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# Upper Primary Science Curriculum Development for Physically Active Youth

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# Science Curriculum Development for Physically Active Youth



# WPI



Olivia Gibbs, Samantha Lor, Ariana Rozen, and Gavin Sabol

# Science Curriculum Development for Physically Active Youth

An Interactive Qualifying Project  
Submitted to the Faculty of  
WORCESTER POLYTECHNIC INSTITUTE  
In Partial Fulfilment of the Requirements for the  
Degree of Bachelor of Science

By  
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Date:  
3 May 2019

Report Submitted to:

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*This report represents work of WPI undergraduate students submitted to the faculty as evidence of a degree requirement. WPI routinely publishes these reports on its web site without editorial or peer review. For more information about the projects program at WPI, see <http://www.wpi.edu/Academic/Projects>.*

# I. Abstract

Physically Active Youth (P.A.Y.), is an after-school program in Katutura, Namibia which provides a safe and nurturing learning environment for Namibian children grades one through twelve who come from disadvantaged communities. The goal of this project was to develop a successful and engaging science curriculum for P.A.Y.'s fifth through seventh grade learners. The project was carried out in a three step methodology. Before arriving in Namibia, a standard for lesson creation and facilitation was established through the administration of a survey, the collection of feedback on lesson plans, and the delivery of a practice lesson in Worcester, Massachusetts. Second, while at P.A.Y. implementing the lessons, the team consistently assessed the lessons through daily reflections and online video critiques, and adapted the lessons accordingly. Third, the team conducted surveys and interviews with key stakeholders, and administered a post-assessment with the learners to determine success. The team produced a guidebook compilation of all science lessons and worksheets to leave behind for future instructors at P.A.Y.

# II. Acknowledgements

Upon reflecting on our project, there are a number of individuals that we couldn't have done it without, and we would like to acknowledge the efforts of these wonderful people. We would first like to say thank you to our sponsor, Physically Active Youth, and the devoted six person staff team who welcomed us as family from the first day. We would like to extend a special thank you to Ms. Ursula Matzopoulos and Ms. Thubaelihle Sibanda for radiating their enthusiasm from our very first Skype call, a hopeful view for the rest of the project, and sharing their dedication and love of Physically Active Youth with us. We would also like to thank Ms. Beata Uungwanga for treating us as one of her own kids, Joy for cooking daily meals for us and the learners, Macdonald Kapukare for supporting us with any technical means, Mr. Laban Naftal Amadhila for mentoring us in BMX coaching, and Ms. Rose Zhuvao for supporting us with various administrative needs. In addition to the full-time staff, we would also like to extend thanks to the countless volunteers at P.A.Y. for welcoming us to the center daily.

We would like to acknowledge and thank our advisors, Professor Joseph Doiron and Professor Bethel Eddy, for their continued guidance and support from the first day of our preparation term to the last day of IQP. In addition, a special thank you to Professor Doiron for setting up, organizing, storing, and receiving video feedback for the team on all of our lessons.

We also send acknowledgments to Jim Eddy for assisting in daily lesson filming, without which we would not be able to collect teacher feedback throughout the process. On this note, we would also like to thank the panel of various teachers that helped us throughout data collection, giving us feedback on various aspects of our project. A special thank you to Miss Gibbs, who let us come to her classroom to practice our lesson, as well as gave the team advice and feedback during our time in Namibia.

Thank you to our fellow peers for the weekly feedback during our project presentations and to all of those who have donated to us to help in purchasing supplies for our science lessons and learners. And our warmest thank you extends to all the learners at P.A.Y., who made everyday something to look forward too with their excitement, curiosity, individual personalities, and welcoming spirits.





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## **Introduction**

Katutura, Namibia has an education problem that is deeply rooted in its country's history. In 1990, Namibia gained its independence from South Africa which ended the apartheid regime, but didn't end many of its problematic legacies. The policies of apartheid physically separated blacks from whites and created inequality throughout Namibia that is still visible today.

The legacies of apartheid are most apparent in areas like Katutura, Windhoek's largest informal settlement where nearly 70 percent of the population lives in poverty. During the era of apartheid, education facilities in Katutura received very little funding and resources compared to facilities in the more affluent white areas of Windhoek. As a result, Katutura was not set up for long-term success in its youth development and educational programs. Some of the education challenges that areas like Katutura face include high dropout rates, insufficient resources, lack of teacher support, and student underperformance. Recognizing this issue, Namibia created Vision 2030, which is the government's guiding plan to become a more industrialized nation. Within this plan, Namibia has identified education as both one of their main focuses and as a mode for development.

## **Sponsor - Physically Active Youth**

One organization that aligns with the aims of Vision 2030 is Physically Active Youth. Physically Active Youth, also commonly referred to as P.A.Y., is an advocacy non-governmental after school program in Katutura that started in January 2003. It is run by six full time staff and a large team of volunteers from both Namibia and abroad. The staff prepare a meal, offer homework assistance, teach a lesson, and facilitate a sports activity for over 80 learners in grades 1-12 every weekday. Their mission is "to nurture self-confidence, critical thinking and active citizenry in young Namibians coming from disadvantaged backgrounds who will build a more equal and knowledge-based Namibia," (P.A.Y., a). They accomplish this through their three pillar approach of quality education, sports, and life skills. Physically Active Youth acknowledged their need for an engaging science curriculum for their learners, and this is where the WPI student team stepped in to create and deliver these lessons.

## **Goals and Objectives**

In preparation for delivering lessons in Namibia, the team identified the guiding research question: What makes a successfully delivered and engaging lesson plan for learners in grades five through seven? In order to answer this question, the team identified a three stage methodology consisting of tasks to complete pre-departure (in Worcester, MA), daily tasks in Namibia, and final tasks to complete upon completion of the project in Namibia.

The three objectives are as follows:

1. Establish Standards for an Engaging Lesson Plan.
2. Create, Implement, and Revise Lessons at Physically Active Youth.
3. Analyze Success of Lessons and Provide Deliverables to Physically Active Youth.

## **Convenience Sample**

The team recognized that with no prior teaching experience, the first thing to do was identify a convenience sample of trained teachers to obtain various types of feedback. The convenience sample was assembled using people from the team's professional networks.

## **Teacher Questionnaire**

The team used the convenience sample of teachers to collect data that would help to establish standards for how to make an engaging lesson plan. A teacher questionnaire survey consisting of twenty questions was sent out, probing about the best ways to design lessons and conduct the classroom. The most significant findings were to connect with the students on a personal level, plan ahead with lessons, and to have movement throughout the lessons in order to keep students engaged.

## **Lesson Plan Feedback**

Using data from the teacher questionnaire, the team created a model lesson plan about the butterfly life cycle. The team used a convenience sample of teaching professionals to receive feedback on how to improve the lesson and make it more engaging. After receiving edits from a teacher, the team improved and sent their lesson to the next teacher for critique until there were no new suggestions for improvement. This is considered the point of data saturation. The major findings from this method of data collection were to start classes with probing questions, have varying levels of difficulty, keep activities simple, announce objectives to the class, and to write the objectives on the board.

### **Worcester Elementary School Practice Lesson**

Once the team's lesson plan reached data saturation, the team organized a time to practice a lesson in a Worcester elementary school. The goal of this was to practice delivery techniques on a fifth grade classroom. After teaching the lesson, the team received feedback on both their lesson content and delivery. An example of the type of feedback received were suggested methods for controlling the classroom in order to get more engagement out of the students.

### **Pre-Assessment**

Once in Namibia, the team administered a pre-assessment to understand the knowledgebase of their students. The pre-assessment consisted of thirteen open-ended questions about topics the team planned to cover during the course of their time in Namibia. The results of the pre-assessment revealed that the students had varying levels of knowledge, and the majority were missing a solid foundation in the basics - for example the scientific method. Overall, the pre-test results aligned with what the team anticipated.

### **Self-Reflection in Namibia**

Finally, the team started creating and delivering lessons using the feedback they received from trained teachers while in Massachusetts. After beginning lesson delivery, the team made daily reflections on their lessons about things that worked well and areas for improvement in order to get more engagement and participation from their students. In order to make their lessons more engaging, the team implemented guided note sheets, more review activities, small elements of competition between students, and varying levels of difficulty in lessons to cater to students who are at different levels.

### **Lesson Video Review**

In addition to self-reflections, the team also received feedback through a program called Compeer Review. The team took video recordings of seven lessons and uploaded them to Vimeo. The videos were sent to a panel of distinguished teaching professionals across the country who were asked to provide feedback on lesson delivery techniques. This program allowed the team to refine their teaching processes in order to make them more effective and engaging based on the advice of trained professionals. Some of the feedback that came from the panel encouraged the team to slow down and allow more time for other students to raise their hands and also to ask more questions that reinforce material and get students to think in different ways. Once these and other suggestions were incorporated into the team's lessons, both learner engagement and participation improved.

### **Post-Hoc Assessment**

In the final stages, the team administered a post-hoc assessment to evaluate lesson retention. The post-hoc assessment consisted of eighteen questions which followed a three level approach in order to test the depth of understanding of each student:

1. Level I: Basic Concept Question
2. Level II: Recalling the Application of Material in an Activity
3. Level III: Specific Vocabulary Question

The results indicated that overall students retained information from the majority of the activities. The sixth and seventh graders performed much better than the fifth graders on the assessment which was expected because they have had more exposure to the science topics the team taught.

### **Satisfaction Survey**

In order to evaluate the team's ability to create fun and engaging lessons, a survey was given out to students that listed out sixteen activities. Students rated these activities on a scale of 0-5, 0 being they don't remember the activity at all, 1 being they strongly disliked the activity, and 5 being they loved it and would want to do it again. Nine of the sixteen lessons fell in the 90%+ satisfaction range, five of the sixteen activities fell in the 80% satisfaction range and only two of the sixteen activities fell into the 70% satisfaction range which means overall, the team was successful in creating fun and engaging lessons.

### **Interviews**

The team conducted thirty minute interviews with two of the full time staff members at Physically Active Youth, Ursula Matzopoulos (Programme Manager & Coordinator of Junior Programme Component) and Thubaelihle Sibanda (Integrated Sports and Life Skills Coordinator & Coordinator of Senior Programme Component) in order to better understand how they viewed the team's overall success in lesson facilitation, ability to meet their expectations, shortcomings, and areas of focus for future projects. Overall, both staff members were excited with the work the team did and were especially impressed with the team's ability to quickly gain the respect of their students through being prepared, having exciting hands-on activities, and getting to know their students on a personal level.

### **Deliverables**

At the conclusion of their time in Namibia, the team submitted three final deliverables to their sponsor. The first deliverable was a link to all of the recorded lessons that were part of the compeer review process as mentioned above. P.A.Y. would be able to refer back to

the videos for future teacher training or for ideas of successful lesson planning. In addition, the team created a guidebook that contained every lesson the team created including lesson plans, work sheets, and lesson reflections. P.A.Y. could use this as a model to generate their own lesson plans and also to re-use with their students once they move on to the next grade. The final deliverable was a supply box containing materials necessary to teaching the lessons, so that they can be reproduced by future educators.

## **Recommendations**

After reflecting on their experience, the team thought of recommendations for Physically Active Youth staff, future volunteers at P.A.Y., and future WPI project teams working with P.A.Y.

### *Recommendations for Physically Active Youth*

#### 1. Communication

- Improvement of communication between staff members and between staff and volunteers would help reduce the confusion that is triggered by daily schedule changes or during transitions between lunch, academics, and sports.
- Create group message with P.A.Y. staff and volunteers

#### 2. Community

- Ursula Matzopoulos and Thuba Sibanda were crucial to the team's preparation by making themselves available for video calls and clearly explaining their expectations for the project; continuing to foster this sense of community is key to the success of the organization

#### 3. Future project recommendations

- There is a lot of potential for future WPI student projects at P.A.Y. ranging from marketing to further science curriculum development.

### *Recommendations for future volunteers at P.A.Y.*

#### 1. Flexibility

- Since the length of stay of each volunteer is different and everyone is assigned different tasks, it is essential for volunteers to come in every day with an open-mind and flexibility

#### 2. Global Perspectives

- As volunteers, it is encouraged and recommended to voice ideas, such as contrasting proposals for projects

### 3. Continuation of Team's Lessons

- In the case that a volunteer wants to teach science lessons to the upper primary learners, it is recommended that they pull out the team's physical guidebook which contains all of the lessons created and implemented

### 4. Conducting a Classroom

- Volunteers should bring enthusiasm and energy to the classroom. This energy will be the driving force that radiates to the learners and continues to get them excited for lessons each day

### *Recommendations for future WPI project teams*

#### 1. Preparation Term

- At the start of the preparation term, the new team should read this project report, schedule a meeting, fundraise, and practice lessons

#### 2. Daily Routine at P.A.Y.

- When designing lessons, future project teams should look over the lesson guidebook and use those lessons as a reference point of where to start



# Chapter 1: Introduction



# Chapter 1 Introduction

As Namibia develops into a more industrialized nation, education continues to prove itself the main vehicle of growth. In order to see how Namibia has progressed thus far, it is important to understand the foundation that the country is built upon. South African rule in Namibia lasted from approximately 1915 to 1990 and implemented harsh and overbearing policies of apartheid. Apartheid brought the segregation and discrimination against people based on their race, which left a legacy of inequality that is still visible today. The impacts of apartheid are most apparent in areas like Katutura, Windhoek's largest informal settlement. One of the largest and most long-lasting impacts can be found in education.

During the era of apartheid, education facilities in Katutura received very little attention and resources compared to facilities in the more affluent white areas of Windhoek. As a result, Katutura was set up for a long-term lack of success in its education programs. Some of the challenges areas like Katutura face include high dropout rates, insufficient resources, lack of teacher support, and student underperformance. Physically Active Youth, also commonly referred to as P.A.Y., is an advocacy non-governmental after school program in Katutura that started in January 2003 to combat these issues. It is run by six full time staff and countless volunteers from both Namibia and abroad. The staff prepare a meal, offer homework assistance, teach a lesson, and facilitate a sports activity for over 80 learners in first through twelfth grade every weekday, working towards their mission “to nurture self-confidence, critical thinking and active citizenry in young Namibians coming from disadvantaged backgrounds who will build a

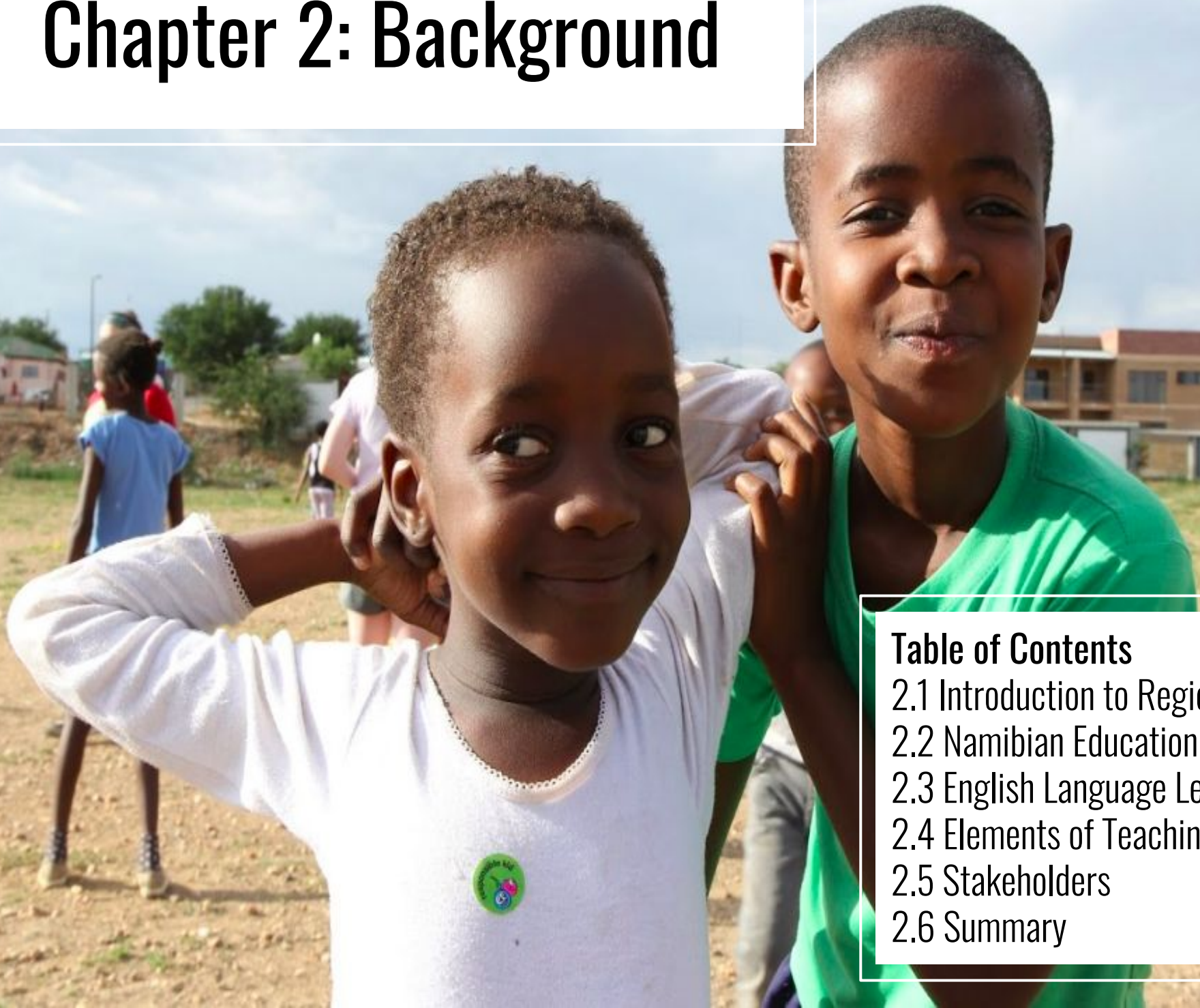
more equal and knowledge-based Namibia,” (P.A.Y., a). They achieve these goals through their three pillar approach of quality education, sports, and life skills. Physically Active Youth has identified a desire for engaging science curriculum for their learners which is where WPI students stepped in to create and deliver lessons at the organization.



*P.A.Y. Learners Pose in Front of New Mural, “Hope”*

In preparation for delivering lessons in Namibia, the team gathered data through a teacher questionnaire, a model lesson plan critique, and practicing a lesson in a local Worcester elementary school. Using this data, the team created and delivered daily science lessons to the fifth through seventh grade learners. The goals of this project were to deliver engaging science lessons to students at Physically Active Youth and leave behind framework for future curriculum development and implementation. The team created and facilitated engaging science lessons, composed a lesson plan guidebook, generated a series of effective teaching strategy recommendations, and left behind several lesson video recordings for P.A.Y. staff to reference for years to come with the hope that the learners will continue to develop.

# Chapter 2: Background



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- 2.2 Namibian Education System
- 2.3 English Language Learners
- 2.4 Elements of Teaching
- 2.5 Stakeholders
- 2.6 Summary

# Chapter 2 Background

## 2.1 Introduction to Region

Namibia, pictured in Figure 1, is a country located on Africa's southwestern coast that is home to roughly 2.53 million people and spans across 825,000 square kilometers making it one of the least densely populated countries in the world (World Bank Group, 2019). It has seen steady population growth of about 2.2% over the last several years, but had a Gini Index of 59.1 in 2015 which indicates that Namibia holds one of the most unequal income and wealth distributions in the world (World Bank Group, 2019). The capital of Namibia is Windhoek, which holds a population of approximately 400,000 people and made up 44% of the Namibian National GDP of \$13.24B in 2018 (Office of the Chief Executive Officer, 2016; World Bank Group, 2019). While this is generally a strong GDP for sub-Saharan African countries, it can be misleading because Namibia is a country with an unemployment rate of 34% with 28.7% of its population living below the poverty line (Trading Economics, 2019; World Bank Group, 2019). This means that as a whole, Namibia has a lot of economic potential and room to grow into a more industrialized nation. Through education and youth development, the next generation of Namibians can continue improving their country, increasing its GDP, and reducing income inequality.

Namibia is full of unique culture, nationalistic pride, and has visions of continual growth and development, however, this hasn't always been the case. Namibia, a country that was once ruled by more developed countries and plagued by apartheid, didn't see independence until 1990. Apartheid was abolished

from Namibia in 1980, but its policies were already deeply rooted within the country and are still visible today. To better understand how this came about, it's necessary to take a step back and look deeper into Namibia's history.



*Figure 1: Namibia Google Maps*

### 2.1.1 Historical Context

Namibia was under the rule of Germany and South Africa for more than 100 years; German rule lasting from around 1890 to 1915 and South African rule lasting from 1915 to 1990 (Pendleton, 1996, p. 18). When the National Party came to power in South Africa in 1948, they introduced policies of apartheid which changed Namibia forever (Friedman, 2000, p. 3). These segregational policies were enforced throughout Namibia, including its capital city Windhoek, which ultimately forced blacks and whites to live in separate locations. This led to the opening of what was known as the “Main Location” on

the outskirts of Windhoek where blacks would reside while whites would remain within the city center. Many colonists justified this decision by the idea that black people would feel most comfortable and be most able to develop in their own ‘nature’, among their own ethnic group (Friedman, 2000, p. 3).



