



WPI

ANIMATING BIODIVERSITY

Creating An Educational Film on Biodiversity for Secondary School Learners in
Namibia

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Abstract

The goal of this project was to assist the EduVentures Trust by developing an animated film about biodiversity for learners in rural schools. EduVentures supplements traditional classrooms with SMARTLessons in a mobile classroom that teach students about biodiversity, sustainability, heritage, and climate change. We collaborated with the EduVentures staff in all aspects of film production so they can create additional animations in the future. Our animated film on biodiversity introduces and defines biodiversity and its implications. Additionally, the film's animated features will act as educational entertainment for the learners. Through images and animated characters the learners will be able to visualize and comprehend what biodiversity means, as well as what they can do to help preserve Namibia's biodiversity.

Executive Summary

Namibia relies on its natural biodiversity for materials, medicine, and the jobs created by ecotourism. Biodiversity is nationally recognized for its importance, but only lightly touched upon in the national curriculum for secondary education. EduVentures Trust in Windhoek, Namibia supplements existing courses through lessons taught in their mobile education unit, the EduMobile, also known as the Ombombo Mobile Classroom. When the EduMobile visits schools throughout Namibia the EduVentures staff teaches lessons about biodiversity, among other subjects, using a SMARTBoard within the EduMobile.

This project sought to assist EduVentures in teaching rural secondary school learners in Namibia about biodiversity through the creation of an animated film and supplemental materials. To accomplish this goal, we developed a script and storyboard, created an animated film about biodiversity to show to learners, and designed supplemental materials. Once our film was created, we assessed its effectiveness through learner and teacher surveys.

To develop the script and storyboard, we observed the EduVentures staff teach their EduMobile lessons and noted how an animated film could be used to supplement the lesson. We then went through their module step by step and created a script that would be educational and entertaining. After we designed the storyboard, we obtained all of the materials necessary for the animation and began filming. Once a first draft of the film was finished, we showed it to the EduVentures staff as well as a Hochland High School in Windhoek to gain preliminary feedback. After this feedback, we edited and improved the script and animation details for the final version of the film.



Figure 1. Character Sketches

The final version of the film received its premiere first with the EduVentures staff and then on the EduMobile itself at Ombika Combined School in Okaukuejo, within Etosha National Park. There we showed the film to learners. The learners and the teachers were given surveys in order to gauge their overall opinions of the film as well as to determine if they had learned anything new about biodiversity from watching the film.

A step-by-step guidebook for EduVentures staff detailing every facet of the animated film was created in order to assist the EduVentures staff in continuing to make additional videos on other subjects for similar lesson modules. The guidebook contains three chapters devoted to the drafting process, the creation and editing of the film, and our recommendations for how to proceed with future films. All steps are explicitly detailed and accompanied by pictures to help the reader visualize and comprehend what is

happening in each step. The guidebook has a list of supplies and simplified task checklist for the user's reference.

The completed animated film is entitled "Biodiversity," and is 5:48 minutes in duration. The film may be viewed in its entirety at https://youtu.be/CRR_BbdO6ow. The script of the film is provided in Appendix J. It introduces the basic definition of biodiversity, as well as the definitions of the three types of biodiversity. There are examples of each topic that are illustrative and relevant to the learners in order to help them better understand the lesson. The film addresses threats to biodiversity as well as what an individual can do to protect biodiversity and why they should want to. The film then ends with the message that anyone can help protect biodiversity and we should all work together to do so. To organize these topics, the film was broken up into three scenes.

Scene One of the film was used to ensure familiarity for learners watching the film (Fig. 2). We used a Namibian flag and based the design of the setting off of the first school we visited in Omuthiya. This is important because it allows learners to learn about the concept of biodiversity by giving them an example that is similar to their lives.

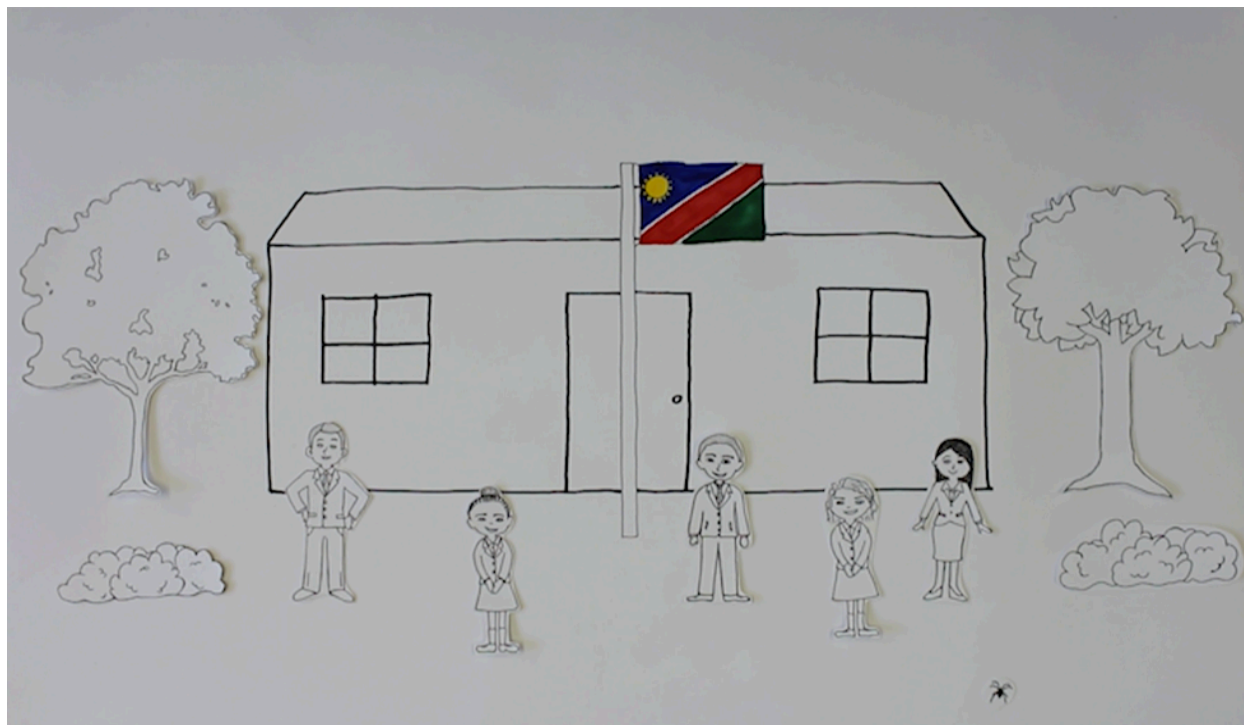


Figure 2. Scene One Schoolyard

The second scene covers the topics of genetic, species, and ecological diversity. This scene was the most involved with multiple background changes and character changes. By using characters in this scene we connected genetic diversity to the learners of Namibia, making a personal connection which will help them understand the importance of genetic diversity for a species survival and growth (Fig. 3).



Figure 3. Scene Two Genetic Biodiversity

Scene Three represents the threats to biodiversity and consequences of wasting resources (Fig. 4). This is important to put into context and instill into the learners that if they do not conserve resources now the same resources will not be available in the future.



Figure 4. Scene Three Biodiversity Threats

At the film's premiere at Okaukuejo, the learners and teachers were given surveys in order to gauge the effectiveness and relevance of the film (Fig. 5). The learners were asked their knowledge about biodiversity, and to rank the helpfulness and new information learned on a scale of 1-5. This ensured that we would have some quantitative data to evaluate the effectiveness of the film. Our results concluded that the film was helpful and presented new information to the learners.



Figure 5. Film Premiere in EduMobile at Ombika Combined School

The teachers were asked to rank the level of important information and new information learned. This allowed us to quantitatively conclude how effective the teachers believed the lesson was. The teachers were given five open-ended responses about their opinions on the structure of the lesson and its relevance to their classes. These open-ended responses included a comment section that allowed the teachers to write down any comments, positive or negative, that they had about the film and program. The teachers survey results concluded that the film presented important information.

Due to the average rankings of the categories in the surveys we determined the effectiveness of the film as follows, helpfulness 4, new information 4.4, and important information 5. The film is now being added to the current EduMobile program as it was successful as a teaching tool for the learners involved.

We worked closely with the EduVentures staff when creating the Biodiversity film. Additionally, we held a Filmmaking Workshop with the staff to go over every step of creating the animated film. At least one member of the staff observed us creating the elements and often times directly helped, such as with the voice-over recording, some character drawing and the filming.

Their participation was incredibly valuable because it gave us direct feedback and direction with the film as well as giving them experience for when they do their own filming. When the staff began the filmmaking workshop, we assisted them in starting an animation on one of their other modules, Sustainability. They created a script, drafted the storyboard, and designed characters. This gave them the direct, hands-on experience necessary to continue making films on their own.

Based on our experience making the animated film and the feedback gained from learner and teacher surveys, we have identified several recommendations for the EduVentures Trust staff as they move forward with additional animated films:

We recommend that the EduVentures staff creates future films as a team. If additional films are to be made, consistency between and within films is important for their artistic quality as well as for the ease of creation. Working steadily as a team allows for a freer discussion about each element created for the film. **We recommend that the future films be integrated with the EduMobile SMARTLessons.** The film should be designed to introduce the SMARTLessons aboard the EduMobile without being too repetitive. By having the film briefly go over the topic before the lesson begins, it will help to emphasize the information and make it more familiar to learners. **We recommend that the EduVentures staff maintain a consistent design and quality among the animated films.** Using the same drawing and editing techniques, scene set-up, and film style will help to create a sense of connection between the EduVentures productions.

The implementation of these recommendations could improve the impact of the EduVentures' EduMobile program and the overall experience of the learners who participate in these lessons.

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Chapter 1: Introduction

The Government of Namibia is committed to protecting biodiversity. This commitment is manifested through national initiatives such as the National Biodiversity Strategic Action Plan (NBSAP 2), which details the steps national agencies will take to improve biodiversity awareness and conservation practices. To complement the government's efforts, independent organizations are integrating the regular school curriculum on a variety of environmental topics, by providing in-depth education on a number of issues, including biodiversity, to learners in Namibia.

EduVentures Trust is based in Windhoek and was founded in 2003, to educate Namibian grade school students (called "learners") about the environment beyond what they are already being taught in their current secondary school curriculum. EduVentures Trust is one such organization that has done an especially good job at directly extending to rural communities, through outreach programs and presentations at schools throughout Namibia. EduVentures supplements traditional classroom lessons by traveling to rural areas with a truck called the EduMobile. The EduMobile is a mobile classroom with SMARTBoards and other educational technology that travels all over Namibia, especially in the North, to help learners grasp the concept of biodiversity, as well as other topics.

In Northern Namibia, rural schools have limited access to the educational resources that are more easily available in schools in urban areas. For example, schools in rural areas do not have adequate building space to accommodate all of their learners. Learners that attend schools in rural areas usually live in various villages surrounding the school area, and speak various dialects of Oshiwambo, the primary language in Northern Namibia. This in turn creates a language barrier when trying to speak to learners and teachers in English, because translating each word may be different in each village's dialect. The EduVentures EduMobile program encourages the learners to speak in English throughout the duration of the program so they can improve their English speaking skills and gain confidence in presenting in the language.

Learners in kindergarten through third grade will speak their native language at school. Once learners enter fourth grade, teachers educate in English. However, native language is commonly utilized to help learners understand new topics. Because of this, learners will often need native language to assist in their comprehension which was utilized several times during the EduMobile program which the student team observed. While the EduMobile is a revolutionary tool used by Eduventures, the addition of animated films would reinforce the concepts for learners and create more resources for teachers. It would also make the topics more understandable to all learners, thanks to the visual nature of these animations which can bridge the language barriers.

The majority of biodiversity animations available to the EduVentures staff are filmed in various English dialects. The learners in rural Namibia have difficulty following these videos because they are unfamiliar with the accent of the narrators (Kaapehi, C. personal communication 23 March 2016). An original animated film narrated by native Namibians could help to bridge the potential language gap and make the content more understandable. EduVentures' current educational modules on biodiversity, climate change, sustainability and heritage could be expanded through animation, enabling learners to understand information through visual prompts, as well as enjoy what they are learning through an entertaining medium. The purpose of this project was to assist EduVentures Trust in the education of secondary school learners in Namibia through the production of an animated film about biodiversity. Our animation was influenced, tested and refined by visits to Namibian schools. After recording the narration and animated sequences,

we produced an animated film about six minutes in length. A survey was given to collect the teachers' and learners' opinions about the film, which helped us revise the film. Additionally, we created a guidebook during the production of the film to leave with the EduVentures team or other interested parties to assist in the development of further educational films.

This film will be used to promote biodiversity education and will also serve as a platform to make more educational films like this in other subjects. It is the first time EduVentures or any such organization like it in Namibia has been part of creating an educational animated film. "Biodiversity" has been entered to be shown at the Environmental Education Association of Southern Africa annual environmental and sustainability conference that EduVentures will attend in October.

