISS TAYLOR

Is that the solo sound of adventure I hear? Well... Which one of you musicians thinks you can accompany such a track?

DAVID, FELICITY, AND ESTHER  
(excitedly)

Yes!

Miss Taylor turns toward Andrew.

MISS TAYLOR

That was an excellent performance  
of John Cage's "Four Thirty Three"  
Andrew. Such golden silence!

Andrew continues playing his video game.

Miss Taylor effortlessly lifts the pedal harp and carries it a few feet back toward the wall to make room for her students on the stage. She begins to pluck out a magical sounding tune on the strings. An energy ball starts to glow around the instrument. Felicity, David, and Esther all join in with flute, trumpet, and guitar. Esther also lends an adorable vocal accompaniment. Andrew casually walks up, still playing his game. The energy ball cascades brightly across the room as it engulfs the group. The ball and everyone inside disappear.

EXT. SAHARAN DESERT - AFTERNOON

Felicity, David, and Esther pop out from small wormholes. They drop onto some sand dunes.

MISS TAYLOR

Alright, we're here.

FELICITY

Great, where's the treasure?

David and Esther wipe dust from their clothes.

MISS TAYLOR

The teleporter isn't entirely  
accurate. Judging by my trusty map,  
the tou tou figure should be that  
direction.

Miss Taylor points far out into the desert.

DAVID

Ah man.

ESTHER

Hey Felicity, where's your brother?

FELICITY

Andrew...

DAVID

There he is... Andrew!

FELICITY

Forget it. He can't hear you  
through the headphones.

MISS TAYLOR

It's not just the headphones. It's  
hard to hear anything over this  
Saharan wind.

DAVID

He's standing pretty close to the  
treasure anyways. Let's just go.

FELICITY

Fine by me, last one there gets to  
clean all the woodwinds when we get  
back.

A desert snake slithers out from under a rock. His head rises high above everybody. His posture curves backward suggesting he will strike. He hisses. Miss Taylor plays a snake charming tune on a violin. The snake responds by forming the straight posture of a soldier. The snake is held in a frozen trance. Everyone backs away. Miss Taylor stops playing the tune and the snake fearfully slithers back under his rock.

DAVID

That was close.

MISS TAYLOR

There are plenty of dangers out  
here. I suggest we stay together  
and walk on the shaded side of  
these dunes.

ESTHER

Hey, where's Felicity?

Felicity pants as the sun beats down overhead.

FELICITY

(panting)

Think fast make bold statements.  
I'll get to that statue first...  
Ow.. my feet. It's so hot.

Felicity stops walking. She takes off her hat and starts fanning herself. Felicity glances to her side and sees a sandy vortex moving towards her.

FELICITY (CONT'D)

Tornado!

Miss Taylor rides up on the desert snake from earlier.

MISS TAYLOR

Actually Felicity, this is a dust devil. They form in places where the sun heavily heats the sand. The freshly heated air rises and voila... You've got yourself a vortex. They're usually harmless, but I suggest we get out of the way.

Felicity takes Miss Taylor's hand and climbs on the snake's back. Miss Taylor plays an African dance tune and the snake forward.

FELICITY

It's gaining on us.

MISS TAYLOR

Well if we can't outrun the vortex what should we do?

Felicity looks toward a series of rugged hills.

FELICITY

Head for the hills. We can hide in the rocks.

MISS TAYLOR

Hang a right reptile.

Miss Taylor plays her dance music more dramatically and the snake hugs a right turn. The dust devil quickly approaches as the snake nears the rocks. Dust flies everywhere. Then a calm stillness. Felicity and Miss Taylor emerge from a hole in the rocky hill side.

FELICITY

That was close.

MISS TAYLOR

Yes, taking shelter was the best option.

FELICITY

Best option, what else would you do in a case like this?... Hey where'd your recorder go? Did you lose it in the dust devil.

Miss Taylor reaches her arm up and catches her recorder as it falls from the sky. She smiles.

MISS TAYLOR

Nope.

Miss Taylor heads back toward the cavern. Felicity scratches her head. David and Esther walk down the hillside with Andrew.

ESTHER

Look who we found.

David, Andrew, and Esther all stare at the dust on Felicity's clothes.

FELICITY

Don't ask.

All the characters enter the dark cavern. Miss Taylor pulls out a glow in the dark carbon fiber violin to light the path. The team reaches a dead end. Miss Taylor holds one finger to her lips. She holds one hand up to her ear. The sound of music cascades softly through the cave.

MISS TAYLOR

(whispering)

Listen...

FELICITY

(loudly)

What?

Arrows shoot out from the cave walls. But the projectiles somehow miss everyone.

MISS TAYLOR

Listen to the pitch the wind is producing as it passes across the cave entrance.

DAVID AND ESTHER

Please...

David and Esther knee in a prayerful position as they beg Felicity to not make anymore loud noises. Felicity reaches up and grabs her hat. The head garment has an arrow stuck in it.

MISS TAYLOR

Only music can unlock the treasure.

David and Esther play accents to the tune echoing from the cave. The cavern rumbles.

MISS TAYLOR (CONT'D)

Cover your heads students.



Miss Taylor holds her violin over her head. The students follow suit with their instruments. Stones fall from the cave ceiling as light begins to fill the darkness. A hole forms at the roof of the cave. A slab of rock on the wall peels back to reveal a hiding place. The students look to see what is hidden in the compartment. Miss Taylor picks up a tattered note.

ESTHER

What does it say?

MISS TAYLOR

Written in the native language, it says "We here leave this figure of the red tou tou who's song brings light."

FELICITY

But where's the tou tou?

Miss Taylor flips the note over.

MISS TAYLOR

I'd suggest we ask Mousez. But we're a few hundred years too late. It says here that Mousez "Discovered the cave in the year of Phillip the Great 1655. Mousez, the brave explorer he was, took the golden tou tou on his journey back to Spain."

ESTHER

Our song bird is in the Spanish Treasury?

MISS TAYLOR

Oh, I don't think so. On his way back to Spain, Mousez followed the triangular trade route. He made several stops to find treasure in the Americas. No one knows if he was ever successful though, because his ship vanished somewhere in the Florida Keys. Experts suspect his vessel met bad weather and beached on a sandbar much like Blackbeard's shipwreck off the coast of North Carolina.

FELICITY

Aww...

ESTHER

Come on...

DAVID

Does this mean the search is over?

MISS TAYLOR

Of course not. The sun may be setting on this side of the world, but it's still morning in the Gulf of Mexico.

STUDENTS

Yeah!

MISS TAYLOR

Now we're going to have to split up for this next part.

EXT. GULF OF MEXICO - MORNING

Andrew and Felicity pop out of their respective worm holes and fall onto a sandy beach.

FELICITY

It's a good thing we keep landing in sand and not something hard.

Felicity looks around her.

FELICITY (CONT'D)

Hey, where's Miss Taylor?

Andrew continues playing his video game. Felicity's cellphone rings. Felicity answers the call. Miss Taylor appears on a video screen.

MISS TAYLOR

Well, I was supposed to teleport your way. But it looks like you guys are on your own.

FELICITY

Miss Taylor, my brother is useless. You can't expect me to find the treasure by myself.

MISS TAYLOR

(smugly)

Have you tried sign language?

FELICITY

Miss Taylor!

MISS TAYLOR

Felicity, for now David, Esther,  
and me are all stuck at the  
Maritime Museum in New Port,  
Virginia. Things go buggy if we try  
to teleport too much in too short a  
space of time. Stay put until we  
can meet you with a diving vessel.

Felicity crosses her arms and rolls her eyes. She disconnects the call. Felicity and Andrew sit in silence. Felicity twiddles her thumbs and taps her feet. She hops up in a burst of frustration. She looks at the tropical vegetation around her. Felicity tries to kick and push down down a small palm tree. Nothing happens to the palm tree. She holds her arms at her side while staring at the tree.

Felicity glances back toward Andrew. Felicity notices that Andrew bites his large set of rodent teeth down every time he hits his controller. She walks up to Andrew and pulls out one side of his headset. She discovers that the bite and finger motions correlate with a sound effect that plays in Andrew's game. Felicity has an epiphany. She takes her phone out and opens a metronome app. The the metronome is set to sixty beats per minute. Felicity connects a set of ear buds to the phone and places one end inside Andrew's headphones. Andrew's chomping immediately starts following the beat of the metronome.

Felicity smirks and turns the speed of the metronome up to two-hundred beats per minute. The sound of Andrew's chattering starts to sound like a saw. Felicity walks Andrew up to a tree. She carefully takes one finger and pushes Andrew's head to a ninety degree angle. The sound of tree cutting resonates loudly. The palm tree falls to the ground.

The tops of a dozen palm trees disappear from the island's skyline. Felicity turns the metronome off. The sawing noise stops and everything becomes quiet again. She drags the felled lumber together and wraps it with vines. A makeshift raft takes shape. Felicity reaches into her backpack and pulls out some markers. She draws a depiction of a treble clef on a brightly colored leaf. She hangs the leaf from a pole that rises above the vessel's flat hull.

Felicity tries to pull the craft toward the water, but it weighs too much. She ties a vine around Andrew and tugs on his arm. Felicity uses the metronome again and lifts Andrew's feet up and down following the beat. She lets go of Andrew's feet and they continue to move up and down. Felicity pushes Andrew forward and the two begin marching over the beach toward the water pulling the raft as they go.

The raft begins to float. Felicity grabs Andrew by the torso and seats him on the back of the raft. Felicity turns up the metronome again. Water splashes as Andrew's feet drive the raft forward like a marine engine. Felicity's phone rings again.

ESTHER

Good news.

DAVID

We found the paper's that survived  
Mousez' voyage.

INT. MARINER'S MUSEUM - CONTINUOUS

MISS TAYLOR

The last journal entry says Mousez  
and his intrepid crew passed by the  
island you guys are on while  
heading to the port of St.  
Augustine.

A flashback montage shows while Miss Taylor reads the  
manuscript.

MISS TAYLOR/MOUSEZ (CONT'D)

The day was clear and golden bounty  
plentiful. But a great fiery whirl  
wind arose as it were smoke  
billowing toward the heavens. The  
smoky vortex hit our ship and  
flooded our vessel with water. The  
added weight caused us to become  
stuck on a sand bar. The ship  
leaned sideways. Holes formed on  
the ship and more water rushed in.  
The vessel was unstable and I could  
not risk the safety of my crew.  
Defeated by the elements, we  
abandoned our golden bounty and  
marked the location of the island  
closest to the wreck. We lit fires,  
and awaited rescue. Days later, an  
armada passed by carrying us to  
safety. I had to wait six long  
years to return to the island and  
reclaim the treasure. But when I  
looked, the ship was no more. I  
returned to Spain penniless. The  
laughing stock of explorers  
everywhere.

ESTHER  
That's a sad story.

DAVID  
That's misfortune.

EXT. GULF OF MEXICO - CONTINUOUS

FELICITY  
Serves him right. I thought  
captains were supposed to go down  
with their ships. I know I wouldn't  
have let the gold sink.

INT. MARINER'S MUSEUM - CONTINUOUS

ESTHER  
My parents always tell me to put  
safety first.

DAVID  
Yeah, and what good is gold if  
you're dead.

MISS TAYLOR  
They have a point Felicity. A good  
leader should always keep safety in  
mind... Speaking of safety, why are  
you on a raft instead of the  
island?

EXT. GULF OF MEXICO - CONTINUOUS

FELICITY  
Oh relax, it's perfectly safe. The  
water couldn't be calmer. The air  
is fresh. The sky is clear...  
except for that big plume of  
spinning smoke on the horizon...

INT. MARINER'S MUSEUM - CONTINUOUS

DAVID, ESTHER, AND MISS TAYLOR  
Big plume of spinning smoke!

ESTHER  
Felicity, you guys need to get out  
of there now!

DAVID

The sea-going smoke stack is what caused Mousez' ship to sink.

MISS TAYLOR

I believe waterspout is the proper term for that smoke stack. Waterspouts form on rivers, lakes, and large water bodies like oceans, or in this case the the Gulf of Mexico when the sun heats a part of the water's surface. Just like the dust devil we saw in the desert, cold air rushes in to fill space as the hot air rises and a spinning updraft is created.

ESTHER

There's an exhibit about them right here. It says their watery color is the result of condensation from where the hot and cold air temperatures meet.

David hits a button on another display stand.

MISS TAYLOR

That's right Esther. History shows these funnel clouds have been sinking ships since Roman times and they're still dangerous today.

A brief animation of a stylized Roman emperor playing Battleship rolls on a television screen. He moves one of his ships and throws his opponent's piece off the board. The emperor gives a victory pose. His Egyptian opponent nods in disagreement. He pulls out a waterspout playing piece and uses it to knock every one of the emperor's ships off the game board. The Roman emperor shakes his fists in anger.

EXT. GULF OF MEXICO - CONTINUOUS

FELICITY

Love the facts guys, but how do I avoid this one here and now?

INT. MARINER'S MUSEUM - MORNING

MISS TAYLOR

If you were on a larger vessel I'd suggest heading below deck and covering your head.

(MORE)

MISS TAYLOR (CONT'D)

But your raft isn't a safe hiding place. How's your breath?

EXT. GULF OF MEXICO - CONTINUOUS

FELICITY

My breath?

INT. MARINER'S MUSEUM - CONTINUOUS

MISS TAYLOR

Fair weather waterspouts like this one are relatively weak compared to waterspouts and tornadoes that form during thunderstorms. You should be alright if you just duck below the vortex.

EXT. GULF OF MEXICO - CONTINUOUS

FELICITY

Are you nuts? I'm not going to wait for the vortex to get here. Andrew step on it... Andrew...

All dialogue in *italics* is Japanese.

ANDREW

*Aww... my battery's dead.*

A battery icon flashes on Andrew's game. The screen blacks out.

ANDREW (CONT'D)

*Well enough of that... Time for school.*

Andrew puts his game away and stares at the endless expanse of water.

ANDREW (CONT'D)

*Felicity, have you been singing in the shower again?*

FELICITY

Andrew, I can't understand a word your saying. And now might not be the best time for questions.

Andrew raises his finger.

ANDREW  
*Okay, but one more...*

Andrew points behind Felicity.

ANDREW (CONT'D)  
*What's that giant tornado-like  
flume heading towards us.*

Felicity turns around.

FELICITY  
(shouting)  
Waterspout! Paddle Andrew, Paddle.

Felicity reaches her arm over the side of the raft. Andrew bears a temporary look of confusion. He watches Felicity paddling with her hand. He looks down at his hand and starts paddling himself.

Despite their efforts, the waterspout catches up. The raft is lifted high up into the air. The two siblings hang on tight as the makeshift vessel spins around and around.

ANDREW  
I was almost the Rhythm of Doom  
world champion.

The raft reaches the top of the vortex.

ANDREW (CONT'D)  
(excitedly)  
Hey, no more wind! Uh oh...

The raft plummets like a roller coaster car. Andrew and Felicity grab hold of each other and scream loudly. Both siblings shut their eyes. Just before reaching the water, Andrew and Felicity collide with the top of an inflatable bouncy slide. The two enter the air one more time before falling onto the slide and splashing into the water. The two sink and swim back to the surface. Felicity spits out a trail of water.

ANDREW AND FELICITY (CONT'D)  
That was... Incredible/*incredible!*

ANDREW (CONT'D)  
It was just like Rhythm of Doom...

An anime style background appears behind Andrew as his eyes enlarge to manga proportions.



ANDREW (CONT'D)

But for real!

FELICITY

I feel were making baby steps. But hey... we're closer to inner-sibling communication. Congrats bro! Your talking.

David, Miss Taylor, and Esther float up on the inflatable bouncy slide.

DAVID

Okay, how hard did you guys hit your heads?

ESTHER

Yeah, the real Andrew never talks. Let alone whatever this is.

MISS TAYLOR

No worries musicians. Andrew is speaking perfectly clear... Japanese.

FELICITY

Japanese?

MISS TAYLOR

Perhaps warnings in another language will be better heeded than my own.

FELICITY

Oops...

David pulls Andrew's video game from the water.

DAVID

Rhythm of Doom... this game was only released in Japan.

FELICITY

Are you saying my brother learned how to speak Japanese as a foreign language just by playing a video game?

DAVID

Stranger... I'm saying he can only speak Japanese because he's been playing for too long.

ESTHER

I don't think that's how foreign languages work.

ANDREW

(excitedly)

*Science!*

ESTHER

Now we don't even know where we are.

DAVID

Umm... We have cellphones...

ESTHER

No coverage this far out to sea.

DAVID

Oh...

FELICITY

Miss Taylor I'm sorry. I should have waited on the island. And I should have listened to you back in the desert. Thanks to me and that waterspout we're just as lost as Mousez' treasure.

MISS TAYLOR

Listening to the advice of experts and observing your surroundings can be the most important skill in an emergency. If you've learned your lesson about putting yourself and others in harm's way, that's worth more than any treasure in the world.

FELICITY

Thank you Miss Taylor... Well, I guess we just float along in the current until we can safely teleport back to school...

The bounce house stops suddenly. The sound of seeping air resonates.

MISS TAYLOR

Oh dear.

DAVID

That sounds like a leak.

ESTHER

Someone grab a roll of beaver tape.

ANDREW

*Where's the bathroom?*

Andrew crosses his legs.

FELICITY

Musicians... You might want to see this.

Felicity leans over the side of the bounce house. She gazes down into the water. Air pours out of a hole in the inflatable next to a rotten hulk of wood resembling a telephone pole. Mousez' ship sits on its side. A pile of gold trails out of the cracked hull.

INT. SCHOOL MUSIC CLASSROOM - AFTERNOON

Light flashes as the group teleports with their instruments. The bouncy slide remains fully inflated. It takes up most of the room's volume.

DAVID

Best field trip ever!

FELICITY

I still wish we could have kept the gold for ourselves.

ESTHER

Too bad it's illegal to take treasure from Floridian waters.

MISS TAYLOR

But musicians, just think. Thanks to your discovery, Mousez' treasure is going to a museum where many students can learn about his story.

FELICITY

And the story of vortexes. After this adventure. I know to stay low, cover my head, and hide in a sturdy location... Perhaps protected by some comfy pillows... and... listen...

MISS TAYLOR

That's right. Always listen to tornado warnings and watch for signs that a vortex may form.

FELICITY

No... Listen.

Everyone holds a hand to their ears. A sound similar to a freight train can be heard. Sirens blare and a tornado warning appears on everyone's cellphones.

ANNOUNCER (V.O.)

Attention, Mammalboro elementary is under a tornado warning. I repeat, a tornado is on the ground here in Mammalboro.

ESTHER

That's a warning none of us are going to ignore.

DAVID

We need to find a safe hiding place.

FELICITY

But where? This school doesn't come with a cave, deep water, or even a basement.

MISS TAYLOR

(firmly)

Stay together and follow me to a central room musicians.

INT. SCHOOL RESTROOM - CONTINUOUS

MISS TAYLOR

This sturdy block and short roof span should keep us safe in here.

DAVID

Great!

FELICITY

Hey, where's Andrew?

ANDREW (O.S.)

*I finally found the restroom!*

Thunder cracks outside.

FELICITY

Andrew!

MISS TAYLOR

That wasn't him. Full fledged tornadoes form from circular cumulonimbus clouds that often bring lightning, rain, and hail. There basically regular rain clouds that spin around a central axis like cotton candy. But believe me, they're anything but sweet.

Andrew walks by carrying a stick of cotton candy.

ANDREW

*Mmm... Very sweet.*

FELICITY

Yuck! Andrew did you find that in the stall?

ANDREW

*It's fine... Science!*

MISS TAYLOR

Can I see that?