*Figure 2 (Above): Segregational Sign (Nixon, 2018)*  
*Figure 3 (Below): Beware of Natives Sign (Leander, 2017)*

The people of the Main Location grew to love their residence and built their own homes made of wood, corrugated metal scraps, and whatever other materials they could come up with (Pendleton, 1996, p. 27). It grew to be a comfortable place where residents fully owned their homes which gave a lot of value to families that could rent, sell, or inherit their structures (Pendleton, 1996, p. 27). Most importantly, the Main Location was in close proximity to Windhoek, a luxury black residents lost when they were forced to move to Katutura in 1959.



*Figure 4: Informal Settlement, Katutura (Nyangove, 2010)*

Overtime, more Namibians decided to migrate to the Windhoek area from more rural areas with the intention of finding better jobs and more money (Frayne, 2007). As a result, the Main Location continued to grow larger and larger and finally began approaching city lines which would make whites and non-whites too close together in the eyes of the South African government. Being in the era of apartheid, a regime that segregated and discriminated against people based on their race, this was a massive issue and to solve this problem, in 1959, the South African government made plans to open “Katutura”, which became the new location for blacks to

live. And as ironic as it is, “Katutura” actually means “The place where people do not want to live” in Otjiherero, the local language (Pendleton, 1996, p. 3).

### 2.1.2 Old Katutura

Most residents of the Main Location opposed the idea of moving to Katutura, but a small group was convinced with promise of better housing and more sanitation facilities (Pendleton, 1996, p. 29). Municipal officials began to threaten and put pressure on Main Location residents to move, but this was ineffective and built tension between them. Tensions continued to rise until December 10, 1959 when protests escalated to the point where police shot and killed 11 people and injured around 44 in the Main Location (Pendleton, 1996, p. 29). This struck fear in a lot of Main Location residents and eventually the Main Location was completely emptied and closed down becoming known as the Old Location. “Katutura”, which is pictured below in Figure 5, officially became the new location, as well as a symbol for opposition of the South West Africa apartheid (Pendleton, 1996, p. 30).



Figure 5: Katutura, Namibia Google Maps

The early years in Katutura were disliked by many of its residents. The houses were pre-built to look the same with the exception of the exterior color; two to four room dwellings with unfinished walls and ceilings. Instead of having ownership of their land, residents had to pay rent which meant they needed a reliable job (Pendleton, 1996, p. 160). In addition, renting the property made residents hesitant to complete any upgrades to their house knowing the municipality would see no value in the renovations and that they themselves could be evicted from their homes at any time.



Figure 6: Mass-Produced Homes in Katutura (Friedman, 2000)

### 2.1.3 New Katutura

Today, Katutura is Windhoek’s largest township, home to an eclectic mix of people and traditions, and located five kilometers from the center of Windhoek (Friedman, 2000, p. 1). Its population makes up about half of Windhoek’s 400,000, but is packed into just around 20% of the capital city’s land

(Winschiers-Theophilus et al., 2017). For reference, Katutura has a density of approximately 80 persons per hectare, compared to 10 persons per hectare in the more affluent white suburbs of Windhoek (Windhoek Municipality, 1996). Modern day Katutura is much different than what it once was; neighborhoods are tightly knit and children and adults play and socialize in the streets (Friedman, 2000, p. 12). A broader variety of socio-economic statuses are visible ranging from large homes on Luxury Hill to squatter shacks, in addition to 28% of residents owning a motor vehicle (Pendleton, 1996, p. 140). This flourishing can be attributed to the abolishment of the apartheid from Namibia in 1980 which gave people more freedom to work and live where they wanted.

Despite these successes, the effects of apartheid still linger. While it's true that racial segregation no longer exists in Namibia, socio-economic segregation is very apparent. Katutura has its own resources, such as educational, medical, and recreational facilities, but they don't match up with the quality of what can be found in Windhoek. These facilities in Windhoek also tend to be out of the economic reach of most Katutura residents (Friedman, 2000, p. 10). After years of poor education and a lack of motivation, Katutura continues to contain 76.7% of Windhoek's black population. The significance of this comes with the statistic that 75% of black Namibians live in poverty and 71% of Katutura residents live below the subsistence level (Friedman, 2000, p. 8). In addition, forty percent of households in Katutura are run by a single parent, and 41% of these parents are unemployed or employed in the informal sector, which includes workers who are self-employed and have limited job security (Pendleton, 1996, p. 116). Jobs in the informal sector can be broken down into

five major categories. Street trading - which includes selling food, clothes, and other miscellaneous items - metal workers or backyard mechanics, taxi services, shebeens - private areas that sell alcohol - and various home based activities such as tailoring and daycare (Pendleton, 1996, p. 72). The reason so many Namibians migrate to and stay in Katutura is for opportunity. Windhoek provides them access to jobs, money, and better education for themselves and their families that can be hard to find in the rural areas of Namibia.



*Figure 7: Informal Sector Business (Nakashole, 2018)*

Windhoek maintains 42% of the country's formal sector employment but only 10% of the nation's population (Pendleton, 1996, p. 148). The problem with this mindset is that while opportunity is available in Windhoek, it's difficult for people in Katutura to fully take advantage of these

opportunities without a solid foundation in education. As a result, generation after generation in Katutura fails to break the cycle of limited success. While living close to Windhoek presents a lot of potential benefits and opportunity, it's important to realize that Katutura and its resources are lackluster compared to those in Windhoek. This makes it hard for children to be inspired to become something greater than what they see in Katutura. The passing rate of public schools in Katutura school is only 37% which sets young generations up for failure from the very beginning (MacKinnon, 2013). Some kids even turn into “street children” as a result of abusive, neglectful, or in most cases families in extreme poverty. These children tend to drop out of school, beg on the streets, and begin engaging in destructive behaviors often times before the age of 15 (Pendleton, 1996, p. 77). Many of the gaps that currently face Katutura and its youth are rooted in apartheid and will remain prevalent in its future until major reform is put into place.



*Figure 8: Family Living in Katutura (Roberts, 2015)*

## 2.2 Namibian Education System

The Republic of Namibia has set the goal of increasing the quality of life for its citizens and transforming its economy to be based upon knowledge; a country where the citizens are well educated and push entrepreneurship, business, and the economy rather than an industrial society where the production of goods and services is the driving economic force. Education reform has been identified as the most important area for development in achieving this aim. Though the education system has improved drastically from the start of independence, there are still many barriers for the country to overcome in order to reach their goals.



*Figure 9: Namibian Primary School Students (NBC, 2017)*



## 2.2.1 National Scope

When Namibia achieved its independence in March of 1990, the education system was plagued by legacies of the apartheid regime. Some of the issues that remained prevalent post-independence include gender and racial inequality, inequitable distribution of resources, and quality of education (Katjaviv, 2016). After independence was attained, the government set out to transform the education system into one with a foundation on democratic principles that grant universal access to education, connect public schools with the working world, and push Namibia to become a nation of learners (Government of the Republic of Namibia, Office of the President, 2004).

Vision 2030 is the long-term guiding government plan that aims to transform Namibia into a more developed society, identifying education as the vehicle for this transformation. The first President of the Republic of Namibia, Sam Nujoma, stated that the goal of Vision 2030 is to “transform Namibia into a healthy and food-secure nation, in which all preventable, infectious and parasitic diseases (including HIV/AIDS) are under secure control; people enjoy high standards of living, a good quality of life and have access to quality education, health and other vital services. All of these aspirations translate into a long life expectancy and sustainable population growth” (Government of the Republic of Namibia, Office of the President, 2004). The idea behind this plan is that by developing education, the citizens of Namibia will become more literate and productive and will gain the skills to make more positive life choices. This vision is the framework for addressing current challenges in the education system.

It is evident from its budget allocation that Namibia is extremely serious about education reforms. In 2016, 18% of their national budget was set aside for education, making it one of the the highest percentage of GDP directed toward education in the world (Katjaviv, 2016). The first reforms made by the Namibian government after independence set out to amend the unjust policies of apartheid. Universal access to education was granted by creation of the Constitution of the Republic of Namibia in 1990 which explicitly states that “all persons shall have the right to education.” (United Nations Educational, Scientific and Cultural Organization, (UNESCO), 2010). Since then, the government has achieved 95% enrollment of school age children in public school (Republic of Namibia). One reform that contributed to this development was abolishing public school tuition fees, so that families’ only education cost became paying for uniforms and supplies (Katjaviv, 2016). Though this increases the affordability of schooling, many families still struggle to pay for these expenses.



*Figure 10: Junior Primary Learners (Delta School Windhoek, n.d.)*

The restructuring of the education system was the next step to reform. This began with the reorganization of education administration into one centralized and governing organization: the Ministry of Education. This action addressed the previously fragmented infrastructure - which left the management of education to each individual province - because centralizing the administration allowed the government to evaluate and improve the state of education across the country, as well as standardize requirements and expectations for all students. A new learner-centered curriculum, the National Curriculum for Basic Education, was implemented for grades one through twelve which established syllabi for each grade. This learner-centered education involves basing the starting point of the curriculum on what students know, and enabling them to acquire new knowledge in relevant and meaningful ways through instruction (UNESCO, 2010).

During the apartheid, black Namibians were not allowed to teach math or science, leaving a legacy of discrimination in the field of education. One post-independence initiative was to increase the number of teachers and to regulate their training through the Teacher's Education Colleges Act of 2003 (UNESCO, 2010). The number of teachers has since increased by 30%. In addition, more public schools were built to improve the accessibility of public school to children in rural regions; as of 2016 there were more than 1700 public schools with plans for the development of two hundred more (Katjaviv, 2016). The government of Namibia has made reforms to the education system through reorganization, curriculum development, and increasing the number of teachers and facilities. However, there are still a multitude of challenges to overcome until Namibia can fully realize their goal of becoming the

knowledge-based society outlined by Vision 2030. These challenges are rooted in poverty and include low quality of teaching, underperformance of students, lack of resources, and high dropout and repetition rates.

The low quality of teaching is a nationwide issue caused by the lack of support and training for teachers. Unlike American teachers who are required to complete trainings throughout their careers, Namibian teachers do not receive ongoing support and training to help them appropriately meet their students' needs, especially in rural areas (Republic of Namibia, 2017). Teachers are spread very thin because they are often assigned to teach multiple grade levels, and they have classes with wide ranges of student knowledge bases which inhibits the teachers' ability to cater to the individual needs of students (Katjaviv, 2016). Unsurprisingly because of this, teacher motivation is low and rates of absenteeism are high among them (Katjaviv, 2016). In addition, the textbooks that teachers have to work with are typically too advanced for the comprehension levels of their students, so the teachers have no resources to work off of (Katjaviv, 2016).



*Team Member Using Book to Give Students Visuals*

Furthermore, classroom observations have shown a trend of poor pedagogy. Teachers were observed presenting ideas in illogical ways that did not guide the learners through concepts (UNICEF, 2011). Subsequently, the instructors struggled to connect the concepts to relevant examples (UNICEF, 2011). Teachers wrote illegibly and made mistakes when presenting material on the blackboard, which made the information difficult to follow for the learners (UNICEF, 2011). Finally, poor questioning techniques did not prompt the students to engage in higher level thinking (UNICEF, 2011). For example, teachers often presented material and then gauged student understanding by asking “Do you understand?” to which the learners always replied “Yes” (UNICEF, 2011). This close-ended question fails to assess the comprehension level of the learners. These poor methods employed by Namibian teachers create a gap between what is taught and what students actually understand. This unpreparedness of teachers is projected onto the students resulting in nationwide student underperformance. The low performance of students on exams being a clear indicator that teachers do not achieve the intended impact on student learning.



*Figure 11: Senior Primary Exam Room (Ngutjinazo, 2019)*

Student proficiency is nationally low in multiple subject areas. Only 45% of grade 5 students and 48% of grade 7 students achieved proficiency in English (UNICEF, 2015). Linguistic diversity is a contributing factor to this low performance. It is estimated that there is a range of 10 to 30 different languages spoken in Namibia (Frydman, 2011,181). The comprehension of material is affected by these dialect and nuanced variations. After independence, the government replaced Afrikaans with English, however junior primary (grades 1-3) is still taught in mother-tongue and the medium of instruction doesn't become English until grade four. Additionally, students still speak their native language at home and only practice English while in public school. Thus, the linguistic diversity in Namibia contributes to the lack of proficiency in English. Students chronically underperform in mathematics as well; only 63% of grade five students and 41% of grade seven students achieved proficiency in math (UNICEF, 2015). Unlike in English where learners can improve their skills over time, mathematics requires students to continually build upon previous concepts. When students fall behind, they have a very difficult time catching up especially without the ability to have one-on-one time with their teacher.

A third of all students drop out by the tenth grade (Republic of Namibia). Poverty, high unemployment rates, substance abuse, early pregnancy, and difficult transportation to public school are all contributing factors to high rates of dropouts (UNICEF, 2015). High absenteeism is another factor that inhibits student learning because absent students miss material being taught. The HIV and AIDs epidemic has a drastic effect on the attendance of children in public schools. About one fourth of

Namibian citizens are infected by HIV/AIDS, and President Sam Nujoma identifies HIV/AIDS as one of the greatest threats to the nation. If a student has been orphaned by the disease, they no longer have the support to pay for schooling or transportation to public school. Additionally, some students miss school to stay home and care for terminally ill parents or because they, themselves suffer from symptoms of the illness. Student performance is directly correlated to student attendance because they cannot learn if they aren't present for the lessons.

The government has committed to investing in education and has made amendments to the unjust education system that was inherited from apartheid. However, there are still many challenges that need to be addressed before Namibia can realize its goal of becoming the knowledge-based society as outlined by Vision 2030.

### 2.2.2 Local Scope

Every issue that is present on the national scale is magnified for marginalized children. Though the country has achieved 95% enrollment of school-aged children, the remaining 5% of children from marginalized and vulnerable communities face even greater barriers to receiving equal education. Many of these children live on the streets, in squatter camps, refugee camps, and resettlement communities, along with children with disabilities, children of families in extreme poverty, and children with illnesses (UNICEF, 2017). These children are even more likely to drop out of public school prematurely, or not be enrolled in the first place. Although there is no tuition, the hidden costs of public schooling - uniforms, school supplies, meals - are more than some of these families can

afford. The feasibility of getting to the public school is also much lower for marginalized children living in rural areas because often times there is no public school close enough for transportation to access conveniently (UNICEF, 2017).



*Figure 12: Learners at Namutoni Primary School (Namutoni, 2019)*

The children of Katutura fall into the category of marginalized children. Nenad Tomić is a volunteer at an after school program in Katutura, and he identified the main educational challenges as being poor teaching standards and poverty. The average completion rate in these Katuturan public schools is 37%, whereas the completion rate in a town school is 90% (N. Tomić, interview, May 10, 2013). A team of students from WPI conducted observational studies and teacher interviews in the Namutoni Primary School in Katutura, and their study showed that teachers were overworked by teaching large class sizes with inadequate resources. Additionally, the school was lacking materials necessary for education, such as textbooks and writing materials. Low attendance at this specific public school was caused by HIV/AIDS and the fact that some

students were required to walk up to 10 miles everyday to attend (Duarte et al., 2018 ). The learners of Katutura have a lower education achievement level because of increased barriers to receiving an education, such as those described previously.

The history of Katutura has created a marginalized community with a multitude of socio-economic problems, including historically underperforming public schools and students. In 1996, the level of education of the Katuturan population was assumed to be low due to the fact that a very small percentage of blacks were attending public school at that time (Pendleton, 1996, p. 69). The youth of 1996 has since become the current adult population, which is now severely uneducated. This poses a serious problem for the current youth population of Katutura because the issues that uneducated parents face are inherited by their children. The learners of Katutura therefore have a lower level of education attainment due to the issues that are passed down from their parents.

For children in marginalized areas like Katutura, a negative feedback cycle is perpetuated by the link between inequitable schooling and income inequality. Where access to education is limited, economic growth is stunted and socio-economic issues remain prevalent. Rates of illiteracy and unemployment remain high, health remains poor, and social division does not improve. Since marginalized children face more extreme barriers to receiving education, they are likely to get caught in the negative cycles of poverty and inequality. This is why, at this point in time, it is critical to reach the Katuturan youth to break the vicious cycle of uneducated parents raising uneducated children.

## 2.3 English Language Learners

English Language Learners, or ELLs, can be defined as students who “come from non-English-speaking homes and backgrounds, and who typically require specialized or modified instruction in both the English language and in their academic courses” (Partnership, 2013). With upwards of thirty languages spoken in Namibia, it is extremely important to gather research on how to best understand the situation of students and to individualize teaching strategies based on this. The teaching of English to students with different native or home languages using an English-only instructional model is known as *English as a Second Language* (ESL). These programs attempt to develop both English skills and academic knowledge simultaneously.

### 2.3.1 Understanding ELL

The first step in facilitating successful lessons with ELLs is getting to know the students in depth individually (Ford, 2014). Not only does this mean assessing the students’ English language proficiency, but also recognizing and appreciating students’ “prior academic experiences (or lack thereof), cultural and religious traditions, hobbies, personality, family circumstances, and background about the student's home community or native country that can inform their instructional decisions in the classroom” (Color in Colorado, 2016). Understanding where students come from is an important step to creating a welcoming classroom environment that engages the student in a way that fosters confidence and opportunities to collaborate constructively with peers of all backgrounds.

A strategy outlined by the educational services group, Color in Colorado, discusses the repeated use of games and icebreakers throughout the year that encourage students to share information about themselves. By continuing to cycle back into discussing students' lives and backgrounds, the teacher can develop a true understanding of where their students are coming from and how to best set them up for success. Not only is it important to ask questions that probe as to what the students' lives are, though, it is equally as important to build trust with the students through teachers sharing stories of their own personal background. As a piece of advice which relates to this, experienced ELL educator, Lydia Breiseth, wrote "tune in to what [your students] are saying, take notice of changes, and talk to your students about what you are observing" (Breiseth, 2018). Having open communication such as this is key to the success of fostering trust and a healthy environment for student achievement.



*Ice Breaker Dance at P.A.Y.*

### 2.3.2 Differentiated Instruction for ELL

Differentiation is a classroom practice that places emphasis on both student need and individualized classroom instruction. Variation of students with respect to "background experience, culture, language, gender, interests, readiness to learn, modes of learning, speed of learning, support systems for learning, self-awareness as a learner, confidence as a learner, independence as a learner, and a host of other ways" makes it difficult to reach every student academically using one method (Color in Colorado, 2016). This puts the responsibility on the teacher to guarantee that all students understand the essential content, regardless of how the student may learn, or what academic level they can currently comprehend. In their book on tackling academic differences within students groups, Tomlinson and Imbeau describe differentiation as "creating a balance between academic content and students' individual needs" (Tomlinson and Imbeau, 2010). They indicate that this balance can be achieved through the adjustment of four specific elements: content, process, product, and affect. Content refers to the academic material the students need to master, process is how students interpret and comprehend the content, product is how students display and apply what they've learned, and affect represents the thoughts and attitudes that influence the student learning environment. Theoretically through the adaptation of these four aspects, teachers should be able to adjust any lesson to meet all of their students' needs.

"Differentiating instruction is a matter of presenting the same task in different ways and at different levels, so that all students can approach it in their own ways" (Irujo, 2004). The key to differentiated instruction is that it is not a matter of teaching students different material, but rather it is teaching the same

material to all students in a way that they can process and understand it based on their individual needs. The main complication behind differentiated instruction is having the resources and time available as a teacher to create varying levels of instruction. This type of teaching involves a lot of premeditated planning as well as an intense depth of instructor involvement, so although it would be ideal, it is sometimes very difficult. Aside from differentiated instruction, there are many simple tactics that can be easily implemented to improve the education of ELLs including talking slowly and clearly, reading instructions out loud in addition to having them written for students, and defining technical terms at the beginning of lessons before using the words repeatedly. A school program in Namibia comprised entirely of ELLs faces a particularly challenging scenario because the students all have a different English language level. In order to give students the best chance of achieving an equal understanding of topics taught, a differentiated instruction based on language can be utilized.



*Students of Various Grades Present on their Project*

## 2.4 Elements of Teaching

The basis of every good education system comes with the combination of quality teaching and appropriate lesson planning. With a wide range of ever-evolving theorems and techniques dating back to the 1700s, it is imperative to start with identifying a teaching style that will cater specifically to the needs of the target audience.

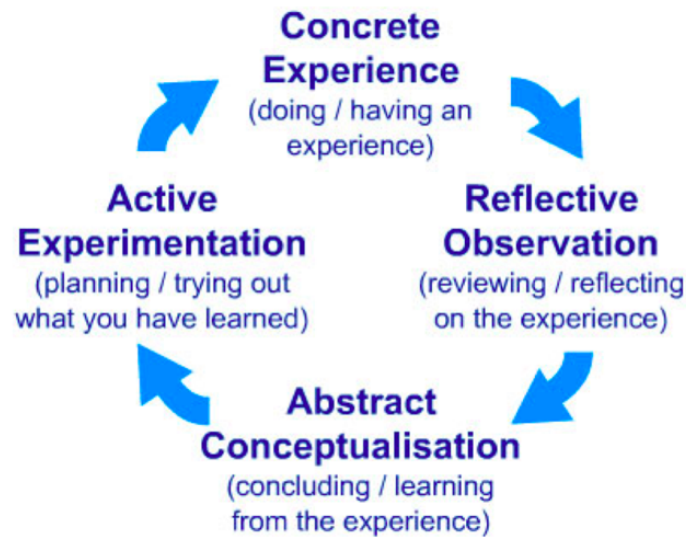
### 2.4.1 Learning Styles

In order to understand and identify the best approaches to teaching, it is important to recognize the process in which the target audience of students learns effectively. The likelihood that there will be a large range of learning styles is extremely high in any classroom, therefore the teaching style put into effect must incorporate ways to engage learners of all types.