Chapter 2: Background

To create an effective program that educates secondary school learners about biodiversity, the animated film will build upon the current EduVentures teaching modules. The EduVentures biodiversity module states that biodiversity is the variety of all living things; plants, animals, and microorganisms and their interrelationships in the places that they live. For the purpose of making a relatable and impactful storyline, the negative impacts of biodiversity loss in Namibia will be highlighted. In addition, current and relevant issues with biodiversity in the country will be addressed in order to make a lasting impression on the learners. In order to assist the EduVentures team in making the most effective animated film, an understanding of the current education curriculum and teaching methods in Namibia must be present as well as knowing the benefits of utilizing animation in the classroom.

2.1 Biodiversity in Namibia

Namibia is a very biologically diverse country. There are four main biomes in Namibia: the Desert, the Karoo, the Succulent Karoo, and the Savanna (Fig. 6). Each of these four main biomes have subsections within them that contain various types of vegetation that makes them different. In total, there are seven of these subsections. The Wetlands, which include multiple rivers and swamps, provide freshwater for various animal and plant species as well as for the people of Namibia. The Broad-leafed Savanna has a high percentage of species diversity, or variation of plant and animal species in an area, and is home to 70% of the entire elephant population in Namibia. The Karoo Biome has harsh climates and is on its way to desertification, while the Acacia Savanna receives between 250 and 400mm of rain each year and is comprised of a vast amount of vegetation as well as large predators. The Desert Biome is home to the largest dunes in the world. Lastly, the Coastal/Marine Biome is home to a plethora of habitats including islands, lagoons, a shelf and abyssal zones (Johannes, M. personal communication, 3 February 2016).

Biomes in Namibia

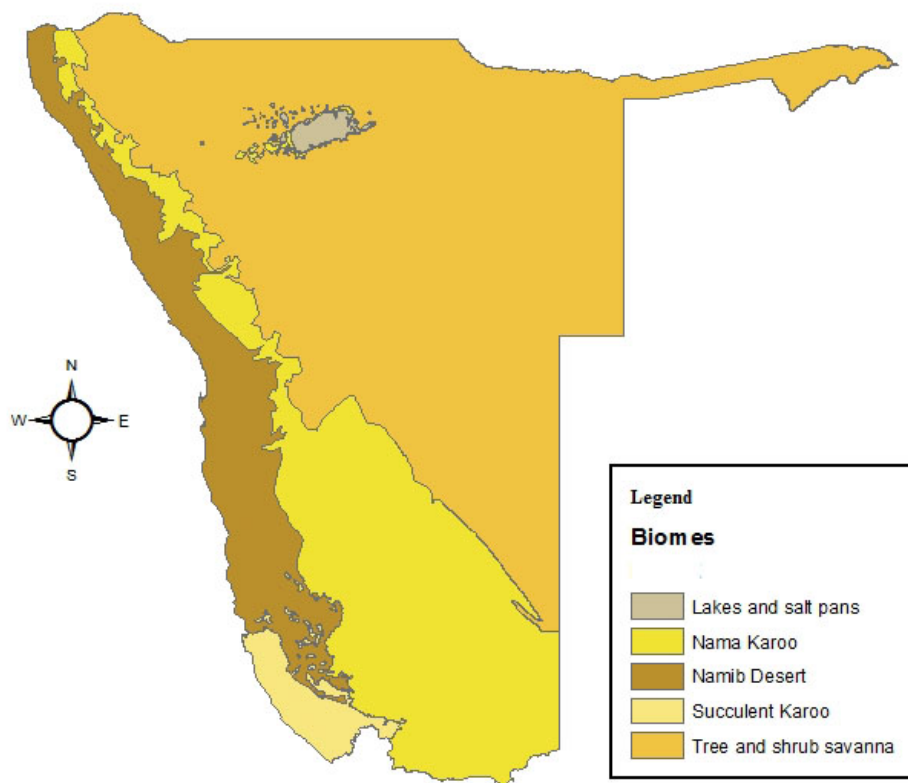


Figure 6. The Main Biomes of Namibia. (met.gov.na)

These diverse habitats are crucial to the harmony of Namibia's biosphere, but they are at risk of dying off due to pollution, tourism, and over usage of resources. Damaging any of these habitats can result in a loss of the biodiversity in Namibia, which would have serious negative impacts. From jobs created by the tourism industry to food for the country, a significant portion of the economy of Namibia relies on its natural resources. If the biodiversity in Namibia were to be lost, the infrastructure would be compromised.

Currently there are 118 endangered species in the country and many of them are being threatened by human factors. These factors include forest fires, pollution, increased levels of mining, and destructive tourism activities (Endangered Species Search, N.d.; Johannes, M. personal communication, 3 February 2016). Reports have shown that ninety-four species in Namibia are considered to be under possible threat of extinction and nineteen species are considered to be under definite threat of extinction (Griffin, 1998). Loss of these species will completely alter the balance of each biome, causing a shift in functionality of the ecosystems.

There are eight taxonomic groups of species in Namibia that include approximately 13,000 species of plants, animals and insects. It is evident through analysis of these taxonomic groups that species richness, or the number of diverse species in one community, is present in Namibia. Additionally, Namibian species have high percentages of endemism. Endemism is when a species is only found in a particular region or area. For instance, the only place the !Nara plant and the Welwitschia can be found in the world is in the Namib desert.

This low level of species richness, but high level of endemism leads to a delicate balance in the Namibian biomes. Some endemic species are susceptible to the dangers that come along with low species richness, such as a higher tendency to lose significant portions of the population to disease (Hood, L. 2010; Johannes, M. personal communication, 3 February 2016 Kaapehi, C. personal communication 23 March 2016;).

The importance of animal conservation is directly correlated to the endemic level of a given species: the higher the endemism, the more important it is to ensure the species' survival. If endemic species were to disappear from Namibia, they would not be found elsewhere rendering them extinct. Birds, mammals, and fish have the lowest endemic percentage of the animal species in Namibia, while insects and reptiles have the highest endemic percentage. This means that these species are of great importance to their respective biomes in order for their symbiotic statuses to remain unaltered (Simmons, 1998). Decreasing the population of the animal species with the higher percentages of endemism can be seen as detrimental to the biome's natural existence. By removing these species, the environment will lose its ecosystem balance, as well as its species richness (Johannes, M. personal communication, 3 February 2016).

The plants in Namibia are often essential to communities' traditions and day-to-day lives. Keeping these resources available is important to the health and wellness of communities. For instance, the regions of Oshikoto and Ohangwena use specific fruits native to their areas for medicinal purposes, from curing snake bites to treating toothaches (Cheikhoussef & Embashu, 2013). The conservation of these fruits can be made a priority through education of their current uses and practices. Not only are certain animal species endemic and important to specific biomes, but also specific fruits and plants are important to all of the four major biomes of Namibia. Conserving these species and resources is part of the education of biodiversity.

2.1.1 Biodiversity Preservation Issues in Namibia

There are numerous threats to biodiversity in Namibia. Deforestation caused by agricultural and urban expansion leads to loss of habitats for numerous species of animals. Springbok, for example, are forced to find shelter elsewhere which can lead to overpopulation, overgrazing and an upset in ecosystem balance. The introduction of alien invasive species, such as thorn bushes, can threaten the survival of indigenous species that are unable to cope with the invasive expansion. Illegal trade of plant and animal resources is unsustainable and could lead to the loss of various species throughout Namibia. Succulent plant species, parrots and rhinos are especially popular targets that are in danger of becoming victims to these unsustainable trade practices. Pollution of air, water and soil can wreak havoc on the habitats of various species of plants and animals. For instance, pesticide usage has been linked to the extinction of numerous aquatic species. Various activities provided by the tourism industry, such as quad-biking on sand dunes, can endanger a large number of endemic species. All these practices, as well as many others, provide a credible threat to biodiversity in Namibia (Johannes, M. personal communication, 3 February 2016).

Losing any number of plants, animals, or bacteria local to a region can have serious effects on the landscape and environment, as well as on the economy of the country. One such problem affecting the environment in the Kavango region is deforestation. The trade for timber brings in a lot of money as well as work for the residents of northeastern Namibia, but also results in a loss of forest cover and biological habitat (Pröpper & Vollan, 2013). Pröpper & Vollan suggest that one of the issues here is a lack of awareness of the scope of the problem or the effect of cutting and selling these trees. One of the solutions researchers found to create awareness and inform local communities about the consequences and effects of timber harvesting was a television film. The film highlights the consequences of over harvesting as well as the land owners' right to manage their property (Pröpper & Vollan, 2013). The goal of this film was to raise awareness of the

consequences of the timber trade and give solutions that would help make a more positive outcome for the environment and maintain the economy and availability of jobs.

2.2 Biodiversity Education in Namibia

Biodiversity education is a useful strategy for maintaining and supporting Namibia's many biomes. Education on key topics like species conservation and resource management can help facilitate discussion and create awareness of attaining proper biological balance.

One of the best ways to help learners absorb these biodiversity lessons is through a "learner-centred" focus in teaching. A "learner-centred" focus, such as the one adopted by the Namibian government in 1990, involves a more democratic approach to education--learners are empowered to succeed academically through their own natural curiosity, personal knowledge and experiences (Kasanda, et al., 2005). However, Kasanda et al. concluded, in their study of everyday contexts in Namibian secondary school curriculum, that Namibian secondary school teachers tended to use everyday contexts only as a secondary strategy instead of a primary one. This implies that the school lessons are "still subject-centred rather than learner-centred" (Kasanda, et al., 2005). They go on to argue that "programmes preparing and supporting teachers for learner-centred science education [should] give stress to [using everyday contexts in lessons] as a main strategy for the classroom" (Kasanda, et al. 2005).

This study shows that using everyday contexts in educational lessons can be invaluable to the Namibian learners, but must also be taught effectively to the teachers and expressed as a primary teaching tool, as opposed to a secondary reinforcement tool. According to Mr. Fillemon Nangolo, the Inspector of Education for the Omuthiya Circuit Office, it is important to educate the teachers and principals effectively about biodiversity in order to expect the learners to learn as well (Nangolo, F. personal communication 16 March 2016).

The Namibian primary education curriculum states that, among other subjects, all learners must take life science courses (S. M. Ipinge, 2013). These courses ensure that learners are ready to advance to secondary schooling. The life science courses includes the subject of Biology, but it does not include any topics that go into depth about biodiversity (S. M. Ipinge, 2013). For biodiversity to be impactful and resonate with learners, it must be clearly defined, as well as relevant. Additionally, it must be presented in a way that engages learners and will assist in their current education.

2.2.1 Videos and Animations in Biodiversity Education

Delivery of information on biodiversity to students is more effective through an engaging medium. Studies show that lecturing provides the least amount of knowledge retention of possible teaching mediums. Improvements made in education included learning gains and conceptual understanding (Knight & Wood, 2005). Learners find that the visual representation of information and navigation creates a sense of urgency for the topic. Rather than text grasping the attention of the viewer, learners in the technological age will take more notice of images (Bayne, 2008). All learners associate certain visual representations with a number of topics. Using icons that relate to those viewed in a directed subject will allow learners to recognize basic information they already know while introducing new information that can be better retained (Lee, 2009).

Although lecture-style classes are still extremely common around the world, the usage of film has begun to make an impact in learner education. A study conducted in 2010 about differences in cognitive skills in children's learning through film concluded that film usage in educating learners is one of the best ways for learning and retention. It proves to be a method that stimulates interest and a desire for further learning into a specific presented topic (Michel, 2010). Animation, more specifically, can also create more opportunities for resonance of presented information. Learners who are engaged visually will have the ability to recreate their knowledge later on as compared to static information. However, that information must be noticeably dynamic. Material will only be effectively retained as long as there is a substantial change in the visual image (Lowe, 2003). Since the information will be relatively new to learners, there is a need for them to retain and apply the information as much as possible after the session. Studies have found that the highest retention rates come from animations that are obviously dynamic and introduce and retain information that is easily observed by the viewer (Lowe, 2003).

2.2.2 EduVentures' Educational Programs

EduVentures Trust was established in 2003 and is located in Namibia's capital city of Windhoek. This organization aims to educate Namibian learners about the environment further than the current school curriculum. To do this, the EduVentures team refitted a truck to serve as a mobile classroom. The "EduMobile", as the truck became known, ventured on its first journey in the spring of 2015. The EduMobile is taking biodiversity into the classroom and making learning a more visual and hands-on activity. Currently, the EduMobile travels to schools in the Northern region of Namibia to educate learners on the topics of biodiversity, climate, heritage, and sustainability (EduVentures Trust).

The EduMobile program is a two part process. First, the EduVentures team contacts different schools and pitches their program. If the school expresses interest, the team travels to the school to give a presentation on the basic ins and outs of the week-long program. The second part is on the school and the learners. The administration of the school must write a letter to EduVentures explaining why their school is a great candidate for the program. Additionally, the learners who want to participate in the program must submit a letter describing why they are qualified to participate and why they would benefit from the EduMobile program.