Miss Taylor takes the cotton candy from Andrew.

MISS TAYLOR (CONT'D)

A tornado is kind of like this cone shaped handle. It's small in comparison to the size of the spinning cloud above it. Just like the iceberg that sunk the Titanic. the real danger is the part most people never observe.

Andrew dumps a pile of ice cubes from a discarded icy beverage into the bathroom sink. He launches a tiny toy boat into the sink. The boat hits the pile of ice and sinks immediately.

ANDREW

*Science!*

MISS TAYLOR

Similar to the dust devil and waterspout, tornadoes form because of hot air buildup at the earth's surface. But the effects are much larger. Massive hot and cold storm fronts collide to create a stream of vacuum cleaner suction lifting cars, people, and other large debris into the sky.

Miss Taylor dips the cotton candy into the trash. The dessert emerges a darker color with lots of trash sticking out.

FELICITY

It sounds like it's ripping the town apart. Too bad no one knows how to stop tornadoes.

MISS TAYLOR

For now, the ability to control the weather remains possible only in myths and science fiction.

FELICITY

Myths... That's it!

Felicity snaps her fingers.

FELICITY (CONT'D)

We can bring light and scare the tornado away with our music.

ESTHER

But we don't have the tou tou with us.

Andrew stands at the bathroom sink whistling and cleaning green algae off the the red tou tou figure with a wash cloth.

DAVID

I thought we left all the treasure in Florida.

FELICITY

Well it's not like he could understand us telling him it was illegal to snatch.

MISS TAYLOR

I appreciate your enthusiasm musicians. But the story of the Red Tou Tou is purely fiction. The statue doesn't really have magical powers. Spanish explorers believed in everything from whole cities made from gold to fountains that granted immortality. Mousez' beliefs in the relic were a brilliant stretch of the imagination.

ESTHER

So there's no way to stop the tornado?

ANDREW  
(boldly)  
*Musicians... I have an idea...*

EXT. SCHOOL COURTYARD - CONTINUOUS

Terrence Mesocyclone evilly whirls toward the school building.

TERRENCE  
Oooo... What do we have here?

A flag bearing the Mammalboro city crest blows heavily in the wind. Terrence rips it from its pole. He laughs to himself. He looks down at a parked school bus. Terrence picks the bus up and holds it like a toy.

TERRENCE (CONT'D)  
Come out, come out and play kids.

Terrence throws the bus at a swing set. The swing set is instantly crushed.

FELICITY  
Hey funnel head, you should play nicer with your toys.

Terrence laughs again.

TERRENCE  
And why should I listen to you?

FELICITY  
Listening is an important skill in situations like this.

TERRENCE  
Well perhaps you haven't been listening to the sound of my spin!

FELICITY  
I've been listening to vortexes and tornado warnings all day. I'm not afraid of you. I know exactly what to do.

TERRENCE  
Well if you're not afraid of me... Let's play.

Terrence reaches out to grab Felicity.

FELICITY

Let's mine for gold Andrew!

Andrew and Felicity jump into dugout tunnels behind them. They dig under the playground making a mole-like escape. Terrence fails to grab them and looks around to see where they disappeared to.

TERRENCE

Where are you?

FELICITY

Ever heard of a magical bird statue that gives music the power to clear any rain cloud.

Felicity holds up the tou tou figure. Its shiny finish glistens. She places the statue in her backpack and pulls out her flute.

TERRENCE

You're making this up.

Andrew strikes a gong. Felicity starts playing her flute.

TERRENCE (CONT'D)

Stop that.

Terrence reaches out to grab the siblings again. They burrow another set of tunnels and pop out in another location. Felicity continues playing her flute. Andrew keeps time with a drum. They play their music faster and faster. The scene looks like a giant whack-a-mole game.

FELICITY

It's all over. We have the low ground.

Terrence makes one more burst of rage, his face and arms move down his column towards Andrew and Felicity. He almost reaches them, but his own suction energy pulls his body parts back into their default positions.

FELICITY (CONT'D)

Wow, it must suck to be you.

TERRENCE

(despairingly)

Nooo... The music... My suction...  
My spin... I feel... Nothing...  
Nothing has changed. I'm still just  
as strong as before.



FELICITY

Release the slushy slide!

David, Miss Taylor, and Esther push the bouncy slide across the lawn. Icicles dangle from the object.

FELICITY (CONT'D)

Such a hot temper... I think you need to chill out.

The light inflatable is instantly sucked toward Terrence. The object spins around him. Felicity takes the feather from her hat and gives it a blow. The feather drifts up toward Terrence's nose. He sneezes and the feather collides with the bouncy slide. The bouncy slide pops and spews cold air everywhere.

TERRENCE

Cold air... No... Noo... It's freezing my hot updrafts away. It's so cold... So cold.

Terrence dissolves into a little baby cloud.

TERRENCE (CONT'D)

(disappointed)

All I wanted was for someone to listen to me... Love me... Feed me dust particles... Take me for long floats across the mountains. Is that too much to ask?

MISS TAYLOR

Well, I don't know about floats across the mountains. But I'm sure everyone here will be much better listeners after this experience.

Felicity and Miss Taylor grin at each other.

INT. SCHOOL MUSIC CLASSROOM - MORNING

Andrew and Felicity sit at a table on the side of the room near a window. Felicity has woodwind instruments spread across the flat surface. She cleans the pads with a dollar bill. She stares at the dollar bill.

FELICITY

It's not quite the equivalent of Mousez' treasure or even the tou tou figure, but at least I get to hold something of monetary value.

She continues running the dollar bill under the instrument's pads.

FELICITY (CONT'D)

I suppose it's only fair that I skip today's adventure and clean the woodwinds to make up for not listening last week.

Felicity sets the instrument down.

FELICITY (CONT'D)

I still have one question though. How did the little bit of refrigerated air you guys released stop the forces of an entire thunderstorm?

ANDREW

*Science.*

FELICITY

I guess... But if you really think about it, tornadoes exist because storms contain both hot and cold air already. A tiny amount of cold air would just be canceled out.

ANDREW

*Science.*

FELICITY

Well Mr. Einstein of the year... Explain why two of the vortexes we encountered were just vortexes while one was sentient... Wait, here's an even better question. If you can only speak Japanese how were you able to understand us when we were speaking in English.

ANDREW

*Science.*

FELICITY

How can you understand me right now?... Never mind, I'm getting too technical. Thanks for staying here with me bro. Your a good listener... Whether you can understand me or not.

Felicity looks out the window. Terrence Mesocyclone floats by. Felicity waves to Terrence through the window.

FELICITY (CONT'D)  
How's it going big guy?

TERRENCE  
Only about three months of  
community service to go.

LANDSCAPER (V.O.)  
Terrence, those plants won't water  
themselves.

Terrence waves to Felicity and heads back to work.

Felicity stares out at the school's courtyard.

FELICITY  
Hmm...

EXT. SCHOOL COURTYARD - CONTINUOUS

The mole-like tunnels Andrew and Felicity created the prior week still fill the courtyard. They make a giant letter "M" shape.

FELICITY (O.S.)  
Happy studies Mammalboro  
elementary.

Andrew pops up from the side of the screen and breaks the forth wall. He gives a Japanese farewell bow.

ANDREW  
(excitedly)  
*Science!*

Andrew pulls a rope and curtains close.

After structuring my story anchors, I was able to craft humor that related to the cartoon's message. This purposeful addition added to the entertainment and educational values of my content. Cartoon logic is utilized to achieve laughs and illustrate important points throughout *Tornado Fortissimo's* screenplay. For example, I wanted to show how poor Felicity's listening skills really were. Since half of music appreciation is about listening, I used the irony of her playing style to demonstrate her weakness. From the first time Felicity plays an instrument to her class performance, Felicity plays as loudly as possible. It is more than a coincidence that the musical term included in my cartoon's title, fortissimo, means to play loudly.

Whether we humans cloud our minds with distractions or just play music as loudly as possible to block out the world around us, we all have problems listening sometimes. Felicity plays her interpretation of Beethoven's Fifth Symphony, a piece already known for being loud and brash, as intensely as possible. Her playing literally makes drywall fall from the ceiling. Miss Taylor and Felicity's classmates beg her to learn a less abrasive piece. She responds by picking another piece designed for loud and forceful playing. Everyone stares with a look of horror. By the story's conclusion, however, Felicity learns her lesson about listening to others. Her playing style changes to a softer dynamic to reflect the transformation she ventures through as a character. Here she plays her golden flute for the first time. Flutes are known for being very relaxed and melodious. In a story about finding golden treasure, the instrument's material symbolizes that Felicity increased her own moral value by learning to listen.

Writing Andrew's character into the screenplay represented an enjoyable endeavor once I figured out what to do with him. I chose to employ an element of minimalism when describing his actions. Unresponsive and very one-note, Andrew represents another specimen of the poor listener. He does not actively seek to block out the world like Felicity. Andrew forms a habit of playing a game that distracts him from real life. Ironically, Felicity despises Andrew's lack of focus while still lacking the ability to listen herself. But in a certain twist, Andrew is a better listener than Felicity. His game, Rhythm of Doom, hypnotizes his sense of hearing so much that his muscle movements can be sped up and slowed down by adjusting the beat of a metronome played in his ear. And just before the waterspout lifts Felicity and Andrew high into the Gulf Stream air, it is revealed that Andrew can speak. But another twist is that he can only speak in Japanese. His listening skills so superior to reality, he apparently learned to communicate solely from playing a Japanese video game. He talks exclusively in Japanese for the remainder of the cartoon. Although some moments show that he can understand both English and Japanese. Andrew is so smart that he even comes up with the idea that stops the story's villain. Whenever the other characters question the believability of the crazy cartoon antics ensuing on screen, Andrew just states in his language of the Rising Sun, "science." More descriptively, Andrew reminds audiences to disregard reality and enjoy moments of wackiness. After all, fiction is merely an idealized state of reality. And as Andrew managed to pick up a foreign language from playing a video game, the audience can acquire tornado safety information from a crazy cartoon.

Using story composition skills such as the three-act structure, subject, theme, and focused comedy, screenplay artists can meet these radical cartoon challenges. Choosing

subjects relevant to our target audience ensures we understand who our content is intended for. And in a selfsame way, ensures our audience understands that some childish things will happen in our stories. Yet by crafting arguments larger than ourselves, we can avoid alienating older audiences. Themes allow us to form children's educational cartoons with far broader appeal than generic picture books. Comedy represents the icing on the cartoon cake. Comedy reminds us that fiction exists for us to have fun enjoying things we cannot experience in our own reality. In a quality cartoon story, it releases healthy portions of neurochemicals that leave us thirsting for more content that challenges us to think. Such focused fictional writing allows the seasoned screenwriter to teach us about the natural world and improve our moral characters, memorably and entertainingly, through means of educational children's cartoon shows.

## THE REVISIONS FLOOD IN

Whether an absolute beginner or an experienced artist, revisions are a necessary part of any successful creative process. When working with a client, one must find and maintain a clear vision of the buyer's intent. Telepathic mind-reading technology could be a serious help in this area of art and design. But until the day that science enables artists to peer directly inside the brains of their employers and read their intents for a project, trial and error is the most proven way to arrive at what a client wants. Because of this, even the most skilled artists must keep their egos at bay and open to critique. There is no room for big heads in art. And one must remember that in terms of a career, your skills are a product. Your client is a customer. And as in any business structure, the customer is always right. With that said, artists should always have clear, agreeable reasons that back their decision-making process. A lack of clear reasoning will make an artist seem unprofessional and scatterbrained. Thus, promoting a feeling distrust in the client. Furthermore, chaotic judgement will hinder the artistic process and lead to a breakdown of direction.

Without delving more into the disorganized artist stereotype, I will now explain the vital function the critique and revision process played in my tornado safety cartoon workflow. In my production, I served the role of creator and client. Though my thesis advisor could help with technical advice, only I fully knew what I wanted out of the project. Much like a person trying to play a game of chess against myself, the two-way communication channeling revisions were all up to me. It has been said that you are your worst critic (Schawbel), after working on this project, I can attest that this phenomenon is

real. When people comment on another person's work, they do so with some semblance of decency. They typically want to avoid offending someone else. When you become your own critic, this philosophy goes out the window. It is harder to be offended by your own thoughts. Seeing as how a decisive brain cannot defend and dislike something at the same time, opinions flood in fast without any balance. Real critiques avoid this rash polarization by having multiple people present. Art is subjective, so, while one person may dislike something, another person may dearly appreciate that aspect of a project. To avoid being an overly pessimistic viewer, thereby leading to a serious case of artist block, I made it a point to carefully examine my own opinions in detail. The tendency of the human brain is to dumb down feelings to be either positive or negative, one can think of it like news media that tells people what they should think rather than giving them the facts ("How politically polarized"). The human brain is ever ready to consume this kind of content, it saves the cortexes from having to make decisions for themselves, the same can be said about art criticism.

To illustrate this concept of instant love or hate, one can imagine themselves as a viewer browsing through an art gallery. This gallery displays many painted examples of the human face, each depiction artistically designed with an element of realism in mind. Suddenly the viewer's eyes come to a painting that does not evoke the same ideals of a realistic human face. The onlooker has no idea why this painting does not match the style of the other paintings. But the individual's brain harps on the issue. The human brain can masterfully find both patterns and a lack of conformity to a set of given rules (Mattson). When the viewer took note of the realism in the previous pictures, the visual cortex started amassing a pattern of what fits the realistic description. In a world where majority rules,



any image deviating from the general stream of data will be tagged as unsuccessful. Realism is difficult to portray and having a single feature such as a nose, brows, or eyes in the wrong position can throw a piece off from the pattern. The painting's artist may have done a billion other things better than their contemporaries, such as lighting or colorwork. But for this demonstration, the art is graded against a single attribute. And thereby deemed unsuccessful. This is the trap that one must avoid in order to provide constructive criticism. You must see beyond the immediate love and hate relationship to find the incorrectly placed noses. In short, if you feel a certain way about something, figure out why you feel that way. Then, when you have located the area that needs correction, determine the specifics of what can be done to improve the result. Whether a critique is given by others or by an artist squared against themselves, constructive criticism helps to bolster the quality of a project and to define a clear intent for the style and message that such creative endeavors communicate.

Of course, adjustment is not as easy when talking about physical paintings on canvas. But in the digital space, constant revisions are part of artistic culture. The ability to make corrections at so many points in the pipeline is one of the main reasons that electronic media has grown so rapidly within the last few decades. Special-effects-heavy movies that once relied on miniatures, stop motion, puppetry, and pyrotechnics, almost always use computer animation to achieve their goals nowadays. If you need to change a character's features, such as a nose job, just make the update on the three-dimensional asset file and press update on all the scenes the character is used in.

Using the modern digital workspace to my full advantage, I made a barrage of revisions to my tornado safety cartoon. Each of these adjustments helped me to better demonstrate my intents for the project. In my own revision process, I find it helpful to step away from projects. Even for a short time, clearing my head before reviewing work allows me to put aside any minor technical issues I may be encountering and to see the state of the project at a far. This project marked the longest break I have ever taken from a single piece of work. During the fall school semester, I found my time fully consumed by my regular classes. Shifting my schedule to meet the demand of these higher-division courses left me with no extra time for thesis work. When winter break rolled around, I set right out to make up for the lost time. The animation work I completed over the summer now left me with a thirty-page script, a collection of character designs, and one moveable character rig. Each asset took approximately one month to produce. I would scrap every asset to accomplish my goals.

Reviewing my original script, I determined that some of the material would make for a decent cartoon. However, I had fallen into the trap of writing a screenplay meant for a full production house. Examples of screenplays for inexperienced writers typically come from ninety-million-dollar feature films and various network programming. Individual learners should never compare themselves to crews of seasoned media professionals. By making this dreamy correlation I had starkly over-estimated my abilities and timeframe to accomplish my storytelling goals.

My first plan to combat the extreme length of my story involved the selection of a short segment of the screenplay. I would discredit myself if I said I did not know thirty-

pages was too long when I wrote my first screenplay. But I live by the rule that more content means better content. If I wrote with length, I could then cherry-pick what stood out. This same principle is often applied to movie trailers. Commercial spots usually have thirty-seconds to convince their audience to watch a ninety-minute film. Any smart director will have these key moments to demonstrate the best aspects of their production. For my story, I wanted to evoke comedy and adventure. I also wanted to demonstrate friendship between characters. Relationships between friends and siblings are relatable human elements that can allow a show about cartoon animals to resonate with their human audience. Establishing clear relationships also allows for believable and engaging dialogue. Wherein, characters interact with the world around them, they comment about what they encounter, and they ask each other questions about their experiences. Beyond the entertainment value, acknowledging realistic human interaction behavior aids in the world of educational content. PowerPoint slides represent a recent and often ineffective means of data dissemination. Before humans started writing, we relied on things such as oral history and first-hand experience. For this reason, I aim to have my characters discover things for themselves. A comedic tone, especially, in a cartoon, allows me to push learning scenarios beyond points of realism in order to illustrate points in clear and memorable fashions. And I believe that learning should always feel like an adventure.

Listing the three main things I would want my educational cartoon proof-of-concept to evoke quickly made me realize that none of my original scripts would work. Not at a single point in my first adaption did the three aforementioned elements come together to clearly embody my intention for the project. But by this point, I wondered if I was simply over-thinking the issue. All my knowledge of what made a good cartoon just represented a

collection of untested theories in my head. And I had learned most of these rules from college classes, that teach content making for adults. I wondered whether my understanding of what makes a good cartoon would really apply to my intended child audience.

The next day, I went to church and conducted a quick trial. With parental permission, I presented summaries of my story to a couple of children who averaged five years of age. To my dismay, all these youth seemed quite confused by my story. One participant verbally voiced how hard my tale was to follow. The children had spoken. It was time for a rewrite. I brainstormed and started development on a new short skit that could feasibly showcase my idea.

## SUPPORTING THE SUPPORTING CAST

After writing my original script, I had a decent understanding of my protagonist Felicity and her brother Andrew. However, the two other students were just that, the other students. This time around, I made it a point to give the supporting cast a stronger personality. Felicity and I decided to change David's name to Steve. At first, I chose David and Esther as matching Biblical names. The matching names would help to distinguish David and Esther as siblings. My plan involved comparing their healthy brother and sister relationship with the tenseness found in Felicity and Andrew's sibling rivalries. A worthy endeavor, though this negatively impacted the script through a lack of comedy. Esther and David represented perfection, resultingly, there was just nothing to laugh at. This made their contributions to the story boring to witness.

For the best comedic delivery, I decided that the supporting characters needed to be more cartoony and exaggerated in persona than the leads. So, I gave David and Esther more identifiable personality traits. First, I renamed David to Steve. Since my sibling story idea no longer seemed engaging. In this revision, Steve would serve the role of safety pessimism while Esther would counter Steve with adventurous enthusiasm. Since the two each possessed their own personalities, they needed to address the world in their own separate ways. Otherwise, the dialogue lines would sound generic, wherein, anyone could say them.

To write Steve's personalized dialogue, I focused on making him oppositional to the idea of safety-training. He constantly voices worry and frustration about everything. His fear and safety obsessed nature mixed with stubbornness can often cause more damage than good. From his perspective, if something is dangerous, then it should be banned. Of course, you cannot ban the weather. But Steve would still rather live his life in a bubble than learn the safety measure that could keep him safe if dangers beyond his rigid control did arise. Oppositely, Esther is eager to learn. And she tries to address every dangerous situation as calmly as possible. With a focus on stress management, Esther tackles the psychological aspects associated with fear and trauma along with the immediate threats. By all definitions, Esther identifies as a non-expert on all topics. In my trailer's script, she even reveals that she does not know what a tornado is (Fig 12). Nevertheless, Esther attains knowledge at a rapid pace. This speedy info-absorption often allows her to surprise her peers with expert insight. Thus, Esther uses a rich variety of dialogue with a chameleon effect. Esther's two-tone speech pattern allows her to switch between talking like a five-year-old and a well-informed adult whenever the plot or comedy calls for such measures. Personality implementations considered, Steve and Esther now represent two unique supporting characters that enhance my tornado safety cartoon.