Several theorists (Kolb, Gardner, McCarthy, Honey & Mumford, Dunn & Dunn) have investigated and formulated models to represent and explain learning styles. Cognitive styles refer to how learners process information through thinking, remembering, and problem solving. Personality type models describe learners' perceptions and approaches to tasks. Environmental models discuss characteristics of the learning context that promote or inhibit learning. Yet other learning style models focus on the abilities of learners themselves (Solvie, 2012).

There are a diverse range of models, such as these, that point to the vast variety of factors that influence learning. And as important as it is to explore learning style, it is equally as important to analyze the environment in which students are learning in order to utilize a teaching style that will best set

students up for success. With analysis of any classroom situation, it will be discovered that individual students take in information and their surroundings very differently, so teaching should always be flexible in order to effectively reach all students, no matter how they learn. Creating a teaching style that will tailor itself to the needs of the target student audience for this project will be achieved on the basis of the experiential learning theory of David Kolb, published in 1984. His developed learning cycle involves progression through four stages, as depicted in Figure 13 below.



**Figure 13: Learning Cycle Four Stages (McLeod, 2017)**

As represented above, the process involves the internalization and reflection of experiences in order to understand information in the ways of real world application. This type of connection to the real world is extremely important as it gives the student a solid way to remember and apply the information they are learning within their classroom to their everyday life.

Effective learning is achieved when the student advances through the four stages, which lead into one another cyclically, and concludes by using their acquired knowledge in future experiences. The subsequent section will discuss teaching strategies that enable students to progress through these learning stages successfully.



**Learners at P.A.Y.**

### 2.4.2 Teaching Strategies

Through consideration of instructing a wide range of learning styles and abilities, the teaching style and lesson planning method to be implemented for this project will be primarily composed of a hands-on learning approach. This will set up students to complete the four stage learning style as discussed in the previous section. Per definition, any “instructional approaches that involve activity and direct experiences with natural phenomena have become collectively known as *hands-on science*” (Haury, 1994).



Interactive teaching has the power to reach the majority of students in that it is extremely engaging. Rather than learning passively within the classroom (i.e. listening to lectures, watching educational films), students are encouraged to actively participate in the curriculum and see topics come to life before them. This not only enhances the students' ability to think critically, but also presents the information in a way that excites the learner.

Benefits for students are believed to include increased learning; increased motivation to learn; increased enjoyment of learning; increased skill proficiency, including communication skills; increased independent thinking and decision making based on direct evidence and experiences; and increased perception and creativity. Research supports many of these claims by providing evidence that the learning of various skills, science content, and mathematics are enhanced through hands-on science programs. Students in activity-based programs have exhibited increases in creativity, positive attitudes toward science, perception, logic development, communication skills, and reading readiness (Haury, 1994).

Since hands-on learning can be fun and engaging, it is beneficial to students by reducing concerns of science anxiety and academic avoidance. A hands-on teaching approach greatly aids in keeping students engaged and interested in the subject matter because it enables students to remember the material better, feel a sense of accomplishment when the task is completed, and have the ability to transfer their experience more easily to other learning situations.



*The Students' First Experiment*

## 2.5 Stakeholders

Stakeholders are defined as “ individuals or entities who stand to gain or lose from the success or failure of a system or an organization” (Godwin & Gross, 2005). The team recognizes four stakeholders for this interactive qualifying project: the sponsor, Physically Active Youth (P.A.Y.), the learners at P.A.Y., the educators at P.A.Y., and the community connected to P.A.Y..

### 2.5.1 Physically Active Youth

The primary stakeholder is the team's sponsor, Physically Active Youth, which is an advocacy non-government organization started in January 2003 as a pilot program run by Dr. Donovan at the Multipurpose Youth Resource Centre in

Katutura, Windhoek. The organization was created with the original aim of “testing how sport can impact the performance of learners [students] at school” (Halwoodi, 2015). After the program took off, it was clear that there was a need to introduce other educational programs in order to help the youth develop into strong leaders with the ability to fill critical and positive roles within their community (Halwoodi, 2015).

P.A.Y. began with only thirty-five grade ten students, but now has a regular attendance of eighty plus students ranging from grades first through twelfth (Halwoodi, 2015). The organization is currently a community-based after-school project registered under Section 21 of the Company Act of 1973 because it is “controlled by the members and managed by the directors”. Additionally, all profits and income support its main objective of promoting education, recreation, social, cultural, and arts activity (VDMACorporate Commercial Attorneys, 2010).

Run by only six full time staff members and countless volunteers, P.A.Y. upholds their mission “to nurture self-confidence, critical thinking, and active citizenry in young Namibians coming from disadvantaged backgrounds who will build a more equal and knowledge-based Namibia” (P.A.Y., a).

To help support and facilitate the healthy development of youth in an at-risk context in low-income neighborhoods, P.A.Y. believes in a holistic approach. They recognize that social, educational, and physical components are all equally influential in youth development and, in response, have established a three-pillar approach to support this idea (P.A.Y., b). The first pillar is an all-encompassing education program with emphasis

on developing the child’s body, mind, and spirit. The second pillar involves physical exercise in the form of sports, which enables children to practice inclusivity, break down barriers, and improve attitudes. And P.A.Y.’s final pillar comprises of life skills, which encourages value of self, equality, fostering well-being, and environmental sustainability.



### *Life Skills Pillar*

The three pillars can be seen in action during the program’s day to day activities. For example, because “better child nutrition is positivity associated with education and income in Katutura”, every day the P.A.Y. staff prepares lunch for the students (Pendleton, 1996, p. 77). Upon arrival, students are

able to enjoy a nutritious meal, often their first of the day, before they break off into an hour of homework assistance in support of their education. From 3 o'clock to 4 o'clock Monday through Thursday P.A.Y. facilitates an educational lesson to supplement the material that children receive from their public school. On Friday, the staff at P.A.Y. take this hour to deliver a life skills lesson to the children. Occasionally, they even have the opportunity to bring in local professionals to share their experiences with the students. The last hour of every day is dedicated to organized sports including swimming, soccer, cycling, chess, gymnastics, and karate, some of which are shown in the images below.



*Three Learners Eating Lunch*



*Physical Activity Pillar (Top: Cycling, Bottom: Chess)*

P.A.Y., due to a minimal budget and inadequate supplies, is requesting new education lesson plans focused on science for their upper primary students, grades five to seven. These lesson plans would be used during the hour long education sessions, and would be essential in continuing to support the learners' youth development and to foster an environment of continual growth.

## 2.5.2 Learners

The second group of stakeholders are the students of P.A.Y. (referred to as learners in Namibia), who are directly affected by the program. These learners are a group of at-risk and underprivileged youth from Katutura neighborhoods; "Some come from abusive families, some come from neglectful families, but most come from families that are simply poor" (Pendleton, 1996, p. 77). Each day, learners may walk up to ten miles to reach P.A.Y. where they receive their first meal of the day before having the opportunity to get homework assistance, educational lessons, and a sports activity.

The learners are critical stakeholders in the lessons because they are the ones who need to receive a well-rounded education in support of their healthy development (Shafer, 2016). In addition, "young people have a perspective on the world that adults can't share, and that perspective should be welcomed alongside the wisdom that adult perspectives bring" (Shafer, 2016). This ideology emphasizes how important it is to have the learner's voice and opinions heard throughout the creation of I. In this sense, the lesson plans aim to foster the engagement of students with each other, their community, and their teachers to increase their personal participation and responsibility for

their own learning (National Education Association (NEA), 2019).

More specifically, the lessons will be taught to learners in grades five through seven to aid in closing the educational gap by supplementing their educational learning from public school. According to their Programme Manager and Coordinator of Junior Programme Component, Miss. Ursula Matzopoulos, many learners cannot recall their multiplication tables or understand the basics of graphs. Learners take exams in their public schools which require drawing graphs, but when presented with these assessments, it is more often than not the first time they have seen and worked with graph paper. Also, according to both Miss. Matzopoulos and Miss. Thubaelihle Sibanda, P.A.Y.'s Integrated Sports and Life Skills Coordinator & Coordinator of Senior Programme Component, many learners struggle with utilizing English since they revert back to their mother tongue when they finish school for the day.



*Grade 5-7 Learners of P.A.Y.*

The learners are direct stakeholders, receiving the most benefits directly from the program. Through different lessons, learners can become more familiar with their everyday surroundings and see how things work from a scientific perspective. Additionally, the modules will highlight a variety of different areas to inspire and empower the learners to dream bigger and discover more in the world outside of where they come from.

### 2.5.3 Educators

The educators at P.A.Y. who mentor, instruct, and influence the learners are the third primary stakeholder group. This group includes the directors, instructors, staff, and countless volunteers which dedicate their time to carrying out P.A.Y.'s mission. Since educators “are able to play a vital role in supporting learners and addressing psychosocial issues in the school and community” it is critical to have all educators on board supporting the program's efforts, so that their positivity can influence the energy of the learners (National Education Association (NEA), 2019). Additionally, the educators will directly benefit from the lessons created because they will have new material to teach and more interactive techniques to increase engagement of learners.

### 2.5.4 Community

The fourth and final stakeholder of module development is the Katutura community and beyond. P.A.Y.'s “programme provides an opportunity for support and volunteerism, thereby enabling all Namibians to take ownership of the future of their own community” (Halwoodi, 2015). Over the last sixteen years, P.A.Y. has relied on over five hundred volunteers to

assist in delivering their program objectives (P.A.Y., c). During their life skills program on Fridays, P.A.Y. utilizes community-based learning: the “belief that all communities have intrinsic educational assets that educators can use to enhance learning experiences for students” (Partnership, 2013). To do this, P.A.Y. recruits current professionals, such as local doctors, to come speak to the learners about their experiences and profession, enabling learners to see what they also have the potential to do one day. The community is a direct stakeholder, in that they supply volunteers to help implement lessons and be role models for the learners. Additionally, the learners will use what they have learned at P.A.Y. to apply to their community for years to come.



*The P.A.Y. Community Celebrates Independence Day*

## 2.6 Summary

In summary, Katutura, while seemingly close to Namibia's capital of Windhoek, has immense differences in education, social expectations, and income compared to the rest of Windhoek's population. Lack of supplies, hidden costs, and transportation issues affect both national and local education and stunt the development of the community's youth. Lack of resources for teachers and poor pedagogy are also factors that limit learner comprehension in schools across Namibia. Appropriate pedagogy for learners in Namibia should include lesson plans that are logically organized, ask engaging questions, connect concepts to real life with relevant examples, and include a variety of activities. Per request, a team of WPI students will be developing science lesson plans for Physically Active Youth (P.A.Y.), an after-school program in Katutura. Physically Active Youth's mission is to support and aid youth during their development through the incorporation of education, physical activity, and social engagement. The main goal of this holistic three pillar approach is to create better leaders for the future to combat the current challenges facing Namibia.



*WPI Team with Stakeholders (Top: Staff, Bottom: Learners)*

# Chapter 3: Methodology



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# Chapter 3 Methodology

The primary goal of this project was to develop a series of lesson plans and teaching strategy recommendations for an after school program in Katutura, Namibia. The scope of this project limited the proposal of “teaching strategies” to the following two elements:

1. Lesson Plan Outline: The key elements necessary to a lesson plan for the teacher to be prepared for delivery on the basis of national Namibian educational standards and continual student engagement.
2. Lesson Delivery: The pedagogical approach that teachers deploy to be successful in achieving lesson objectives.

The definitive project deliverable was the accumulation of recommendations and teaching materials within a guidebook that was left at P.A.Y. for future use. More specifically, this project aimed to design and implement successful engaging lesson plans for grades five through seven at Physically Active Youth that supplement the topics learned in school. The following objectives guided the project:

- |  |
|--|
| Objective 1: Identify the Components of a Successful Lesson Plan |
| Objective 2: Create and Implement Lessons within Katutura        |
| Objective 3: Evaluate Success and Deliver Recommendations        |

## 3.1 Objective 1: Identify Components of a Successful Lesson Plan

### 3.1.1 Research

One goal of this project was to understand the components of a dynamic lesson plan, which the team defined as a lesson plan that is both engaging and constantly developing to fit the needs of the students. Additionally, a dynamic lesson plan must be effective in presenting and teaching the given material. Through research, the team concluded that a dynamic lesson plan is formed on the basis of a number of criteria. These components not only engage students and encourage them to actively participate in lessons, but also successfully provide the fundamentals of the teaching material. The most important characteristic of a dynamic lesson plan was discovered to be that it must provide the means for students to develop skills that are transferable to settings beyond the classroom.



*Students Learn About Different Places in the World*



Before having the ability to create a dynamic lesson plan, it was key for the team to identify the current curriculum strengths and weaknesses of their classroom and conduct an up-to-date needs assessment. Once knowledge was gained on *what* was needed to be taught, the new problem at hand became, *how* it should be taught. David Kern, associate professor in the Department of Medicine at the John Hopkins University, developed a six-step approach to creating a successful curriculum, which is as follows:

- (i) Problem Identification and General Needs Assessment
- (ii) Targeted Needs Assessment
- (iii) Goals and Objectives
- (iv) Educational Strategies
- (v) Implementation
- (vi) Evaluation and Feedback (Nygaard, 2008)

In order to create a successful program for P.A.Y., these methods of evaluating current knowledge base, solidifying teaching strategies, facilitating lessons, and evaluating success were utilized by the team of WPI students before arriving in Namibia. The team also analyzed various methods of which to create lesson plans. A lesson plan is defined as a comprehensive description of the specific lessons that a teacher plans to teach on a given day. The instructor utilizes lesson plans as a means of preparation to guide their teaching throughout the day. “A lesson plan traditionally includes the name of the lesson, the date of the lesson, the objective the

lesson focuses on, the materials that will be used, and a summary of all the activities that will be used” (Meador, 2017). There are a number of different routes instructors can take in order to teach the material they are given, however, every effective lesson plan has a number of aspects in common. Lesson planning is most powerful when it focuses on the short-term while always being conscious of the long term. It must also be sequential in building skills; primary skills being introduced first before building up to more difficult skills (Tsui, 2002).



***Student Showing Off His Lungs in a Bottle Model***

Every well-organized lesson plan is formed first through having a specific objective or objectives, which are the definitive goals that students should obtain through participation in the lesson. Following in the lesson plan is the topic’s introduction, which should be both attention-grabbing and interesting to the student body. In many cases, with no

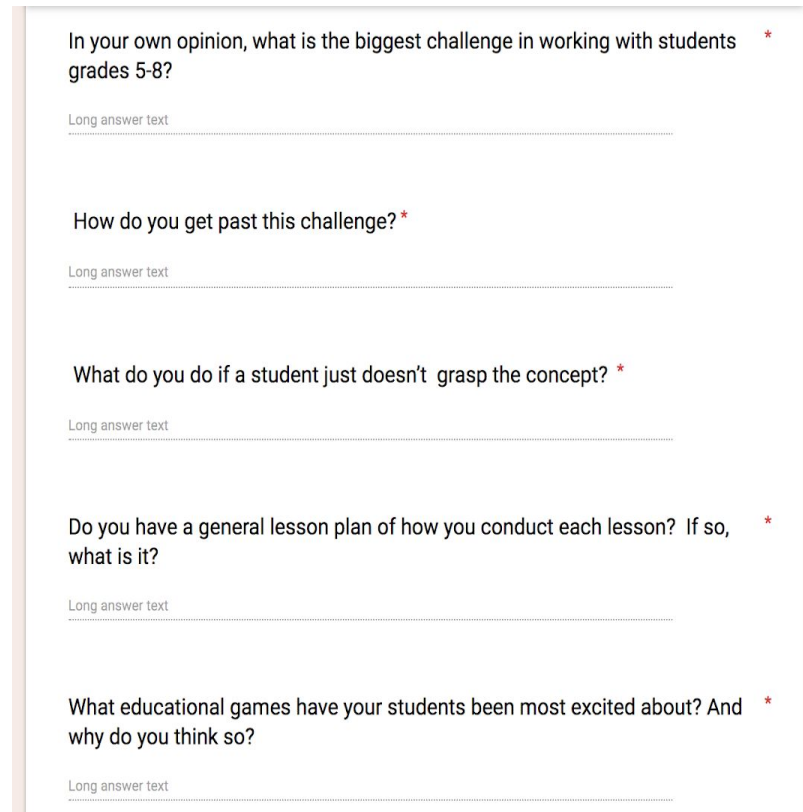
exception to teaching in Katutura, it is extremely important to teach lessons which apply directly to the world around the student. Showing real-world applications can be the best, and sometimes only, way for students to conceptualize certain ideas and models (Meador, 2017).

Delivery of the main topic material follows the introduction in the form of lectures, activities, and more, and once the educator has completed their teachings, student assessment begins to take form. Students should always be given a variety of assignments, which both challenge their knowledge and allow them to refine their skills in the topic. Through work on guided practice problems completed with teacher assistance and independent work, students can grasp the concepts that were taught in the classroom setting. If they cannot complete the independent work, it is evident that the lesson may need reinforcement.

### 3.1.2 Teacher Questionnaire

The first method of data collection was a teacher questionnaire. The purpose of this questionnaire was to gain insight into what makes an engaging lesson, discover obstacles which may be encountered in day to day teaching, and to help prepare the team for teaching students and working alongside other teachers. Using a convenience sample, the team sent the questionnaire to twenty teachers of grades five through seven who had diversity in terms of experience level, gender, and

school district. Highlights of some of the types of questions can be found in the Figure 14 below.



In your own opinion, what is the biggest challenge in working with students grades 5-8? \*

Long answer text

How do you get past this challenge? \*

Long answer text

What do you do if a student just doesn't grasp the concept? \*

Long answer text

Do you have a general lesson plan of how you conduct each lesson? If so, what is it? \*

Long answer text

What educational games have your students been most excited about? And why do you think so? \*

Long answer text

*Figure 14: Teacher Questionnaire Sample*

The teacher questionnaire can be found in full in Appendix A.1. The data from the teacher's responses was reviewed by the team and utilized while creating lesson plans.

### 3.1.3 Sampling Procedures

In order to identify the components of a successful lesson plan, the team determined that they would need to identify a sample of teachers that would be willing to provide insight on their experiences within the classroom and on their knowledge of teaching. This sample brought valuable data to the team which could only be gained through teaching experience, of which no team members had. The team determined that the most effective way to arrive at an effective lesson plan would be to access the expertise of professional teachers. In order to obtain this data, the team utilized a convenience sample. A convenience sample is a sampling method that relies on data collected from a group of participants who are easily accessible and available to participate in the study. Typically, there is no inclusion criteria identified before collecting data, and all subjects are invited to participate (Dudovskiy, 2019).

The potential downsides of using a convenience sampling method include the inability to generalize research findings and the potential of bias and sampling error. The goal of this data collection, however, was only to better understand qualities that make up a dynamic lesson plan and facilitation. The data was treated as suggestions and was used as guidelines to develop and improve lesson plans and teaching styles that were ultimately implemented at P.A.Y. Since the goal of this study was not to arrive at a generalizable understanding of an ideal lesson plan, but rather to create a high quality lesson plan

template for further testing, the team determined that a convenience sampling procedure was most appropriate. For the team's convenience sample, data was collected from educators within the Massachusetts Public School System, who have a personal or professional connection to one or more of the team members.

### 3.1.4 Lesson Plan Data Collection

In order to solicit feedback on one of the team's lesson plans from experts in the field, a plan for data collection was developed. Since the team was not seeking to determine what a representative lesson plan was within the population of teaching experts, but rather simply aimed to produce a high quality lesson template, data was collected utilizing the same convenience sample as the teacher questionnaire.

For this data collection, the team sent its developed lesson plan to a series of teachers within the convenience sample one teacher at a time and requested feedback on how it could be improved. Each time the team received feedback, they made improvements to the lesson plan before sending it to the next teacher. This process was repeated until no new improvement suggestions were made, which is considered the point of "data saturation". Data saturation is defined as the point where no additional data is being discovered, and this was the criteria used for when to conclude the period of data collection. The main goals of this data collection were to identify requirements for a successful and engaging lesson and to create a strong

lesson framework that could be used as a baseline for creating lessons in the future.

### 3.1.5 Worcester Practice Lesson

The team realized that both the content of the lesson and the quality of teaching weigh equally on the success of the lessons to be implemented. For example, without energetic facilitation, a lesson could easily fall flat and not achieve its student engagement and comprehension targets. Additionally, it is crucial for teachers to pose probing questions, vary their inflection, and provide relevant examples in order to maximize student take away from the lesson. The team decided that the best way to ensure effective co-facilitation would be to teach a practice lesson to a classroom in the United States.



*Team Teaching at Norrback Avenue School*

The team found a participant in the original convenience sample who was willing to let them come in and teach a lesson

to their 5<sup>th</sup> grade class at Norrback Avenue School in Worcester, MA. Teaching this practice lesson allowed team members to evaluate their teaching techniques and ability to grab the attention of students. In addition, it gave the team more confidence in teaching lessons and gave them the opportunity to collect data on lesson flow and potential teaching obstacles. This data was essential for the team to revise lesson facilitation before implementing lessons at Physically Active Youth.