In 2015, a WPI project team helped to equip the EduMobile's SMARTBoard with SMART Lessons in order to engage learners with active learning styles. This SMARTBoard is now a key resource for the EduVentures teachers to effectively convey the lesson plans from their four modules in a more hands-on way. Now, the twenty-four learners that can be accommodated in and outside of the EduMobile can benefit from the active teaching methods of the EduVentures program. Our project builds on this previous work by implementing a new way of learning on the EduMobile.

Chapter 3: General Methodology

The mission of the WPI student team was to assist EduVentures' education of rural secondary school learners in Namibia about biodiversity through the creation of an animated film and supplemental materials that will be integrated with the EduMobile program. The following were our team's objectives:

1. Develop a script and a storyboard for the film
2. Create an animated film about biodiversity to show to learners
3. Design supplemental materials that support the animated film
4. Assess the effectiveness of the animated film
5. Create a guidebook for future animated film production.

Our target audience for the short animated film was secondary school learners, ages fourteen to eighteen (UNESCO, 2014). The project took place in Namibia, from March to May of 2016. The EduVentures Trust is associated with the National Museum of Namibia and has its main offices at the museum in Windhoek.

The stars in the map below show the schools our team visited with the EduVentures staff (Fig. 3). The film was created for the EduMobile, and the team traveled with it to the Nicodemus P. Nashandi Combined School in Omuthiya in the northern Oshikoto region (top star). The first test of the film was done at Hochland High School in Windhoek (bottom star). The final test of the film was done at Ombika Combined School in Etosha National Park with the EduMobile program (middle star).



Figure 7. Map of Namibia Highlighting Schools Visited (Namibia Physical Map, [Image]).

Chapter 4: Animation Design

The first two steps in creating any film is developing a script and then a storyboard. A script is the breakdown of dialogue and actions of a film and a storyboard is used to create the basic plot and convey the key frames. These tools for filmmakers provide a skeleton of each scene and the key information and script points to be included within each key frame. For our project, we employed this method to help create the backbone of our animation. A narrative was created to supplement and support the observed EduVentures Biodiversity module. In the film, there is one main narrator and multiple characters that come in and out of the scenes, as well as multiple scene changes. Our storyboard was drawn out on paper and went through multiple drafts. This allowed us to make quick edits as a group as well as to add and delete boards as we saw fit. As the storyboard became more detailed, our animation began to come to life.

4.1 Observing the EduVentures Team

From March 14th-18th, we joined the EduVentures team on their trip to the Nicodemus P. Nashandi Combined School in Omuthiya in the Oshikoto region of Namibia. While there, we observed their EduMobile lessons and obtained important information in order to finalize the script and the storyboard of the film. We interacted with the learners and teachers in order to better gauge what topics would be the most beneficial to include in the film and what information was unnecessary. The most important takeaways that we gathered from this trip were that our accents are difficult for the learners to understand and someone from the EduVentures team would have to record the voiceover. We also concluded the film should reinforce the Biodiversity module and help to illustrate the more difficult concepts.



Figure 8. Observing the Sustainability SMARTLesson in Omuthiya.

4.2 Developing the Script for the Animation

A detailed script was necessary to bring our illustrations to life. The final script is provided in full in Appendix J. The script was based off of the EduVentures module and contains the main scenes, as well as the characters that appear in the film. The setting and character actions are detailed in the script, so that the actions and words will flow well together in the storyboard and film. It is also important to include the setting cues in the script, such as characters changing, or hands swiping in and out of the camera frame.

Our script was the template for the layout and structure of the animated film. The narrator of the script is Sophia Nuuyuni, an EduVentures Staff member. We chose her as the narrator in order to ensure that learners could more clearly understand the information presented. As we learned in our visit to Omuthiya, our accents are unfamiliar to the learners and would make it more difficult for them to comprehend the information. Additionally, the EduVentures staff will be creating additional films on their own after we leave Windhoek. By including Ms. Nuuyuni as the narrator for the first film, as well as including some of the other staff observing the making of the film, the EduVentures staff will be well prepared to produce additional films in the future.

4.3 Sketching and Creating Storyboards

The process of sketching the storyboards of the biodiversity film involved brainstorming and critical thinking. For the storyboard of “Biodiversity”, see Appendix K. Prior to drawing the storyboard scenes, the outline of the story was drafted along with the characters. The background research in section 2.1 was used as a template for the outline of the biomes in Namibia and the species and habitats within each. After creating some preliminary storyboards and discussing them with the EduVentures staff, we determined that it was important to include a shot of Namibia with each of the biomes highlighted, as shown in Figure 2 in Chapter 2. We also included elements that are recognizable to the learners of Namibia, such as a Namibian flag, national animals, and geographic locations commonly found throughout the country.

EduVentures expected a four to five minute animated film, which we used as a guideline for the timing of the storyboard. The location of the film takes place mainly in a schoolyard in Namibia, and it also illustrates the various biomes and ecosystems within the country. The film was made with simple, but illustrative, visual representations. It is simple in its story arc for effectiveness and simplicity for the learners.

Chapter 5: Animation Development

Once all of the storyboarding and script writing were completed, it was time to get started on creating the animated film. First we drew the characters that would appear in the film and then moved on to the scenery. We ran through the script with the artwork multiple times to work out timing and practice the flow of the film. Once we felt that we had sufficiently rehearsed, we recorded the animation and made our final copy of the video. Once the video was finished, the audio was added and the final edits of the film were made.

5.1 Applying Animation Techniques

For our animation, the visuals were sketched out on plain white paper with a thick black marker. The background scenes were first sketched in light pencil to give an outline for the black marker, the marker was drawn in while the camera filmed the hands creating the scene. All characters, plants, and animals were drawn in black marker before filming and cut out so they can be free-moving for the recording of the film. An LED light pad was used to trace characters in order to make duplicate copies that looked the same regardless of which group member was drawing at the time. The LED light pad made it possible to accurately illustrate Namibian animals and plants, which made the drawings more accurate and recognizable. The background scenes were created by various members of the team and copies were made by the person who made the original in order to maintain consistency throughout the animated film.

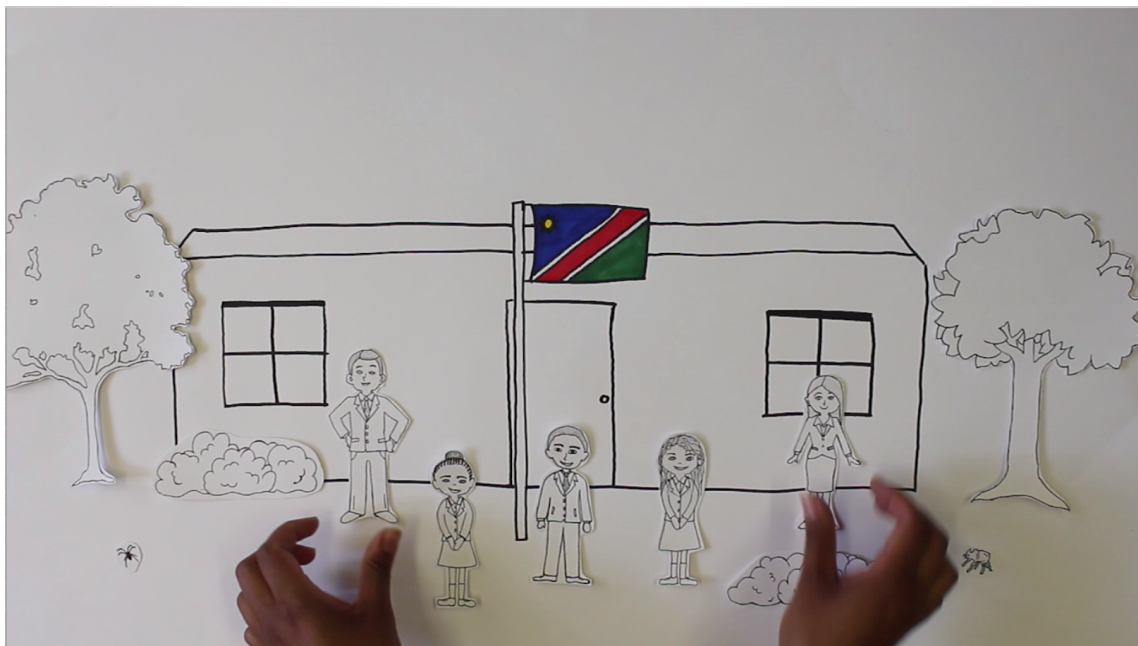


Figure 9. Animation Scene Example.

5.2 Filming and Editing the Animation

The animation was filmed using a Canon Rebel T5 camera. Our film’s perspective is of a person looking down at the drawings. To achieve the right perspective we had to position the camera above the drawing surface perpendicular to the posterboard animations. The filming of the animation was conducted in the conference room of the National Museum of Namibia. The film is one continuous shot with scene changes, character entrances and exits, and background changes throughout the film to efficiently present information to learners. Once there were multiple shots taken of various scenes, the recordings were downloaded from the camera to our laptops so they could be edited.



Figure 10. Film Recording Set-Up.

The animated film is the cornerstone of our project. Our film was edited with Adobe Premiere, a linear editing software. Premiere allowed us to create a professional product. The film and its contents, discussed in the next section, will help learners understand and retain important information presented. As our research has shown, a dynamic animation is one of the most effective and engaging methods of teaching in our technological age.

5.3 The Animated Film

The completed animated film is entitled “Biodiversity,” and is 5:46 minutes in duration. The film may be viewed in its entirety at https://youtu.be/CRR_BbdO6ow. The script of the film is provided in Appendix J. This film is the main result of our project, and exists primarily in that medium. For those with limited access to the film (or if links should become inoperable), this section describes the film’s

three main scenes. The first scene introduces biodiversity and how it relates to the learners. The second scene discusses genetic, species and ecological biodiversity. The third scene discusses the consequences of biodiversity loss and what everyone can do to help preserve biodiversity.

5.3.1 Scene One

The first scene opens on a blank page. While the narrator introduces the topic of biodiversity, a set of hands comes into the frame and draw a schoolyard. Learners are brought into the scene as well as teachers, trees, bushes, and various insects (Fig. 7). One by one, the characters are removed from the frame as the narrator asks: “How would your schoolyard look without trees, would there be any shade?”, and at the same time, the trees are removed from the frame. After similar questions are raised, the characters are brought back into the frame and the narration reiterates how important all of them are to the setting. Then everything is swiped away for the next scene.

The schoolyard setting is the starting point since the familiarity of the setting will help them to better understand the importance of biodiversity. A schoolyard is already featured in the EduVentures’ biodiversity module and we expanded on it for the film. By pointing out the role each character has in the schoolyard, the learners can visually comprehend the interdependence of all species in the environment.



Figure 11. Schoolyard.

5.3.2 Scene Two

The second scene covers the three types of biodiversity; genetic, species, and ecological. This scene was the most involved because it has three background changes, each a separate backdrop, one for genetic, another for species, and a third for ecological. First we started with three different learners and talk about genetic diversity and how it keeps everything from looking the same (Fig. 8). To illustrate this

concept, the hands place in three copies of the same learner to convey that genetic diversity makes every being in every species look different. Next, species diversity provides examples including endemic species such as the !Nara plant. We also explain high species diversity with an example of Etosha National Park. Lastly, ecological diversity is the connection from individuals to entire countries and beyond, so we build from an individual to a population, to a community, to an ecosystem, to a biome, to a biosphere, ending on a country map of Namibia with an outline of all of the biomes.

The examples we used follow the definitions from EduVentures' biodiversity module. We used the example of Etosha National Park after visiting the park ourselves, but also to illustrate the connections between multiple species and the consequences of biodiversity loss. The illustration for ecological diversity was chosen to show that one person as an individual is connected to an entire biome and to an entire biosphere, and therefore one learner can have an impact on their country's biodiversity.



Figure 12. Genetic Biodiversity.

5.3.3 Scene Three

Scene three opens with the biome map of Namibia. Arrows point out the four biomes as the narrator mentions them. The biome map is removed and a single learner is brought back on a blank page. As the narrator asks why the learner should care about biodiversity, a giant question mark is placed on top of them. Then both the learner and the question mark are swiped away.

The narrator talks about the consequences of biodiversity loss and how water, food, materials and medicine could all disappear (Fig. 9). As each item is mentioned, an image depicting it is brought into the frame, i.e.: bottles for the medicine, a lake for the water, etc. The narrator discusses how biodiversity can be lost and images are placed to illustrate them. After the discussion about biodiversity loss concludes, the narrator then the importance of biodiversity to the ecotourism market. All of the images are once again removed from the frame and illustrations for how to preserve biodiversity are brought into frame.