Fig. 12. “Tornado Fortissimo” trailer screenplay, version one

**Tornado Fortissimo: A Whirlwind of Adventure  
(Trailer Version)**

**written by**

**John McKeon**

EXT. PUPPET SHOW WORLD - DAY

Narrator  
Since the times of ancient  
civilizations, tornadoes have been  
wreaking havoc around the world.

Roman Mariner Figure  
(panic)  
Dearest me... Why did we decide the world  
was flat?

Narrator  
Tornadoes are still a problem today.

Hippie Figure  
Dude, a little privacy please!

Terrence throws the house and bathtub into the  
ocean. Terrence laughs manically.

Hippie Figure  
Well, at least the world isn't flat...  
what a crazy notion that be! A wave  
washes the hippie's bubbles and paper  
sailor's hat away. Don't look at me!

Narrator  
Everyone agrees... Tornadoes are bad...  
Kittens are cute... And the earth is most  
likely shaped in the fashion of a  
caterpillar, half turned into a  
butterfly holding little rubber duck.  
Quack, quack. Wait... whose writing my  
script?

INT. CLASSROOM - DAY

Cameraman  
So, Esther, tell us what you think about tornadoes?

Esther  
What's a tornado?

Cameraman  
Andrew, how do you feel about tornadoes?... Most  
insightful... Steve, how do you feel about tornadoes?



Steve

Feelings are for the simpletons of society. I merely wish to capture, study, and preserve such a spectacle of nature for future generations.

Esther

But Steve, your mom said you can't have any pets.

Steve

Don't ruin my super-educated fantasy!

Esther

(Taunting)

At least I'm smart enough to know rocks can't talk.

Steve

She didn't mean it geodesic... Your sediment tells us the past.

Geodesic

You rock man!

Steve

You rock too!

Cameraman

Andrew, I know you have a voice! You're thinking of a word... 4 syllables... 8 syllables, 12, 16... Comm'n... at least give me a hint! Felicity, what are your thoughts on..

Felicity

Why is there a camera? Is this a documentary? Wait... should I pretend you aren't there? Answer me! I'm the one asking the questions here buddy!

Felicity moves close to the camera. With one finger prick, the camera falls to the ground.

Felicity  
Oops.

Cameraman  
(frustrated)  
Augh... Just cut to the title cards!

Narrator  
Tornado Fortissimo: A Whirlwind of  
Adventure

## **AUDIO: LOUD AND CLEAR**

At this point, I had developed the writing for four main characters in my animated production. Each character possessed enough individual personality that their interactions and experiences would come across as believable, and thoroughly defining the characters on paper provided a solid platform for me to write my new trailer script. Since the trailer's primary focus was on showcasing the characters themselves, I simply applied the personality principles to my writing. Things started to have some semblance of order. When I finished the new trailer script, the characters had decent comedic dialogue and acted in ways that suited their roles in the story. I sent this revision in for review by both my thesis advisor and my family. All the respondents said that the characters had interesting interactions, though they had a hard time deciphering what was happening from the script alone.

I knew one last revision for the trailer's script would benefit the project. However, I was unsure of how to make my action and dialogue read more clearly. My main idea up to this point was to introduce the characters. I had accomplished this task. But I needed to do something more. More would have to wait though because it was Christmas Day and I had holiday meal plans with my family. During the long car drive to my family's farm, I listened to music on my phone. But at some point during the commute, YouTube's algorithm switched from playing music to playing one of my favorite cartoon shows. The phone was upside down, so it did not visually distract me from driving down the freeway. I thought about pulling over to listen to music again, but there were no exit ramps for

several miles. So, I listened to the cartoon. The longer I listened, the less I felt like changing the entertainment input. Many exit ramps zoomed by, but I did not stop. The screenless cartoon show was way more interesting. A few episodes later, and it felt as if I had arrived at my family's house in mere minutes rather than hours. On the way back to my school residence, I continued listening to the cartoons. This time I paid careful attention and analyzed my attraction. First, I wondered how I could follow let alone enjoy a story I could not see. One of the major things I noticed is that character dialogue, sound effects, and music all worked to paint the story with words. If the characters entered an ice cream parlor, they would talk about ice cream or some other clear imagery that evoked such a setting. If an explosion happened or someone dropped something, the sound effects would say. If the mood felt dark and eerie, the music would work to accommodate the atmosphere. The audio allowed the audience to create the visuals with their own imaginations. It pained an animator such as me to admit such a fact. But I realized that sound was just as important, if not more paramount an element of a quality cartoon than any animation or flashy visuals effect.

I took back to the writer's chair and made one last revision to my trailer script. This time I would emphasize selling the story through audio alone. I still loved the interactions between the four main characters. However somewhere in the process of writing an engaging story I had ceased engaging my tornado safety subject matter. I needed to better relate the trailer to tornadoes. This thought complicated things in my first ideas. Even here, having the characters interact with a tornado would increase production time. Tornadoes require special skills to animate, skills that I had not honed as far as I had hoped at the beginning of the project. I needed the trailer to take place in an ordinary location. To cover

for this lack of tornadoes in a tornado safety cartoon trailer, I added a narrator character to explain the whole predicament (Fig 13). Pushing the cartoon into a wonderful forth-wall-breaking territory, the unseen narrator explains that the cast is about to film the tornado safety cartoon that the trailer is advertising for. This allows the audio to fully dispense exposition about what the trailer is for. He also interviews the cast. During these interviews, the characters show off their vivid personalities along with their attitudes and knowledge about tornado safety. With the trailer now able to speak for itself, I felt my writing now came across with an increased level of witty charm and purposeful intent. My thesis advisor and my family agreed that the new tornado safety trailer revision came across clearly and was also a lot of fun.

Fig. 13. "Tornado Fortissimo" trailer screenplay, version two

Tornado Fortissimo: A Whirlwind of Adventure  
(Trailer Version)

written by

John McKeon

EXT. TWO-DIMENSIONAL SLIDESHOW - DAY

Thunder claps loudly as a low-quality illustration of a lightning bolt appears on a slide projector.

Sales Narrator (V.O.)

(fast, loud, energetic, and breathless)

Did you see that? There's a thunderstorm outside. And you know what that means... Tornadoes! Over a thousand of these bad boys plow through the United States every year!

Random Viewer 1 (V.O.)

(high pitch overlap)

That's a lot!

Sales Narrator

If you live in the Midwest, tornadoes are a common danger.

Random Viewer 2 (V.O.)

(high pitch overlap)

Say what?

Sales Narrator

If you live in the Southeast, tornadoes can strike day or night.

Sales Narrator

How can you stay safe?

Serious Narrator (V.O.)

(low pitch)

Take shelter on the lowest floor of your home or school. Hide in a sturdy central room. Shield your head. Pay attention to storm alerts on your phone, radio, or television. And put on shark repellent...

Sales Narrator (V.O.)

All these are fantastic suggestions... except the shark repellent... that's entirely useless unless your swimming in the ocean. In which case you'll still need to know how to stay safe...

Because tornadoes can form over water  
too.

But have no fear! We're making a whole  
movie to tell the world about  
tornadoes!

INT. CLASSROOM - CONTINUOUS

Sales Narrator (V.O.)

Here's one of our stars now! Esther, tell the fans how  
excited you are to be in our thrilling movie about  
tornadoes?

Esther

What's a tornado?

Sales Narrator (V.O.)

Andrew my man, what's your spin on this tornado safety  
masterpiece?...

Andrew plays his handheld videogame player. He does not look up.  
He does not say a word.

Sales Narrator (V.O.)

Most insightful... Steve, how do you feel about our work  
here?

Steve (O.S.)

How do I feel?

Steve

I thought this was a safety cartoon!

Steve points at a long script.

Steve

These stunts don't sound very safe to me!

Felicity

Unsafe stunts. That's my department!

Felicity softly plays two notes from Beethoven's symphony on the  
piano. She then strikes a huge gong. The rumbling sound makes  
sheetrock fall from the ceiling. The sheetrock hits Steve on the  
head.



Steve

Ouch!

Felicity

Oops.

Steve

I'm a child and an animal... this is cruelty on two counts.

Esther (O.S.)

(calm, innocent, childlike)

You sound upset Steve. Take conscionable (con-shuh-nuh-bowl) effort to relieve your stress. Untreated anxiety can cause symptoms including but not limed to; headaches, muscle tension, and eating disorders. Wow, I just used five new words!

Steve angrily chomps through a carrot.

Steve

That's it! I've had it with this ridiculous project! Go find someone else who'll work for carrots!

Sales Narrator (V.O.)

Well it's time to go... Oh wait... Andrew has something important to say!

Andrew's lips remain silent. Only the subtle sound of his finger-tapping gameplay can be heard.

Sales Narrator (V.O.)

What's that... Our tornado safety production is coming to screens soon... And your super excited... Wow! Me too.

INT. TWO-DIMINSIONAL SLIDE SHOW - CONTINUOUS

Serious Narrator (V.O.)

Tornado Fortissimo is a cartoon. No real children or animals were harmed during the making this trailer. Though the shark repellent may have had some unintentional side effects. Did we say it repelled sharks?

The camera pulls back to reveal that a shark has taken a bite out of the projector screen. Scream sounds play.

Serious Narrator (V.O.)

Remember... Safety first.

## CHARACTER DESIGN: A CLEARER VISION

Since my window of time to make revisions amounted to a little more than four weeks, visual development for Tornado Fortissimo heavily overlapped with my script work. As an artist, I take storytelling very seriously. Readers may wonder why an animation student would spend more time talking about writing than making visuals come to life. But without grounded scripts, a cartoon's visuals will crumble. Such is the case as it relates to character design. Earlier in the paper, I discussed how designs are a visual accent of a character's personality. To add to that statement, designs based on characters written without personality tend to fall flat. The same applies to cooking, you need the recipe before you cook, otherwise you are just guessing on proportions. With that said, my estimates for Felicity and Andrew's designs came somewhat close to their final looks.

I felt it important to give Felicity her update first. I knew that her proportions needed some adjustment. From a design standpoint, she looked more like a stylized teenager than an eight-year-old. I also felt that her silhouette would benefit from some exaggeration. Reference ever an essential part of the artistic process, I turned to the 1980's to help me age down Felicity. Series such as "The Looney Tunes Babies," "Flintstone Kids," and "A Pup Named Scooby-Doo" provided good scaling ideas. Each of these properties took pre-existing characters and stylized them with a baby-like theme. Given the subject matter, I had plenty of similarities to compare. General trends shown across these examples always involved larger heads, shorter bodies, shorter limbs, chubbier limbs, larger eyes, and small mouths located closer to the eyeline. Designers seemed to avoid sharp edges as much as

possible too. Even going so far as to remove Bugs Bunny's pointy whiskers when drawing him as a baby.

Keeping all these trends in mind, I tried my hand at designing the new version of Felicity. In her original design, Felicity already had a very large head. Felicity's legs, however, looked like they would collapse from the weight of such a cranium. Her arms suffered from the same issue. I replaced these noodle-limbs with plumper arms and legs designed to mimic the adorable look of baby fat (fig. 14). I also increased the size of Felicity's feet fourfold. Nearly reaching down to these feet flow Felicity's large circle skirt. I had initially used a shorter and tighter pencil skirt to avoid animating extra movement. As with any piece of dangling fabric, looser skirts are affected by secondary forces such as wind and delayed inertia from quick character movements. For instance, if a character like Felicity comes to a sudden stop, the skirt will continue moving in the same direction in the fashion of a pendulum. The secondary action will not stop until an equal, opposite force acts on the free-flowing object. Eventually, the skirt will collide with the legs, and gravity will force the skirt back to the resting position. But until physics kick in, secondary actions must be managed by the animator. Despite the challenge this would bring for animation, I was convinced that a broad, flowing skirt added too much to the silhouette to leave out (fig. 15). Furthermore, the increase in proportional size at the bottom of her figure was intended to balance the visual weight of her head. Felicity's head itself received some vertical enlargement, turning into more of a square shape than its circular predecessor. She would now be the strong member of the Tornado Fortissimo gang and this shape adjustment reflected that position.

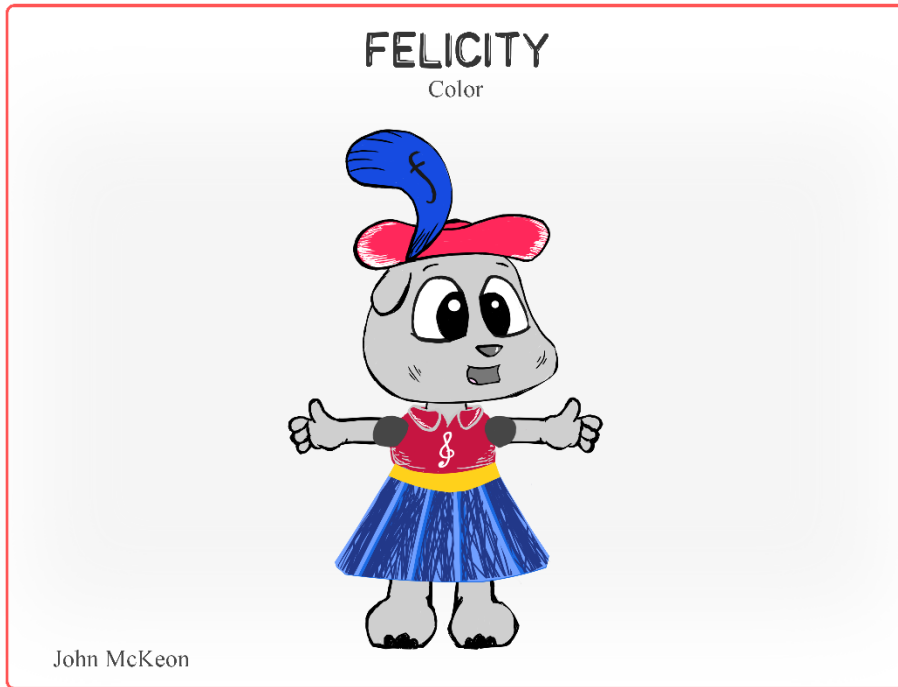


Fig. 14. Felicity's final, revised character design shown in full color

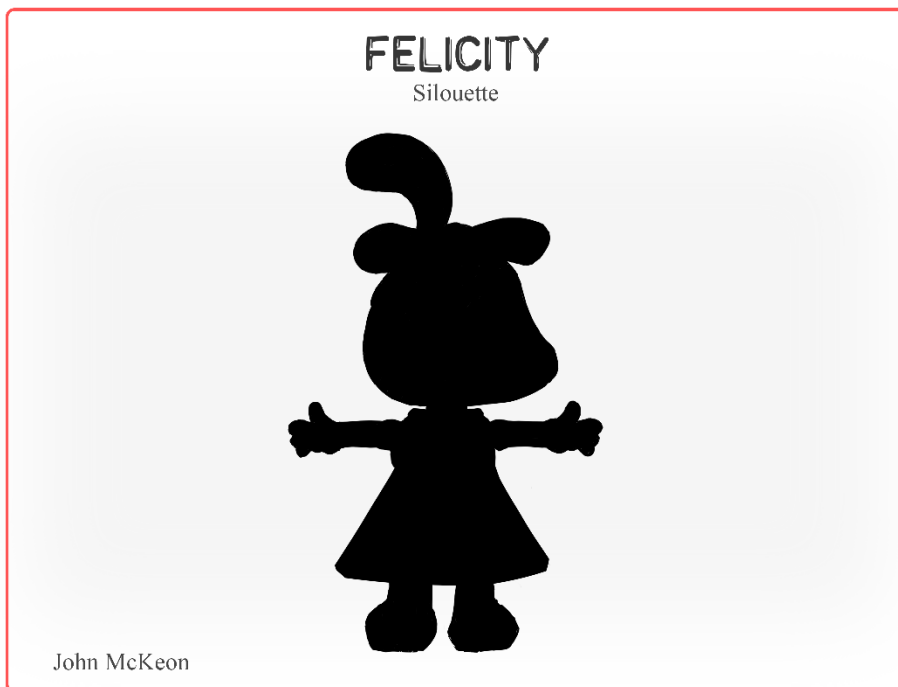


Fig. 15. Felicity's final revised character design shown in silhouette

In her original design, I always represented Felicity with closed eyes. However, her update now sported ultra-large and expressive eyes. Facial space to fit these glamorous peepers was increased by lessening Felicity's mouth and nose proportions. For headwear, I still favored her classic red beret and blue feather. I used these headwear choices in the original design to evoke the idea of a marching band member. Given that Felicity's musical background remained, it only seemed fitting to keep this as part of her design. The hat and feather also worked to cap off Felicity's silhouette with some nice asymmetry (fig. 15). My design finalized. I decided to add some artistic style. I experimented with hatched linework, repeated straight lines drawn close to one another, to mimic a fabric texture on Felicity's dress, hat, and feather (fig. 14 and fig. 16). I also added blush marks for her cheeks. The style accomplished by using hatching for texturing had an appearance that one could describe as hand-drawn. By this, I mean that Felicity looked like a character straight out of a children's book. Without the rendered hatching, she looked more like a traditional computer animation character. Where lines are kept to a minimum of defining key shapes and nothing else to save on animation time. Since I would be working with a three-dimensional computer-animated rig, I was comfortable with a higher level of detail. I would only draw and build the character once and let the computer do the difficult rendering work. From new proportions to classy illustrative style, I counted Felicity's design overhaul as a complete success.

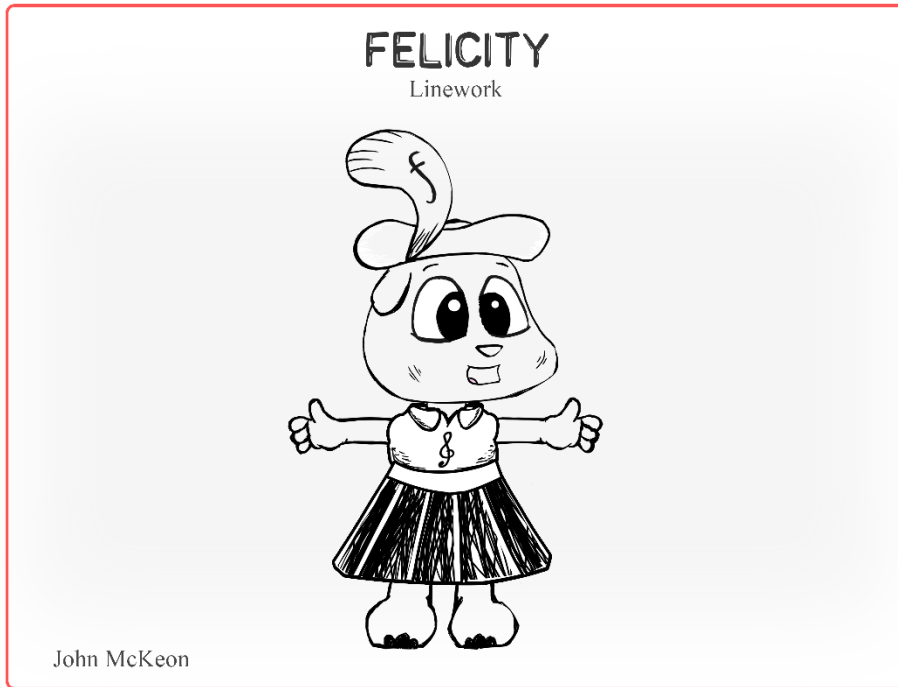


Fig. 16. Felicity's final revised character design shown with linework only

## PRODUCTION RAMPS UP

Over the course of one week, I had revised my trailer's script, found the perfect illustrative style for my characters, and made it home for Christmas. I was burning more midnight oil than Santa Claus. But there would be no sleep for me. I now had four characters to prep for production and a script in need of voiceovers.