## 3.2 Objective 2: Create and Implement Lessons in Katutura

Physically Active Youth identified the need for engaging science lessons for their learners in order to reinforce what is taught in school and spark interest in STEM fields. To do this successfully, the team identified the following three steps: creation of initial lessons, implementation and observation of lessons, and refinement and creation of additional lessons.

### 3.2.1 Lesson Topic Selection

The first set of lessons was created before arriving at P.A.Y. and were taught during the first week there. These lessons were designed to be a length of 1-2 hours long, and were created to engage students through energizing and hands-on activities. The first step in the creation of the lessons was topic selection utilizing national educational standards. The National Namibian Institute for Educational Development is a division

of the Ministry of Education that establishes syllabi for each grade level and outlines the topics and competencies that schools are expected to cover. Based upon these standards, the team created a topics calendar (Figure 15) to outline the topics to be covered during their lesson implementation at P.A.Y. The topics were pulled from the national science syllabus for the senior primary level which covers grades five through seven. Any lessons that the team did not get the opportunity to teach were left with the organization to be used at a later date.

## March

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
10	11 Intro + Tour of Katutura	12	13	14	15	16
	Week 1: Introduction and Scientific Method					
17	18	19	20	21 Independence Day	22	23
	Week 2: Matter					
24	25	26	27	28	29	30
	Week 3: Environment					

## April

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
31	1	2	3	4	5	6
	Week 4: Living Organisms					
7	8	9	10	11	12	13
	Week 5: Human Body Systems					
14	15	16	17	18	19 Etosha National Park	20
	Week 6: Holiday (P.A.Y. is closed)					
21	22	23	24	25	26	27
	Week 7: Holiday School					
28	29	30				
	Week 8: Holiday School					

Figure 15: Topics Calendar

After deciding on topics, the next step was to design the individual lessons. Lessons were composed according to the following template:

<b>Lesson: Template</b>
<b>Objectives:</b> Learners will be able to <b>Standards Covering:</b> <i>(Taken from Namibian Syllabi)</i> <b>Materials:</b> <b>Prep-Work:</b>
<b>Energizer (5 mins):</b>
<b>Key Vocabulary:</b>
<b>Activity (35 mins):</b>
<b>Debrief/Recap (5 mins):</b>
<b>Lesson Plan for Next day:</b> <b>Future Lessons:</b>
<b>Sources:</b> <b>Work Cited:</b>
<b>Feedback:</b>

Figure 16: Lesson Template

Feedback from the teacher questionnaire and the lesson data collection from the first objective were used to create the first five lessons. Each lesson began with an energizer, which is a brief activity that gets the group engaged through physical movement or discussion. Additionally, the team ensured that the energizer chosen for each particular day related directly to the topic of the previous day's lesson. This was intended to spark engagement among the learners and to reinforce previously taught topics. After the energizer, team members would introduce the main topic of the day and teach new information that is pertinent to the understanding of the material. The goal of this segment was to explain the material in a way that students were able to connect to their everyday life, thus improving their comprehension of the topic. Finally, the last twenty-five minutes of the lesson was typically dedicated to an activity that required participation from the students. This included a variety of activities such as group discussions, worksheets, or partner activities.

### **3.2.2 Pre-Assessment**

In order to form a base of student knowledge at P.A.Y., a pre-test was administered prior to the team implementing their lessons. The pre-assessment was administered by the team on the first day of class, and consisted of a broad range of topics, all of which the team planned to cover during their time at P.A.Y. This pre-assessment provided the team with information regarding how well learners understood certain topics in science. Using this information, the lessons that the

team implemented were tailored to the needs of the learners at P.A.Y. to ensure that they received an education based upon the National Curriculum of Basic Education that Namibia's Vision 2030 outlines. The full document of pre-assessment questions can be found in Appendix A.3.

### **3.2.3 Implementation Cycle**

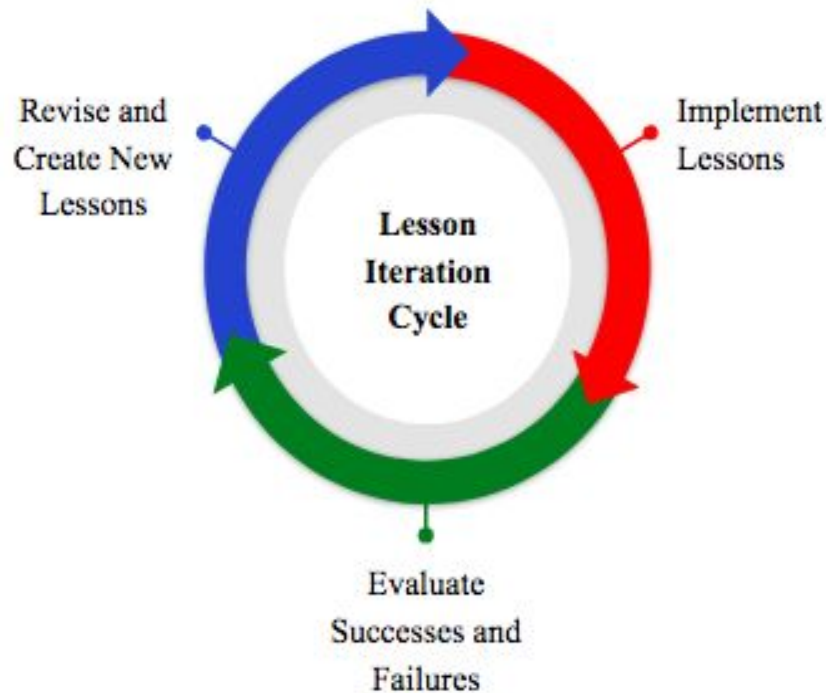
Lessons were made on a continuous basis, and were refined as the students' needs saw fit. As the team taught each day, they made observations and later reflected on the strengths and weaknesses of lesson content and facilitation. In addition, the team paid close attention to how students reacted to each part of their lessons in order to gauge their students' level of engagement. At the end of each school day, the team had a meeting to discuss their individual observations from the day and compiled these into a master list. Some of the questions investigated during these self-reflections include:

1. How was the day's lesson engaging, and how could it be improved upon or utilized in future lessons?
2. Was there anything specific that could have affected that day's lesson? If so, what?

At the end of each week, the team would re-address these notes and decide what the main takeaways from the week were. Using this feedback, the team made adjustments to their

teaching strategies, so that the lessons were constantly improving and achieving greater effectiveness.

The process described above is called the Lesson Iteration Cycle. Each week lessons were created, implemented, and reflected upon. These reflections were then used to create the next week of lessons. Figure 17 summarizes the iteration cycle of creating and implementing lessons.



*Figure 17: Lesson Iteration Cycle*

### 3.2.4 Instructional Performance Review

In order to receive feedback on the team's performance as amateur teachers, a video feedback method with a multitude of steps was utilized. First, the team filmed the classroom each day as they taught, demonstrated, and facilitated activities with the students. Upon completion of each day's work, the team cut the video down to a handful of approximately ten minute key segments. The team removed any transitions, independent student work, etc. so that the feedback received was solely based on important aspects of delivery. Once the videos were cut down to the necessary footage, they were submitted by email for review by a roster of identified reviewers. In order to receive feedback, Vimeo, an interactive annotation tool, was used where reviewers could timestamp and comment on videos as they progress. This was a key aspect of the team's methodology because, similarly to the teacher questionnaire, it allowed the group to refine their teaching processes based on the advice of trained professionals.

### 3.3 Objective 3: Evaluate Success and Deliver Recommendations

During this portion of the project, the team utilized various methods of data collection to evaluate success in achieving project goals. Through a post-hoc assessment, student satisfaction survey, and sponsor interviews, the team was able to assess the engagement and overall effectiveness of the implemented lesson plans.






### 3.3.1 Post-Hoc Assessment

In order to collect quantitative data to drive the team’s final recommendations, the team utilized a post-hoc assessment. Post-hoc means that the assessment is occurring after the event and doesn't suggest that there was an assessment that happened beforehand. The post-hoc assessment consisted of questions referring to specific engaging activities the students participated in over the course of the project. The goal of the post-hoc assessment was not to see if the students were able to improve from the pre-assessment, but rather if they were able to recall what they learned from lessons. This evaluation allowed the team to gauge how effective their teaching strategies were. The post-hoc assessment questions can be found in Appendix A.4.

### 3.3.2 Stakeholder Feedback

Upon completion of the team’s time at P.A.Y., they collected data from two of their stakeholders: the learners at P.A.Y. and the team’s sponsors, Thubaelihle Sibanda and Ursula Matzopoulos. The first form of data collection was a satisfaction survey that was administered to the learners in grades five through seven. The survey was intended to expose which activities the learners enjoyed the most and which they enjoyed the least. The learners were asked to rate sixteen activities on a scale of zero to five, zero being they don’t remember the activity, one being they disliked it, and five being they loved it. Figure 18 below shows the scale which the learners were given to rate the activities.

Using this data, the team was able to give recommendations for creating engaging activities for future lessons knowing which activities the students preferred. The survey can be found in full in Appendix A.5.

						
<b>A</b> You were NOT in class	<b>0</b> You don't remember the activity	<b>1</b> You hate the activity & never want to do it again	<b>2</b> You disliked it	<b>3</b> It was okay, you don't feel strong about liking it or not liking it	<b>4</b> You liked it	<b>5</b> You LOVED it & want to do it again

*Figure 18: Satisfaction Survey*

The second mode of data collection from stakeholders came in the form of interviews with P.A.Y. staff members Ursula Matzopoulos (Programme Manager & Coordinator of Junior Programme Component) and Thubaelihle Sibanda (Integrated Sports and Life Skills Coordinator & Coordinator of Senior Programme Component). The goal of these interviews was to better understand how they viewed the team’s overall success and provided a chance to give feedback that could be taken into account for future projects.

The interviews followed a semi-structured interview guide, which had predetermined questions and topics to cover, while



also providing room for interviewers to probe for elaboration depending on the interviewee's responses (Zorn). The team chose this interview style because it allowed for the same topics to be covered with each interviewee while maintaining the conversational nature of the team's day-to-day interactions with the P.A.Y. staff members. This interview style also allowed the team to obtain responses on the same topics while allowing the P.A.Y. staff members to add anecdotes as they wish. If the staff member's response to a prepared question sparked a topic that would provide beneficial information for future recommendations, the team steered the conversation towards elaborating more on that topic. To view the interview guide, please refer to Appendix A.6.

### 3.3.3 Recommendations and Deliverables

The final step in the team's methodology was to compile and analyze all of the collected data in order to create an extensive guidebook to be left behind at P.A.Y. The guidebook included all of the team's lesson plans, worksheets, reflections, videos of lesson facilitation, and further teaching recommendations. Observations and reflections included the student learning environment, Namibian curriculum standards, knowledge of learners, and stakeholder feedback. The team also left recommendations on the teaching strategies which yielded the highest levels of learner engagement and lesson satisfaction throughout the five week program. The compilation of recommendations aimed to give P.A.Y. long term success in their education programs.



*Top: Supplies to Be Left at P.A.Y, Bottom: P.A.Ys Current Books*

### 3.4 Summary

This project’s mission was to evaluate success in the design and implementation of a five week lesson plan delivered to the students of Katutura, Namibia in order to form recommendations for its sponsor to continue active student learning. To accomplish this goal, the team first conducted research to identify the components of an engaging lesson plan. These components were determined using a teacher survey, lesson plan feedback which utilized data saturation, and the run-through of a lesson at a Massachusetts public elementary school. Using this information, the team developed a number of lesson plans to be implemented at P.A.Y. Through classroom observation, daily team discussion, and video feedback, the lessons were continuously refined and edited to become the best version they could be. Upon completion of the five weeks of teaching, the team reached out to its stakeholders at P.A.Y. with surveys and interview questions, to gauge how successful their lessons were to those most directly affected. From these methods, the project provided final recommendations for how P.A.Y. should educate their learners, as well as a guidebook of which teachers can use for training or for future lessons and worksheets.



*Collage of Weekly Lesson Topics in Student Review Activities*

# Chapter 4: Findings



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4.2 Implementation Data
4.3 Evaluation Data

# Chapter 4 Findings

In order to reach the team’s goal of providing recommendations as to how to create engaging lesson plans for Physically Active Youth, a multi-phase process, as described in detail in the methodology section, was utilized. The three phases, or objectives, include research through data collection before arriving in Namibia, project work during lesson plan implementation in Namibia, and finally deliverables. Because the process involved data analysis after each phase in order to apply it to the next, the following section is compartmentalized into the data and analysis for each of the three objectives.

## 4.1 Preparation Data

The goal of the first objective was not only to gain information on creating lesson plans, but also to understand the ins and outs of lesson facilitation. This understanding came through the collection of expert advice on both lesson planning and lesson facilitation. The following section outlines the data and analysis from the three data collection methods the team used during the first stage of data collection: a teacher questionnaire, lesson feedback collection, and a practice lesson at a public Worcester, MA elementary school.

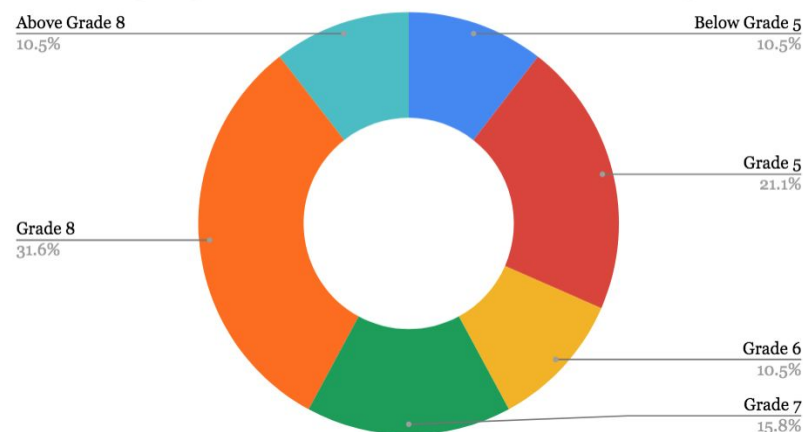
### 4.1.1 Teacher Questionnaire

The teacher questionnaire, which can be found in full in Appendix A.1 was the first method of data collection utilized.

The questionnaire consisted of twenty questions which aimed to give the team information on creating and facilitating engaging lessons per advice of experienced teachers.

Once data collection concluded, there were a total of fourteen respondents to the questionnaire, all of whose answers can be found in Appendix B.1. An figure of responses is found below, and upon completion of reading and discussing the responses, the team created the main takeaways chart, which is on the following page.

**Teaching Experience Within Convenience Sample**



**Figure 19: Teaching Experience Within Convenience Sample**

This graphic shows that the convenience sample provided the team with a varying range of teacher experience, with the most having experience in teaching the eight grade.

Topic	Main Takeaways
Lesson Planning	<ul style="list-style-type: none"> <li>✓ Have a <b>Lesson Outline</b>: Warm-Up, Mini Lesson, Workshop (Various Activities with Academic Choice), Wrap-Up</li> <li>✓ Utilize Any Activities that Offer <b>Movement</b>, Student Choice, and Group Work</li> <li>✓ <b>Align Standards</b> with Assessments and Vary Instructional Methods</li> <li>✓ Use <b>Project Work</b> and Group Work!</li> </ul>
Classroom Environment	<ul style="list-style-type: none"> <li>✓ Take the Time to <b>Build a Community</b> of Learners</li> <li>✓ <b>Connect</b> with the Students - Understand Who They Are</li> <li>✓ <b>Be Mindful</b> that Your Class is Probably Not the Most Important Thing in the World to Them</li> <li>✓ <b>Be Excited</b> About What You Teach!</li> <li>✓ Foster an Environment of <b>Trust</b></li> <li>✓ <b>Plan Ahead</b> and Keep the Students Busy</li> </ul>
Potential Roadblocks and Solutions	<ul style="list-style-type: none"> <li>✓ <b>Roadblock</b>: Student's Fear of Failure <b>Solution</b>: Create Assessment System Where Learning from One's Mistakes is Rewarded</li> <li>✓ <b>Roadblock</b>: Keeping Students Engaged <b>Solution</b>: Mix Up Activities</li> </ul>
General Advice	<ul style="list-style-type: none"> <li>✓ You are Much More a Coach than an Evaluator, <b>Be Supportive</b></li> <li>✓ Give <b>Constant Constructive Feedback</b>; Encourage Improvement in Small Increments</li> <li>✓ <b>Remain Patient</b> with the Students and Remember You Are There to Teach Them Content, but Your Presence will be Helping Them Become More Socially Aware Too</li> </ul>

*Figure 20: Teacher Questionnaire Main Takeaways*

The main takeaways outlined in Figure 20 above were not only answers that were repeated by many teachers, but also pieces

of advice that the team, with no prior teaching experience, found very valuable. The team divided the chart into four main sections: lesson planning, classroom environment, potential roadblocks and solutions, and general advice. These were the four target areas in which the team hoped to gain insight, as these are the bits of pedagogical advice that are best discovered through the words of actual teachers rather than online research.

### 4.1.2 Lesson Feedback Collection

To create the basis of a lesson outline to be used for lesson iterations while in country in Namibia, the team found that the teachers used for the teacher questionnaire were willing to give feedback in the form of edits on an established lesson plan. The team created a model lesson plan and sent it out to teachers one by one, receiving feedback and making the revisions before sending it to the next teacher. The teachers made edits in one of two ways. The first option was direct editing on the document, which can be seen in Figure 21, and the second option was creating comments on Google Docs, as seen in Figure 22. These qualitative methods of data collection allowed for teachers to fully express their reactions and criticisms to the lessons with no boundaries. This qualitative data was essential to the team's ability to create a fully refined lesson plan.

**Debrief/Recap (10 mins):**

How many people became butterflies?  
 Who was first to become a butterfly?  
 For them specifically, what was a challenge they faced? (i.e., ~~ie~~ trying to wait for the next caterpillar ~~to arrive to so can play against them~~)

How many people were ~~able to make it forward to become a~~ caterpillar?  
 How many people were ~~able to make it forward to become a chrysalis -crystallizes?~~  
 How many people remained an egg ~~for the entire game?~~  
 How many other eggs did you compete with but lost every time?  
 Discuss: The actual time frame in each part of the life cycle  
 Why do you think ~~some players people~~ never advanced ~~through in~~ the life cycle?  
 Discuss: ~~This happens to butterflies too- Why don't all butterflies complete the steps in the cycle? (die due to weather conditions, predators, chemicals, nature, etc.)-~~  
 Any other comments or questions about a butterfly life cycle?  
 Did we like this activity?  
 Tomorrow we will talk more about how things evolve.

~~The stages of their life cycle. (Use the same terminology/vocabulary words throughout your lesson)~~ how they are created. Butterflies need to complete four phases before they are actually butterflies. Does anyone know what one phase or stage is called? *Instructor can write vocab terms on the chalkboard, if no student knows then proceed to introduce them. A good question to ask in advance, to help them wrap their heads around the idea of the changes a butterfly goes through: Do humans look the same during their entire life?*

**Figure 21: Teacher Direct Edits on Lesson**

After the team received feedback from an educator, they reflected upon which notes were applicable to teaching learners in Katutura and applied the changes that the teacher suggested. This revised lesson plan was then sent to the next teacher and the process repeated itself. The starting lesson plan, which can be found in Appendix A.2 was sent to a total of six teachers before data saturation was reached, at which point the teachers had no further feedback.

Respondent 2  
5:11 PM Feb 17

Resolve

These are all great reflection questions. If you change the game they may need to be adjusted a bit. Could you play the game you created with dice instead of rock, paper scissors?

Respondent 2  
5:14 PM Feb 17

Resolve

Perhaps before drawing the phases on their own, they can practice with labeling first. The culminating activity might be the whole group working together to create a large mural of the cycle that can remain on a wall or blacktop somewhere.