Those are then removed from the frame and all of the people that have appeared thus far in the video are placed back in frame with the EduVentures Enviro-Ambassador butterfly logo.

All of the definitions and examples mentioned in this scene are based on the EduVentures biodiversity module. Placing all of the characters together in the viewing frame at the end of the film was designed to symbolize how everyone is needed to help preserve biodiversity.

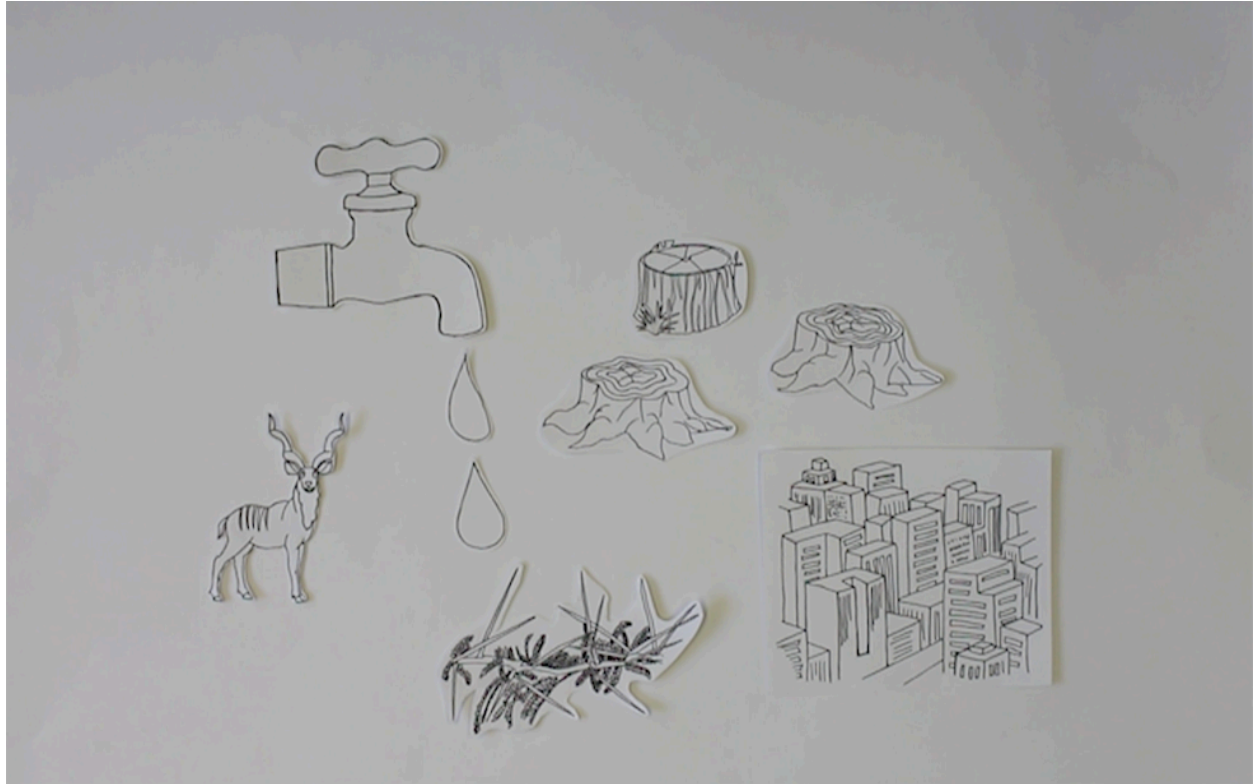


Figure 13. Biodiversity Threats.

Chapter 6: Supplemental Materials

We created additional materials to supplement the film by utilizing the EduVentures biodiversity module's facts, figures, and activities, as well as our key points featured in the animated film. The following list contains the steps that we used to complete these materials:

- a. Determined the overarching theme of the lesson
- b. Observed school classes on site
- c. Created the structure of the materials
- d. Incorporated the key points of the animated film and biodiversity module
- e. Received feedback from sponsors and teachers.

These steps will ensure that the supplemental materials will help engage learners as well as benefit the Ombombo Mobile Classroom program.

6.1 Learner Questionnaire

Successfully completing and delivering supplemental material in the form of an interactive worksheet helped the learners absorb the information and continue the reiteration of the subject. This worksheet incorporated key points from the animated film, as well as aspects from the EduVentures Module. This way, learners grasped all parts of the topic being presented to them. The first part of the worksheet asks learners to identify key terms and pair them with their respective definitions. The second part of the worksheet has pictures that are found in the Biodiversity Module and ask the learner to describe the environmental problem going on in the photo, as well as how to fix it (i.e. soil erosion, cutting down trees, bush encroachment, and wasting water). The third part of the worksheet is an open-ended response section asking learners how they can help save Namibia's biodiversity with the information they have learned. This last section ties the entire lesson together as well as promotes active thinking. The worksheet can be found in Appendix B.

6.2 Animation Guidebook

We created a guidebook, similar to a step-by-step handbook, detailing every step of the process in creating the animated film and any suggestions we had along the way. It serves as a template for the EduVentures team to continue filmmaking after we leave Namibia. Each of the three chapters of the guidebook goes into detail about a specific portion of the process so that anyone reading it can create another film similar to our Biodiversity animation. Chapter 1 of the guidebook goes over the necessary components for drafting the animation. Supplies, techniques, and different methods are explained, as well as how to best create a script that is related back to the module. Chapter 2 is about the execution of the animation and the editing process. This chapter is perhaps the most important due to the extensive explanation of how to use the Adobe Premiere software. Additionally, this chapter delves into alternative options for editing software that could be used by the EduVentures team. Chapter 3 provides further suggestions for filming. This chapter is broken up into 3 sections, before, during, and after filming. Each

section is comprised of tips and tricks, as well as cosmetic details, for successfully and effectively creating a clean cut film. Excerpts from the Guidebook can be seen in Appendix I.

6.3 EduVentures Training Workshop

We felt that it was necessary to plan and execute a workshop with the EduVentures staff to accompany the guidebook. In the office everyone has their own tasks so a workshop is a good way to get everyone working together on the same thing and answer questions and discuss possibilities of the other films. The EduVentures staff worked alongside us to create their own script, voice-over, characters, scenes, and a section of a film. The workshop was broken up into three parts, the script and character creation and then the storyboarding, as well as editing. Recording the voiceover and film was not done as part of the workshop, as the staff had observed and participated in those steps multiple times prior to the workshop period. This hands-on approach to working with them on the steps in filmmaking was much more effective than only giving them a guidebook to create a film on their own.

Chapter 7: Animation Assessment

In order for the film to be successful, it needs to keep their attention, pertain to their lives, and, most importantly, provide educational content. A survey was also given to the teachers to gauge their opinions of the film. It is important to know what the teachers' opinions are since they will incorporate it into their lesson plans and teaching strategies. Our first test of the film was given at Hochland High School in Windhoek and those surveys can be found in Appendix G and Appendix H. The learner survey (see Appendix C) and the survey for Teachers (see Appendix D) were created to test the film at the Ombika Combined School at Etosha National Park with the EduMobile program. The data gained from the survey was then used to conclude whether or not it was effective as a teaching supplement in the EduMobile program.

7.1 Learners' Survey

The survey for the learners was created in order to obtain their opinion on the animated film and the discussion that follows showing the video. The surveys for the Hochland High School learners were aimed to gather the knowledge gained from the film, as well as reactions to the film without seeing the rest of the biodiversity lesson. It is important that the animations gained their attention while also teaching them about the biomes and what makes each one unique. The questions were open-ended to allow the learners to explain their response, or give an example of what they liked or did not like.

There was also a section where the learners had an opportunity to rank their experience. In Windhoek, the survey scale was from zero to five. At the Ombika Combined School, the survey scale was from one to five. The different scales were used to better assess the results the second time showing the film. This is helpful for quantifying the results in order to better ascertain and analyze the effectiveness of the animated film. One of our goals for this lesson was to teach learners the various ways they can maintain biodiversity in their own lives. The question about whether the learners feel like they can contribute to maintaining biodiversity was included in the survey to assess the effectiveness of the entire lesson. When creating the survey questions we also felt that it was important to keep the questions short and to not ask too many to reduce learners' chances of rushing through the survey. This survey was given after showing the animation in the EduMobile classroom. The survey was completely voluntary and this was emphasized to the learners.

7.2 Teachers' Survey

The teachers' survey was focused on their reactions to the film and the structure of the lesson plan. The Hochland High School Teachers were asked to reflect on the video and to give their opinions on whether it was informative and would be useful. There are fewer questions for the teachers in the survey, but there is a section dedicated solely to other comments they may have. The questions focused on asking why the teacher thought the lesson worked well or what was useful about the animation. The goal in asking the teachers these questions is to assess the effectiveness of our lesson plan knowing that they have experience in creating and teaching lesson plans. This survey, like the students' survey, was completely voluntary.

7.3 Survey Results at Hochland High School in Windhoek

On April 7, 2016 we visited Hochland High School to show our pilot test of the animated film. There were 13 learners and 7 teachers that viewed the film on the EduMobile. A survey was completed before and after the film. The learners' survey before the film featured a matching section of various definitions about Biodiversity and the learners' survey given after the film had the same matching section as well as a questionnaire about the quality of the film. The teachers were given a survey after the film that focused on its quality as a teaching tool.

The learners' surveys were collected and recorded in an excel sheet. The number of learners who defined biodiversity correctly were 7 out of 13 or 53.8%. The average test scores of the learners before the film was 34% and after the film 33%. The overall student ratings of the film were helpful: 4, enjoyable: 3.3, and new information learned: 4.3. The results for enjoyable not used in the final analysis because it is too qualitative to provide advice in revision of the film. These numbers were determined from the average ranking from the learners (the scale was 0-5). The teacher's ranked the information presented: 4 and the new information presented: 2.6. The teachers' surveys included individual comments that were very helpful in giving further suggestions and they all responded that this type of film is something they would use in teaching. Of the five teachers surveyed, all of them found the information presented important for learners.

The results from the test given to the learners before and after the film did not give conclusive results. The average test scores of the learners were practically the same before and after the film, and thus it was unclear whether the students gained any new knowledge of biodiversity during the film. In Windhoek, the learners who attended our screening and completed this survey were all members of the Environmental Club, so they may not be a representative sample of learners. We got a lot of responses from the learners and teachers that the audio was very low and it was hard to hear the explanations and that some of the narration was too fast. The low audio and speed of narration would have affected the learners' ability to hear and process the information and this would have contributed to the lack of change in the test scores. Moving forward from this, it was clear the voice-over needed to be redone and the script had to be adjusted in order to explain terms more clearly. We also added in more color to some scenes in order to make the film more visually appealing based on the responses from learners and teachers.

7.4 Survey Results at the Ombika Combined School in Etosha National Park

On April 25, 2016 we visited the Ombika Combined School in Okaukuejo right inside of Etosha National Park. There were 17 learners and 2 teachers in attendance at the EduMobile program. There was a survey asking the definition of biodiversity before the film and after the film which were identical multiple choice quizzes and a worksheet given after the SMARTLesson. The teachers were given a survey before and after the film asking about the definition of biodiversity and a questionnaire to fill out after the biodiversity lesson.

The surveys were collected and recorded in Google Sheets to organize the data collected on the learner's knowledge of biodiversity and the teachers' opinions on the film and SMARTLesson. Before the film, 57% of students were able to define biodiversity correctly and after the film, 63% were able to define biodiversity correctly. The overall rating of the film's helpfulness by the learners was averaged at 4 out of 5. The teachers both responded with excitement toward the program and felt it was helpful to their learners to get them concerned about their environment and to fill in the gaps of the life sciences and natural sciences curriculum.

7.5 Survey Analysis

After collecting surveys from learners and teachers, an analysis of their responses was performed. The surveys had both a section for qualitative responses and quantitative responses. This combination of responses allowed us to gain some valuable insight to the film's viability and effectiveness. This allowed us to further improve the animated film to ensure that its quality was high enough to be a part of the EduVentures curriculum.

The surveys could only be handed out to a maximum of 24 learners and 10 teachers. Since the number of people surveyed was low, these results are unlikely to be representative of a much wider sample. Despite these limitations, the responses nevertheless provide sufficient data to evaluate our project goals and improve the film for the EduMobile program.

7.5.1 Learner Survey

As expected, there were differences between results from Hochland High School and the Ombika Combined School because the Hochland learners were only shown the film, whereas the Ombika learners were enrolled in the EduMobile program and experienced the Biodiversity lesson that goes along with the film. The main focus of the surveys given to the Hochland High School learners was to gain feedback about the quality of the film and to ascertain what needed to be changed for the final product. They were asked mainly open-ended questions in order to get the maximum amount of feedback for the film. Comparatively, the Ombika learners weren't asked any open-ended questions in their surveys because we wanted to focus on what information they retained from the film, in order to see how effective it was as a teaching tool. The base knowledge is also hard to test because we could not send a pre-test prior to the visit and showing of the film in order to gauge the learners' knowledge before the biodiversity lesson. All of the tests and surveys were given on the same day during the biodiversity lesson.