Using Felicity's design as a style guide, I immediately set out to give Andrew, Steve, and Esther their final looks. Much like Felicity's headgear, I chose to keep Andrew's signature blue headphones as part of his design (fig. 17). His video game obsession had survived all the script revisions. And the headphones still made a wonderful addition to Andrew's silhouette (fig. 18). In the new version, I wanted to wildly accentuate the headphones. So, I made them exceptionally large. Scale-wise the new proportions tower above Andrew's whole body and account for nearly half his overall height. To make the head seem strong enough to support such a sizable listening device, I increased the cranium's proportions. Moreover, I changed Andrew's head shape to an oval-like semblance. I believed this would show off his friendly nature while also serving the practical purpose of giving his headphones geometry to hold on to. In Andrew's first concept, his headphones looked like they would slip right off if not for cartoon physics. For color, I again stuck to the source pallet of orange and blue (fig 17). However, I adjusted his values by using brighter versions of these hues. Andrew's updated design successfully portrayed his personality, maintained a recognizable silhouette, and matched the style standard set by Felicity.



Fig. 17. Andrew's final revised design as shown in full color

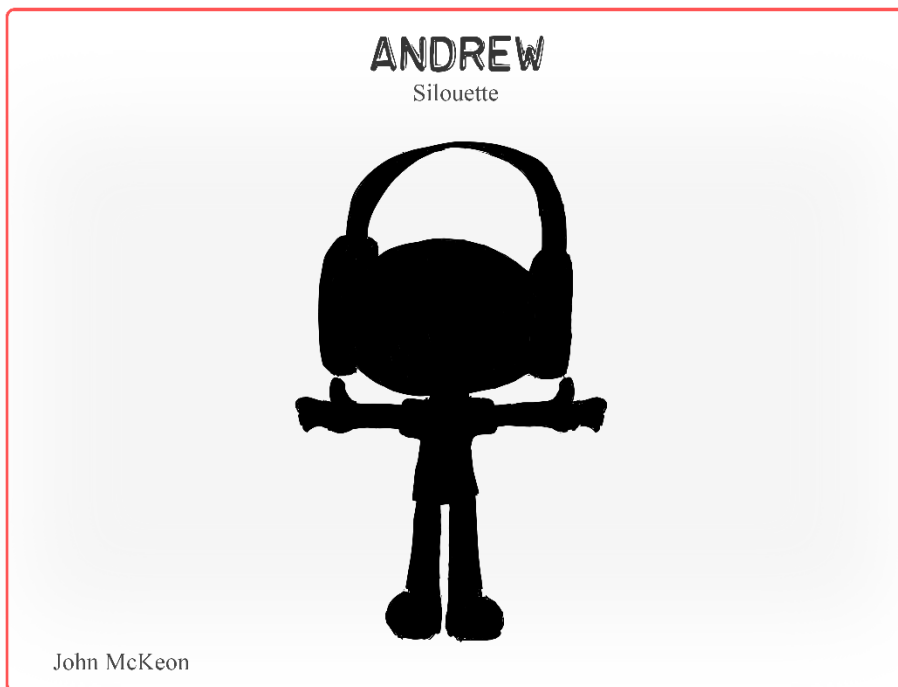


Fig. 18. Andrew's final revised design as shown in silhouette



Steve introduced the first special case of designing a character completely from the ground up. With no prior design work for Steve, I felt free to experiment with designs. I knew he would be a bunny with insecurity issues. So, I tried to incorporate the emotion of fear without breaking from my established style. I figured that, although stressed, Steve would still be a friendly character. After all, the whole cast were supposed to be friends and siblings. To portray this more split personality, I gave Steve an egg-shaped head (fig. 19 and fig. 20). The bottom is more rounded while the top comes to a point representing his insecurities. Since Steve was written to be pessimistic about everything and dislike adventure, I gave him the blandest color pallet of any Tornado Fortissimo. A dull yellowish fur tone intentionally gives Steve less value and a decreased presence on-screen. The only significant dark color on Steve comes from his green pants. With so much visual weight being driven downward, one can comprehend that Steve is more interested in staying seated or at least keeping his feet situated on solid ground than embarking on an adventure.

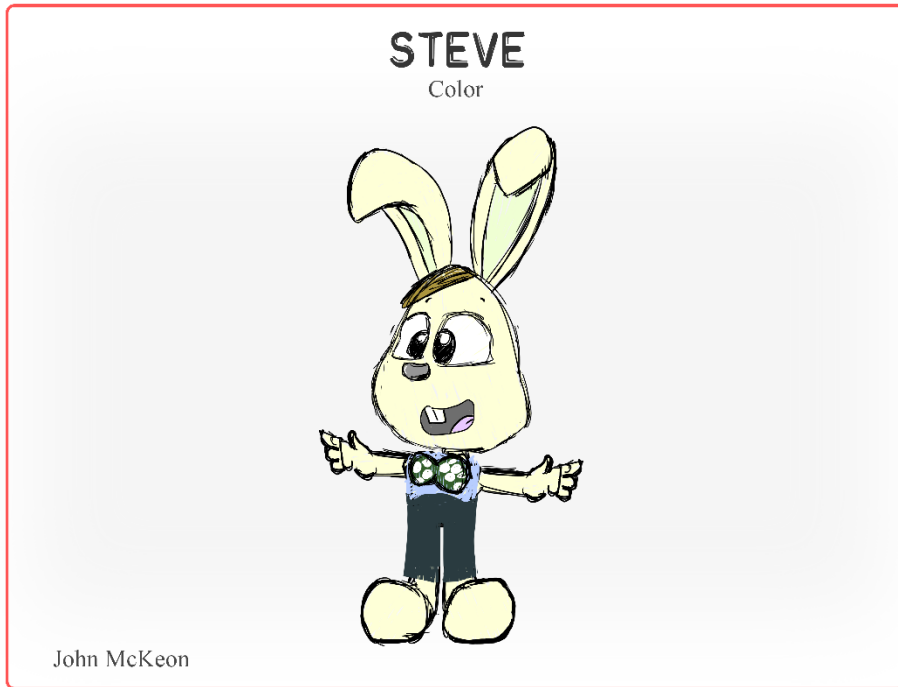


Fig. 19. Steve's final revised design as shown in full color

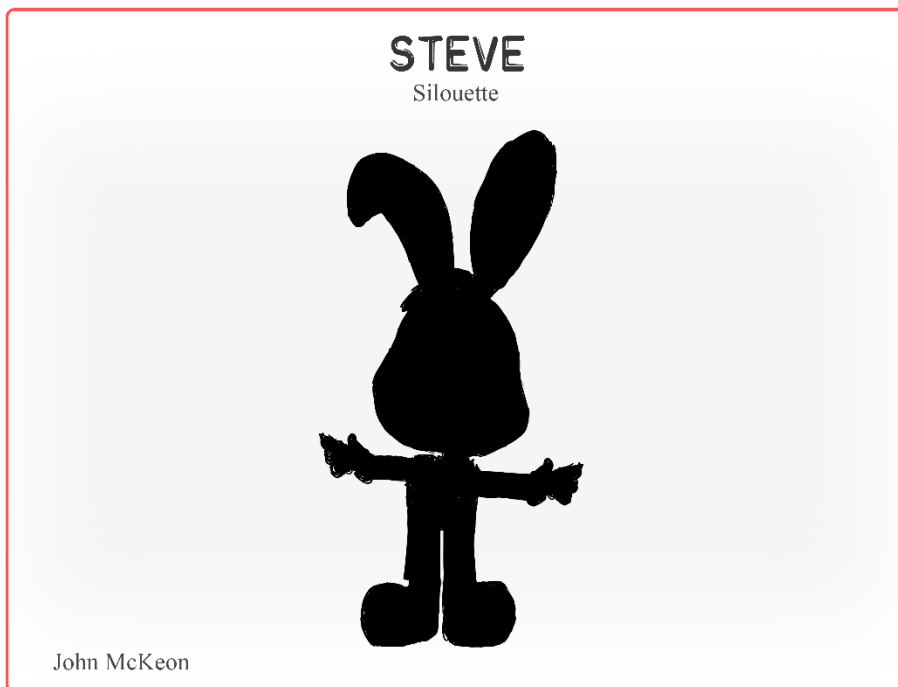


Fig. 20. Steve's final revised design as shown in silhouette

When it comes to the illustrative style of Tornado Fortissimo, no character better embodies my aim for cuteness than Esther. From literal head to toe, everything about Esther was custom created to evoke elements of the adorable. As in the original script, Esther was supposed to be a mouse and I had every intention of drawing her as one. I had already changed Steve to be a different species, so I figured that Esther could remain in her original form. After all, she was supposed to be cute, and a little mouse would fit that bill perfectly. While toying with possible designs I also played around with tail proportions. I wanted Esther's tail to affect her silhouette in a unique way. To add interest to the linework, I added lines to separate the tail into proportioned sections (fig. 21 and fig. 23). I had the idea to then taper these subdivisions.

I thought the result tail tapering resembled battle armor. Just for fun, I added some makeshift armor to Esther's head. I could have used a piece of armor to shield my own head as the notion to push this concept further hit me like a ton of bricks. Esther the armadillo had been born. I tediously toyed with proportions. Though baby-like I determined Esther needed to be a tad taller than her current height. Once I had the perfect scale for her, I sought out as much baby reference material as possible. Her fingers, hands, arms, legs, and feet all needed to have the perfect infant proportions. I gave Esther huge round eyes. Unlike with Felicity, facial space for the eyes was easily acquired. With the largest head of any Tornado Fortissimo character, I had to take special measures to ensure that the massive element read as simple and cute as possible while still allowing the silhouette to show (fig. 22). Esther's head takes on the shape of a circularized rectangle. This form choice shows that she is a trustworthy friend. With such a soft shape and lack of hard edges, I had to work to define detail in Esther's silhouette. This came in the form of

exaggerating bumps on her head-shell. I spaced the bumps out to give some resemblance to curly hair. I furthered this imitation hair concept with hatched linework (fig. 23).

For Esther's color palette, I chose a monochromatic hue arrangement (fig. 21). Meaning that the colors are very similar and sit next to each other on the color wheel. In Esther's case, I used purple and pink. Both colors are a mix of red and blue. Red is associated with a passionate personality (Brooks p.75). Meanwhile, blue tones can demonstrate tranquility and security. Thus, besides looking good, my choices for Esther's color pallet provided a subconscious indicator of her personality traits. By using reference, experimenting with proportions, and assigning a fitting color pallet, I successfully completed my last main character design for Tornado Fortissimo.



Fig. 21. Esther's final revised design as shown in full color



Fig. 22. Esther's final revised design as shown in silhouette

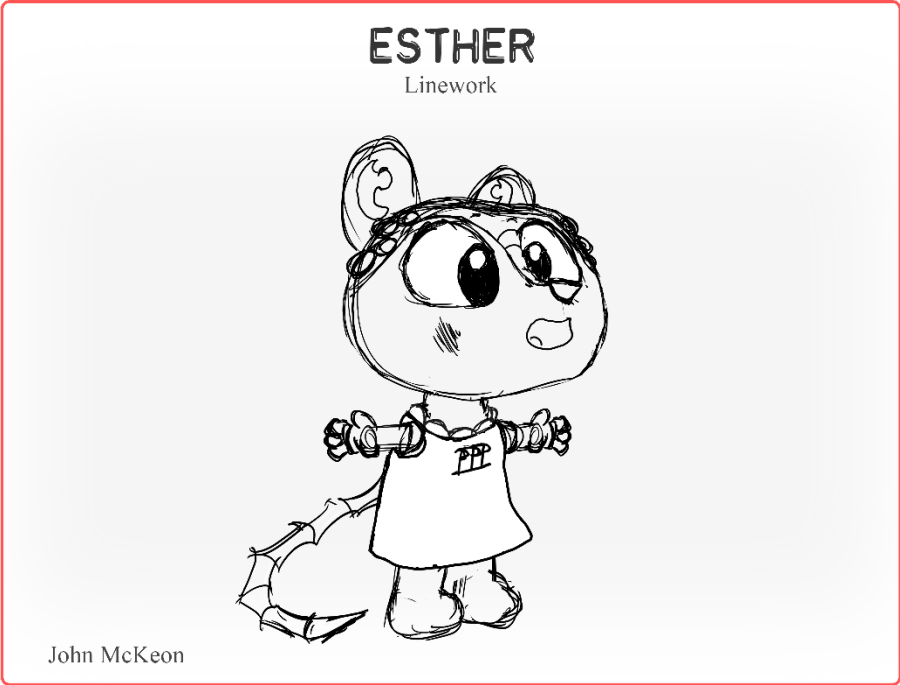


Fig. 23. Esther’s final revised design as shown with linework only

## VOICE ACTING

My character designs finalized, I now needed voice-over work to match the stylized artistry. Keeping the importance of sound in mind after my discovery of its power at Christmas, I knew that I needed to choose my actors carefully for my story to have the most impactful effect. Voice acting represents an interesting stage in the animation workflow. Despite the human traits and movements that animators try to emulate, voice acting is usually the only real human element in a piece of animated content. Everything else is an artist's interpretation of human looks and mannerisms. This gives vocal delivery the power to make or break a project like *Tornado Fortissimo* that depends heavily on character dialogue to tell its story.

Understanding the huge importance of voice actor selection, I invested a significant amount of time searching for the perfect artists to portray my animated cast. At first, I considered tracking down actors in my local area. But I immediately realized that doing physical interviews would slow down my search. As fun as traditional role casting would present, I opted for online voice actor recruitment. Using Fiverr, a freelance service marketplace, I browsed through hundreds of voice actor options. I found Fiverr's platform well-suited to hosting voice actors since it allowed their artists to upload demo reels to their accounts. As the name implies, demo reels provide a conglomerated glimpse into an artist's skill range. And it allows someone searching for the perfect voice to see if they should even consider a certain voice actor for a role. If someone cannot provide the voice needed for a certain project, there is no point in wasting that individual's time with auditions.

Broadening my search to the World Wide Web also increased my options for voices. I found the voice variety very important for this project, as the four main characters needed to have youthful child voices. However, most actors clearly trained for adult roles. Their attempts to imitate a youthful tone often came across as fake. This flaw allowed me to shrink my selection from about two-hundred actors down to a more manageable twenty. The remaining twenty represented child actors and adults with youthful charm. The child actors sounded alright on their own, but as expected, their voices were still developing. Though realistic, I felt tonality differences would sound inconsistent if the children voiced multiple characters. Referencing many cartoon examples, I confirmed this hypothesized trend. Creators would choose real child voice actors to voice one or two children. But if children played lead roles, or delivered large chunks of dialogue, adult actors would fill the role. Seeing the wisdom in this tendency, I sided for the latter option. Three adult actors would provide consistent, quality voice performances for Felicity, Steve, and Esther. Andrew did not have any dialogue in the trailer, so he was excluded from the search process. I also looked for a voice actor to play the narrator, but individuals charging by the word wanted more than my meager student budget would allow for. I decided that with practice I could provide this voice myself.

With actors picked out, I prepared my work orders. The variety of specialized artist choices is the largest upside of working with freelancers in an online environment. But the same beneficial feature of far-reaching searches can also be the biggest disadvantage of online job sourcing. With such a distance between the work dispenser and the contracted individual, strong communication skills become of the utmost importance. For quick freelance jobs, voice actors base their performances entirely on the descriptions their



employers provide. Given this, I made sure to make my instructions as clear and detailed as possible. I also talked with my thesis advisor about voice acting tips. He suggested me having the actors provide extra, non-diegetic sound such as heavy breathing noises, oohs, and ahhs. Restricting cartoon characters to spoken dialogue alone can make their deliveries feel like those of bland sock puppets. My advisor explained the benefit of considering a character as if they were a living, breathing person. Furthermore, many animations do not include language-based dialogue. In these instances, voice actors must convey personality through simple grunts, sighs, screams, etc. Taking this advice to heart, I constructed personalized instructions for each voice actor. In these guidelines, I provided contextual information surrounding the actor's lines. For instance, the primary emotion a character is feeling, if conversing with another character should they be friendly, frustrated, afraid, etc. Though good practice, actors often do not read through an entire script, especially if they are big-name celebrities being paid thousands of dollars for each voice session. Thus, it becomes imperative for the director to vividly summarize the story to help the actor with their delivery. After I had my written character descriptions and line summaries ready, I attached completed character designs for their corresponding actors. People say seeing a picture is worth a thousand words. Whether these words are mathematically accurate is a matter of some debate, but anyone can agree that physically seeing the fictional character one is portraying is a beneficial acting tool. Having a tangible asset also shows credibility. This does not apply too much in my case since Fiverr comes with freelancer payment protection that requires service buyers to pay upfront. However, many freelancers do jobs with the intent of payment at the end of a project. This leaves strangers on the internet with a lot of room to cheat artists. Unless you have actual film credits to your name, describing

yourself as an animator means as much as claiming the presidency of Timbuktu. To show a mark of legitimacy, examples of one's quality work can serve as a good proof of brand and trusted identity. Moreover, showing seriousness and professionalism on the receiving end of the transaction encourages the freelancer to take the job seriously and provide their best quality work in return rather than shuffling it to the bottom of their order stack. Combine these professional curtsies with a sound promise of payment and one can generally expect quality voice acting for their animated projects. For me, this process resulted in excellent voice work for Felicity, Steve, and Esther. Each voice actor provided their parts confidently, while portraying their characters with a lively personality, and finishing the voice work in quick turnaround times.

## MODELING

Just like the voice actors needed my character designs to understand their characters, I needed the finished designs to enter the modeling stage of my project. The moment I had my orders out for voice acting, I immediately switched to modeling. Definitions of modeling vary depending on the field, but for my project, modeling refers to the process of turning a two-dimensional drawing into a three-dimensional computer-generated asset. A computer-generated, or CG, model is formed using many techniques common in clay sculpture making. Though, I speak from experience as an art minor when I say that CG modeling is far less messy.

Moving into the digital realm, the world of animation software evolves so fast that animators must learn new modeling methods at a fast rate to keep up with change. For Tornado Fortissimo, I decided to try out Sculptris. Sculptris was free sculpting software that SIGGRAPH, my university's local animation and visual effects organization, had showcased in a workshop during the previous semester. Exploring new approaches when the clock is ticking spells a big artistic gamble. If experimentations do not pay off, the learning investment could cost an animator precious work time. Nevertheless, I embraced the chance of failure with a determination to enhance my workflow to its fastest. I personally enjoy modeling more than any step in the CG pipeline. But turning out four completed character models in a week would be four times the characters I had ever completed in that time period. With the clock racing, I needed all the help I could get. Thankfully, I found Sculptris's graphical user interface, or GUI, simple and intuitive.

Developers had given the tool pallet intuitive names, allowing an intermediate CG generalist like myself to figure out function fast.