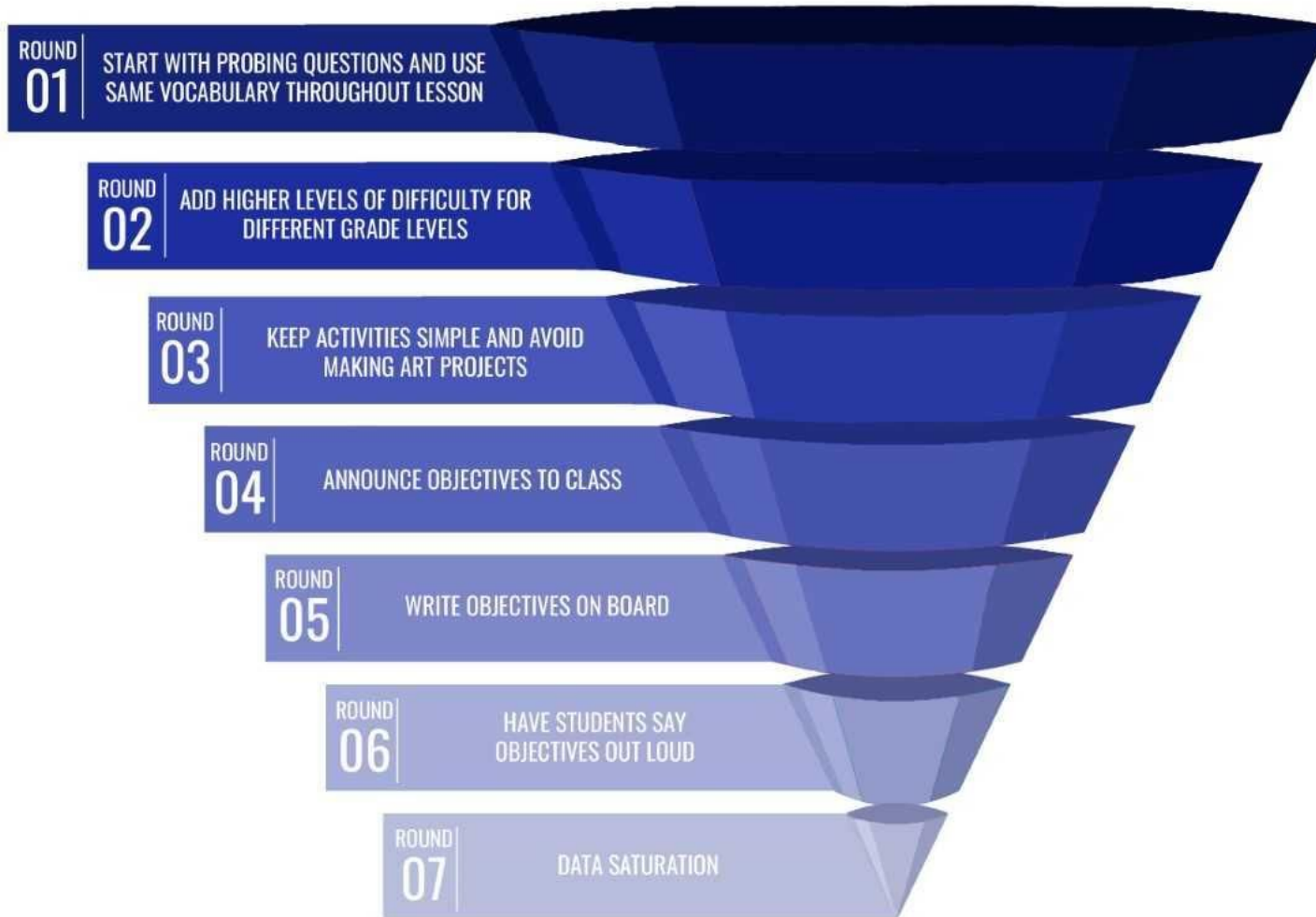
**Figure 22: Teacher Comments on Lesson**

Although the full set of responses from teachers can be found in Appendix B.2, through discussion of feedback, the team determined the most prominent lesson changes, or main takeaways from each round of feedback and outlined them in Figure 23 on the following page.

The figure visualizes, the more feedback that was given, the more narrowed down the lesson plan became, and the less and less feedback the team received until reaching data saturation.

This is shown explicitly through rounds four through six in Figure 23, where the only changes to the lesson plan revolved around announcing, writing, and having students state the objectives of the lesson. This data collection method allowed

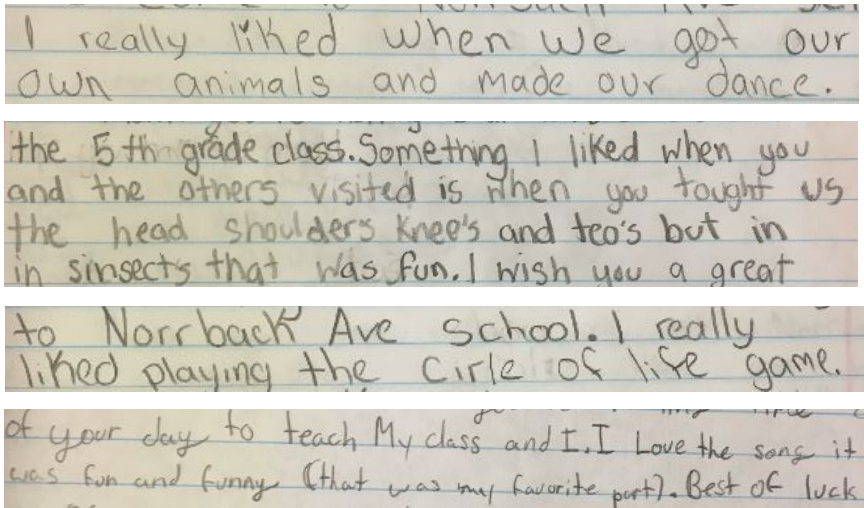
the team to gain valuable feedback on where the proposed lesson plan needed work through the advice of experts in the field. Without this commentary, the team would not have been able to refine the lesson plan in a way that would facilitate the best classroom experience for their learners. The main takeaways from the data collection were applied to all future lesson outlines, and the final lesson plan outline from the feedback was used as an outline for all prospective lessons.



**Figure 23: Lesson Data Takeaways**

### 4.1.3 Practice Lesson at Norrback Ave

At the end of the team's time in Worcester before going to Namibia, the lesson that was revised by the six teachers was practiced in a Worcester public school. The team travelled to Norrback Ave Elementary School to teach the lesson for one hour to Miss. Gibbs' fifth grade class of pupils. This experience was extremely important for the success of the project because it taught the team how to co-facilitate lessons to students in an effective and engaging manner. Through teaching, the team also learned methods of keeping the class focused, quiet, and excited to participate in activities. Through completion of teaching the lesson, the team received feedback from both the fifth grade students and the teachers who observed the lesson. Both Miss. Gibbs and her students wrote letters, some of which are highlighted in Figures 24 and 25.



**Figure 24: Miss. Gibbs Students' Letters**

Dear Olivia, Gavin, Ariana, and Samantha,

Thank you for taking the time to teach a demo lesson with my students! All of my students were beyond excited to have current WPI students in their class. Although you came to the class with the objective of getting yourselves acclimated with leading a class of students as well as ensuring your teaching tactics are attainable, you have accomplished much more. Your presence and excitement left my students with curiosity beyond the content of the life cycle. My students are eager to make the real-world connection of another country as well as opportunities for their own futures.

Your engaging lesson left my students leaving the insect body parts song for a few days, they even taught it to our other 5th grade students. Mrs. Dunn, Norrback's Academic coach, was impressed with the level of action and connection your lesson brought to our class. Based on your time in my classroom, I know you will be successful with your future endeavors in Namibia. You each offer your own personality for students to connect with and learn from. Overall your team's dedication to the tasks, ability to connect with each student, and your overall curiosity of the world will help serve you as the teachers and role models for your future class. The students you will be teaching are very fortunate to have such articulate and patient role models to be learning from.

Being a teacher is one of the most rewarding positions in the world. You are granted the opportunity to educate and shape our world's future, while learning from the many lives you will meet. Take the time to reflect daily on your most challenging moments, for those are the moments you will learn the most about yourself and our world. Keep track of your most joyous victories (even if they are small daily victories), they will keep you going on even your most toughest days. But, most of all, remember you are human entitled to all your emotions and dreams. Being present with your students will be enough everyday to help them learn what it means to be a human in society.

Along with my students, we send you well-wishes of adventures and stories to last you a lifetime. We hope you enjoy and learn from your time in Namibia and we look forward to hearing all about your journeys.

Best Wishes,

Miss Gibbs

**Figure 25: Letter from Miss. Gibbs**

The experience at Norrback Ave taught the team important lessons on how teaching is in the real world, which was vital to be applied within their classroom in Namibia. Miss. Gibbs'



letter gave the team the confidence and advice needed to be able to apply what they have learned in Katutura, and to trust their instincts. In addition, the student letters gave the team important information on which activities the students enjoyed, which was used as a baseline to creating activities in future lessons.

#### 4.1.4 Conclusion

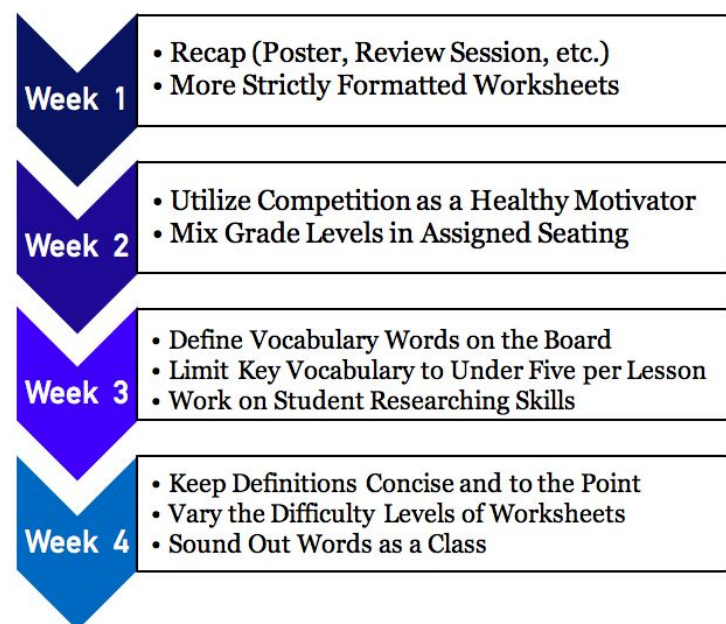
Data collection before travelling to Namibia was crucial since no members of the team have official teacher training. Not only did it give the team the ability to refine lesson plan strategies but also taught the ins and outs of lesson facilitation.

### 4.2 Implementation Data

The goal of the second objective was to utilize self-reflection and constructive criticism from teachers in the field to continually better the team's lesson strategies. After each lesson, the team would reflect on what went well and what could be improved to make the next lesson more engaging. In addition to this, the daily lessons were filmed and sent to a panel of teachers from across the United States to have the team's lesson facilitation examined. Through the teachers' feedback, the team was able to constantly refine both teaching strategies and lesson content, so that it could become the best it could be.

#### 4.2.1 Team Reflection

Daily team reflection proved to be an integral aspect of data collection as it allowed the team to openly discuss the successes and failures of the day. These successes and failures were then applied to the processes of creating future lessons. At the end of each week, the team reviewed the week's conversations and discussed which takeaways were essential in applying to the next week of lessons. The following figure outlines the key takeaways week to week that the team applied in lesson plan creation and facilitation. There are four weeks of lesson reflection represented in this figure due to the fact that the team was only able to teach five weeks of official lessons.



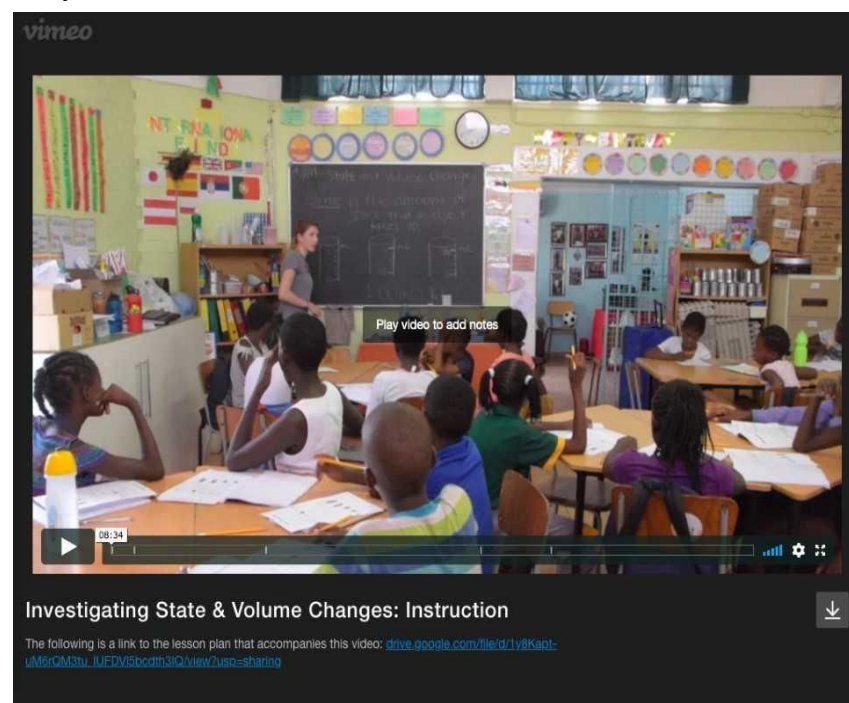
*Figure 26: Weekly Key Takeaways*

As the weeks progressed, the team continued to discover new ways to improve. Each week was improved upon by applying the revisions from the previous week. Towards the beginning, many of the takeaways were focused on fostering a healthy and effective learning environment for the students. Understanding the students' individual dispositions and work ethics was key to placing them in a situation that enabled them to succeed. In week three, the team was able to assign seating that allowed for this, which greatly approved the attention levels of the students. As Figure 25 shows, the team was always learning new information that enabled them to succeed in the next lesson iteration. For example, in week three the team realized that the students need to be able to read the vocabulary definitions on the board in order to fully understand. In week four, the team applied this, but soon realized that the definitions provided were much too long, and the students were receiving too many words each day. In order to solve these issues, the team limited the number of vocabulary terms and shortened their definitions in week five. Improvements such as these were how the team evaluated themselves and continued to develop as lesson planners and instructors.

## 4.2.2 Video Feedback

In order to receive advice and pointers regarding the team's lesson facilitation, video feedback methods were used. The team had their lessons filmed and uploaded to Vimeo, which is a video sharing platform that allows for those with the link to make comments. The team sent this link to a broad range of

various teachers across the United States, who then gave feedback. To comment, teachers timestamped the specific portion of the video they wished to address, and commented accordingly. This made it very simple for the team to review where the teacher had improvement suggestions and to adjust accordingly. Figure 27 and Figure 28 below shows how the comments were represented on Vimeo for the team to view and analyze.



*Figure 27: Lesson Posted on Vimeo*

As educators comment on the videos, the video itself is on the left side of their screen (Figure 27), while the respondent

comments are on the right (Figure 28). Clicking on the comment shows where in the video the comment addresses. As the team taught lessons, it was very beneficial to have the ability to watch the facilitation and see where improvements could be made. The instructor comments also gave the team great insight on refining instruction methods. The team created an analysis note sheet of the feedback, which can be found in Appendix B.3.

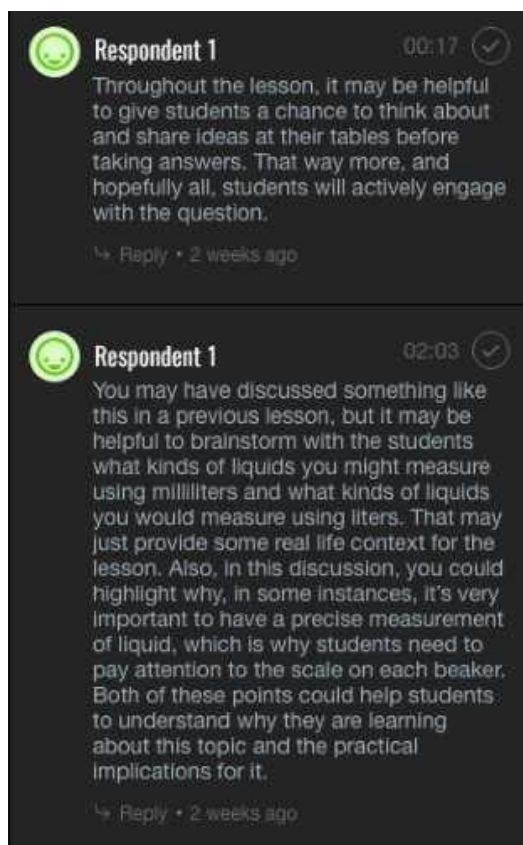
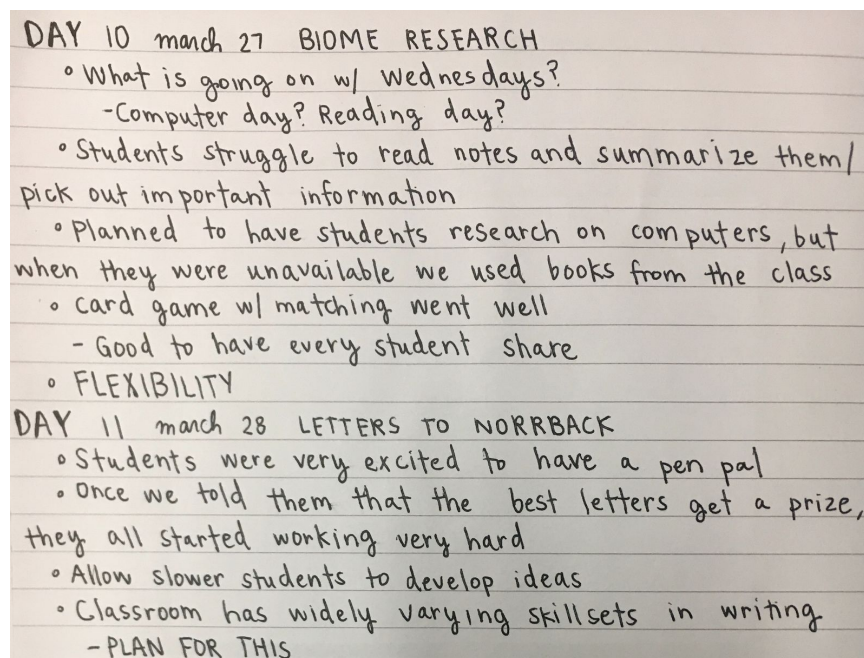


Figure 28: Teacher Feedback on Vimeo

### 4.2.3 Conclusion

Analyzing and refining continuously while implementing lessons in Namibia was a necessary step for the team to ensure that engaging lessons were being taught to the learners. Through collection of both personal reflection and professional advice, the team was able to execute and deliver the most effective lessons.



Teams Daily Reflection Notebook

## 4.3 Evaluation Data

The goal of the third objective was to gain feedback in order to gauge the team’s success in delivering lessons at Physically Active Youth. First, to evaluate the effectiveness of the lessons in teaching material, learner retention was analyzed using a post-hoc assessment. To assess the team’s work further, comments from the stakeholders in the form of a student satisfaction survey and interviews were collected.

### 4.3.1 Post-Hoc Assessment

The first form of stakeholder feedback was a student post assessment which targeted the student stakeholders. The post assessment was administered to the students with the intent of evaluating lesson retention, and the questions probed at both depth of understanding and which activities were most memorable.

For each topic, the post assessment investigated using a three level approach:

1. Level I: Basic Concept Question
2. Level II: Recalling the Application of Material in an Activity
3. Level III: Specific Vocabulary Question

This method allowed the team to assess the depth of understanding of the lesson content. By going over the post-hoc assessments and determining if the student answers were correct or incorrect, the team determined that the most successful lessons were those that the students could elicit

specific details from. Figure 29 gives six student answer examples and the corresponding level of grading based on whether the team thought the student grasped the concepts.

	15: What is an omnivore?	
<b>Correct Answers:</b>	an omnivore is something that you only eat meat and plants	living things that eat both plants and animals
<b>Incorrect &amp; Forget:</b>	I don't remember	don't now
<b>Incorrect:</b>	animals that eat meat	is an animal that is plants

Figure 29: Sample of Graded Student Answers

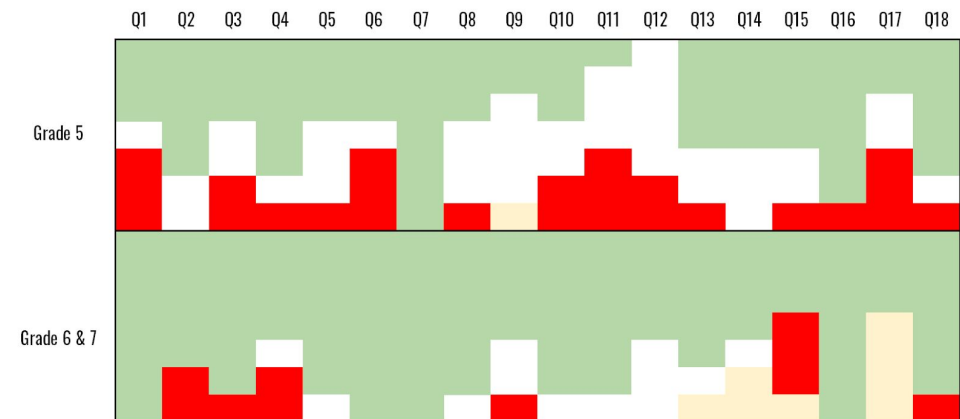


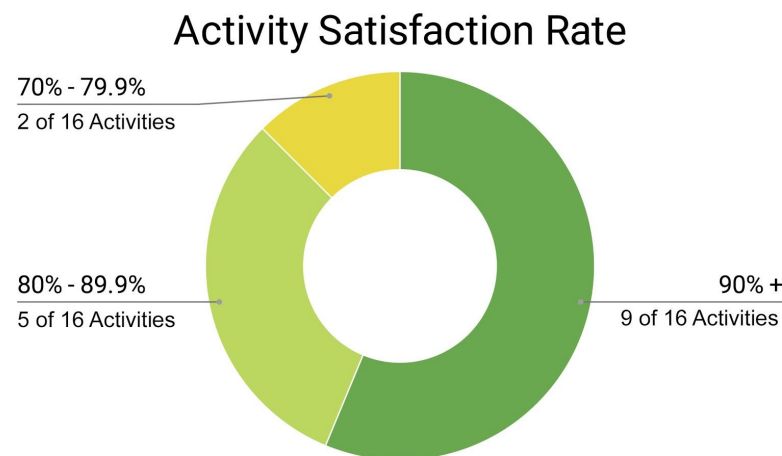
Figure 30: Post-Hoc Assessment Answers Aggregated by Grade

Within this portrayal, green blocks represent a right answer, red blocks represent an incorrect answer, white blocks represent a student writing “I don’t know” on their assessment, and yellow blocks represent an absence. The answers were aggregated for each of the eighteen post-assessment questions and separated based upon grade level. Grades six and seven were combined as sixth grade students often received the seventh grade worksheets. Through analysis of the post assessments, the team discovered that the most successful lessons were about the states of matter and food chains. In these lessons the team focused on repeating vocabulary and content and on having hands on activities that would get each student involved. These are likely contributing factors to the lessons’ success. Through analysis of the data, it is clear that the sixth and seventh graders were able to recall more information than the fifth graders. It was important to divide the data between the grades because the learners started with varying knowledge bases. The sixth and seventh grade students have had exposure to some of the topics the team taught within their school, whereas the lessons were the first introduction of the material for the fifth graders. Repetition could be the cause of the sixth and seventh graders scoring higher on the post assessment.