7.5.2 Teacher Survey

It was very important to create a product that is appealing and functional to teachers because they are the target audience for the film's use and promotion. Our first test at Hochland High School in Windhoek gave us great suggestions and feedback on the visual aspect of the film, as well as the information presented. We made appropriate changes to our script and visual aspects of the film in accordance to the relevant feedback from these surveys. One of the teachers present in the EduMobile for the film said that it was excellent, well summarized, and educational.

The teachers from the Ombika Combined School were the advisors to the student Environmental Club. Before the film we had them each take a multiple-choice survey to identify the definition of

biodiversity. At this point, both teachers selected the wrong answer, but when the survey was handed out after the film, one of the two teachers selected the correct definition. After the biodiversity SMARTLesson, the Ombika teachers were given the same survey as the Hochland High teachers that asked them to rate the value of the new information presented and the important information presented on a scale of 1-5, with 1 being the lowest score and 5 being the highest. Using the even numbered scale (0-5) for the Hochland teachers' surveys gave a less distinct median, so the Ombika school teacher surveys had an odd numbered scale (1-5) in order to obtain a clearer median of the quantitative data. After averaging their rankings, the results were New Information: 4.5 and Important Information: 5. These results showed that the teachers at the Ombika Combined School really felt that the lesson was important and helpful to biodiversity education. The comments the teachers made were also very positive and encouraging for the whole EduMobile program. They both said this kind of lesson was very helpful to the learners because they do not get all of this information in the Life Sciences or Natural Science curriculum. One of the teachers said the film was helpful because it gave a visual representation of the information, which can be helpful to students that have trouble listening. Both of the teachers were happy with the lesson because it encouraged the learners to have concern for their environment and share what they have learned with others.

Chapter 8: Recommendations for Future Animations

The aim of our project was to create an animated film about Biodiversity that correlated with the EduVentures teams' module, to be included in their EduMobile lesson plan. The animated film used various techniques including hand-drawn aspects and Adobe Software for editing. This project posed many challenges, as none of us are animators or artists. However, the EduVentures team provided us with many constructive criticisms that ultimately enhanced our animation. While working with the team, we learned new things about biodiversity that our research could not have taught us, which helped the creation of our film. Being able to work closely with the team allowed us to teach them everything they needed to know about creating their own films for the remainder of the modules, Sustainability, Climate Change, and Heritage. All in all, our animated film experience was a success.

The major recommendation for film production by the EduVentures team is that they continue the process started with us and complete a film for other modules in their EduMobile curriculum. While in the office, once we had the final recordings for our film on biodiversity, we took time to workshop with EduVentures on creating a script for a film on Sustainability. If this project is to continue and grow their current EduMobile lessons, the production of more films for each module needs to be made. Part of the collaboration with EduVentures was to workshop the filmmaking process, as well as leave a guidebook of our work so that this could be continued for other modules despite our own time constraints while in Windhoek.

8.1 Create Future Films as a Team

Along with the guidebook, we have a few recommendations for the EduVentures staff to create additional films. First, is to act as a team and work together on each step of the film. Consistency between films and within the film is extremely important. Additionally, nobody can create an entire film on their own, especially one in the style that has been created for biodiversity. The best thing the team can do is work on the film all together for long amounts of time to keep their thoughts, drawings, voice-overs, and filming as consistent as possible. We have found that open communication about each element created for the film resulted in a larger personal investment and consistent structure throughout the entire process.

Second, is to take your time with a film. To create the best quality film, you cannot rush or cut corners in your drawings, filming, or editing. Films made hastily or half-heartedly will not get the message across. It will not be a polished product and will distract the learners from what is really important: the content. We found that if there is an anomaly, the learners will be distracted. For example, during the test at the Hochland School, the audio was a bit low for the noises that were occurring outside. This resulted in the learners missing portions of the information that was critical to their understanding of the material. This factor was not overlooked; it was simply due to the fact that the proper equipment to record the audio was not purchased in time for the testing at Hochland.

Lastly, share what you have learned in each step. Coming into the project, none of us knew how to create a film of this sort. That being the case, we were all able to learn from each other by asking questions, sharing what we learned, and letting each other complete new elements in each phase. Through this method, we all were able to learn everything about the production. Having shared the knowledge

gathered at each stage, we were all equally prepared and comfortable doing the work and did not rely on one person to take the lead or be stuck doing one particular step each time.

8.2 Integrate Future Films with SMARTLessons

Since the film is being created as a preface to the SMARTLessons presented during the EduMobile program, it should not be made to replace them. The film should include details from the lesson so that it introduces the learners to the overall topic and gets them to start thinking about it. Since the film is only about six minutes long, there is no way that it could contain the same information as the SMARTLessons without rushing through material, which would compromise learners' retention of information. By having a film briefly go over the topic before the lesson begins, it helps to reinforce the information and make it more familiar to learners. This will help to encourage them to ask more involved questions during the lesson since they will already have seen the information.

Because the animated film is meant to supplement the existing EduMobile SMARTLessons, we recommend that the film does not delve too deeply into the subject matter. The film is intended as a reinforcement tool, so only the most important information of the lesson should be focused on. The film should include enough details from the lesson to give the learners an introductory basis of the topic that the lecture portion of the lesson could reinforce. The film should only be about six minutes long, so including the same information as what is shown in the SMARTLesson would be difficult to achieve. Having the film briefly touch upon the subject before it is gone into depth during the lesson, would help to reinforce the important information and make the content more familiar to learners.

8.3 Maintain a Consistent Design and Quality

For future animated films in the EduVentures program, it would be beneficial to utilize the same filming dynamics. The software, filming techniques, and hardware are all integral to the production of the animated film. The Adobe software package ensures that the audio and video are combined seamlessly and enables an ease in editing all segments of the animated film. Using the same filming techniques would create a connection between the animated films in the EduMobile program, which would make them an easily recognizable EduVentures product. It is beneficial to use the same style of characters for these films to keep the style consistent. The hardware used for the film would be the most cost effective and simple method for continuation of the animated films. All three of these dynamics would make for the best possible animated films.

In order to achieve the same level of professional quality as the biodiversity film and to have an easier transition process from the student team to the EduVentures staff, we believe EduVentures should invest in the same software we utilized, Adobe Premiere. Other software may not have every feature used to create the biodiversity film, which would make it difficult to complete the same steps. They could potentially hinder the editing process and render film or audio useless. In order to avoid potential technology hindrances, the best thing would be to purchase the same software so all the necessary features are at the disposal of the EduVentures staff.

To create the same caliber product as the biodiversity film, the same filming techniques should be adopted. Techniques like drawing, sliding characters in and out of frame, opening and ending of the film should all be recreated for the other films. If all the films are created similarly, they will be easily

recognized as an EduVentures production. This will make presentation of the films more of a joint process as learners and teachers will see the connection and relation between the films, rather than just being separate entities teaching different topics.

All the equipment used to create the film is either similar to equipment at the disposal of the EduVentures staff or already their property. This being the case, the EduVentures staff should continue to use their own equipment. Use of own property will give a sense of comfort as well as being consistent with heights, lengths, and other metrics that went into positioning the camera, recording audio, and drawing elements for the film.

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Appendix A: EduVentures Trust

To truly grasp the concepts of secondary schooling in Namibia, we will be traveling with our sponsor and the EduMobile to observe the lessons that occur in the classrooms in which our animation will be shown. The EduVentures team has created modules that they use to teach learners on the EduMobile, and these modules feature activities to engage learners in the lessons. Our video will refer to these modules, and we will be getting feedback from the EduVentures team to ensure the quality and success of the educational content. The team consists of Tharina Bird who is the founder of the organization, Corris Kaapehi who is the manager of the program, Benson Muramba who is the chairman of the board (EduVentures Trust) and other educators.

EduVentures mission is to actively provide environmental experiences to primarily disadvantaged youth in Namibia, while continuously contributing to the expansion of Namibian scientific knowledge. Our team aims to accurately execute all aspects of their mission in our animated film and get positive feedback nearing the end of our project by incorporating the EduVentures modules.

Appendix B: Animation Worksheet Layout

Name _____

Date _____

Biodiversity Worksheet- EduVentures

Section 1: Vocabulary

Below is a list of vocabulary words that are featured in the biodiversity SMARTLesson. Match the word on the left with the correct definition on the right by placing the corresponding number on the line next to each definition.

- | | |
|-------------------------|---|
| 1. Endemism | _____ Sum total of all activities and relationships in which individuals of a species engage as they secure and use the resources required to survive and reproduce. |
| 2. Biodiversity | _____ Life zones, environments with similar climatic, topographic and soil conditions and roughly comparable biological communities. Most are identified by the dominant plants of the community. |
| 3. Genetic Diversity | _____ The populations of all species in a habitat associate with one another directly or indirectly as a community. |
| 4. Species Diversity | _____ the variety of all living things; including plants, animals, microorganisms (species) and their interrelationships in the places they live |
| 5. Ecological Diversity | _____ the measure of the variety of flora and fauna species in particular ecosystems or the Earth as a whole. |
| 6. Ecosystem | _____ the richness and complexity of an entire ecosystem, including the number of niches, trophic levels and ecological processes. |
| 7. Biome | |
| 8. Habitat | |
| 9. Community | |
| 10. Niche | |

Section 2: Identifying Environmental Problems

Below are several environmental problems that are common in Namibia. In the spaces provided, explain the issue and at least one example of a way to solve the problem.





Appendix C: Survey for Learners at Ombika

Rate the video below, 1 being the lowest rating and 5 being the highest rating.

Question	1	2	3	4	5
Helpfulness					
Easy to Hear Film					
New Information Learned					

Please define biodiversity below.

- Living things in a village.
- The variety of animals in a region.
- Plants, animals, and microorganisms.
- The variety of all living things in an area.
- I don't know.

What is genetic diversity?

- Differences within a species that make individuals unique.
- Diverse genes in a specie.
- People with different colored hair.
- I don't know.

What are the parts that make up an ecosystem?

- Learners, trees, animals.
- Trees, bushes, village.
- Families, plants, animals, microorganisms, houses in a village.
- Learners, teachers, school building.
- I don't know.

If we don't protect our environment what could happen?

- Lose resources like water, and trees.
- Ecotourism suffers, resources wasted, overpopulation, environmental changes, species suffer.
- Jobs are lost from lack of biodiversity.
- Endemic species become extinct.
- I don't know.

Appendix D: Survey for Teachers at Ombika

Rate the video and lesson below, 1 being the lowest rating and 5 being the highest rating.

Question	1	2	3	4	5
Important Information					
New Information Learned					

Did you find the information in the video important for learners, why?

How did you find the organization of this lesson compared to the rest of the EduVentures program?

What are some improvements that could be made to this lesson plan?

How was this lesson helpful in adding to the students' current school lessons?

Other Comments:

Appendix E: Trip to Omuthiya's Combined School

On the week of March 14th to 18th, we, the student team, along with three members of the EduVentures staff traveled to Omuthiya, a village in northern Namibia. There, EduVentures and ourselves visited to Nicodemus P. Nashandi Combined School. The learners ranged in level from Kindergarten to ninth grade. EduVentures presented the Biodiversity and Sustainability modules for the twenty-two learners participating in the program. Our role was to observe and absorb the lesson plans and how EduVentures carries out their modules. Through the trip, we were able to understand how the staff teaches their modules and cater the video to the style of teaching utilized. Additionally, we were able to use the trip to realize and pitfalls of the project. Upon arrival, it was apparent that the learners had some difficulty understanding us as we spoke in English. After experiencing this, it was obvious that a member of the staff should be the narrator of the film to avoid any accents and make the learners comfortable with the english they were hearing. Additionally, it also resulted in making sure the voice-over speaks clearly and at a pace acceptable for the learners. The trip's main purpose to observe the EduVentures staff was accomplished and was exceeding by being able to notice cultural and lingual barriers that were necessary to address for the success and effectiveness of the film.

Appendix F: Excerpts from Teacher Interviews

Interview with Fillemon Nangolo, The Inspector of Education, Omuthiya Circuit Office:

(1:00) “And if we are not trying to be very careful with environmental issues and cultural issues or cultural heritage, biodiversity and all those things, we are not going anywhere, but mostly I know. Believe with me. I know we are facing a problem. It’s why the issue of the environmental issues is a discussion everywhere.”

(3:34) “I remember when I was still a small boy, we had all types of animals in our environment, or in our area, but now you go there: nothing. Why? It’s because of us human activity that have completely destroyed the nature and the environment does not look the same any longer.”