The mechanics and modeling process inside Sculptris run as follows. When opening a blank project, Sculptris places a simple sphere in the middle of the screen. Though the sphere is three-dimensional, the operator must still interact with the asset on a two-dimensional computer screen. A mix of mouse and keyboard shortcuts allows one to control a viewport camera. Just like a real camera, the viewport camera can spin around the model, move close, or move away. The result is rendered as if the asset were filmed with a camcorder. With the spatial rules of Sculptris under wraps, I took to using its claim to fame feature, the sculpting tools themselves. I imported a finalized character concept to use as reference and stared at my work. I had worked with sculpting tools in Autodesk Maya, an industry standard for all things animation. Still, a state of confidence with the Sculptris equivalent took a while to reach. In Maya, sculpting tools have a significant amount of control. Meanwhile, the grab tool in Sculptris feels like doing surgery with a bulldozer (fig. 24). Despite the learning curve and brute force approach, I adopted Sculptris as a valuable part of my modeling workflow. I appreciated how I could block in large shapes quickly. The speed felt more akin to hand sculpting with real modeling clay than a digital improvisation of the process. Each of my four characters' heads took an average of one hour to sculpt, my investment had paid off. Maya simply could never have matched this time for blocking as its workflow does not accommodate creation and adjustment of organic shapes with such ease.



Fig. 24. Screenshot showing Felicity's rough head model as created in Sculptor

I felt satisfaction having general modeling completed for my characters' heads within just a few hours. But much modeling work remained. I now needed to detail the rough sculpting output. I exported the heads from Sculptor and imported them into Maya. When examining the rough model, I could tell that the topology would need a complete overhaul. Topology refers to the arrangement of geometric shapes that a CG modeling software uses to create a model. For instance, the surface of Felicity's rough head model was comprised entirely of small triangles. These triangles did accurately define the model but lacked organization. Thinking ahead for the rigging stage, I needed geometry that could behave like human skin. Without clearer order, the current topology would confuse Maya and weird bumps would likely form if one moved a major control such as the jaw. To help

the software better understand the general areas where deformation should occur, it is important to retopologize. In Maya, this involves using a special tool to place new shapes over the existing ones. Performing the procedure feels like solving a three-dimensional jigsaw puzzle. One must align all shape edges and achieve a sweeping geometric flow. This was my first time using Maya's build-in retopology tool. Much like Sculptris, the learning curve took me a little time and effort to overcome. But I started breezing through retopology by my second head. To finish off my head models, I added inward extrusions that included mouths and eye sockets. I also added in the eyes themselves. Two days' into the modeling process, I had four finished character heads (fig. 25, fig. 26, fig. 27, and fig. 28).

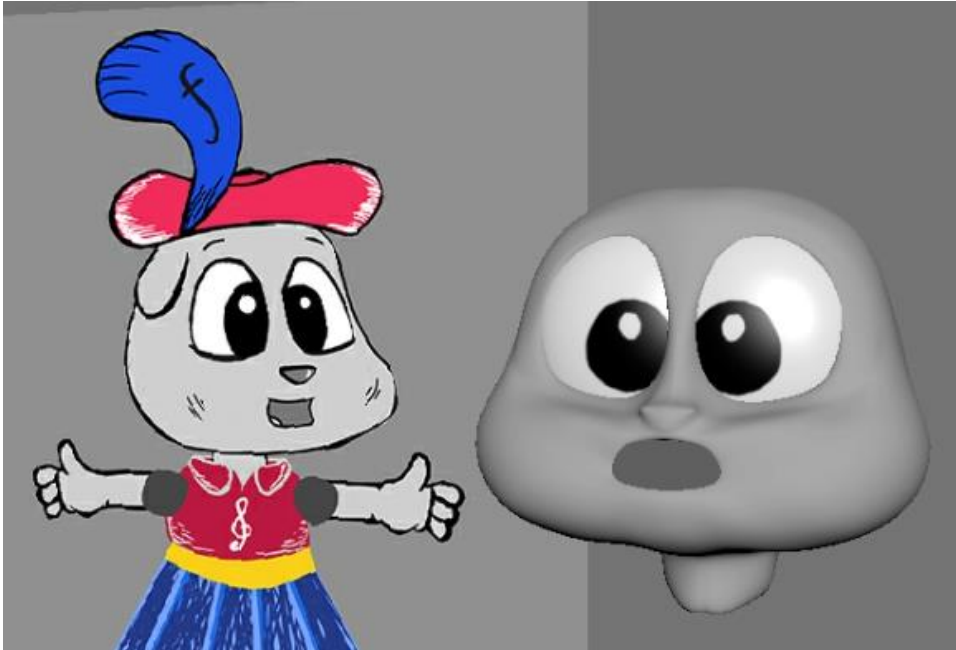


Fig. 25. Screenshot of Felicity's completed head model



Fig. 26. Screenshot of Steve's completed head model

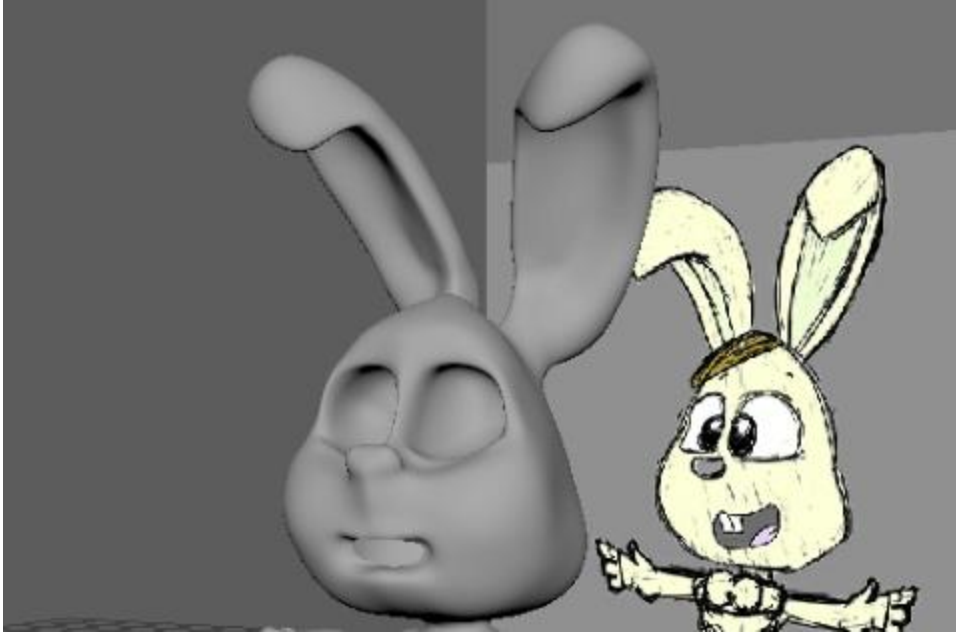


Fig. 27. Screenshot of Steve's completed head model

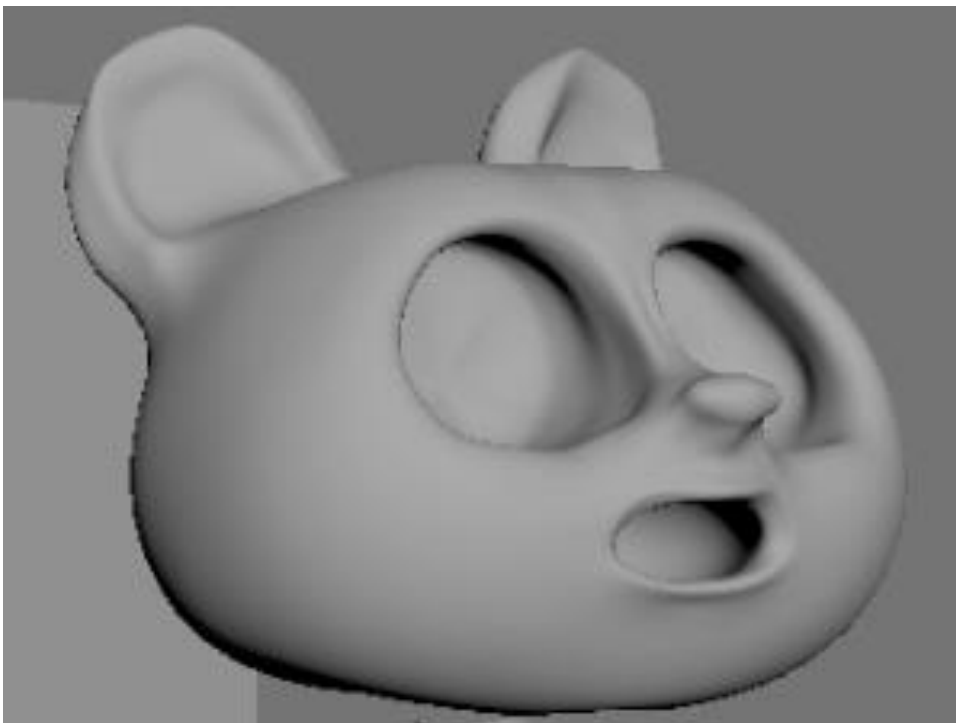


Fig. 28. Screenshot of Esther's completed head model



For body sections, I would take a shortcut to speed character modeling along. I had designed this part of the characters with less organic shape exaggeration. So, I opted to do all my body modeling inside Maya directly. Pulling geometry from a single cube, I formed the torso, legs, arms, hands, and feet. For the bottom half of the neck, I extruded upward and cut a hole through the top where the head would attach. Though the topology achieved in Maya looked far better than the Sculpttris model, the body still needed some deformation guidance. So, I took back to the Quad Draw tool for some more retopology. This concluded my work on Felicity's body model. I saved the body as its own separate asset file before attaching it to Felicity's head. Felicity's body had taken eight solid hours to model. I spend much of this time on the hands and feet. Since my other characters featured similar designs, I decided to use Felicity's body as a template to speed up the process for the other three characters. By adjusting proportions, rather than starting from scratch, I managed to finish Andrew, Steve, and Esther's body models in under four hours (fig. 29, fig. 30, fig. 31, and fig. 32). From there, I spent a combined tally of fourteen hours adding extras such as brows, teeth, tongues, tails, shells, and noses. The characters also received their custom outfits. With some last-second adjustments, I finished the characters' models with a strike of success.



Fig. 29. Felicity, full-body CG model



Fig. 30. Andrew, full-body CG model

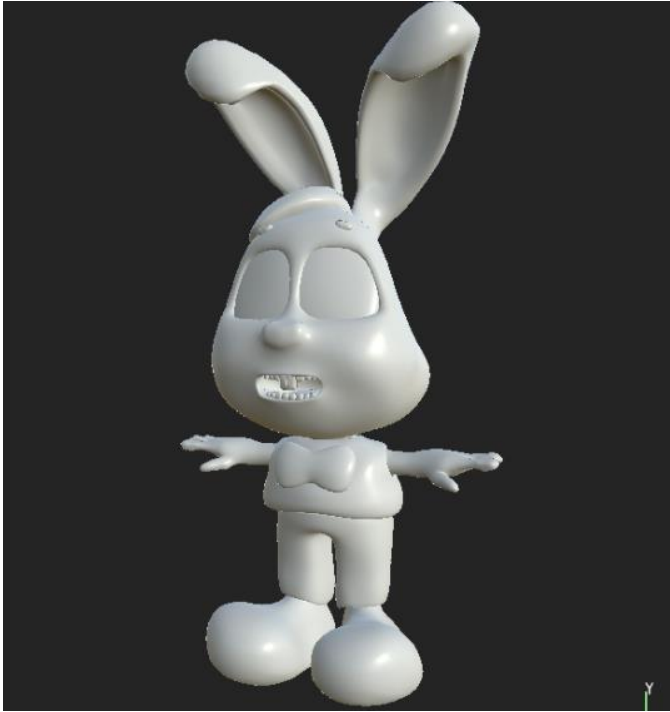


Fig. 31. Steve, full-body CG model



Fig. 32. Esther, full-body CG model

Though the characters now existed in three-dimensions, I still needed to paint them with their signature color schemes. By default, Maya makes its geometry a single color of grey. Though one can change colors and add multiple hues directly within the software, I wanted to do a full texturing job. Selecting edges along the clean model topology, I told Maya where to cut UV seams. UV refers to the “X” and “Y” axes of a two-dimensional texture map. Meanwhile, “X”, “Y”, and “Z” are already used in Maya’s three-dimensional coordinate system, so the name change is meant to cut down on user confusion between the two. Just like clean topology, quality UVs layout cleanly on their respective maps. With UVs laid out, I exported my models and opened them in Substance Painter. This marked my second time using Substance as part of my workflow. The software delivers what its name implies. Using the program, one can paint directly on any three-dimensional asset with an accumulation of digital brush tools. Using a digital pen and drawing tablet, I spent many hours painting every detail of my characters. I made it my texturing goal to mimic the look of my concept art wherever possible. Thus, creating a more organic and hand-crafted feel.

To accomplish this artistic objective, I avoided solid colors. Pure colors are rare in the real world. And from my experience, they tend to constitute an unnatural appearance on characters. To avoid this look of fabrication, I gradated my values and hues to exaggerate shadows and highlights. I also added pencil lines to imitate the stylized fabric texture and to define the painterly eyelashes. For thoroughness, I even textured the top and bottom teeth sets. I found that darkening the inner side of the teeth helped to show the heavy shadow generated by the mouth absorbing light. It also made more sense from a standpoint of bone composition authenticity. I determined that the translucent property of

teeth would make an absolute white smile impossible. Some other shading would undoubtedly show through. My models hand painted to perfection, I rendered off some high-resolution pictures of the project and sent them in for review by my thesis advisor (fig. 33, fig. 34, fig. 35, and fig. 36).

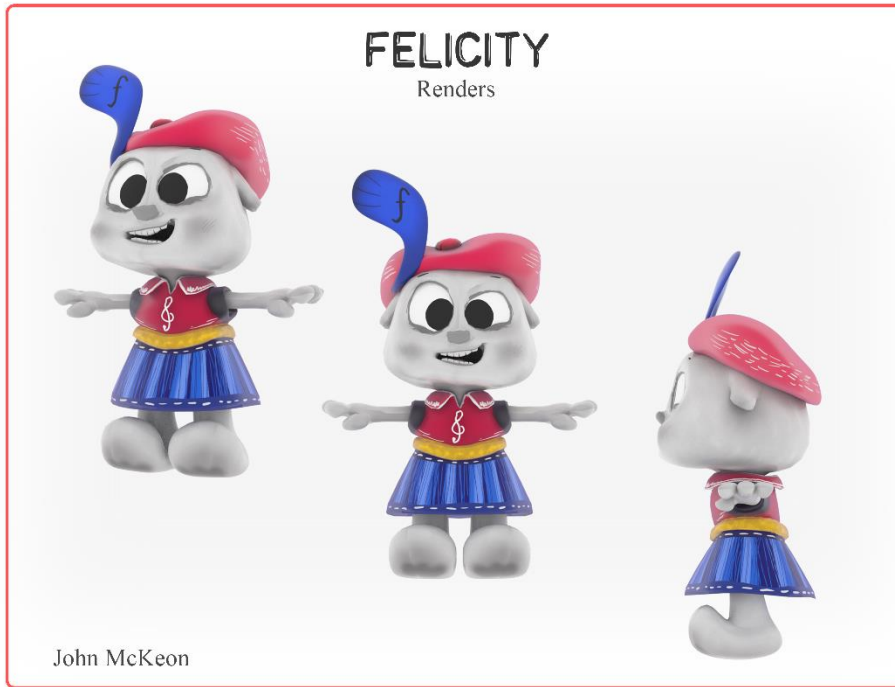


Fig. 33. Felicity, final textured and rendered images



Fig. 34. Andrew, final textured and rendered images

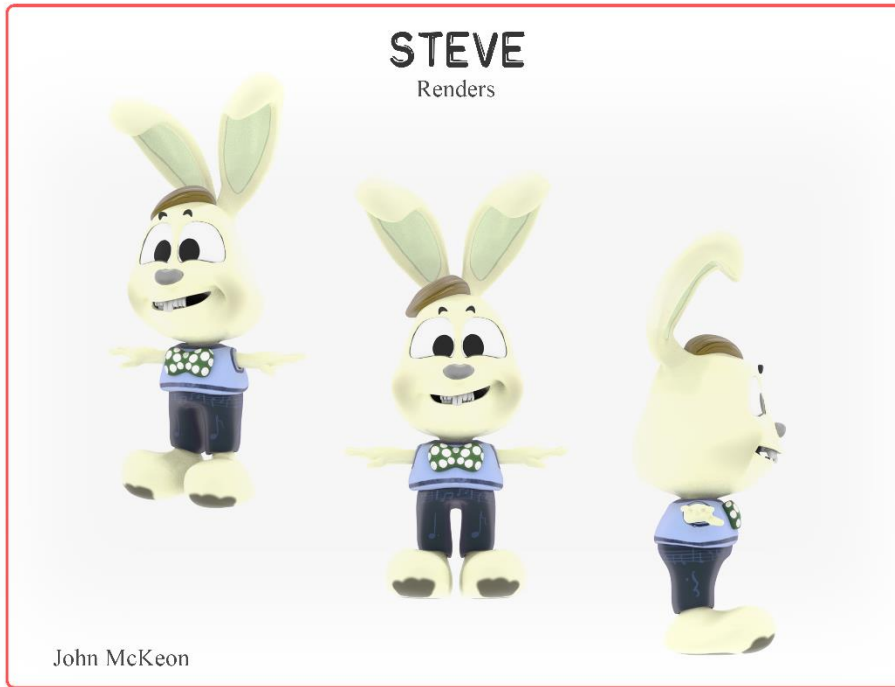


Fig. 35. Steve, final textured and rendered images



Fig. 36. Esther, final textured and rendered images

## AUDIO ENGINEERING

My thesis advisor would give a positive response to my modeling work early the next morning. But I had plenty to work on in the meantime. My voice actors had completed all their parts. And I really wanted to hear their performances together. Using Adobe Premiere Pro, a video and audio editing software, I edited and mixed all my diegetic sounds together. As these job descriptions indicate, I paid close attention to the timing and the loudness of my clips. This insured performance landed on-point and that dialogue came across with clear perceivability. I recorded my part as the story's narrator. With character dialogue in place, I started layering my trailer's soundscape. Scouring free-online libraries, I collected many sound effects and music options.

As a rule of thumb, I tend to pick out many more audio files than a project requires. This ensures I have a vast array of options to achieve the best mix. For example, if I need to illustrate a metal object falling to the floor, I will test ten variants of metal ding sounds on my software timeline. Though one can preview sound files before the process of downloading and importing them, the best way to know whether a sound effect or piece of music fits is to place it in context with its accompanying audio.

For me, editing and mixing my audio marked the least technically demanding part of my production workflow. But by no means, the least important. The best editing, for either sound or video, is the postproduction work no one can detect. Any professionals I have ever talked to in the editing world agree that their trade should remain an invisible art



form. Competent editing will allow the viewer to focus on the story rather than demanding attention in and of itself. A quality edit or mix just sounds so good that no one questions its existence. In animation, this bleeds over to branding. Major studios such as Disney, Pixar, and DreamWorks do not pride themselves on having the best audio quality around, though many of these companies' films have phenomenal sound work, they spearhead the visual entertainment industry. And said companies use their marketing campaigns to promote that component of their workflow. Which explains why most of the time I tell a non-expert that I am an animator, they immediately think of someone drawing at a light table, even though the field spans into much more diverse facets than characters on pencil and paper. Thankfully, this project gave me the chance to explore the wider range of careers supported by animation. Not just physically making a character move. Experimenting with different sound effects and music options, playing with various timings, and choosing the best takes from my actors allowed me to achieve my goals for sound quality. I invested a good portion of my time in this area as I understood audio's power to either captivate or bore my trailer's audience. Even if the work of sound engineers happens under the hood, my effort in this area of my project leads me to believe that such professionals deserve more recognition for their contributions to the visual entertainment sector than they generally receive credit for.