### 4.3.2 Student Survey

The next form of stakeholder feedback the team received was through a student satisfaction survey. A survey was given out to students who were asked to rank sixteen activities on a scale

of 0-5, 0 being they don’t remember the activity at all, 1 being they strongly disliked the activity, and 5 being they loved it and would want to do it again. This was used to evaluate how well the team did in achieving their goal of creating and delivering engaging lesson plans. The team graphed the results of the survey, which can be visualized below:



*Figure 31: Activity Satisfaction Rate*

Based on the results from the student survey, the team was able to conclude that the majority of their lessons were fun and engaging for the students. Nine of the sixteen lessons fell in the 90%+ satisfaction range, five of the sixteen activities fell in the 80% satisfaction range, and only two of the sixteen activities fell into the 70% satisfaction range.

The two activities that received the highest ratings were the Lungs in a Bottle activity and the Solid, Liquid, Gas Acting Game. During the Lungs in a Bottle activity, students first learned about the respiratory system and then got the chance to work more hands on and create their own respiratory system model using a water bottle, straws, and balloons. The reason this activity was so successful with the kids is likely a result of them being able to build the model themselves and use it to connect concepts of something that they use every day.



***Student Showing Lungs in a Bottle Model***

The Solid, Liquid, Gas Acting Game was a quick energizer activity to help reinforce the different phases of matter. During this activity, the class went outside to the courtyard to play a game where students would have to act like atoms in a container. Depending on the phase that was called out, students would match their movements to that stage. For example, if

solid was called out they would freeze in place, in liquid form they would walk around slowly, and in gas phase the students would run around. This activity was successful because it gave students a chance to act out the concepts they were learning in a fun and memorable manner.



***Students Participating in Solid, Liquid, Gas Game***

The two activities that received the lowest ratings were the Measurement Scavenger Hunt and the Life Cycle Rock Paper Scissors Game. During the Measurement Scavenger Hunt students were asked to work in pairs and were given a worksheet with various objects that they needed to find and measure around P.A.Y.'s facility. While it appeared that students enjoyed the activity as they were doing it, there were a couple factors that might have led to its low rating. The biggest factor was that this activity was run very early on in the team's project, so the activity had less direction and structure than it

needed. Also, it seemed that the activity was too simple for some students. In hindsight, this would have been a good lesson on which to vary the level of difficulty on their worksheets according to grade level. The team reflected on this post-activity and made adjustments to future lessons, so they wouldn't have the same problem.



*Students Complete Measurement Scavenger Hunt*

The Life Cycle Rock Paper Scissors Game was an energizer activity that was intended to reinforce the different stages of a butterfly life cycle. Students would play rock, paper, scissors against each other and the winner would advance to the next stage of the butterfly life cycle. Once a student advanced from the egg stage to the adult butterfly level, they won. Part of the reason this activity received a low satisfaction rating was because it was not very memorable among students. This activity received the most zeros of any activity, meaning that

the students didn't remember it, which caused the overall satisfaction rating to drop. For the students who did remember the activity, ratings were generally 4's and 5's.



*Butterfly Life Cycle Rock Paper Scissors Game*

### 4.3.3 Sponsor Interviews

The team used sponsor interviews with two of P.A.Y.'s full time staff members to obtain the final form of stakeholder feedback. Major themes about the highlights and shortcomings of the project arose from these interviews. The highlights of the program can be categorized into content of lessons and facilitation of lesson. Both interviewees mentioned one critique which was centered on the level of noise that was produced by some of the activities.

Both Miss. Matzopoulos and Miss. Sibanda expressed positive attitudes toward the work the team had done with the class. Ms. Matzopoulos has been a trained teacher since 1978 and has

over eighteen years experience teaching grades five to seven. She also served as the head teacher for students in grades five through seven at P.A.Y. so she is very familiar with the students and appropriate content for the class. She had positive feedback on both the content and facilitation of the lessons. In terms of the content lessons, she said “I don’t think there was a lesson that you did that was unnecessary” (U. Matzopoulos, personal communication, April 4, 2019). The content was a good revision for the seventh graders while still challenging them with new terminology, and it was a fair introduction for the fifth graders. She thought that the worksheets were successful in challenging the students to apply critical thinking because they posed in depth questions that required students to deduce the answer rather than just recite it verbatim. In addition, she liked that the team had the students create science workbooks that were used in daily lessons. This not only allowed the learners to have a dedicated science book for all of their material, but it also serves as a showcase for the work that P.A.Y. does to supplement academics. A full student notebook from the team’s time teaching can be found in Appendix B.4. Ms. Matzopoulos said, “say if the Board Member would come we could give it and say ‘this is what WPI did’ or the Ministry of Education people just pop in and then we can say ‘this is what we do at P.A.Y.’ which I know doesn’t happen at school” (U. Matzopoulos, personal communication, April 4, 2019). One of the biggest highlights of the content of the lessons was the hands-on activities and practicals that allowed the students to discover things for themselves. These activities and

experiments provided exposure to materials and terms that the students had never seen before, such as graduated cylinder and hydrogen peroxide. Learner exposure to new things is one goal that P.A.Y. is constantly striving for.



*Learners Working in Science Workbooks*

When speaking about the team’s style of lesson facilitation Miss. Matzopoulos said, “Your young spirit helps. Taking breaks with the students is a good tactic” (U. Matzopoulos, personal communication, April 4, 2019). After having watched a few lessons being taught to her students, she quickly recognized that her students were learning a lot, having fun, but more importantly, doing it at a pace that works for all of the students. After observing this, she mentioned that it might be a tactic that she incorporates into her facilitation when she takes



over the class after the team’s departure. Miss. Sibanda thought that a highlight of our program was the level of preparation that the team put into the lessons. She said, “you just went hands on and prepared from the get go and without supervisions. You have flown since day one” (T. Sibanda, personal communication, April 12, 2019) Overall, one of the greatest highlights was “just having science” in the classroom, as Miss. Matzopoulos said.

When asked about areas where the team could have improved, both Miss. Matzopoulos and Miss. Sibanda mentioned the noise level. Miss. Matzopoulos emphasized the importance of learning names and building relationships with the students. She noticed that in the first few days there was some unproductive noise coming from the classroom before the team had a chance to learn the students’ names, but she explained it calmed down the minute the team learned them. Though the noise level was distracting at times for the staff members that work outside of the classroom, neither Miss. Matzopoulos nor Miss. Sibanda felt the need to step in to quiet the class because they both recognized that the noise was not the result of lack of discipline but the result of excitement and productivity. Ms. Matzopoulos said, “they would go loud but with excitement but it wasn’t loud in the sense that it was chaotic.”

These interviews provided evidence that the team had delivered engaging lessons and had met Miss. Matzopoulos and Miss. Sibanda’s expectations for the project. It also confirmed the

desire for future project teams to continue developing curriculum that is full of practical hands-on learning.

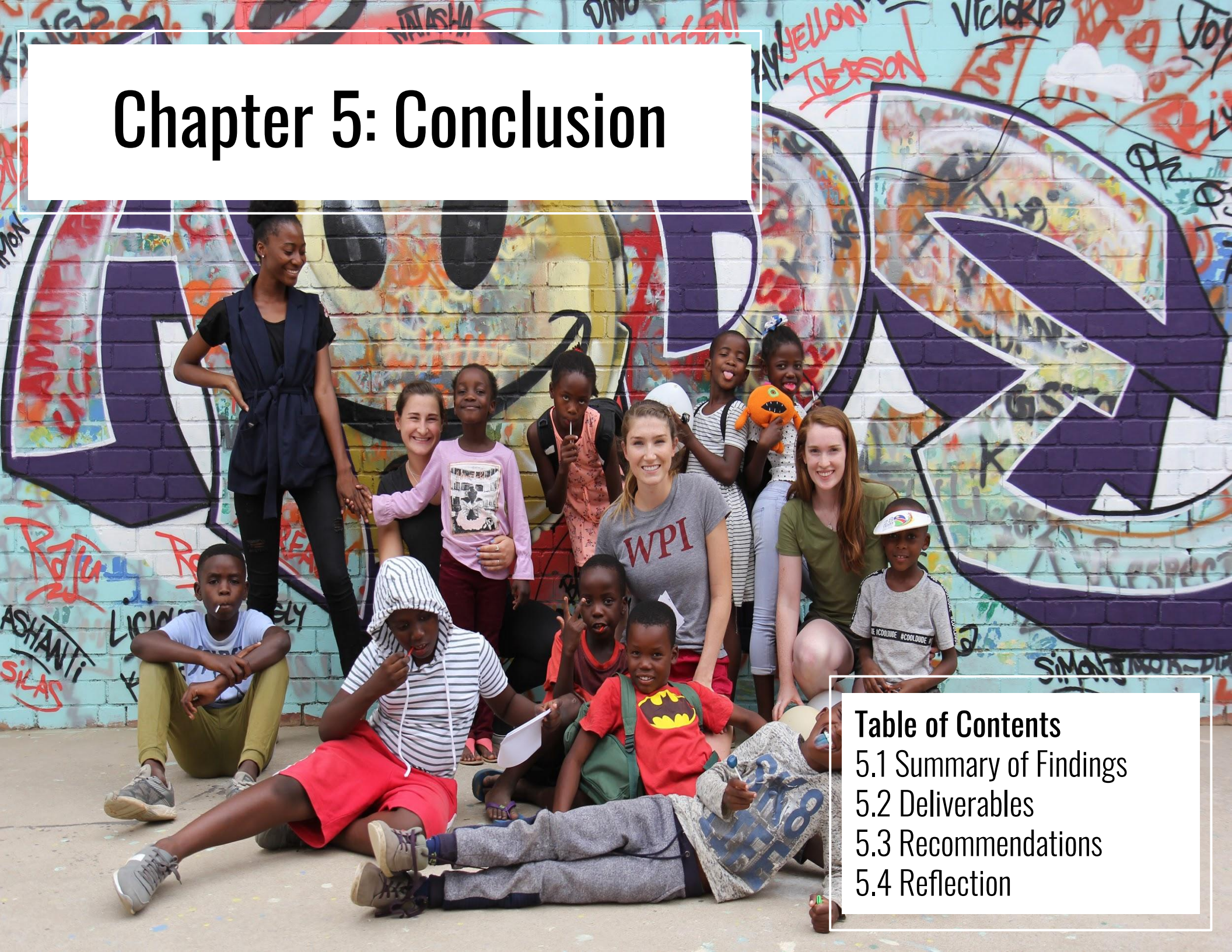
#### 4.3.4 Conclusion

In order to analyze the success of the team’s lesson implementation at P.A.Y. it was important to receive feedback in various ways. By interviewing and surveying stakeholders, the team was able to grasp how well they achieved their goal of creating successfully delivered engaging lesson plans.



*Student Notebooks*

# Chapter 5: Conclusion



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- 5.2 Deliverables
- 5.3 Recommendations
- 5.4 Reflection

## Chapter 5 Conclusion

This project was based at an afterschool program in Katutura, Namibia, a region that still sees the lasting impacts of South African apartheid rule, especially in quality of education. In an effort to bridge this gap, Physically Active Youth provides supplemental academics and physical activity for its students. The primary goal of this project was to develop a series of engaging science lessons and teaching strategy recommendations for students in grades five through seven at P.A.Y. In order to accomplish this, the team of WPI students compiled data from experienced teachers, their stakeholders, and their own self reflections to continuously develop and improve lesson plans which were ultimately handed off to Physically Active Youth for future use. In addition to lesson plans, the team delivered video recordings for seven of their lessons, along with recommendations for P.A.Y., future P.A.Y. volunteers, and future WPI project teams. While it may take many years to see the impacts of this project, the team and the learners impacted each other's disposition and outlook every single day. Through daily interactions with students, their sponsors, and locals who stopped by, the members of this team learned more about Namibia, its education system, and culture than they could have imagined they ever would.

### 5.1 Summary of Findings

The research question for this project was to determine what makes up a successfully delivered and engaging lesson plan for learners in grades five through seven. In order to do this, the team first established a objective stage plan that included data collection during both the preparation term and the time in Namibia. In Objective I, the team used a convenience sample of experienced teachers to collect data that would help to establish standards for how to make an engaging lesson plan and conduct a classroom. Some of the most important aspects of lesson planning that the team learned from this teacher questionnaire were to align the lesson content with national standards outlined by the national syllabus, to plan ahead with lessons to ensure smooth transitions between topics, and to incorporate movement throughout the lessons to keep students engaged. The key takeaways about conducting a classroom were to create a community by supporting and connecting with learners and to be excited about the topics you're teaching. This data was used directly to create the team's first lessons. Next, the team used the same sample of teachers to receive feedback on their model lesson plan on how to improve the initial lesson to make it more engaging. The team continuously sent this lesson to teachers for critiques and made revisions to the lesson until there were no new suggestions for improvement, at which point the team reached data saturation. Once the lesson hit data saturation, the team traveled to a local Worcester Elementary school to test their lesson and delivery

techniques on a fifth grade classroom. After teaching the lesson, the team better understood what it is like to facilitate a lesson, and they learned important tactics in co-facilitation and controlling the classroom. This was the final data collection the team received before departing for Namibia.

Once in Namibia, the team began Objective II which involved the creation and delivery of lessons using the data collected in Objective I. During implementation, the team made daily reflections on their lessons about components that worked well and areas for improvement in order to get more engagement and participation from their students. Some of the adjustments the team made to make their lessons more engaging overtime included creating guided note sheets, adding in more review activities, small elements of competition between students, and varying levels of difficulty to lessons in order to cater to students who are at different levels. In addition to self-reflections, the team also received feedback through a program called Compeer Review. Using this program, the team took video recordings of their lessons and uploaded them to Vimeo, which were then reviewed by a panel of distinguished teaching professionals. This method allowed the team to obtain feedback on their delivery techniques and refine their teaching processes. Along with other tips, the feedback that came from the panel encouraged the team to slow down and allow more time for other students to raise their hands, as well as to ask more questions that reinforce material and get students to think in different ways. Once these suggestions were implemented to

the team's lessons, a large improvement in learner participation occurred.

In Objective III the team collected data to measure the success of the program and evaluate stakeholder satisfaction. A post-hoc assessment was administered to measure content retention. The results showed that the sixth and seventh grade cohort retained more information than the fifth grade cohort. Learner surveys measured the level of satisfaction with the activities that were included in lessons. This revealed that all of the activities were above 70% satisfaction with nine of the sixteen activities ranking above 90%. Sponsor interviews communicated that highlights of the program were the amount of hands-on practicals and experiments, the team's level of preparation, and the personal connections made with students. The learner surveys and interviews revealed stakeholder satisfaction with the science curriculum.

## 5.2 Deliverables

Upon completion of the project, the team has compiled two main deliverables for the sponsor, Physically Active Youth. The first deliverable is the accumulation of all lesson plans, worksheets, notes, etc. in the form of a guidebook, and the second is access to a platform with videos of the team's lesson facilitation and other operations in the classroom. To supplement these, the team also created a place where all of the

deliverables are compiled and easy accessible, as well as a box of supplies to be left at P.A.Y. to continue lessons.

### 5.2.1 Lesson Guidebook

In order to ensure that the team’s work can be continued after the conclusion of the project, the team left an educator guidebook with Physically Active Youth.

The guidebook represents the work that the team completed during a seven week time period at Physically Active Youth, leaving behind a framework for the continuation of curriculum development. The guidebook was printed and compiled into a physical binder that was left at the organization, as well as an electronic copy on a flashdrive and links to all necessary documents. In addition to the binder, a filing box was also given to P.A.Y. which organizes all of the extra worksheets that the team printed, organized by week and lesson. On the tab for each week, there is a description of which worksheets are included in that section for easy location. In the weeks of this project, the team taught a lesson every day to the students. The accumulation of all lessons can be found within this binder. The lessons are numbered for the user of the guidebook to see the order in which they were taught, and all worksheets, memorandums, handouts, activities, etc. for each lesson are attached to the end of each lesson. The table of contents of the guidebook can be found at the beginning of the binder in corresponding colors to the tabs in the filing system. Here, anyone who is looking to teach a lesson should be able to use

the table of contents to locate the lesson they wish to use within the guidebook. Before starting the lesson, the educator should read through the entire lesson outline to see if all the materials are available. Additionally, they should carefully read the feedback section found at the end of the lesson that describes what went well and reflection of what should be altered the next time the lesson is taught. The educator should make appropriate changes to the lesson before teaching. The team is hopeful that this guidebook will provide a user-friendly way for future educators to continue facilitation of the lessons implemented during this project.



*Lesson Guidebook (red binder) and Filing Box*

## 5.2.2 Lesson Videos

In addition to the guidebook, the team left behind a portal of videos of lesson facilitation for Physically Active Youth staff members to reference for years to come. Seven of the lessons were filmed, and the team hopes that providing these videos will help to supplement the guidebook lessons by allowing for staff and volunteers to recreate the lessons and to see directly what methods the team used to help facilitate. In addition to the lesson videos, the team also gave access to the lesson video feedback that was received during objective two of the team's methodology. It is through watching and truly understanding the team's facilitation and lesson explanations that future educators will be able to recreate the team's project work. The video lessons can be found using the following link: [tiny.cc/WPIDeliverablesVideos](https://tiny.cc/WPIDeliverablesVideos).

## 5.2.3 Compilation

In addition to a physical copy of all the lessons and a portal of videos on the internet, the team has created a digital copy of the lessons and videos that can be found both on the flashdrive located in the binder and at this link: [tiny.cc/WPIDeliverablesforPAY](https://tiny.cc/WPIDeliverablesforPAY). This can be used for both reference and as access to any worksheet for printing purposes.

The *WPI Deliverables for Physically Active Youth* page that the team created contains all deliverables in one place for easy access. This two page document is divided into four sections to ensure utilization of all deliverables on various platforms.

Additionally, everything has been linked either via PDF document or online video link.

The first section is *Lessons* where all lessons are in order and categorized by week. Each week of lessons is color coded to match the color of the dividers in the filing system for easy location, and in order to see the lesson plan of a specific lesson, the user simply clicks the title of the lesson and it will bring them to the corresponding PDF. If the lesson was filmed, all videos are listed below the corresponding lesson. When the italicized word is clicked on, it will pull up the corresponding YouTube video link. In addition, on the YouTube video links are the links to the teacher feedback collected for each lesson. All lessons can be found in one PDF which is linked at the top of the section along with the link to the homepage of the team's YouTube channel, where the lesson videos are kept.

The second section is titled *WPI Final Presentation* where the final PowerPoint presentation can be viewed by clicking on PowerPoint. In addition, the video of the presentation can be accessed by clicking on the word video.

The third section, *WPI Final Report*, is where the entire formal project write-up, written from January to May 2019, can be read. Simply clicking on report will have the corresponding PDF open.

The fourth and final section, *Additional Articles and Photos*, is a collection of articles written about the WPI team and their project along with a collection of photos taken throughout the project. To see the photos clicking on “our daily photos” will load a separate album of photos. The article published in the national paper, *The Namibian*, is linked to a PDF and the personal P.A.Y. blog has five links: one for the home page with all blog posts and then four blog links, one for each team members’ article. There will also be a New York Times article published in June 2019 and will be attached via link in the WPI Deliverables for Physically Active Youth.

Finally, the team created a streamlined document called *Upper Primary Science Curriculum* which contains only the lesson plans and the corresponding videos lessons. This PDF and link can be used to easily distribute and share all the science lessons developed to other schools and educational programs. The document can be accessed at the following link: [tiny.cc/ScienceCurriculumbyWPI](http://tiny.cc/ScienceCurriculumbyWPI).

Because the team provided deliverables on many different platforms, it was key to compile them in some way for easy accessibility and usage. The *WPI Deliverables for Physically Active Youth* page was the team’s way of addressing this.

## 5.2.4 Supply Box

The final deliverable that was left with Physically Active Youth is a supply box with various materials. Along with basic

materials, such as crayons, markers, colored pencils, construction paper, pencils, and more the team left materials for activities. The full list of supplies can be found in the supply list below:

### Supply Box \*list as of 1 May 2019

18 Dice	1 Funnel
100 Popsicle Sticks (red, green, yellow, orange)	2 - 500 mL Bottle with nozzles
2 Magnifying Glasses	1 - 75 gram scoop
230 Rubber Bands	1 - 1000 mL Beaker
50 Pom-Poms	1 - 500 mL Beaker
1 Pair of Kneehighs	1 - 250 mL Beaker
230 Index Cards	1 - 100 mL Beaker
8 Yeast Packets	1 - 50 mL Beaker
6 Ping Pong Balls	7 pairs of Safety Glasses
40 Pipe Cleaners	2 - 5 g Test Tubes with Lids
40 Clothes Pins	36 Twistable Crayons
72 Colored Markers	96 Colored Pencils
5 Paper Plates	1 - 75 mL bottle of Hydrogen Peroxide *handle with caution
1 Roll of Trash Bags	3 - 192 Page Graph Paper
3 Thermometers	Notebooks
6 Scoopers	8 Rolls of Tape
150 Toothpicks	30 Straws
3 - 100 mL Graduated Cylinder	70 grams ENO
1 -10 mL Graduated Cylinder	1 - 100 gram scooper
1 - 250mL Graduated Cylinder	10 Pencils
1 - 1000 mL Graduated Cylinder	20 - 3 mL Pipettes

The team hopes that these materials will not only allow for more reproducibility in their lessons, but will also allow the future educators of P.A.Y. to enhance their own lessons with hands-on activities.