Interview #1 with Hiatsinta Shivute, Principal of the Nicodemus P. Nashandi Combined School (video #1):

(0:17) “Well, actually, EduVentures, to us, is exposure to the learners that at the end of the program, most especially the presentation, they will be left with an in depth understanding of the biodiversity, natural and cultural heritage, and that will also complement what we are learning in classroom. For example, what we learn is just more based on theory and we are challenged with finance to take them out, to see other things and see them in practice. So by the end of this, they will open up and they will apply their skills they are getting in the mobile classroom, in their examinations and in their studies.”

Interview #1 with Hiatsinta Shivute, Principal of the Nicodemus P. Nashandi Combined School (video #2):

(0:20) “I asked some [learners] yesterday ‘what did you think about the lesson?’ It was very interesting and they are learning a lot of new things, so to them it’s really a live lesson learning opportunity that they can pick up all the skills and understanding that they have been missing in the classroom.”

Interview #2 with Hiatsinta Shivute, Principal of the Nicodemus P. Nashandi Combined School:

(1:45) “The learners told [the teachers] what they are learning in the mobile classroom is complementing more the competencies they are learning in the classroom. For example, life science, agriculture and they are learning more about natural science. I wish this program could be extended to all the schools so we all had an understanding on how to conserve our natural resources and our cultural heritage.”

Interview with Marta Alumbungu, English Teacher:

(0:43) “It’s helping a lot because it’s not only what learner learns in the classroom, they’re also learning what’s happening in the community around... They are learning what’s happening in the environment. It’s helping a lot.”

Appendix G: Survey for Learners in Windhoek

1. Endemism
2. Biodiversity
3. Genetic Diversity
4. Species Diversity
5. Ecological Diversity
6. Ecosystem
7. Biome
8. Habitat
9. Community

 7 Life zones, environments with similar climatic, topographic and soil conditions and roughly comparable biological communities. Most are identified by the dominant plants of the community

 9 The populations of all species in a habitat associate with one another directly or indirectly

 2 The variety of all living things and how they interact with each other in the places they live

 5 The variety of different processes, habitats, and niches that exist within a biome or biosphere

 3 The type of biodiversity that makes sure we don't all look the same.

 4 The variety of living things in an area

 1 A specific species is only found in one specific area

Question/Section	0 (Low)	1	2	3	4	5 (High)
Helpfulness						
Enjoyable						
New Information Learned						

What did you like about the film? Why?

Was there any part of the film that you found confusing? Which part?

What didn't you like about the film?

What can you do to maintain biodiversity?

Appendix H: Survey for Teachers in Windhoek

Question/Section	0 (Low)	1	2	3	4	5 (High)
Important Information						
New Information Presented						

Did you find the information in the film important for learners, why?

What are some improvements that could be made to this film?

Would you use a film like this to teach a lesson? Please explain your answer.

Other Comments:

Appendix I: Educational Videos Guidebook



Educational Videos Guidebook

Sketch Art Animation

Prepared by the students of Worcester Polytechnic Institute for the EduVentures staff

Tori Claverie

Rachael Heard

Jacqueline O'Connor

Joseph Sabatino



WPI

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Introduction

This guidebook will serve as the template to produce more animated films that support EduVentures Ombombo Mobile Classroom teaching modules. The process of drafting, creating, editing, and producing the film will be outlined in separate chapters of this booklet. During the Spring 2016 of our Interactive Qualifying Project (IQP) we produced an animated film for the EduVentures' Biodiversity teaching module. Due to time constraints only one complete film was produced. In order to continue the project this guidebook was made with the intention to allow for more videos to be produced after the end of our IQP.

Chapter 1: Drafting an Animated Film

The first step in creating an animated film is to draft and outline the final product. Drafting the script first helps to nail down the narrative as well as the scene changes and character actions. After finalizing the script the storyboard, or outline of the film's scenes, can be created. The storyboard serves as a visual representation of main scenes, character position, and scene transitions. Once the storyboard is created and agreed upon the recording of the script can begin. The voice-over should be recorded a few separate times to allow for editing.

1.1 Animated Film Materials

It is important to obtain materials for filming before the project starts. After brainstorming and determining the sketch art style of our animation a list of materials was created. In Table 1 below the tools and paper used for this animated film are shown below. The backgrounds will be drawn onto the large cardstock paper, this will serve as the base of the scenes in the film. A copy of each character will be drawn on card stock, the thicker material will reduce the damage done to the characters as they are used in the recording of the film. The original image of the characters was kept in case of future need to replace or make new characters. In order for the drawings to be clear in the video thick black markers will work best, the heavy drawing lines will stand out better on the plain white of the flip chart paper. The characters were all outlined in black ink pen. For this particular animation we only used the colored markers when creating the flag of Namibia and the genetic biodiversity scene, this was to emphasize the country and its biodiversity it was also done to make a recognizable Namibian product. The tools for recording this film are the video camera, and then the Adobe editing software on a computer.

Table 1. Filming Materials

Paper	Tools
Flip Chart paper (2 packs unlined)	Black Ink Pens
Card Stock	Thick Black markers
Computer paper	Thick Colored markers
	Scissors (4)
	Glue Stick (2)
	Ruler
	Camera
	Adobe Editing Software or Other

1.2 Script

An animated film needs a script to organize the narrative, character actions, scene locations and design, and scene transitions. The first part of the script is a Cast List, each main character is put into a list. The supporting cast of characters are in a list below the main characters. Then each scene is introduced with the background setup, when a character speaks it is text-centered to differentiate between spoken words and supporting text, scene transitions, or character actions. When a character performs an action their name is put in all caps and left-text aligned the action is described preceding the comma after the character's name. The transitions are also typed in scenes left-text aligned. Each scene is separated in the script which helps for the production of the film, if each scene is separated then each scene can be filmed during the same time frame. Editing will be made easier if there is a timeline for when scenes begin and end with the transitions. After creating our script we had other people in the EduVentures office read over it to get opinions on the narration to make final edits. Once the script is approved and agreed upon by everyone the next step is to solidify the storyboard.

1.3 Storyboard

The storyboard is a rough draft of the visual aspects of the animated film, this will include scene designs and background, major scenes, and important character actions. A storyboard is ultimately a rough draft of what needs to be included in the animated film. The creation of a storyboard helps visualize ideas and dialogue. This is the part of the process where the layout of the scenes happens, and these do not have to be high quality drawings it is more for personal use than for presentation. Our storyboard consisted of each scene background as well as the actions done by the hand (explained in a note with each scene) that adds and takes away characters from the background scene. By including the scene with all the characters and the background scene it was easy to visualize how each scene would move and flow into each other. Our storyboard for the biodiversity film can be seen below, including sketches and the corresponding notes (Fig. 1).

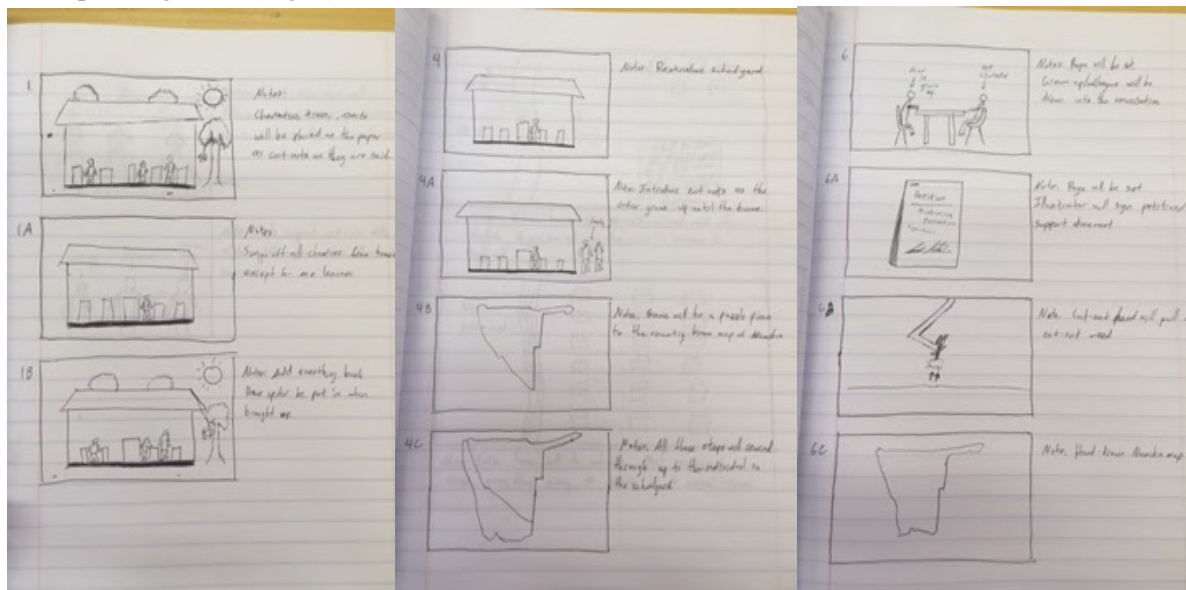


Figure 1. Storyboard Example

1.4 Voice-Over

The narrative or dialogue of an animated film will be in the script of the film. In order to include the audio with the animation it needs to be recorded separately. For our project we recorded the voice-over before creating the animation, our reasoning was to get a rough idea of how long the video would run. After multiple recordings of the voice-over the file was edited on a computer using Adobe Audition. Dead space, or times in the audio where there is only background noise, and sentences that were repeated were also edited out.

Another part of editing the voice-over is adding effects and adjusting the audio volume to have a cleaner sound and to reduce background noise. This is also the time when effects can be used to change the pitch or tone of the person's original voice to make it sound exactly how you would like. To cut out any dead space, simply cut out and delete any parts of the recording where the script is not being read. To filter out background noise before recording, record 5 seconds with nobody speaking or moving around. Then, click on the "Effects" tab on the top bar, select Noise Reduction/ Restoration then select "Capture Noise Print". After the voice-over recording is complete, the audio just recorded should be selected and highlighted in white. Then go back to "Effects" → "Noise Reduction / Restoration", then select "Noise Reduction (process)". It will take a moment to load. When complete, you will have background free audio!

In Adobe Premiere if you would like to alter the effects on the audio, drag and drop effects from the Audio Effects section and click "Edit" and adjust them until the voice sounds normal and any background noise disappears. Effects called "Mastering" was mostly used. Effects like DeNoiser and PitchShifter were used to fine tune the voice when needed but will most likely not be needed to achieve a good audio clip.

Chapter 2: Creating and Editing an Animated Film

After you have drafted the animated film, the next step is to bring the animation to life with actual filming. For our project we used a number of materials from paper for characters, a tripod secured by tape and a weight, and Adobe Premiere software along with a few techniques to achieve a consistent and well-produced film.

2.1 Recording an Animated Film

The first part of creating an animated film is to record the film. The recording of our film was done using a Canon Rebel T5 camera. The recordings of each scene were uploaded onto a computer from the camera's SIM card so the audio and video can be spliced together.

2.1.1 Set Up of Equipment

No matter how many times the film is done, the set-up should be consistent. For the biodiversity film, the camera was placed on the edge of a table using a tripod taped down and weighted down for more stability with a backpack (Fig. 2). The method used was to capture the film while looking straight down at the illustrations. The frame of the camera is extremely important as it should capture the largest area possible so the animation can be seen as well as give the artist ample space to complete the character placements as the film is captured. All proper camera techniques should be followed such as white balancing and testing the image appearance when played back before starting the filming. The camera was tested by having all the lights on and with the window shades opened but seeing that there were too many shadows on the viewing area of the camera, the shades were then closed again. Depending on the camera used, the procedure to white balance the camera is different. All cameras have a manual that explains the proper procedure. If the following films are done on a phone or smaller camera unit, adjusting the colors by focusing on a completely white area will adjust the lens as needed by itself.