## **RIGGING: CHARACTERS IN MOTION**

Hearing my story unfold in beautiful stereo left me inspired as I turned back to advancing the visual aspects of my tornado safety cartoon trailer. My thesis advisor had now approved my character models that looked stunning with their hand-painted texture work. Despite their charm, Felicity, Andrew, Steve, and Esther all remained in their default t-pose positions. Modelers use t-pose when creating CG characters as it creates a midpoint for all limb deformations. With a default t-pose arm stretching directly out perpendicular to the body, rigging artists have a good midpoint from which to rotate the limb up, down, or forwards without creating strange-looking contortions. The same goes for the legs, which artists typically model perfectly straight, allowing for hip deformations in all directions. To create these kinds of kinetics for my characters, I needed to build specialized skeletal rigs for my characters. I had attempted this with Felicity during the summer. The process took me a full month (fig. 37 and fig. 38). And the finished rig still had many issues. However, I made this ambitious attempt before taking my major's rigging class. I heavily invested myself in this course during the fall semester and my rigging skills improved. However, a single useable character rig still took me two weeks to complete. I now had less than two weeks before the spring semester would start. This would undoubtedly take my focus away from the creative section of the project. Additionally, I had yet to write anything for this accompanying thesis paper since the summer. And I had made significant creative revisions since then.

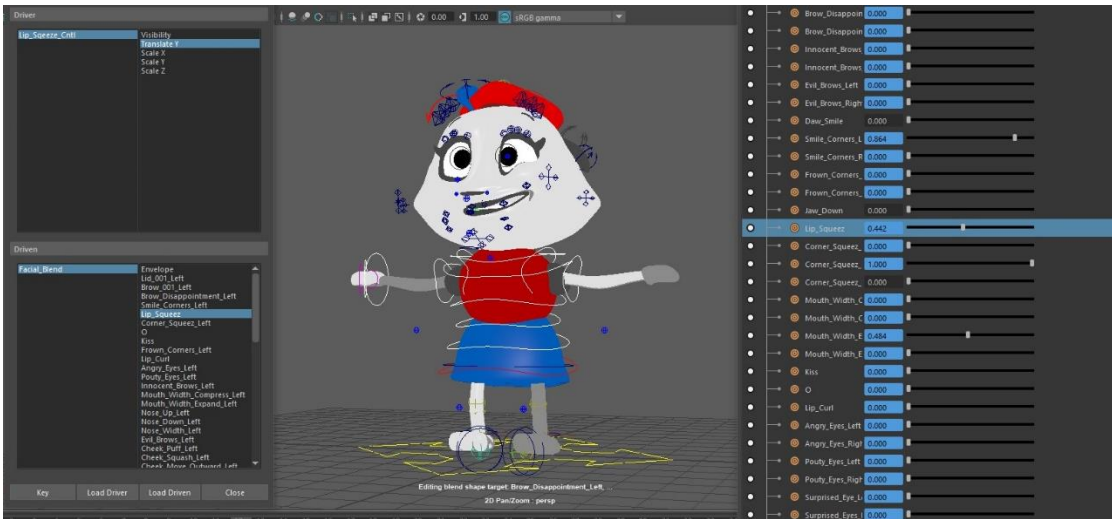


Fig. 37. Felicity, initial rigging attempt

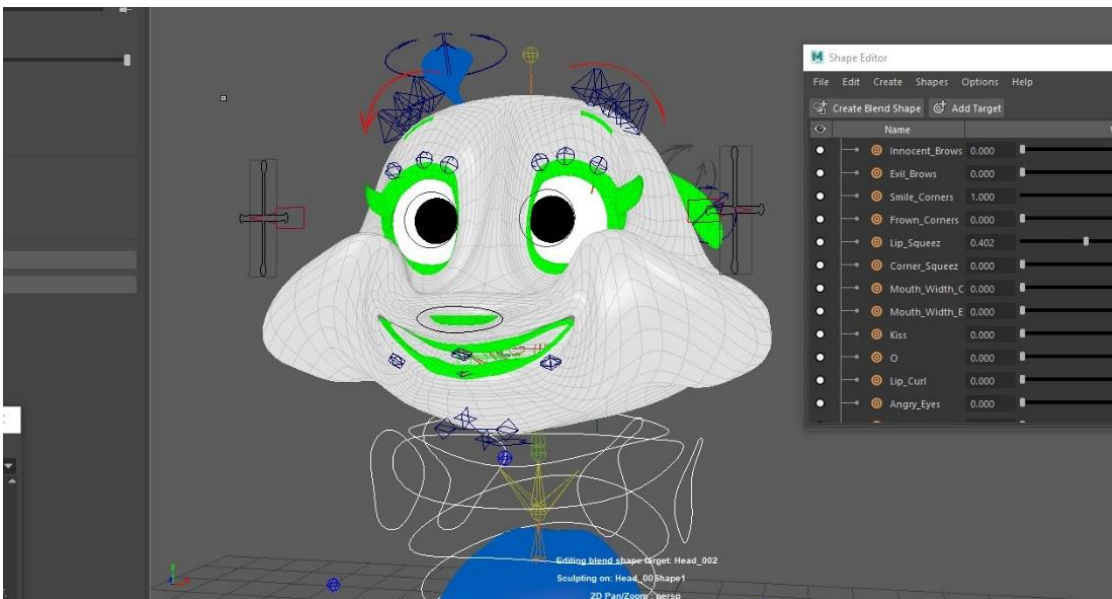


Fig. 38. Felicity, early facial deformation tests

Given these time parameters, manual rigging did not present a humanly possible option for me. I needed four poseable characters as soon as possible. To improve productivity, I decided to incorporate yet another new animation tool. At the tail end of the rigging class, I had previewed an auto-rigging system called Advanced Skeleton. Despite the term “auto” being included in the title, Advanced Skeleton still requires a large amount of user input to generate a CG puppet. I was a little scared to use the system as it crashed in my previous use attempt. Regardless, of the trauma inflicted by the plugin, I knew Advanced Skeleton represented the most feasible speed-rigging solution.

Functionally, Advanced Skeleton works as a plugin, a sort of miniature program, within Autodesk Maya. This differs from the previously mentioned Sculpttris and Substance Painter applications which were their own independent software packages. Installing Advanced Skeleton can take a little skill as it must be manually placed within Maya’s folder structure and scripted into the GUI. Once up and running, Advanced Skeleton allows for a full rigging process directly within Maya. To help me with Advanced Skeleton operations, I consulted a series of tutorials. These helped me significantly. However, the instructions applied to a different version of the plugin. Just like before, I encountered many computer crashes. But, using a rigorous process of trial and error along with a pure determination to make the plugin work, I found the solutions for all the problems I faced.

Following the order of operations suggested by the tutorials, I prepared the body rigs first. Whether using Advanced Skeleton or making a manual rig from scratch, artists have to understand joint placement (fig. 39). Just like humans have places for bones to

rotate, a CG character rig needs defined points for model deformations to pivot from. For a bipedal, human-like character, comparative anatomy helps to pinpoint these locations. This involves referencing a real human bone structure and applying similar spacing to the CG incarnation. Of course, the proportions of a rig may look very different than the real example. Still, spines, shoulders, elbows, and other body parts will be in the same general locations.

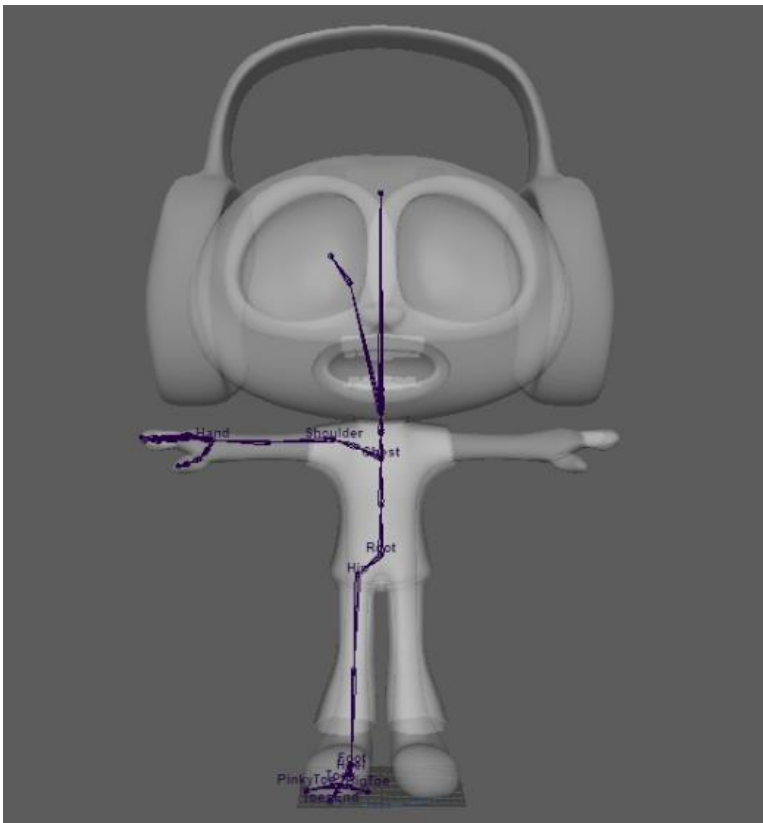


Fig. 39 Joint placement for Andrew's plugin-assisted rigging process.

With joints positioned properly, one-click allows for the creation of a comprehensive control array. Controllers add another layer to the rig's complexity (fig. 40). One can think of them like the strings on a marionette. With live puppets, a puppeteer must control their character with the strings alone. If they were to grab the character itself, the audience would see their hands. Obviously floating hands do not present a problem in the digital realm. But animators do avoid using digital joints for manipulation. The controllers that in-turn move the joints are used instead. This lessens the likelihood of software crashes. As a bonus, controllers can be customized to fit a wide variety of characters. For instance, if a certain CG rig features large shoulders, one can increase the size of the associated controller to match the accompanying geometry. Meanwhile, joints all display at the same size. When creating controllers manually, one must name and constrain every controller. With Advanced Skeleton, this process is automated based on joint placement.



Fig. 40. Control systems created for Andrew's body movement

It felt good to have a basic body rig in place, but Felicity remained in her t-pose. To start moving my character I needed to connect the rig to the model. Once I told Maya to link the two assets together, I tested out my rig. For the most part, Felicity moved as expected. Though some problem spots such as the shoulders and hips required me to manually adjust joint influence for more realistic deformations. Once I had Felicity's body kinetics operating correctly, I backtracked and applied the same steps to Andrew, Steve, and Esther.

My CG puppets could now move their lower halves, but they still needed a complete facial setup for optimal acting potential. This is where I knew Advanced Skeleton would shine if I could figure out how to use it. Full facial rigs can take an insane amount of time to build from scratch. Since one must mimic the organic movement of over forty muscles, interwoven, and arranged over an intricate surface, CG facial rigs often spiral into complex tweaking mechanisms. But with Advanced Skeleton, I managed to avoid bogging down too hard into the technicalities (fig. 41). For facial setup, Advanced Skeleton asks even more specific location questions. For instance, the plugin inquired where the eyeballs should pivot, the size of the eyeballs, the jawline seam position, and the throat position. Scripting discrepancies on some of Advanced Skeleton's questions required several tries to gauge correctly. The facial location trackers were designed for human characters. Felicity and the rest of my stylized cast featured, animal-inspired heads that often skewed the plugin's results. Despite the technical setbacks, I still managed to complete my character's base facial rigs in record time.





Fig. 41. Base facial rig created for Felicity

The basic setup worked wonderfully, though I felt compelled to push my rigs further than the standard Advanced Skeleton templet to achieve more custom capabilities. One major limitation I overcame was the default brow controls. My character's youthful eyes took up a large amount of facial real estate, while foreheads became near nonexistent. With this lack of deformation room, the eyebrows had difficulty forming expressive shapes. For such cartoony characters, subtlety in facial performance represented a highly

objectionable limitation. To overcome this, I manually added deformation nodes to the eyebrows.

These nodes allowed for the desired facial deformation exaggeration. However, I still believed I could push expressions further. To achieve this emphasis wish, I decided to borrow a two-dimensional animation trick for amplifying facial performance. In two-dimensional animation, character brows often float in front of the face. This allows them to overlap obstructions such as hair and hats. However, I needed to create a special way to achieve this effect in CG. My brows had depth, while two-dimensional substitutes usually consisted of an unshaded layer. I needed to define where my brows would ride over the face. To make this concept a reality, I constructed a simple curved surface, modeled to fit the nuances of each character.

Through experimentation, I learned that a series of movement constraints would force the brows to magnetically ride along the geometry. By adding controllers, I could move the brows up, down, and side to side along the surface just like a refrigerator magnet (fig. 42). To make these detached brows expressive, I added two deformers that allowed for raising and lowering. I repeated all these steps for each character.

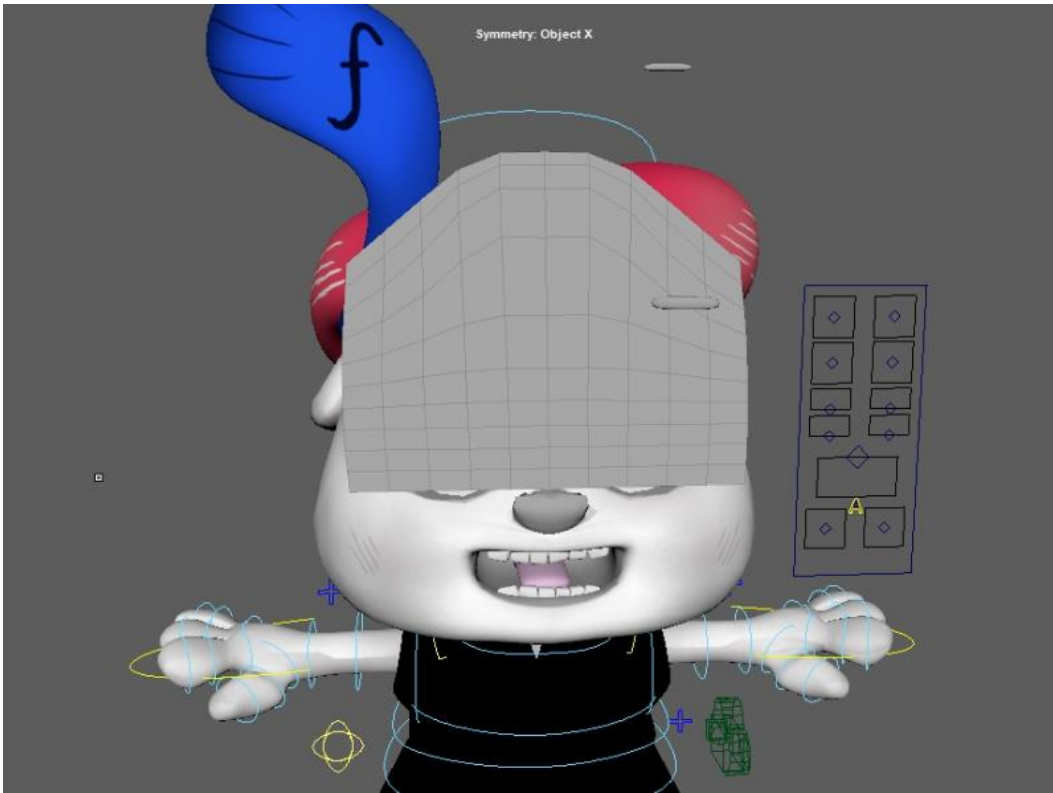


Fig. 42. Specialized brow plane created for Felicity

Besides requiring specialized brow rigs, my characters' large eyes presented their own issues. To create the ultimate cute effect, I modeled Felicity, Andrew, Steve, and Esther with the flattest facial features possible. Though aesthetically pleasing, this squashed look made round eyeballs look out of place. To match the style, I modeled eyes in the shape of a beveled cube. Given the properties of such a shape, rotating the eyes in the fashion of a real eyeball caused them to pop out of their sockets (fig. 43). To counter this, I turned rotation influence down for the eye control. No more socket popping, but eyes could only move a few degrees now. To put the pupils back in motion, I employed a common CG rigging trick. I constrained the movement of the eye's texture to the eye controls (fig. 44). Now toying with the controls would move the pupil around directly without a need for intense eyeball rotation.



Fig. 43. Felicity's default eye rigging with extreme rotation issues

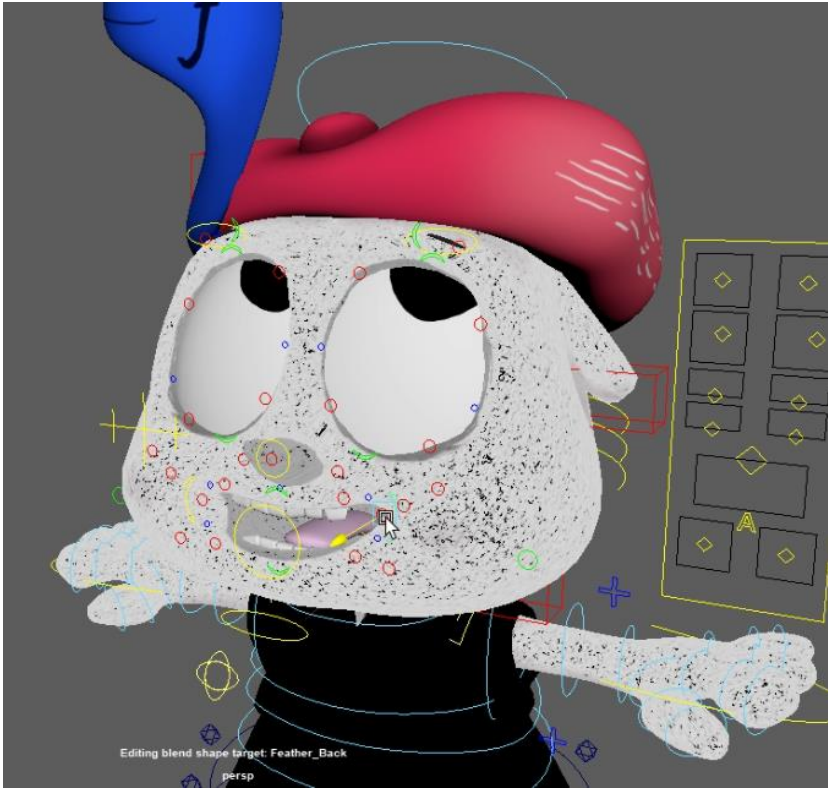


Fig. 44. Felicity's eye rigging with manual corrections applied

With these major issues fixed, I decided to give individual characters rigs something special. Felicity and Esther both received controls for skirt movement (fig. 45 and fig. 46). I gave Esther's tail its own joint chain (fig. 47). And Steve received controls for his big bunny ears (fig. 48). Despite any personal doubts, I managed to fulfill my characters' unique rigging needs with astounding results. More impactful than the rigs themselves, this step showed me that I could handle complex computer animation tasks. No matter how many times a program crashes, no matter many times life gets you down, you must rise back up and persevere. You know you can make it through your struggle when you make it through the toughest part.