*Science Supply Box*

### 5.2.5 Summary

The team hopes that with proper application and use of the materials left behind at P.A.Y., educators will be able to both re-create and build upon the work from this project. In this, the learners of the organization will continue to receive the science education that the team began to give to the learners.

## 5.3 Recommendations

This chapter details the list of recommendations based on the team's observations and reflections during project

implementation at Physically Active Youth. The team is hopeful that the recommendations will help to foster a long-lasting relationship between the sponsor and WPI.

The recommendations can be categorized into the following three classifications:

1. Recommendations for Physically Active Youth Staff
2. Recommendations for Volunteers at P.A.Y.
3. Recommendations for Future WPI Project Teams Working with P.A.Y.

### 5.3.1 For P.A.Y.

Physically Active Youth was an incredibly supportive sponsor and treated the team so well over the term of the project. The dedication of the staff members to the well-being of their youth is evident by how much time and energy they devote to the organization. The team has the utmost respect for those that keep the program running and have learned that P.A.Y. thrives on “organized chaos” as the sponsors have described. The nature of P.A.Y. creates a highly functional, yet semi-chaotic, atmosphere because of its multifaceted programming and high learner to staff ratio. Upon reflection of the team's time with this organization, the following recommendations were put into effect, hoping to help the P.A.Y. staff members mitigate some of the disorganization within their operations. These recommendations can be divided into the following three categories: communication, community, and future projects.



## Communication

Communication is the pivotal area for improving the daily functioning of the programs that P.A.Y. offers. Improvement of communication between staff members and between staff and volunteers would drastically reduce the confusion that is triggered by daily schedule changes or during transitions between lunch, academics, and sports.

To this point, the team recommends three changes:

1. Creating an Easily Updated Calendar of Events
2. Creating a Group Chat with Staff and Volunteers
3. Creating a Volunteer Guidebook

During the course of the term, there were instances where lapses in communication caused confusion for both volunteers and P.A.Y. staff leading to interruption in scheduled programs. For example, one day the team's lesson was disrupted in the middle of an activity because a reading teacher was scheduled to come in and tutor the class, but nobody had communicated that. The entirety of that day's lesson could not be completed and when the team planned ahead for the next week by creating a shorter lesson, the reading teacher did not come. In fact, the teacher never came back again for a Wednesday reading session. From these instances the team learned to be flexible with the events of the day, but it would have been extremely beneficial to know if any other programs outside of the team's science lessons were scheduled for the day and for how long. To address this unintended miscommunication, the team recommends having a calendar on a whiteboard of the schedule for each class that can be updated as changes occur to the

class's program. The calendar should include special programs that aren't normal in the day to day schedule and are not set in stone as being the top priorities. An example of the type of information that should be included on the calendar is represented below in Figure 32.

1 Lower Primary has Swimming Today!	2 Science Lesson 2:00 - 3:45 Chores 3:45 - 4:00 Soccer 4:00 - 4:55	3 Grades 8-12 on Computers Today 2:00-3:45	4	5 Life Skills Teacher Coming 2:00-5:00
8	9	10 Reading Teacher Grades 5-7 3:00-3:45	11	12

*Figure 32: Example Calendar*

A staff member who schedules a program for a class, such as the reading tutor for the fifth-seventh grade class, would have the ability to write in the program and the time on the calendar. Additionally, this would make the academic program and the sport of the day available for anyone who is looking for clarification of the agenda, and it could be easily updated should a change occur.

The second recommendation to improve communication between all parties is to create a group chat on a platform similar to WhatsApp that includes staff members and current volunteers. The groupchat would function as a way to keep everyone on the same page with important updates. This recommendation stems mainly from one day during the term when the water wasn't working at P.A.Y., and the team was informed by other volunteers that some of the students were being sent home. After asking various staff members for clarification, the team received inconsistent responses and had no information on the day's schedule. Had the group chat existed at this point, the staff member who made the decision to send students home would have been able to update everyone with a quick message in the groupchat saying "Water is broken. First through fourth grade is being sent home. All other classes resume as planned".

In addition to lack of daily communications, there was also a large learning curve during the team's first weeks at P.A.Y. due to lack of orientation from the staff. Coming in as volunteers, the daily routines and expectations were not thoroughly explained, which lead to lapses of understanding duties. For example, during the first week the team was not made aware that the students were expected to complete chores before going out to sports and that it was the job of the team to assign, enforce, and evaluate the chores completion to the unwritten expectations. It wasn't until about the third or fourth week and multiple explanations later that the team truly

became comfortable with P.A.Y.'s daily operations. For this reason, the team recommends that the staff compiles a guidebook for volunteers that outlines the daily routines and expectations to understand how P.A.Y. operates as well as for common practices. The guidebook should include direct instructions for facilitating chores and an explicit set of rules that volunteers should know to enforce. It would also be useful to include a list of responsibilities for volunteers, which would be especially helpful for volunteers who don't have a long stay so that they are better equipped to assist the staff without completely understanding empirically how P.A.Y. functions. In the case that the guidebook is too time consuming to compile, the volunteers should be given a more extensive orientation on their first day to inform them of the most pertinent common practices and expectations.

During the team's interview of staff member Miss. Sibanda, she mentioned how fastidious the staff is about who they bring into P.A.Y. as volunteers because they want to make sure the learners are well taken care of. This could partially be remedied by a more efficient volunteer orientation and guidebook because the volunteers would be prepared to help in a productive way. The final communication centered recommendation is for P.A.Y. to look for a fellow, potentially through the Peace Corps or another organization, to spend an extended time at P.A.Y. As an organization that works primarily based on volunteer help, it is important to be able to utilize the volunteers to their full potential, and this fellow

could function as the point person for volunteers who cycle in and out on a more frequent basis. Additionally the full time staff members at P.A.Y. have a lot on their plate with keeping P.A.Y. running and don't have the time to focus on monitoring the volunteers. The fellow would take the pressure off the staff members by helping volunteers acclimate to the atmosphere and transition into P.A.Y.

### **Community**

Ursula Matzopoulos and Thuba Sibanda were crucial to the team's preparation by making themselves available for video calls and clearly explaining their expectations for the project. This provided a clear direction of how to develop the project and it is recommended that they continue to do so for future projects. From Thuba's final interview, the team understood that one of the highlights of the program was the massive amounts of preparation before arriving at P.A.Y., which is a direct result of their guidance during the preparation term. We recommend that they continue to maintain frequent contact with the WPI students during the term before their arrival and be explicit with what they want because it will help the WPI students prepare as much as possible for their time at P.A.Y. A reliable taxi driver was arranged by P.A.Y. to take the team to and from work everyday which was extremely helpful throughout the course of the project. The small actions that the P.A.Y. staff took to help the team adjust to the country and the community are so appreciated and the staff should continue this for future volunteers.

One regret that Miss.Sibanda expressed during her concluding interview was that the team didn't network with the other volunteers as much as she had hoped. Usually our team would arrive in the morning and get right to working on one of the various parts of our project, and then the other volunteers would arrive and start right on their daily tasks. Consequently and regretfully, the team never really took the time to get to know the other volunteers. If P.A.Y. is passionate about having their volunteers develop closer relations, they should promote contact by initiating casual gatherings of the volunteers, such as a biweekly morning coffee time.

### **Future Projects**

There is a lot of potential for future WPI student projects at P.A.Y. The team has identified four main areas of improvement for teams to focus on that would benefit the organization.

1. Improving Communication and Efficiency
2. Marketing and Fundraising Efforts
3. Science Curriculum Development
4. Reorganization of Programming

The Board of Directors and staff members of P.A.Y. should consider the following suggestions when deciding on the project topic for the next team of students.

As previously discussed, breaks in the lines of communication from staff members down to students causes disorganization

and inefficiencies in the program's daily functioning. A WPI team could focus on this topic and work to improve communication flow thus increasing overall efficiency of the programs. Currently, all of P.A.Y.'s records are kept on paper, Miss. Sibanda admitting that the organization is "slow to digitize". The team completing this potential project could also help P.A.Y. transfer their current records to a digital version and facilitate the transition to keeping digital records.

The team learned that marketing and outreach is essential to the continuation of the programs at P.A.Y. Without supporters and donors, the organization would no longer have the funding to stay open. Their model is also unique in that P.A.Y. invests in the long term development of the youth accepted into the program. Therefore, the payoff for their efforts does not become apparent until far down the road. This creates a challenge when searching for investors because most investors are looking for quick return on their investment. Without sufficient funding, P.A.Y. will not be able to sustain the permanent staff nor continue to provide meals for their students, which is one accomplishment that they take much pride in. A team of WPI students could focus on marketing P.A.Y. to potential donors and expanding the network of supporters.

The third project suggestion is continuation of the work done in this project. Over the course of the term, the team was able to create and deliver a set of lesson plans that began to touch upon

some of the material that fifth through seventh graders are expected to know according to national Namibian syllabi. The limited time of the project prevented the team from being able to go into extensive detail on any one topic and there are many more topics on the syllabus that no lessons were developed for. Future WPI students could analyze the content that was created and work to fill in the gaps of knowledge. Another possibility could be for the team to adapt the lessons from this project for the lower primary students or for the high school students rather than creating an entire new set. This decision would be left for P.A.Y. to discuss if they would prefer each grade level to have a broad curriculum in science or have an in depth program that is only taught at the upper primary level.

Finally, a project team could be tasked with helping facilitate the reorganization of P.A.Y.

Miss. Sibanda has recently mentioned her idea to restructure the academic program across all grade levels. Under the current structure, the learners are split into three groups: grades one through four, five through seven, and eight through twelve. Each group is assigned to their own classroom and spends all of their academic time in that classroom regardless of the topic of study. Miss. Sibanda's idea is to transform the four classrooms in a system where each is dedicated to one subject. Throughout the week, each grade grouping would rotate throughout the classrooms, focusing on one subject per day. This would allow for equal learning opportunities in each subject area and would promote educationally well-rounded

learners. This enterprise would be a refreshing and beneficial reorganization for P.A.Y., but would also take a lot of effort to carry out since the staff members are already busy with their normal responsibilities. For this reason, the assistance of a project team would be helpful in realizing this vision.

### **5.3.2 For Future Volunteers at P.A.Y.**

Underlying P.A.Y.'s vision of growth is the need to continue working to expand the volunteer and intern network, and after spending substantial time with the organization the team is confident in their ability to provide valuable insight into life at P.A.Y. for future volunteers. These insights focus on the continuation of lessons and general recommendations about the daily operations of P.A.Y.

#### **Daily Operations**

The learners understand how much P.A.Y. does for them by providing a meal and a loving atmosphere that nurtures growth. However, the values of P.A.Y. enforce the concept that learners cannot just get things for free. Rather, they must earn what they are given and they should take actions to give back to the organization that gives them so much. This is mainly done through the daily chores, which keep the facility clean. It is the expectation that volunteers also pitch in to maintain the facility. Everyone from staff to learners is expected to help with chores each day on a rotating schedule.

Since the length of stay of each volunteer is different and everyone is assigned different tasks, it is essential for volunteers to come in every day with an open-mind and flexibility. Being able to jump in to assist in the kitchen, a different classroom, sports, or cleaning is extremely beneficial and will help ease the stress or chaos of the day. It is also important for volunteers to speak up and ask for clarification when they don't understand how something is supposed to be completed.

#### **Global Perspectives**

In addition to all of the other aspects of the organization, P.A.Y. strives to bring global perspectives to their students to increase their learners' exposure to things outside of their daily life. As volunteers, it is encouraged and recommended to voice ideas, such as contrasting proposals for projects. This also goes for sharing personal life background with the learners and fellow staff. Forming a connection with people is an eye opening and extremely rewarding experience for all of whom are involved.

#### **Continuation of Lessons**

In the case that a volunteer wants to teach science lessons to the upper primary learners, it is recommended that they pull out the team's physical guidebook which contains all of the lessons created and implemented. All lessons are categorized weekly by topic and can be easily located by the Table of Contents on the front page and on the individually labeled tabs

dividing each section. Before starting the lesson, the volunteer should read through the entire lesson to see if all the materials are available and to make potential adjustments based on the feedback section. Feedback can be found at the end of each lesson that describes what went well and ideas of what should be altered the next time the lesson is taught. The volunteer should make appropriate changes to the lesson before teaching. Additionally, volunteers need to be aware that all lessons taught by the team during this project were implemented from March - May 2019 with the current fifth-seventh grade learners. This means that it won't be until March 2022 that all learners in grades five through seven will be new and would not have seen any of the lessons before. If lessons are re-taught the teacher should go more in depth on the second iteration of each lesson to continue to add more content and challenge for learners.

In terms of facilitation, when introducing new vocabulary during lessons, volunteers should ask the learners to repeat vocabulary words multiple times in various ways such as whispering, yelling, and turning to tell their neighbor. This will act to enhance both memorization and pronunciation. Additionally, since the learners are English language learners and have varied levels of English mastery, repetition should be utilized to reinforce the new terms. One of the correspondents on video lesson feedback suggested to begin the discussion of new terms “by asking students to raise their hand if they have ever heard of the word before. Then, the instructor should call

on a student to share where they have heard this word before. Once a student uses the vocabulary word ‘volume’ in an example sentence, students who may not know the definition already will have some contextual information to draw a predicted definition from” (Respondent Two, Introduction to States of Matter Lesson: Volume). This is a great tactic that the team didn't think of while facilitating lessons, but it is recommended that this strategy be used to provide more relatable context for new vocabulary. Another way to provide real life context for the students is to brainstorm examples of concepts with the class and have the learners come up with examples. This will not only engage more students in the discussion, but it will also promote more critical thinking, which makes the tactic and one which should be utilized in future facilitation of lessons.

In addition to the previously discussed tactics, volunteers should also utilize the black board and the worksheets that correspond to each lesson. All notes that were taken on the board were photographed and put directly in the lesson plan, so future volunteers know what to write. If no printer is available to print the worksheets, try to have the students recreate them in some way in their science notebooks. Physically writing down and taking notes is extremely beneficial and allows the students to flip back and remember all that they have learned.

## **Conducting a Classroom**

In addition to the physical copy of lessons, a handful of lessons were filmed and can be found on the flashdrive found in the front pocket of the guidebook and as links within the table of contents. Each lesson video is labeled with the same title of the lesson for easy location, and all lesson videos are available on the team's P.A.Y. YouTube channel here: [tiny.cc/WPIDeliverablesVideos](http://tiny.cc/WPIDeliverablesVideos). Volunteers should watch the corresponding lesson or any lesson if they can't find the corresponding lesson in order to see the team's approach to teaching the fifth-seventh grade learners.

From the videos, volunteers will notice a few tactics that were utilized to conduct the classroom. These tactics should be continued by future educators. One is using methods to re-center the classrooms focus. The team would use one where they say "Waterfall, waterfall" and then the learners respond with "shhh" (the sound of a waterfall). The clapping method where the educator claps a pattern and the learners respond with the same pattern clap was also utilized. In addition, the team used hand signals to allow the learners to identify when they were ready to move on. The learners would give a thumbs up when they had completed the task, and this ensured that the pace was appropriate and prohibited learners from falling behind. It is also a good tactic in identifying learners who are struggling and need one-on-one attention. Hand signals should be continued by facilitators to ensure that students feel supported and get individual help when needed.

Volunteers should also continue to build upon learner collaboration when working on projects, worksheets, and discussions. Facilitators should encourage the development of teamwork skills and promoting group work since the students are so competitive by nature.

Most importantly, all volunteers should bring enthusiasm and energy to the classroom. This energy will be the driving force that radiates to the learners and continues to get them excited for lessons each day. Be excited and be supportive, and a nurturing learning environment will easily follow.

## **5.3.3 For Future WPI Project Teams**

Future WPI students working with P.A.Y. should prepare to apply all the recommendations from the above volunteer section in addition to taking all of the following recommendations into consideration. WPI students need to be fully aware of the level of flexibility that is required. Day in and out teams need to adapt to the current moment. Lessons will be interrupted, cut short, start late, or not be taught at all. Additionally, WPI students should over plan lessons to always be prepared with constructive work in the case that they need to fill extra time. The most important recommendation for WPI students working with P.A.Y. is that they must be prepared to come in with energy and passion for what they are teaching because the educator's level of energy and passion radiates directly to the learners. This organization is particular about the volunteers that they bring in because they have high standards

of who works with their students, therefore anyone who comes in needs to be equipped to handle a classroom of students comfortably and confidently.

### **Preparation Term**

At the start of the preparation term, the new team should read this project's report, schedule a meeting, fundraise, and practice lessons. First, it is important to read through this entire report and at least five lessons to gain insight about P.A.Y., our learners, and the lesson facilitation. Next, reach out and schedule a meeting to ask questions, receive any clarification, and get some inside advice. It is also highly recommended to fundraise from the start to the end of the preparation term.

While it is extremely important for reproducibility reasons to create lessons that do not require many supplies, the money fundraised was helpful for planning holiday school and getting science equipment for the classroom. The funds raised provided a way to purchase materials for an interactive and hands-on program with few limitations. Before coming, also consider bringing a bag of samples of items like leaves of oaks, maples, apple trees from the United States to provide a hands-on example for learners.

### **Lesson Planning**

When designing lessons, future project teams should look over the lesson guidebook and use these as a reference point of where to start. The team covered five main topics to see the learners academic level and give them a basic understanding of

each topic. If the sponsor chooses to have the next project team continue with science curriculum development, we recommend the next team choose two specific topics to dive deeper into. When creating lesson plans, they were always created by referencing the US fourth grade level lessons that were available online, but continue to create worksheets of various levels to allow all grade levels to be challenged. All worksheets and additional learner work should be added to a workbook, so all of their work is in one place. Additionally, all content and images that are used to create lessons need to be cited. From the very start of lesson creation, cite everything including all the sources used for research to create the lesson and document all photos used. All photos need to be usage rights free to use, modify, and share and they must have public copyright. This will dramatically decrease the quantity of photos to use but is essential for proper use.

### **Daily Routine at P.A.Y.**

While at P.A.Y. and implementing lessons, always treat the students as equals. For example, sit with the learners at lunch and get to know them on a personal level. They are not children to be pitied; they are learners who deserve respect and a good education. Learn their names as soon as possible and ask for them to repeat it as many times as you need to pronounce them correctly. It's incredibly difficult to earn the respect of the learners and to control the class without knowing their names. Continue to learn about where the students are coming from and try your best to understand their situations.



The classroom for fifth through seventh graders is adjacent to the office and there is no door to close. It also has the refrigerator, library, storage, and freezer for all food and supplies for other classrooms, so more often than not other teachers and staff members come in to grab supplies and food. Also, engaging activities produce noise which is distracting for the staff members working. It is recommended to move the fifth through seventh grade class to the separate building which has two more classrooms in order to foster an environment that welcomes productive noise and provides fewer distractions. It is also recommended to bring and use hand sanitizer often to prevent potential illnesses and to bring lysol wipes or buy some to wipe down tables to be more sanitary.

If you have any other questions don't hesitate to reach out. The team is extremely passionate about this organization and are hopeful that future projects will only better WPI's relationship with Physically Active Youth.

## 5.4 Reflections

Upon completion of the team's time implementing lessons at Physically Active Youth, it was important to reflect upon the experiences and setbacks of the project. This section outlines a brief reflection of the team's time at P.A.Y. using personal narrative, anecdotes, and open discussion.

## Limitations

Although the team was able to successfully create over twenty science lessons to leave with P.A.Y. for continued use, the team also acknowledges a few limitations to the curriculum.

Time is the first limitation. With only five weeks to teach, the lessons only scratch the surface of the content encompassed in the fifth through seventh grade syllabi. Of the content covered, it is a broad overview of the material in each topic because the time constraint limited how in depth each topic was taught. In addition, with the continuous changing schedule we were been only able to fully teach sixteen science lessons. Missing lessons caused issues in gaps of knowledge with the students because when lessons were skipped over, there was a lack of transition in content from one lesson to the next for the learners. In addition, the team could not write a feedback section for future improvement, so the lesson was given to P.A.Y. in its rawest form. Another drawback is that the curriculum we created is designed for a classroom that mixes grades five through seven. Consequently, the fifth grade learners will remain in this classroom for another two years. If our curriculum is re-taught verbatim within the next two years, the material will be a repeat for learners and will not pose a new challenge for them. This means that the curriculum, in the current state, can only be utilized every three years in order to be completely new to learners.

Upon reflection, the team realized that the budget and lack of resources would have been an extreme constraint without prior fundraising. For example, one of the first items that we purchased were notebooks and pencils for each learner to record their science notes in. Without these notebooks, the students would not have been able to write notes or keep material in one place, which are both crucial to learners grasping the new content. The team worked consciously to design lessons that used minimal materials to ensure reproducibility, but there are a handful of demos and activities that require some materials to be gathered or purchased. For example, the first lesson was centered around an experiment called “elephant toothpaste” which was used to spark excitement among the students for the science curriculum. This experiment requires hydrogen peroxide which P.A.Y. does not regularly have on hand and would need to repurchase. With this in mind, one bottle has been left at P.A.Y., but it will not last forever.