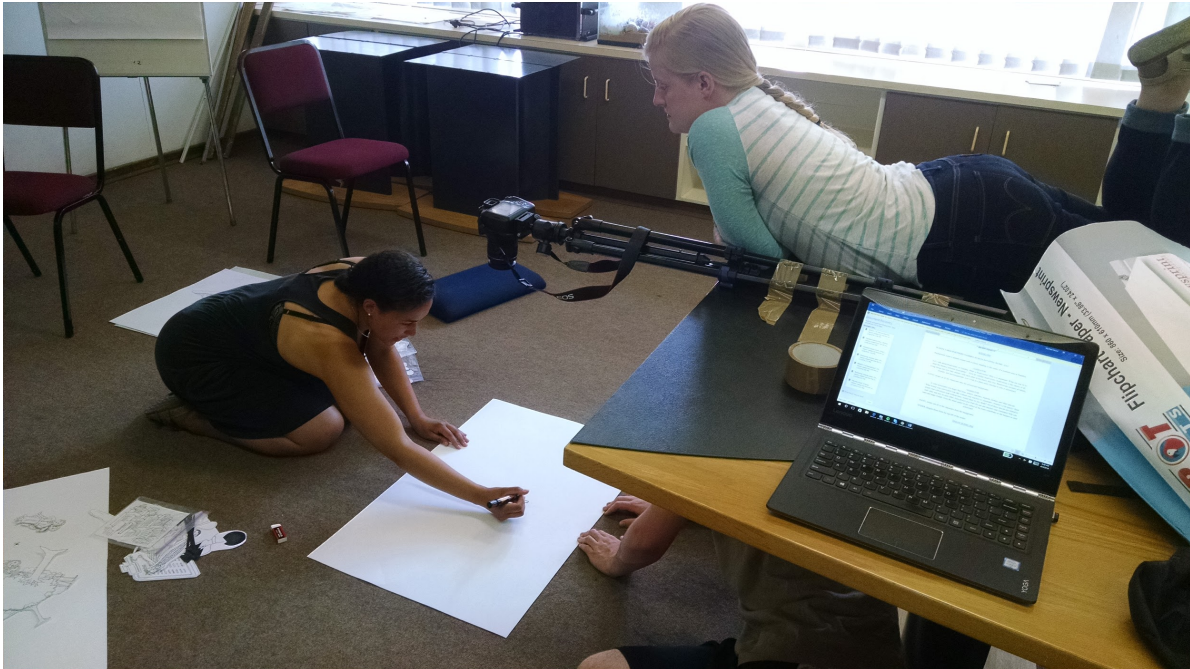


Figure 2. Camera Setup for Filming

2.1.2 Recording

Once the camera is set up, recording the film is the next step. All cameras are different in how they record but are all relatively straightforward. Take your time capturing the film. The best method to avoid any mistakes is to prepare the animations beforehand. Most cameras either cannot capture light pencil lines or can be set so that they do not pick up the pencil lines in the viewing frame. The biodiversity film used a method of lightly tracing out the illustrations beforehand and lightly erased so that it was invisible to the camera and then traced over with marker during the actual filming. This ensured proper drawings and reduced the risk of having to start over or scrap an illustration during filming. Between each illustration, the artist should step completely back from the camera and the paper. By getting out of the frame, the film can be edited easily so there are no overlaps or jump cuts (better known as discontinuities) and clips taken at different times can be edited into each other. The best thing that can be done for continuity is to both have the artist stand back between illustrations and record the entire film in one take in a day, leaving the camera continuously recording.

2.1.3 Object Movement

When moving objects in and out of frame, we made sure that each character was slid flatly on to the background scene paper, as well as assuring that only the hands and forearms were captured in the frame. The characters were also placed in the background scene paper and when removed or moving to another scene the characters were slid down or swiped out from left to right. Additionally, when moving each object, be cautious about how the lighting in the room makes it look. Moving an object too fast or too slow into the frame may cause the camera to auto adjust and make a bright white light. This step will take lots of trial and error; figuring out timing of movement, and the path in which each object is moved into the proper spot on the background paper. In addition to timing of each object's movement, the person

who is moving the objects must also take into account the audio. While moving the objects, they must listen closely to the audio clip and match up each movement with the corresponding script cues. The best method is to just take movement slowly and speed up the footage and time the cues in editing.

2.2 Editing the Animated Film

For the film, the software Adobe Premiere has been used. For future productions, the same software can be used. If unavailable, an alternate software can also be used as mentioned in section 2.3. Adobe Premiere is a linear editing software that functions through separate timelines for audio and video. Default settings will keep audio and video synced.

2.2.1 Importing Media into Adobe Premiere Pro CC

From any camera, phone, or recording device, any sort of media can be imported. From the media browser section in the lower left corner, pictured below, videos can be pulled into the timeline, also shown. The software may take some time to load, or “render” the media. Finding the correct file on the media browser is a challenge, but it comes down to good file management. Save the videos to a well-known and easy to find place, not hidden in a bunch of folders. The best place to store videos in the videos folder of the documents section of your computer. From there, it will be extremely easy to find and quick to import. Once all the clips have been imported, the next step is to order the clips in the desired order for editing.

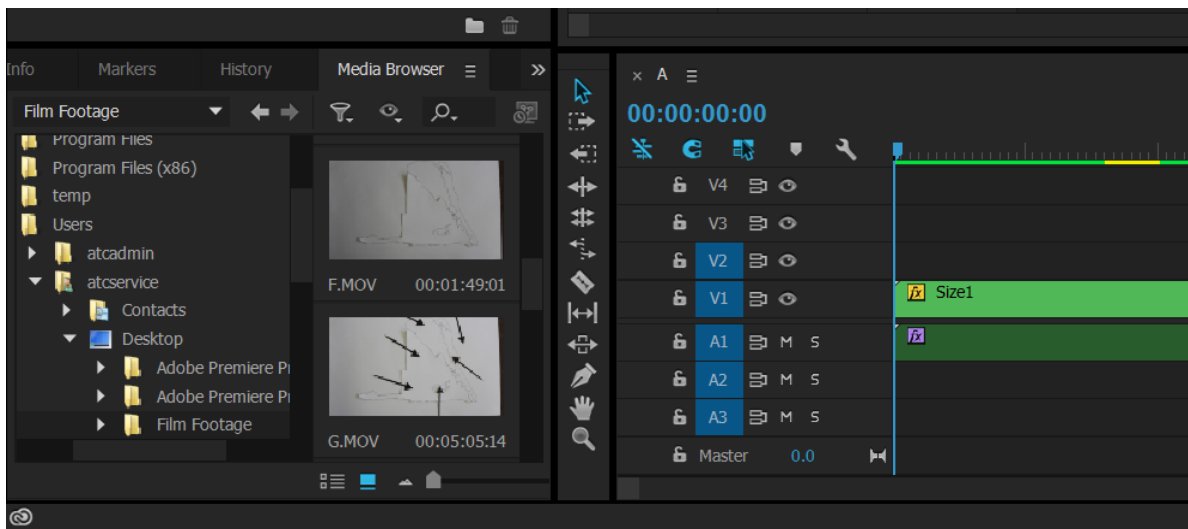


Figure 3. Media Importing Area

2.2.2 Editing with Adobe Premiere

Editing with Adobe Premiere is a skill that won't be perfect, but some few basic functions will be the basis and allow the user to create a professional product. The best things to know are the keyboard commands and their function.

Table 2. Adobe Premiere Computer Commands Guide

Command	Keyboard Button
Blade for Cutting	C
Selection Tool	V
Delete	BACKSPACE or DELETE
Move 1 Frame to the Left	Left Arrow
Move 1 Frame to the Right	Right Arrow
Play / Pause	SPACE BAR
Display Options for a Clip	Right Click on Clip
Save	CONTROL + S or File → Save
Adobe Help	F1

2.2.3 Editing Techniques for Film Style

There are multiple styles that need to be implemented to recreate the style of the original biodiversity film. Three main techniques were used and should be recreated. First, is the sped-up drawing of the animations. To do this, simply cut a clip to the desired section that needs to be sped up. Then, right-click on the clip, select Speed/Duration and change the percentage of speed until the clip fills in to the desired timeframe so the narration can continue without yielding for the video. The sped up drawing should be set to a time that corresponds with the duration of the narrations for that section of the film. This technique will be used alot. To keep everything on pace and within the audio cues, speed was altered a number of time. Putting in characters, sweeping away scenes, and even drawing were all altered. Some were slowed down, some were sped up. It is up to the editor to decide what should change based off the voice-over's pace. For example, the final scene where all the characters were placed in the frame was sped up to 150% to keep the pace consistent with the voice-over and get everything in the frame in the time allotted by the voice-over. The second technique is cutting the recorded video. Cutting dead space or unnecessary footage will take time and patience. However, no matter what methods you use, it will also take some time. To reduce footage time and keep the film on pace, cut out any time when the artist is not completing any action in a frame. For example, in the Etosha scene, all the animals are placed in the frame back-to-back in quick succession. In reality, there was a second or two where the artist was grabbing the next animal to place it in. Those breaks in between were cut out to keep that pace going. These techniques must be employed into the film to achieve a great finished product. It is daunting, time consuming, and an acquired skill. However, the more you practice, the easier, quicker, and more enjoyable it becomes. Just because it is a difficult task does not mean it is impossible. anyone can do it with the right motivation and desire to create an amazing film!

2.2.4 Saving, Exporting, and Sharing Film

With Adobe Premiere, saving, exporting, and sharing is extremely simple. When saving, simply click File → Save. Exporting is a bit more involved and requires a bit of attention. Click File → Export → Media and then a window with options will pop up. For the biodiversity film, the format MPEG 4 was used. The best quality exporting has a number of steps. To find the best exporting quality, this YouTube video was used for the settings: <https://www.youtube.com/watch?v=VuFn0ia-7P8>. Additionally, below is a table that lists exporting settings. Lastly, choose the file location of the exported video, most common is the Desktop so it will appear with all your files when complete. Sharing is extremely simple. After exporting, the film can be shared anywhere via USB, YouTube, Vimeo, email, and so on. The file may be too large to send via email with some servers. The best medium is to upload the video to a sharing site like Google Drive or OneDrive or a website for videos, like YouTube, Vimeo, even Facebook. Wherever you want to share the video, the only limiting factor is file size upload or sending restrictions.

Table 3. Export Settings

Section	Option	Setting Selection
Format	N/A	H.264
Preset	N/A	HD 1080i 29.97
Video	Render at Maximum Depth	Yes
Video	Bitrate Encoding	VBR, 2 pass
Bottom Section	Use Maximum Render Quality	Yes

2.3 Alternate Editing Softwares

Editing software can be extremely expensive and supercede the complexity of what is needed to make a video. The best software that is free and reliable that comes from a reputable developer is Windows Movie Maker. If Adobe Premiere is too expensive at \$29.99 (US Dollar) per month after the 30-Day Free Trial, Windows Movie Maker is the next best software. There are other softwares that can be recommended. However, downloading softwares can be risky as viruses are commonly found from softwares downloaded. Some other softwares are VirtualDub, Wax, and Avidemux. All of these can be found from their original developer's website. However, it is very easy to download from an incorrect or corrupt sources. The best thing to do is to locate the creator of each software. From the creator's website, it will be easy to download the software correctly and safely. Any other site other than the software creator's website should be avoided. For Adobe, the WPI student suggests the following solution. First, write all the scripts for all the films you plan on completing. Then, purchase Adobe Audition and record the voice-overs throughout the month. Next, film all the clips for all the films. Then, purchase Adobe Premiere and edit the voice-overs and films over the course of the next month. Within two months, you will have all the videos completing looking very professional, for an inexpensive price plan.

Chapter 3: Further Suggestions

After completing the task of creating this film we also have come up with some suggestions for future productions. These suggestions are from our experience with filming recording and editing the film.

3.1 Before Filming

While creating a list of necessary supplies needed for filming, always reference your script to ensure that the proper amount of materials are purchased. Additionally, perform tests with the camera for quality purposes before the initial set up during filming. When cutting out characters and objects, use the main characters of scene one to accurately size all objects for the rest of the film. For example, you don't want a learner to be the same size as an elephant. After a few of the characters have been created, test them out under the camera lens to ensure that the appearance is exactly what you are envisioning.

When all characters have been created, organize them into groups to keep them safe and secure from any damages. When the scenes have been drawn, make sure to lay them in an area without any dirt or grime. The camera will pick up any and all imperfections on the paper, so protect it from wrinkles and dirt. Additionally, make all paper for each background scene the exact same size. Different sized papers will be noticed in the film, so be wary of this when cutting the paper.

3.2 During Filming

While creating the film, make sure to use the same space to provide similar lighting and background in all parts of the animation. Also, use a quiet space so background noise does not become a problem. When recording the voiceover, this is a must. Excessive white noise and background sound will be disruptive to the quality and clarity of the voiceover. It is advised that you also record between twenty and thirty seconds of the background noise, wherever you record the voiceover, in case you need to edit in this sound to cover up any unwanted sounds during the voiceover.

After the voiceover has been edited and finalized, it is time to begin the actual filming. As mentioned above, utilize the same space during every session of filming. Depending on where you film, outdoor lighting may pose a few issues. If there are blinds in the room, close all of them and just expose the camera to the overhead lighting in the room, since this lighting is consistent. The camera set up will depend on the room you are using. In this case, the board room table was great for the horizontal camera and tripod method.

When moving objects in and out of frame, make sure that the paper is flat on the surface beneath it. If the edges are lifted up, the objects become difficult to slide onto the page. A piece of clear tape can be used if necessary. It may also be helpful to mark on the carpet where the paper is when it is aligned with the viewing frame of the camera. By marking the edges of the paper it will be easier to change the background scenes and keep the placement consistent. If you make a mistake while moving an object onto the page, simply take it away and start over again. Dead space and mistakes can easily be edited out after all of the filming is finished.

As silly as this sounds, make sure that the hands that are moving the objects in the animation are properly cleaned. As mentioned before, the camera picks up everything!

3.3 After Filming

Congratulations!! You're almost finished!!!