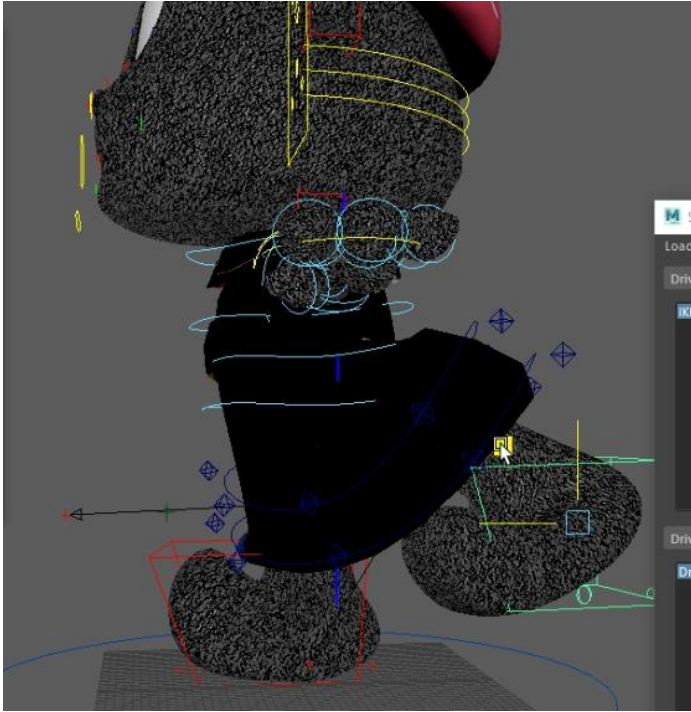


Fig. 45. Felicity's specialized skirt rig

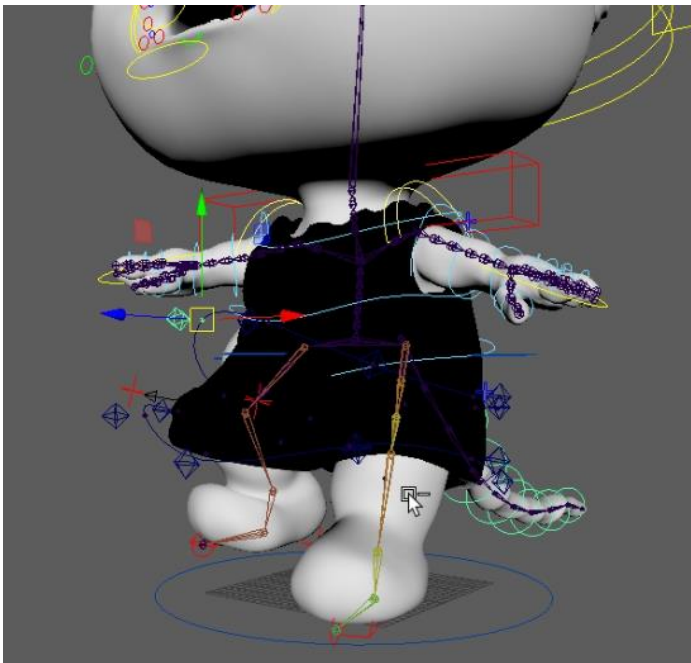


Fig. 46. Esther's specialized skirt rig

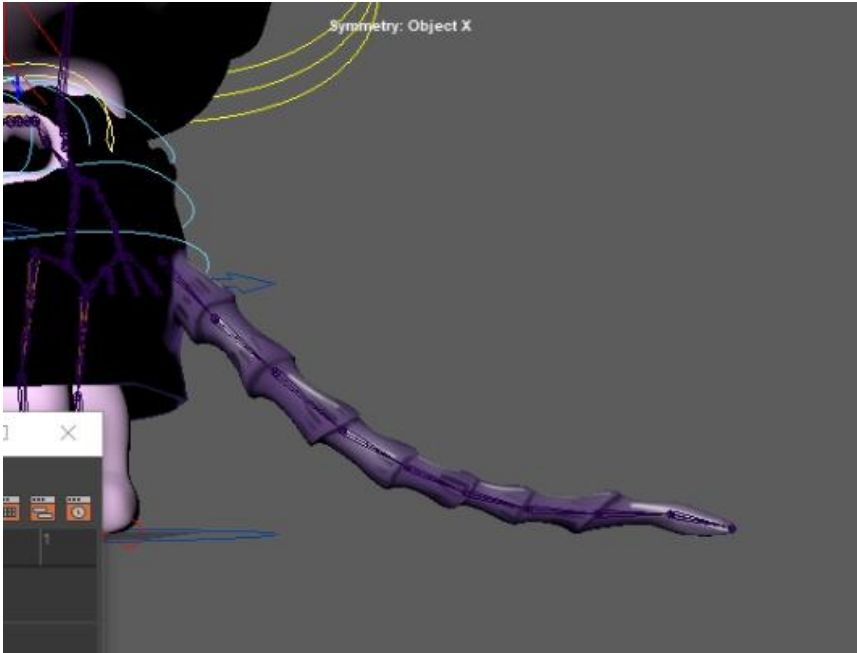


Fig. 47. Joint chain allowing for Esther's tail movement.

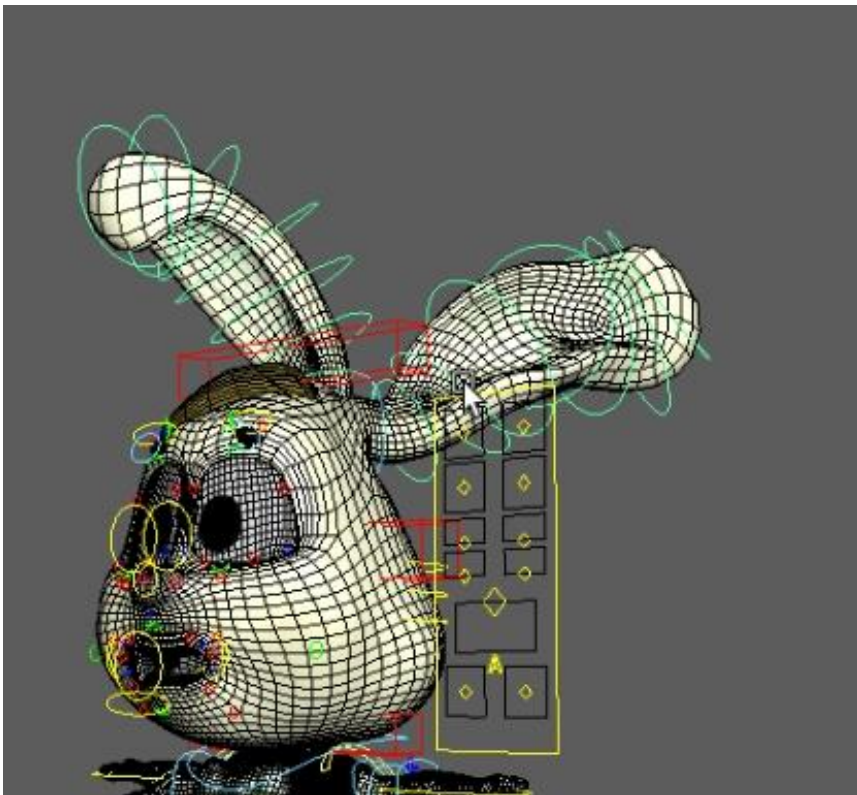


Fig. 48. Extra rigging for Steve's ears



From a technical achievement standpoint, I had just fought my leviathan. A vast sense of accomplishment empowered me to continue my work. In the three days before school, I made the best of what opportunity remained. To aid the animation stage, I filmed reference footage of myself acting out the main characters' performances and lip syncs. I then edited the recordings to fit the timings of my audio.

To further creative aspects, I also created two new Tornado Fortissimo characters, Marvin and Vicky. Unlike previous character designs, I created these two without the intention of animation. To make my tornado safety cartoon trailer more informative and tornado-related I had planned for a large portion to rely on held illustration frames rather than full movement. Moreover, I believed that Marvin and Vicky served a vital story role because they existed for the sole purpose of demonstration. Free of dialogue and specific personality, they could represent any audience member. This omission of exclusive character temperament would make them bland characters to watch for full-length cartoon episodes. But for short-form infographics, the two worked perfectly. Whatever I needed to have happen on-screen for the audience to comprehend a complex topic, Marvin and Vicky could expressly explain. And I could have these explanations happen without concerning myself with story context or continuity.

With no plans for animating Marvin and Vicky, I would avoid building full CG assets and CG rigs for their characters. Instead, I would draw each of their held frames by hand. Individually crafting each frame would allow for more cartoony antics, as I could morph the characters however an illustration concept required. Using a more traditional two-dimensional approach would also help to delineate Marvin and Vicky's universe from

the world of Felicity, Andrew, Steve, and Esther. Furthermore, I wanted to compensate for the lack of trait writing by making Marvin and Vicky's designs unique. While I had certainly stylized my CG characters, I still paid very close attention to real human references to create my designs. Though I exaggerated their proportions, solid drawing during the concept stage and the quality of their final renders endowed a stark amount of realism and believability. Felicity, Andrew, Steve, and Esther could walk, talk, and express themselves in very life-like ways. For Marvin and Vicky, I would largely ignore anatomy references and draw from my head in order to achieve a stylized design.

First and foremost, I needed a simple enough design for Marvin and Vicky that I could draw the two of them many times over. My inspiration for an easily drawable character came from a stick person. Such stylizations of the human body are often drawn by children. So, I figured that this would come across as relatable. Following the rules of character design, I would make my stick people much more structured than the average child depiction.

For eight long hours, I worked to create the perfect stick persons for my project (fig. 49). To make my designs stand out from the average circles with lines extending in all directions approach, I determined how I could push silhouette and thereby memorability (fig. 50). I looked to the past for some inspiration. Marvin and Vicky seemed like good PSA characters. So, I looked at some propaganda cartoons from the 1940s and 1950s. Besides the impressive educational film libraries of Disney and Warner Bros., I stumbled on the work of United Productions of America or UPA (Andrae). As an animation student, I was surprised I had never heard of their studio. Further research revealed that they were

responsible for breaking norms of realism in the animation industry in order to push artistic style through character design. Falling in love with their aesthetic, I decided to incorporate their techniques into Marvin and Vicky's forms. I used more flat, geometric shapes and put careful intent into each line stroke (fig. 51 and fig 52, fig. 53, and fig. 54). I also implemented blocky colors with minimal shading. Employing the UPA style allowed me to capture a wonderful 1950s aesthetic for Marvin and Vicky.

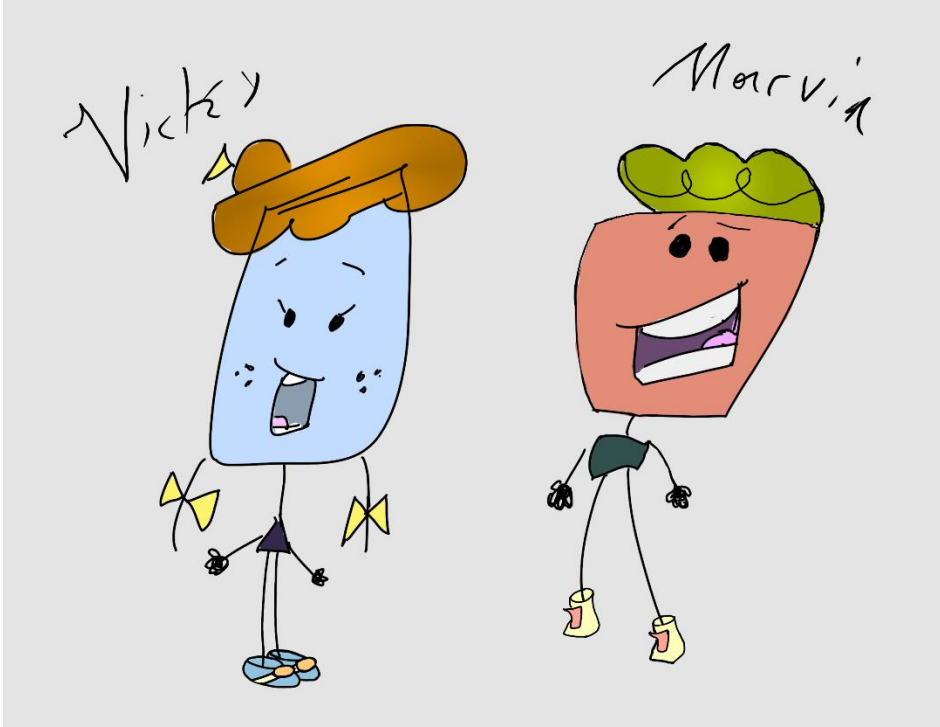


Fig. 49. Marvin and Vicky initial concepts

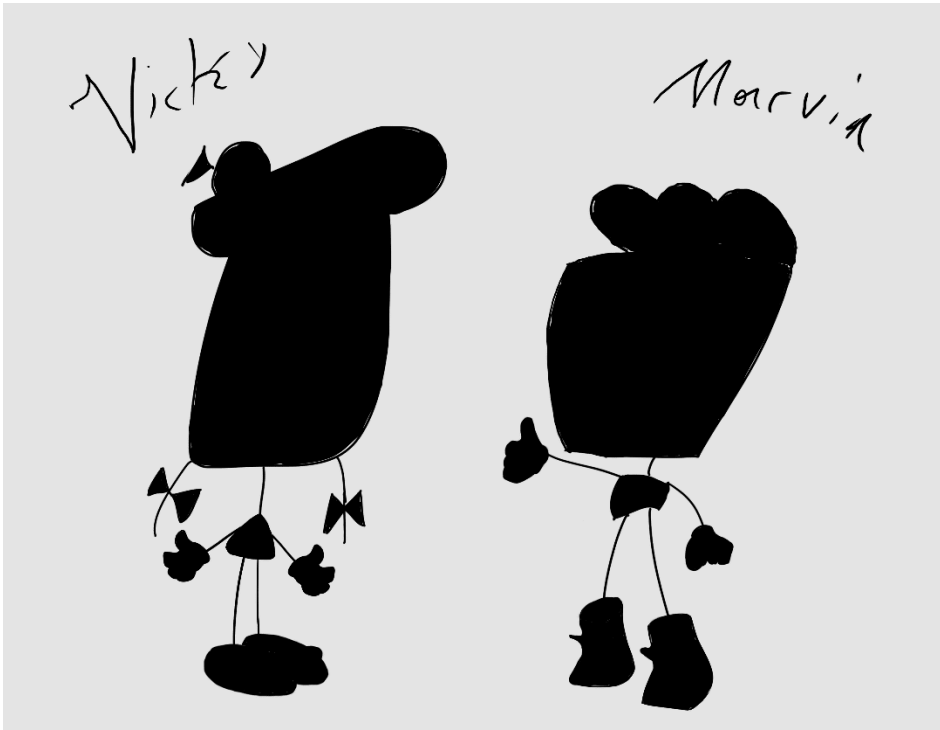


Fig. 50 Marvin and Vicky shown together in silhouette

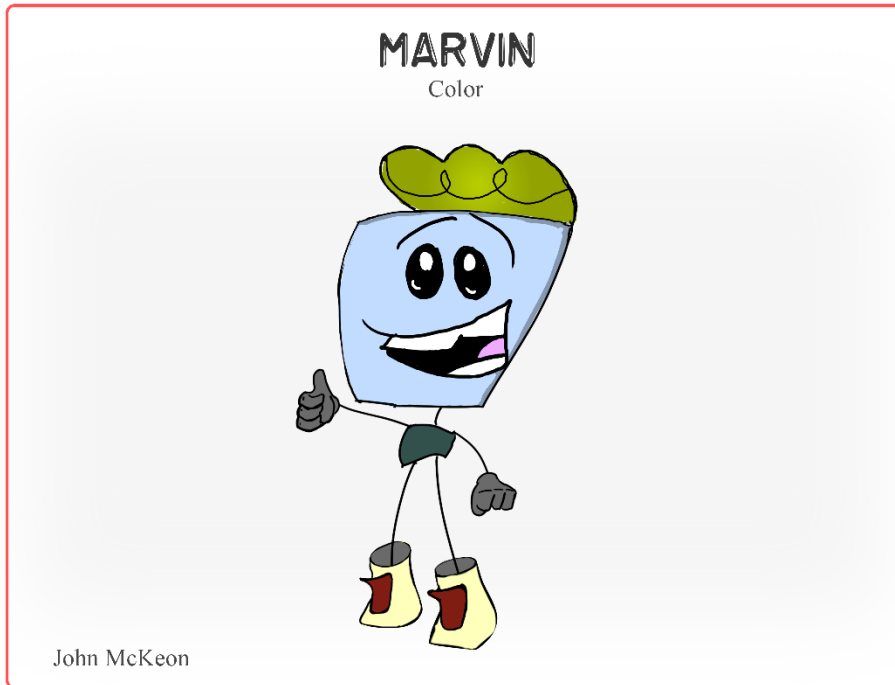


Fig. 51. Marvin's final design shown in full color

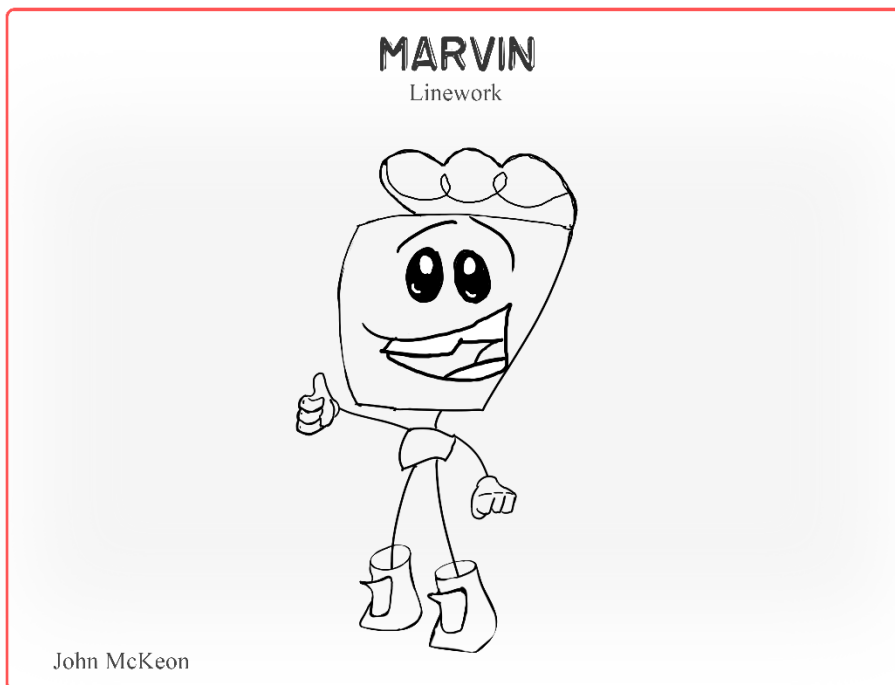


Fig. 52. Marvin's final design shown with linework only



Fig. 53. Vicky's final design shown in full color

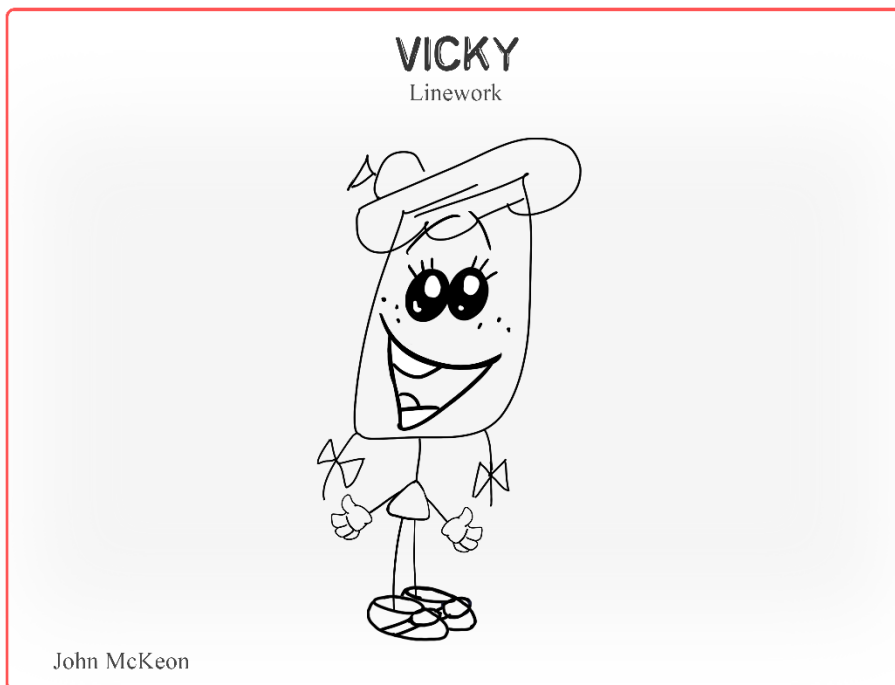


Fig. 54. Vicky's final design shown with linework only

## TIME CATCHES UP

Despite my best efforts, time had finally overrun my ambitions. For a proof of concept, I had left the project in a decent spot. As school called, I spent every spare second working on a series of environment props for Felicity, Andrew, Steve, and Esther's world (fig. 55, fig. 56, fig. 57, and fig. 58). I even completed a few of Marvin and Vicky's still frames (fig. 59, fig. 60, and fig. 61). My reference footage sat ready to inspire its animated counterpart. I looked at the completed work and smiled. Finished or not, my thesis project represented one of the best learning experiences of my animation career. I constantly pushed artistic and technical boundaries above and beyond my level of expertise. Developing so many concepts by myself allowed me the joy of blending a variety of cartoony character design styles. As a storyteller, I discovered how to channel my screenwriting to have a point, engage audiences, and to present more realistic objectives for animation time.