This next part of completing the film is all about patience. The Adobe Premiere software takes some time to get used to and figure out so don't stress if you don't get the hang of it initially. To save yourself time, cut out all unnecessary parts of the recording. Unnecessary parts would be any audio that is not the narrator reading the script, any part between lines or distractions can be cut out. Now you'll only be left with footage that is important. After that, bring in the voice over. Now that all the clips have all they need in them, the only thing left to do is make the timing work. In all softwares, you can adjust the speed of a clip to play faster or slower to help it fit into the part of the audio you want it to represent. To do this, simply right-click on the clip, select Speed/Duration and adjust the speed so it fits in the time needed. On other editing softwares, usually an option called "Adjust Speed" or "Clip Speed" or anything regarding the speed will complete the same function. This can easily be done by either right-clicking or going into the menu option where you can adjust the speed accordingly. Once you have all that down, watch the video over a few times. Watching it repeatedly about three or four times will help you realize any awkward or incorrect clips. Just edit as needed for your final cut, and you're one step from being done. After that, just save and export as discussed in section 2.2.4. Once it is done saving, you're all done!

Film Task Checklist

Task	Completed?
Writing a Script	
Storyboard the Film	
Collect Materials for Film	
Record the Audio	
Edit the Audio Recording	
Create the Characters	
Design Background Scenes	
Begin Filming	
Upload Video Recording to a Computer	
Start Editing Audio and Video together	
Export Film as an “.mp4” file	
Share Film	

Appendix J: Script

CAST LIST:

1. Narrator - Sophia Nuuyuni

SUPPORTING CAST

1. Learners
2. Teachers
3. Parents
4. Plants
 - a. Trees
 - b. Bushes
 - c. Thorn Bush - Alien Species
 - d. Welwitschia Bush
 - e. !Nara Melon
 - f. Tree stumps
 - g. Water Faucet
 - h. Waste
5. Animals
 - a. Elephants
 - b. Hyenas
 - c. Kudu
 - d. Lion
 - e. Wildebeest
 - f. Springbok
6. Insects/Invertebrates
 - a. Spider
 - b. Mosquitoes

“ BIODIVERSITY ”

SCENE ONE

SCHOOLYARD NORTHERN NAMIBIA ACACIA SAVANNA BIOME -DAY

Background scene is already drawn with a school standing in the center of a northern area in Namibia

NARRATOR:

Let’s talk about biodiversity in Namibia. What is biodiversity? Why is it important? What can you do to keep the balance between ecosystems? – First let’s define biodiversity; biodiversity is the variety of all living things and how they interact with each other in the places they live. Biodiversity includes all plants, animals, and microorganisms. Let’s look at a place more familiar to you, a schoolyard

HAND, swipes in all the characters onto the schoolyard background

NARRATOR:

In your schoolyard you might find trees, insects, teachers, learners, bushes, and other species. What would your schoolyard look like without your teachers or classmates, wouldn’t it be lonely? How would your schoolyard look without trees, would there be any shade? All of these species are related to each other and rely on each other; trees protect you from the sun and teachers and classmates help you learn and make friends. Even the small spider in the corner of the room contributes to the balance in your schoolyard.

SPIDER, dangles down from the top left of the screen

HAND, swipes out all of the characters from the background

END OF SCENE ONE

SCENE TWO

GENERAL BACKDROP - TYPES OF DIVERSITY

Background scene is a blank page, it will go through genetic, species, and ecological diversity.

NARRATOR:

There are three main types of Biodiversity: Genetic, Species, & Ecological.

HAND swipes in the words “Genetic Diversity”, “Species Diversity” & “Ecological Diversity”

NARRATOR:

These three types of biodiversity help keep individuals, species, and biospheres in balance. Genetic Biodiversity ensures that diversity within a species is present. Think of the citizens of Namibia. Everyone is different! If there was no genetic biodiversity, everybody would look the same!

HAND, swipes out different people and then swipes in the same looking people

HAND, swipes in Species Diversity set and Species Title Card

NARRATOR:

Species diversity is the variety of living things in an area. When there are more kinds of different species in an area, the species diversity is higher. Low species diversity means that there are only a few species in an area. Namibia also has many endemic species among their species diversity. Endemic means that a specific species is only found in one specific area. For example the !Nara plant which is only found in the Namib desert. If they are not managed they could become extinct and will be gone forever.

HAND brings in different kinds of species: all the animals plus the plants and bushes

NARRATOR:

Think of Etosha National Park: there are trees, bushes, elephants, lions, hyenas, spiders, mosquitos, Kudu, Wildebeest, and Springbok which make for a more diverse ecosystem.

HAND, swipes in Ecological Diversity set and Ecological Title Card

NARRATOR:

Ecological diversity is the variety of different processes, habitats, and niches that exist within a biome or even biosphere. Think of yourself - you are an individual. Add your family, and you become a population. Add your classmates and their families and you are now a community. Put everyone into their surroundings, and you are now a part of an ecosystem. Add your ecosystem to all the surrounding ones, and you get a biome. Add all the biomes together and you are now part of a biosphere!

END OF SCENE TWO

SCENE THREE

BIOMES OF NAMIBIA - DAY

NARRATOR:

There are 4 main biomes in Namibia: the Savanna, the Karoo, the Succulent Karoo, and the Desert. Within these 4 biomes, there are subdivisions that contain different types of vegetation. All these biomes are pieces of Namibia that make up life zones with similar climates and landscapes that are defined by the dominant plants of the communities.

HAND, swipes in arrows to highlight each biome as it is said

NARRATOR:

But with all these biospheres, biomes, ecosystems, communities, and populations, why should you as an individual care about biodiversity? Well, loss of biodiversity could mean disaster for Namibia. Water, food, materials, and medicine could all disappear.

HAND, brings in individual and places giant 'question mark' over them

NARRATOR:

Biodiversity can be lost in a number of ways. We could not treat our land with respect, waste the water, and overharvest natural resources like cutting down all the trees. We could hunt too many animals, overpopulate cities and villages, and alien species could invade the land because of poor management. Without biodiversity there wouldn't be food to eat, water to drink, or medicine to cure illnesses. All of these materials ensure our survival.

HAND, ~~put in bush with litter sticking out of it~~, dripping faucet, tree stumps, Kudu, city, "X" over thorn bush

HAND, add back in the resources

NARRATOR:

There is a large economic importance on the natural products that sustain global trade. Additionally, part of our economy relies on Namibia's biodiversity for tourism activities that involve the environment. Activities like safaris bring jobs and money to the people of Namibia. If we lose our biodiversity, we could lose tourism business and the economy will suffer.

NARRATOR:

There are so many simple and easy things we can do to protect Namibia's biodiversity. The best thing we can do is to share what you have learned so others may help as well. We should support and promote our Government's plans to maintain biodiversity preservation. We can help control weeds or alien species in our own community. We can all help support Namibia's biodiversity in many ways. We need your help to

spread awareness and knowledge of Namibia's biodiversity to keep it alive. Together we can preserve
Namibia's biodiversity!

HAND, swipe in student sharing knowledge with other people, signing petition, and creating a club

HAND puts in all of the people that have appeared so far in the film. Then the ENVIRO Ambassador
butterfly logo is brought in

END

Appendix K: Biodiversity Storyboard

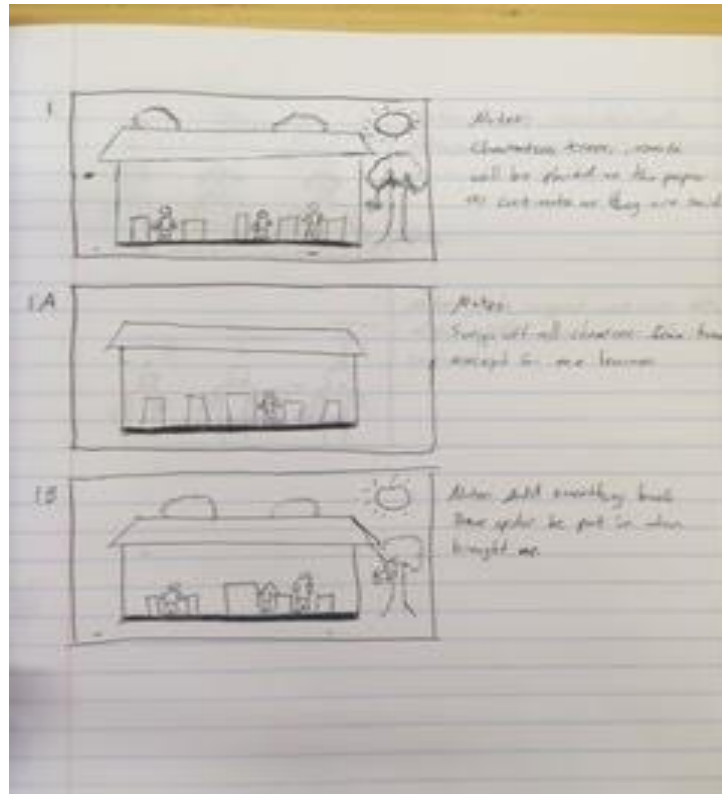


Figure 14. Biodiversity Storyboard 1.

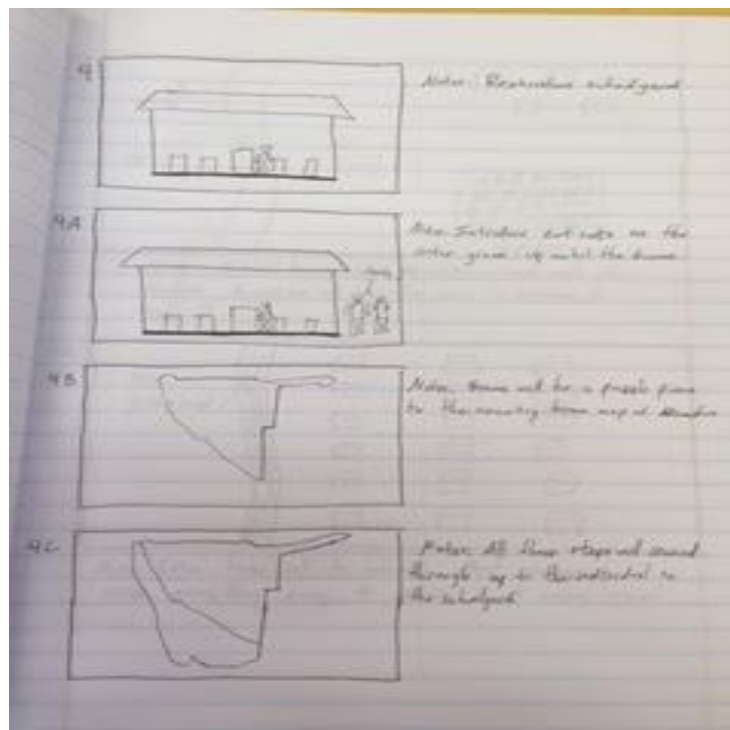


Figure 15. Biodiversity Storyboard 2.



Figure 16. Biodiversity Storyboard 3.

Appendix L: Trip to Ombika Combined School

On April 25th, we traveled to Etosha National Park to show our final film to the environmental club at the Ombika Combined School. When we arrived, we were welcomed by teachers and learners from all different grade levels. During the Biodiversity lesson, the learners seemed eager to participate and gain new knowledge from the film, lesson plan, and excursion out into their school yard. The surveys given after the film confirmed that it was a helpful learning tool, as well as being enjoyable for all who watched it. The learners benefited from the information presented in the film and the teachers explained that they believed this to be an excellent teaching tool since Biodiversity isn't taught in depth in the classroom. After the lesson and film were completed, the learners ventured out into their school yard to collect specimen to examine under the microscope. Learners showed excitement when they collected different species like centipedes and scorpions. Overall, the trip to Etosha was successful for us and the learners who participated in the program.

Appendix M: Cross Cultural Experiences

After visiting Nicodemus P. Nashandi Combined School and Ombika Combined School we were given a new perspective on our student opportunities in the United States of America. It is easy to take for granted all the supplies and facilities that our schools can afford to provide us with throughout our current academic careers. While at these schools in rural Namibia we saw that through underfunding, the schools cannot always afford to build appropriate classrooms or hand out enough supplies for teaching. Despite the lack of support these schools were still supported by their community. For example the parents and other community members helped build additional classrooms and helped cook meals for learners at the Nicodemus P. Nashandi Combined School.

During our visits it was refreshing to see participants excited to learn about biodiversity and the environment. One part of the EduMobile program is for learners to go on an excursion and collect trash around their schoolyard. After the glass, metal, and plastic were collected the learners picked out items to recycle into usable products. The learners created items that ranged from an energy-efficient stove to handbags and cups. This part of the program was when we really got to see the learners become passionate about improving their environment and creating something that they were proud of. The final step is for the learners to present their project in front of their school. From the first day of the program to the final day it was inspiring to see their confidence grow in speaking in English as well as expressing what they have learned in making their project. These experiences left something behind at these schools with these learners but it also left a positive impression on our experiences as students and individuals.