Fig. 55. Piano prop for “Tornado Fortissimo”



Fig. 56. Cabinet prop for “Tornado Fortissimo”





Fig. 57. Chalkboard prop for "Tornado Fortissimo"



Fig. 58. Gong prop for "Tornado Fortissimo"



Fig. 59. "Swimming with Sharks," illustration featuring my two-dimensional style



Fig. 60. "Tornado Over Water," illustration featuring my two-dimensional style



Fig. 61. "How can you stay safe?" Illustration featuring my two-dimensional style

## CONCLUSIONS

One can grasp from the research presented herein that the National Weather Service would benefit from a superior method of increasing tornado safety awareness. Since the largest danger that the American public faces from cyclonic threats stem from an insufficiency of education on the topic. A piece of media rationalizing complex weather science and demonstrating simple safety procedures would help Americans to better understand and combat tornadic issues. By showcasing safety strategies through an audio-visual means, multi-sensory brain processes ensure the long-term storage of such vital information. And as the success of Smokey the Bear made manifest that an animated short film featuring stylized cartoon characters represents an effective way of channeling information.

The creative aspect of this thesis project allowed me to showcase my concept for what an animated tornado safety production could look like. While rapidly expanding my own skillset, I found many fantastic ways to create an entertaining and educational story. Explorations of short-form screenwriting, character design, sound engineering, CG modeling, and CG rigging all helped me to clearly condense my idea, make that notion enjoyable for children, and to cleanly slide an educational element into a piece of audio-visual content without boring audiences. Beyond the technical processes discussed, the journal of my artistic procedures shows the importance of perseverance. Revisions now and forever remain a necessary part of animation. Accordingly, an animation preproduction

artist must keep their ego in check and remain comfortable with scrapping sketchy ideas in the pursuit of a stronger structure. The more concise a story, the more organized.

Along with the advice to condense confusing stories to their most simplistic form, I offer these words to future animators and fellow creatives. During my candid work on my honors thesis project, I have learned that I can do almost anything I think of if I persist. But my persistence will wear thin when I try to do everything I think of. Plainly stated, imagination runs faster than realization. Art takes a long time to produce. Skills take a long time to grasp. The violinist does not join the orchestra on his first day with the bow. Whether a learner or a seasoned professional, give yourself time to aspire. When I started this project as an intro student, I wanted to tackle the world. I dreamed of animating my own full-length cartoons. I am still tackling the world. I am just doing it in smaller steps. I am studying the most minute details and seeking to master their secrets. When I embraced quality over quantity, I found it much easier to work on my tornado safety cartoon. I discovered the joy in the journey and conceptualizing my ideas became a quest full of adventure rather than a chore. To this end, I owe the deepest gratitude to the MTSU Honors College for making my studies about creating a tornado safety cartoon possible.

## WORKS CITED

- “About the Campaign.” *SmokeyBear.com*. 2018. Web. 12 Dec. 2018.  
[smokeybear.com/en/smokeys-history/about-the-campaign](http://smokeybear.com/en/smokeys-history/about-the-campaign).
- Andrae, Thomas. “Animation's Icarus: UPA and the Fate of the Modernist Cartoon.” *Studies in American Humor*, no. 27 (2013): 189–200. *JSTOR*. Web. 22 Mar. 2020  
[www.jstor.org/stable/23823984](http://www.jstor.org/stable/23823984). Accessed 22 Mar. 2020.
- “Be a Force of Nature.” *WeatherSafety.Ohio.gov*. N.D. Web. 6 Feb. 2019.  
[www.weathersafety.ohio.gov/Documents/FactSheets/Be%20a%20Force%20of%20Nature%20-%20Info%20Sheets.pdf](http://www.weathersafety.ohio.gov/Documents/FactSheets/Be%20a%20Force%20of%20Nature%20-%20Info%20Sheets.pdf).
- Brame, Cynthia J. “Effective Educational Videos.” *Vanderbilt.edu*. Vanderbilt University. 2015. Web. 12 Dec. 2018. [cft.vanderbilt.edu/guides-sub-pages/effective-educational-videos/](http://cft.vanderbilt.edu/guides-sub-pages/effective-educational-videos/).
- Brooks, Josiah. *Draw with Jazza: Creating Characters*. Blue Ash, Ohio: Impact, 2016. Print.
- “The Bullwinkle Show.” *IMDB*. N.D. Web. 6 Feb. 2019.  
[www.imdb.com/title/tt0054524/](http://www.imdb.com/title/tt0054524/).
- Cain, Victoria. “From Sesame Street to Prime Time School Television: Educational Media in the Wake of the Coleman Report.” *History of Education Quarterly* 57.4 (2015): 590-601. *EBSCOhost*. Web. 6 Feb. 2019.  
[eds.b.ebscohost.com/eds/pdfviewer/pdfviewer?vid=1&sid=94d8eba8-6cbe-4fb0-80cd-45fdeb6883c5%40sessionmgr120](http://eds.b.ebscohost.com/eds/pdfviewer/pdfviewer?vid=1&sid=94d8eba8-6cbe-4fb0-80cd-45fdeb6883c5%40sessionmgr120).
- Calvert, Amy. “Pyramid of Khafre and the Great Sphinx.” *KhanAcademy.org*. Khan Academy. N.D. Web. 20 Mar. 2020. [www.khanacademy.org/humanities/ap-art-history/ancient-mediterranean-ap/ancient-egypt-ap/a/old-kingdom-pyramid-of-khafre-and-the-great-sphinx](http://www.khanacademy.org/humanities/ap-art-history/ancient-mediterranean-ap/ancient-egypt-ap/a/old-kingdom-pyramid-of-khafre-and-the-great-sphinx)
- Carpenter, Clarence Ray, et al. “An Investigation of Closed-Circuit Television for Teaching University Courses: Report Number One.” *RIEMAY* (1955): 1-102. *EBSCOhost*. Web. 12 Dec. 2018.  
[eric.ed.gov/contentdelivery/servlet/ERICServlet?accno=ED013540](http://eric.ed.gov/contentdelivery/servlet/ERICServlet?accno=ED013540).
- Carpenter, Clarence Ray, et al. “An Investigation of Closed-Circuit Television for Teaching University Courses: Report Number Two.” *RIEMAY* (1958): 116. *EBSCOhost*. Web. 12 Dec. 2018.  
[eric.ed.gov/contentdelivery/servlet/ERICServlet?accno=ED014871](http://eric.ed.gov/contentdelivery/servlet/ERICServlet?accno=ED014871).

- Cartwright, Mark. "Ancient Greek Theatre." *Ancient.eu*. Ancient History Encyclopedia. 14 July 2016. Web. 21 Mar. 2020. [www.ancient.eu/Greek\\_Theatre/](http://www.ancient.eu/Greek_Theatre/)
- "Cigarettes and Other Tobacco Products." *drugabuse.gov*. DrugAbuse. Jan. 2020. Web. 21 Mar. 2020. [drugabuse.gov/publications/drugfacts/cigarettes-other-tobacco-products](http://drugabuse.gov/publications/drugfacts/cigarettes-other-tobacco-products)
- Comedy Central. "The Colbert Report: Who's Attacking Me Now?" *YouTube*. YouTube. 1 Apr. 2014. Web. 12 Dec. 2018. [www.youtube.com/watch?v=0cODBQqaGTw](http://www.youtube.com/watch?v=0cODBQqaGTw).
- "Cones and Color Vision." *NCBI.NLM.NIH.gov*. 2001. Web. 12 Dec. 2018. [www.ncbi.nlm.nih.gov/books/NBK11059/](http://www.ncbi.nlm.nih.gov/books/NBK11059/).
- Cooper, Sean. "The Death of the Disc." *Slate.com*. 16 Nov. 2006. Web. 12 Dec. 2018. [slate.com/technology/2006/11/why-hd-dvd-and-blu-ray-are-dead-on-arrival.html](http://slate.com/technology/2006/11/why-hd-dvd-and-blu-ray-are-dead-on-arrival.html).
- "The Discovery of Stapes." *NCBI.NLM.NIH.gov*. N.D. Web. 12 Dec. 2018. [www.ncbi.nlm.nih.gov/pmc/articles/PMCC3825043/](http://www.ncbi.nlm.nih.gov/pmc/articles/PMCC3825043/).
- "Emergency Management." *PublicSafety.gc.ca*. N.D. Web. 17 Mar. 2019. [www.publicsafety.gc.ca/cnt/mrgnc-mngmnt/index-en.aspx](http://www.publicsafety.gc.ca/cnt/mrgnc-mngmnt/index-en.aspx).
- "Fast Facts: What are the new back to school statistics for 2018." *NCES.ED.gov*. N.D. Web. 12 Dec. 2018. [nces.ed.gov/fastfacts/display.asp?id=372](http://nces.ed.gov/fastfacts/display.asp?id=372).
- "Functional Specialization of the Rod and Cone Systems." *NCBI.NLM.NIH.gov*. 2001. Web. 12 Dec. 2018. [www.ncbi.nlm.nih.gov/books/NBK10850/](http://www.ncbi.nlm.nih.gov/books/NBK10850/).
- The Great Courses. "Tornadoes and Their Amazing Winds." *MTSU.Kanopy.com*. MTSU.Kanopy.com. 2017. *EBESCOhost*. Web. 12 Dec. 2018. [eds.a.ebscohost.com/eds/detail/detail?vid=0&sid=c9ad0d92-15eb-41e4-84eb-5d10660cf09c%40sdc-v-sessmgr06&bdata=JnNpdGU9ZWRzLWxpdmUmc2NvcGU9c2l0ZQ%3d%3d#AN=mts.b3537721&db=cat00263a](http://eds.a.ebscohost.com/eds/detail/detail?vid=0&sid=c9ad0d92-15eb-41e4-84eb-5d10660cf09c%40sdc-v-sessmgr06&bdata=JnNpdGU9ZWRzLWxpdmUmc2NvcGU9c2l0ZQ%3d%3d#AN=mts.b3537721&db=cat00263a).
- Harris, Beth and Steven Zucker. "Polykleitos, Doryphoros (Spear-Bearer)" *KhanAcademy.org*. Khan Academy. N.D. Web. 20 Mar. 2020. [www.khanacademy.org/humanities/ap-art-history/ancient-mediterranean-ap/greece-etruria-rome/a/polykleitos-doryphoros-spear-bearer](http://www.khanacademy.org/humanities/ap-art-history/ancient-mediterranean-ap/greece-etruria-rome/a/polykleitos-doryphoros-spear-bearer)
- Henderson, Sarah. "Laughter and Learning; Humor Boosts Retention" *Edutopia.org*. Edutopia. 31 Mar. 2015. Web. 21 Mar. 2020. [www.edutopia.org/blog/laughter-learning-humor-boosts-retention-sarah-henderson](http://www.edutopia.org/blog/laughter-learning-humor-boosts-retention-sarah-henderson)

- “How politically polarized media is driving our alternative realities” *PBS.org*. Public Broadcasting System. 20 Apr. 2017. Web. 21 Mar. 2020.  
[www.edutopia.org/blog/laughter-learning-humor-boosts-retention-sarah-henderson](http://www.edutopia.org/blog/laughter-learning-humor-boosts-retention-sarah-henderson)
- “The Jetsons.” *IMDB.com*. N.D. Web. 6 Feb. 2019.  
[www.imdb.com/title/tt0055683/mediaindex?ref=tt\\_pv\\_mi\\_sm](http://www.imdb.com/title/tt0055683/mediaindex?ref=tt_pv_mi_sm).
- Lavi-Rotbain, Ori, and Inbal Arnon. “Developmental Differences Between Children and Adults in the Use of Visual Cues for Segmentation.” *Cognitive Science* 42 (2018): 606-620. *EBSCOhost*. Web. 12 Dec. 2018.  
[eds.b.ebscohost.com/eds/detail/detail?vid=0&sid=57b0b1be-d9c4-4f74-a007-a075c1dc143a%40pdc-v-sessmgr02&bdata=JnNpdGU9ZWRzLWxpdmUmc2NvcGU9c2l0ZQ%3d%3d#AN=129954487&db=edb](http://eds.b.ebscohost.com/eds/detail/detail?vid=0&sid=57b0b1be-d9c4-4f74-a007-a075c1dc143a%40pdc-v-sessmgr02&bdata=JnNpdGU9ZWRzLWxpdmUmc2NvcGU9c2l0ZQ%3d%3d#AN=129954487&db=edb).
- Mattson, Mark P. “Superior pattern processing is the essence of the evolved human brain.” *NIH.gov*. National Institute of Health. 24 Aug. 2014. Web. 21 Mar. 2020.  
[ncbi.nlm.nih.gov/pmc/articles/PMC4141622/](http://ncbi.nlm.nih.gov/pmc/articles/PMC4141622/)
- Mazzucco, Roberta. “African Myths and What They Teach.” *Yale.edu*. Yale University. N.D. Web. 21 Mar. 2020.  
[teachersinstitute.yale.edu/curriculum/units/1998/2/98.02.03.x.html](http://teachersinstitute.yale.edu/curriculum/units/1998/2/98.02.03.x.html)
- Mertz, Pierre, et al. “Motion-Picture Photography.” *Britannica.com*. 24 Oct. 2016. Web. 12 Dec. 2018. [www.britannica.com/technology/motion-picture-technology](http://www.britannica.com/technology/motion-picture-technology).
- “Mister Magoo.” *IMDB.com*. N.D. Web. 6 Feb. 2019. [www.imdb.com/title/tt1044551/](http://www.imdb.com/title/tt1044551/).
- “Poor old England endeavoring to reclaim his wicked American children.” *LibraryofCongress.gov*. Library of Congress. N.D. Web. 20 Mar. 2020.  
[loc.gov/resource/ppmsca.40235/](http://loc.gov/resource/ppmsca.40235/)
- Rhyannon, Bemis. “Repeating Something Familiar: Using Reoccurring, Television-Inspired Segments to Promote Students’ Recall of Learning Events and Course Content.” *Teaching of Psychology*, 45.2 (2018): 183-188. *EBSCOhost*. Web. 12 Dec. 2018.  
[eds.a.ebscohost.com.ezproxy.mtsu.edu/eds/detail/detail?vid=0&sid=837fcb2b-3acf-4bfc-ad6a-6470513eb0d6%40sdc-v-sessmgr01&bdata=JnNpdGU9ZWRzLWxpdmUmc2NvcGU9c2l0ZQ%3d%3d#AN=EJ1174034&db=eric](http://eds.a.ebscohost.com.ezproxy.mtsu.edu/eds/detail/detail?vid=0&sid=837fcb2b-3acf-4bfc-ad6a-6470513eb0d6%40sdc-v-sessmgr01&bdata=JnNpdGU9ZWRzLWxpdmUmc2NvcGU9c2l0ZQ%3d%3d#AN=EJ1174034&db=eric).



- Ripberger, Joseph, et al. "False Alarms and Missed Events: The Impact and Origins of Perceived Inaccuracy in Tornado Warning Systems." *Risk Analysis* 35.1 (2015): 13, 44-56. *EBSCOhost*. Web. 6 Feb. 2019.  
[eds.b.ebscohost.com/eds/pdfviewer/pdfviewer?vid=1&sid=94d8beba8-6cbe-4fb0-80cd-45fdeb6883c5%40sessionmgr120](https://eds.b.ebscohost.com/eds/pdfviewer/pdfviewer?vid=1&sid=94d8beba8-6cbe-4fb0-80cd-45fdeb6883c5%40sessionmgr120).
- Schawbel, Dan. "Michael Ian Black on His Career, Expedia and Social Media." *Forbes.com*. Forbes. 12 Apr. 2012. Web. 21 Mar. 2020.  
[www.forbes.com/sites/danschawbel/2012/04/12/michael-ian-black-on-his-career-expedia-and-social-media/#36fb1abf7ee5](https://www.forbes.com/sites/danschawbel/2012/04/12/michael-ian-black-on-his-career-expedia-and-social-media/#36fb1abf7ee5)
- "Super Mario Bros: Electronic Game." *Britannica.com*. Britannica. 16 Jan. 2020. Web. 21 Mar. 2020. [www.britannica.com/topic/Super-Mario-Bros](https://www.britannica.com/topic/Super-Mario-Bros)
- "Super Mario Bros." *IMDb.com*. Internet Movie Database. N.D. Web. 21 Mar. 2020.  
[www.imdb.com/title/tt0108255/?ref=vp\\_back](https://www.imdb.com/title/tt0108255/?ref=vp_back)
- Toy Story*. Dir. John Lasseter. Perf. Tim Allen, Tom Hanks, and Laurie Metcalf. Amazon, 2020. *Prime Video*. Android app. [www.amazon.com/Toy-Story-Tim-Allen/dp/B0049J0DC8](https://www.amazon.com/Toy-Story-Tim-Allen/dp/B0049J0DC8)
- "YouTube for Press." *YouTube.com*. N.D. Web. 12 Dec. 2018.  
[www.youtube.com/intl/en-GB/yt/about/press/](https://www.youtube.com/intl/en-GB/yt/about/press/).
- "Video Format Timeline." *Obsoletedia.org*. 2017. Web. 12 Dec. 2018.  
[obsoletedia.org/video/](https://obsoletedia.org/video/).
- "Weather Fatalities 2017." *NWS.NOAA.gov*. N.D. Web. 6 Feb. 2019.  
[www.nws.noaa.gov/om/hazstats.shtml](https://www.nws.noaa.gov/om/hazstats.shtml).
- Wilson, Tracy V. "How HD-DVD Works." *Electronics.Howstuffworks.com*. 2008. Web. 12 Dec. 2018. [electronics.howstuffworks.com/hd-dvd4.htm](https://electronics.howstuffworks.com/hd-dvd4.htm).
- Zabel, Gary. "The ancient Egyptian theatre." *faculty.UMB.edu*. University of Maryland, Baltimore. 2003. Web. 21 Mar. 2020.  
[faculty.umb.edu/gary\\_zabel/Courses/Phil%20281b/Philosophy%20of%20Magic/Arcana/Neoplatonism/theatre.htm](https://faculty.umb.edu/gary_zabel/Courses/Phil%20281b/Philosophy%20of%20Magic/Arcana/Neoplatonism/theatre.htm)