Another reflection came from the language barriers. Over five different mother languages are spoken among the learners, and coming in, the variety of languages was an anticipated challenge. Surprisingly, there were minimal issues among the learners’ comprehension of our spoken English; they could understand and follow our lessons even though it was all their second language. Unfortunately, it was quickly revealed that a few learners could not write in English and one could not read in English. To address this, the team gave these learners more

verbal directions and arranged the seating order strategically to place them next to strong peers for support. It wasn’t until the one hour of sports time that the language barrier between the younger learners was a major limitation of our effectiveness as instructors. When a disagreement arose between the learners, they would argue in their mother tongues which left the team struggling to mediate the confrontation. Additionally, the team sometimes coached grades one through four in soccer and cycling. These students on the whole knew less English than the older grades because English does not become the medium of instruction in Namibian schools until grade four. The communication barrier was more apparent when working with this group.



*WPI Team at Soccer with Grade 1-4 Learners*

## Experiences

The staff of P.A.Y. was inviting and welcoming from our very first video call in the preparation term, even commenting that we were “too serious” and needed to smile more. It was very comforting knowing how strong the sense of community is at P.A.Y., and to know the amount of excitement for our arrival energized us. The moment we stepped foot in P.A.Y., we were welcomed with open arms. We embraced the familial atmosphere and tried to connect with the learners as much as possible, especially during lunch time and playing sports at the end of the day. The mission of P.A.Y. is “to nurture self-confidence, critical thinking, and active citizenry in young Namibians coming from disadvantaged backgrounds who will build a more equal and knowledge-based Namibia” (P.A.Y., a). P.A.Y. guarantees their learners a hot meal, supplements their education, and builds character through sport and life skills. We ate the pap and meat stew along that was prepared by the volunteer cooks, which Miss. Sibanda even commented was surprising saying “you guys have eaten every meal, even if it was pap, everyday you have eaten it and we don’t really see that a lot.” We were always greeted by Beata, P.A.Y.’s security officer, and she often told us that she would protect us as her own.

Although day to day operations were full of bonding opportunities, we felt the warmest sense of family during the celebrations we experienced at P.A.Y. The day before any national holiday or break is dedicated to celebration through

dancing and coming together, and everyone is expected to partake. Namibian Independence Day was our first experience of this. Students arrived in the traditional outfits of their different cultural groups and showed us the dances of their heritage. Then, they insisted that we try their outfits and attempt their dances. For the last hour of the day, everyone congregated on the back stoep in a large circle as the P.A.Y. community members took turns giving performances. And we were no different. We couldn’t ignore Miss. Sibanda’s rule: “if you watch, you dance, so what dance will you do?”. Though it was only our second week at P.A.Y., we took center stage alongside our students and performed their traditional dance. Fully embracing the familial atmosphere, we got up and made a fool of ourselves in the middle of the circle in front of everyone. When it came time to celebrate with P.A.Y. on our last day, we were sure to have a choreographed dance prepared ahead of time.



*Independence Day at P.A.Y.*



*Learners Teaching Team Members Traditional Dance*

During our first week at P.A.Y., we felt overwhelmed by the task of learning all of the names of the kids in our class. Not only were there over thirty different learners, but they also had names that were uncommon to us. Not to mention that the learners were shy and would whisper their name under their breath when we asked for it. We struggled to conduct the class in the first week because we would point to a learner and say “you” in order to call on them. We didn’t yet know their names and they hadn’t yet trusted us with their respect. We began our program with the very first lesson demonstrating elephant toothpaste: a chemical reaction that was intended to spark the

learners’ interest and curiosity in science. On the first day with learners, we demonstrated the experiment and had them all sit around and spectate. We introduced new aparati such as beakers, graduated cylinders, and funnels. They were undoubtedly intrigued, but it wasn’t until the second day when they had the chance to mix the ingredients and carry out the experiment themselves that they really felt the spark of excitement for what was to come. There is a quote from a Chinese Proverb located within a binder of inspirational quotes at P.A.Y. that says, “tell me and I’ll forget; show me and I may remember; involve me and I’ll understand.” The learners want to be involved, they want to use their own hands to mix the ingredients and see the result. This kicked off our term of lessons.

Monday’s were always hard; the most challenging days of the week. The learners were quick to lose focus and lacked cooperation. After bringing this up in one of our team meetings with Miss Sibanda and Miss. Matzopoulos, they mentioned it is often due to the lack of food that some learners have on the weekend that cause their bodies to be physical drained by the time they arrive to P.A.Y. on Monday. Our team left work exhausted and usually retreated to our rooms to relax and recharge. We were challenged by the learners level of competitiveness because they were quick to fight over who could do things better. Even in small games and competitions, we would have to mediate conflicts between the learners. Each learner always wanted to be at the front of any line, whether it

was a passing line at soccer or the line to get bikes before cycling, and would push and shove to get to the first spot. We were also challenged to think on our toes and come up with examples that would make the topics we taught more relatable to the learners' everyday lives. When talking about energy, we tried to relate the measurement of watts to money to explain how it's better to use less energy to power the same thing, like spending less money for the same object.

We've come to know just how important the academic pillar of P.A.Y.'s program is. Everyday the learners would arrive at P.A.Y. and sit down to eat lunch with us. Through our lunch conversations, we learned a lot about their individual personalities, quirks, and daily lives. Since P.A.Y. is an after school program, we would ask, "How was school today? What'd you learn?" Common responses included "School was boring. The teacher didn't show up" and "We didn't learn anything." From these interactions we heard first hand how the Namibian education system is very different from the education system we were brought up in. In Namibia, the quality of the education you receive relies very heavily on the school that you attend. The quality of teachers is poor in some public schools, and they have little investment in the success of their students. The teachers will randomly not show up, and in response the learners will just sit in the classroom and wait for the school day to be over. In addition, the quality of the content and assigned work is low. Our students would frequently bring projects in that they were assigned, so we got an idea by the

end of what their schools expected of them, and it was disappointing for our group to see how their teachers assigned work. For example, one day a learner brought two projects in for us to help with, and both were due the following day. The first was unrealistic to complete and we didn't even know how to tackle it, and the second was a project that the learner had already done one year before. These small looks into the Namibian education system proved to us that the teachers are unmotivated to provide proper learning material, projects, classroom activities, etc. for their students. Miss Matzopoulos, who is a former school teacher, shared once that teachers will just pass failing students to the next grade, so that they don't have to deal with the problem. Students who fall behind in the first grade get passed and passed until they no longer have a chance of catching up. By the fifth grade, they are lost. From these examples, we have realized how significant the supplementation of academics is at P.A.Y.

Volunteers are an integral part of this organization because they not only help around the facility but also bring in new perspectives that are great for the learning purposes of the students. P.A.Y. strives to bring in volunteers from different parts of the world to contribute cultural diversity and other world experiences to the organization in an effort to increase the learners' exposure to life outside of Katutura. For example, our team connected with a fifth grade science classroom in Worcester, Massachusetts and had our learners write letters to those students about the biomes they had researched along with

questions about the United States. This was a great activity for our kids to learn about what life is like for students their age on the other side of the world. Even though our team was assigned to the fifth through seventh grade classroom, we ate lunch with the younger learners, a time where we would share photos about places we have been and things we have done. This was one tactic we used to open their eyes to other parts of the world they would not normally see, and show them how many opportunities they have. We invited other WPI project teams working for Eduventures to visit P.A.Y. and teach about ocean literacy and sustainability in their mobile classroom. We also ran two workshops with the high school students where we shared our college experience and talked about various possible careers which led to many questions and interests from the high school learners eager to hear more about other possibilities they could have. Based on our own experience, we have helped in many other areas as well. We have made lunch, served lunch, assigned chores, picked up chores that were missed, gardened, and taught soccer and cycling when needed. This flexibility proved extremely important to us as volunteers so that we could help out as much as possible. Throughout our time there, we came to understand that P.A.Y. as an organization needs volunteers who can fill the gaps when needed and also share experiences that expose the learners to life beyond what they know.



*Eduventures Ocean Literacy Day (Top: Mobile Classroom, Bottom: Learner Observing Shark Jaw)*

Although P.A.Y. is a very successful program, it is reliant on outside funding. The work that this organization is doing to provide a safe and nurturing space for Katutura youth is so noteworthy and it's important for people to know about it, so the staff works to market and bring awareness to the organization in order to keep an influx of funding. In just our time there, this effort was apparent through all of the outreach to local and larger scale news organizations. For example, last year they applied for funding from the Obama Foundation to support girls' education efforts. P.A.Y. was accepted into this program, and while we were there teaching lessons P.A.Y. hosted the Obama Foundation to visit the facility and see first hand the organization's daily operations. In addition, Miss. Matzopoulos had Namibia's national newspaper, *The Namibian*, visit P.A.Y. and publish an article to highlight what the program does for its youth. We were even lucky enough to be featured! Namibian interns have also been working at P.A.Y. to increase awareness through blog posts about new developments within the organization. In addition to previously mentioned marketing efforts, the New York Times did a feature on study abroad programs and interviewed the team towards the end of our project. This opened our eyes into how truly amazing this experience has been and how grateful we are to have had the opportunity to participate. All these efforts work towards maintaining the program, but the challenge of finding investors is that the payoff of the investment is slow.

As a team, we have definitely had key moments that stick out as the highlights of our time at P.A.Y. One highlight was when one of the students said that she wanted to grow up to be a chemical engineer, which is team member Ariana Rozen's major. When she showed the student a picture of a typical processing plant that a chemical engineer might work at the student said, "We don't have those here. I think I'm going to be the first chemical engineer in Namibia". The most standout moment of our time at P.A.Y. was seeing two of the seventh grade students have the confidence to use the new materials they've learned about in our class to recreate one of the experiments at their own school for a project. We lent them the materials, wrote a procedure, and sent them off to school. They came back to P.A.Y. beaming about how well the experiment went, and we were so proud of them. Throughout our time at P.A.Y. we saw the spark excitement for science among the students because we would come in to work in the morning during Holiday School and the learners would already be sitting in the classroom finishing up their work from the previous day. Even the younger learners who we never had the chance to teach but would often have lunch with us would ask daily what we were teaching that day in science.

Another one of our daily highlights was getting to know the learners in grades one through four by sitting with them for lunch. Ngombiro was one of the first ones we met when he strolled in with his front-toothless smile. We were curious about who we were and why we were there, but had trouble

communicating his curiosities due to his lack of English. We'd ask a question and he'd say "eh" and then he'd point to something that he wanted us to explain, like the stickers on Gavin's laptop. Through lunch we also met Kelvin, Cornelius, JJ, Kuku, Gene, Jayden, Samantha and many others. One of their favorite lunchtime games was to call out our names and then hide under the table so we wouldn't know who called. And after every weekend they would ask us to show photos from our weekend as they knew we had traveled. They were always excited and in awe to see different parts of their own country. We'd send them off to their class at the end of lunch, and then meet back up later for sports.



*Team Member Gavin Showing Learners Airplanes on his Computer*

As the weeks progressed, we got to see their skills develop on the soccer field and the BMX track. One Wednesday we were assisting the young learners with cycling and first-grader Cornelius was trying so hard to learn how to ride the bike, but he couldn't ride without us holding on. He kept losing balance and steering into the fence, but he was persistent. Over and over he'd ride the course with one of us holding the bike and when we returned to the starting line he'd say "Miss, again." As we reached the end of the hour he got closer and closer to keeping his balance and riding solo. Then, when we weren't paying attention, he took off to tackle the course alone. It wasn't until he was halfway through that we noticed he was riding by himself. As he came back to the starting line, he radiated a smile of pride and accomplishment. At soccer practice we saw the kids glow with pride, too. Once at practice, first grader Kelvin took a big spill on the cement patio. He cut up his knee and was crying on the ground. "You're tough Kelvin, you're tough," we reminded him. He immediately shifted gears from wincing to absolute attack mode to get the soccer ball. From then on, we always reminded him that his greatest strength was his toughness. We asked him, "what's that word we always call you?" and he said, "tough, I'll never forget that word." Small successes such as these added up to make our experience at P.A.Y. so meaningful.





*Developing Soccer Skills*

The unique personalities of our learners came out over the course of our time with them. They were too shy to reveal them all at once, which was good for us because I don't know if we could've handled them all during our first week. Jordan is an outgoing fifth grader who loves to play pranks on us, but if you put him in charge of the chores he will round up a crew and make sure that the room is cleaned pristinely. Varelia is a seventh grade student full of sass and attitude, but she will proudly stand up and read aloud to the class. Victoria is a hard-working seventh grader who aims to be the "first chemical engineer in Namibia." Once, she wasn't happy with the quality of work that her team produced when making a poster, so she remade the poster at home over the weekend. Gerhard and Ndangi are seventh grade boys who are "too cool"

to answer questions out loud but will get perfect scores on their worksheets almost every time. Michael is a sweet sixth grade student with a huge smile but struggles to keep up with the class. Julia isn't the best at following directions but she's tenacious when it comes to playing soccer. We could write something about the individuality of each student that has sat in our class, and we are grateful for the time we got to spend getting to know them.

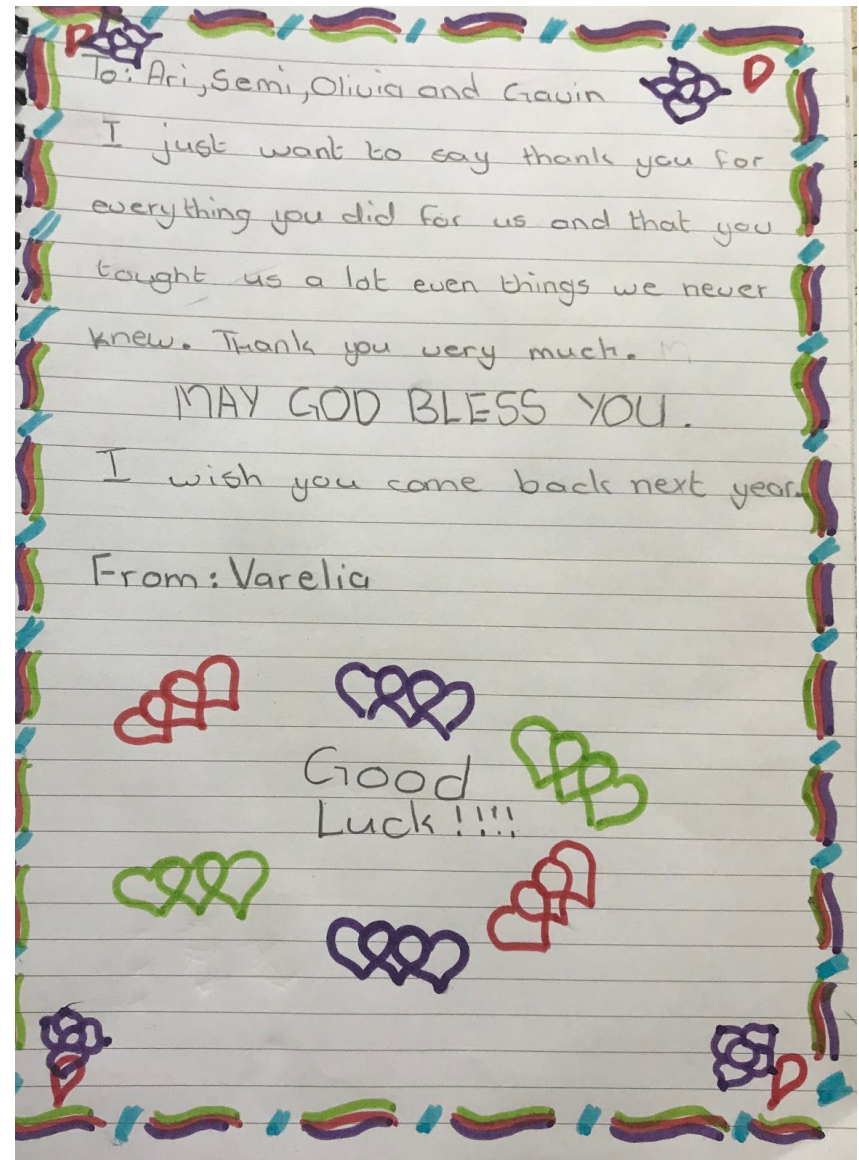


*Two Learners Playing "Ships and Sailors"*

As a momento we asked all learners who wanted to write a letter or draw a little note in the back of our daily reflection book so we could have an additional tangible item to remember

all our learners by. Many learners were eager to have their chance to write as they knew how important this was to all of us.

The kids are tough. They come from disadvantaged backgrounds and don't have access to some of the basic resources that we're used to. Each carries a story that they could use as an excuse not to succeed, but each also holds the ability to make decisions that propel them above their current situation. This sentiment is at the core of P.A.Y.'s values and they proudly hang a quote by Steven Covey saying, "I am not a product of my circumstances, I am a product of my decisions". Each student also carries a young spirit that craves encouragement and new discoveries, and for the last eight weeks we have had the chance to feed this hunger through our lessons. Above all else that it does, P.A.Y. provides a family that invests in every one of its learners, and we were fortunate enough to be fully immersed in this family for eight whole weeks. We will forever cherish the time that we've spent as a part of it.



*Snapshot of Student Letter to Team*

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## Appendix A - Data Collection Methods

### A.1 - Teacher Questionnaire

1. How many years have you been teaching? *The purpose is to establish their experience level.*
2. In what subjects are you certified to teach? *The purpose is to establish what fields they are more educated in.*
3. What grade levels have you taught? *The purpose is to ensure their experience is relevant to our grades 5-7th teaching in Namibia.*
4. What do you find is the key to creating lessons that grade 5-8 students will remember? *The purpose is to discover what makes a lesson memorable.*
5. What type of activities do you find help the student grow and learn most effectively? (Example: book work, worksheet, group work etc.) *The purpose is to learn what format students learn most from.*
6. In your opinion, what is the biggest challenge in working with students grades 5-8?
  - a. How do you get past this challenge? *The purpose is to discover a challenge for us to start thinking about and proactively try to prepare as best as we can for*
7. What do you do if a student just doesn't grasp the concept? *The purpose is to get insight into different methods of summarizing information taught, ie worksheets, homework, discussion, games etc.*
8. Do you have a general lesson plan of how you conduct each day?
  - a. If so, what is it? *The purpose is to discover what is the best flow to a lesson to help support the success of implementing a lesson.*
9. What educational games have your students been most excited about?
  - a. And why do you think so? *The purpose is to discover what is the best flow to a classroom to help support the success of implementing a lesson.*
10. If you could give one piece of advice to a new "teacher" what would you say to help them be more effective teachers? *The purpose is to see what the number one thing we need to focus on/be prepared for.*
11. How do you foster an environment of trust with your students? *The purpose is to discover ways of creating a trusting, safe, welcoming environment in the classroom*
12. How do you work with challenging students who simply don't want to participate? *The purpose is to determine ways to work with challenging students who may not want to participate or be engaged.*
13. What are 3 -5 supplies your classroom can't live without? *The purpose is to determine what materials we should start to collect/pack/fundraise for.*
14. What are the top 3 life skills lessons that students grades 5-8 should be taught? Life skills include career guidance (ie study skills and career research), daily living skills (ie health care, family life, and finance) and personal-social skills (ie relationships, self-awareness, and citizenship). *The purpose is to narrow down topics to teach during life skills program.*
15. Have you ever had a student-teacher shadow you?
  - a. If yes, what did you find was the most effective way to educate them? / When we switch roles what should we remember to be the best mentor teacher? *The purpose is learn how to best deliver lessons to the current instructors, ensuring it is clear so they can continue to use them after we leave.*

## A.2 - Starting Point for Lesson Feedback

### Lesson: Butterfly Life Cycle



**Objectives:** Learners will be able

- To understand what a life cycle is
- To identify four stages of butterfly life cycle: *egg, caterpillar, chrysalis, butterfly*
- To work with each other in a competitive game environment

**Standards Covering:** (Taken from Namibian Syllabi)

1. Standard 1 observe and draw different stages in the life cycle of a simple invertebrate
2. Standard 2 state the different stages in the life cycle of a simple invertebrate

**Materials:** Chalk, worksheet, pencils, colored pencils/markers/crayons

**Prep-Work:** Make sure desks are arranged to allow space for game and conduct lesson when learners have already been introduced to Rock/Paper/Scissors.

**Energizer (5 mins):** Head, Thorax, Abdomen Song *This will be a recap of the previous day's lesson on the body parts of an insect. Everyone stands up to sing the song.*

INSECT'S BODY (Tune: "Head, Shoulders, Knees, and Toes")

Head (Point to head.)

Thorax (Point to chest.)

Abdomen – ~~abdomen!~~ (Point to stomach.)

Head, thorax, abdomen – ~~abdomen!~~

Two eyes (Point to eyes.)

Six legs (Wiggle 3 fingers on each hand.)

Two antennae (Stick 2 fingers up.)

Maybe wings (flap arms as wings.)

Head, thorax, abdomen – ~~abdomen!~~



**Transition (5 mins):** Now that we have learned the different parts of butterfly, let's discuss how they are created. Butterflies need to complete four phases before they are actually butterflies. Does anyone know what one phase or stage is called? *Instructor can write vocab terms on the chalkboard, if no student knows then proceed to introduce them.*

**Key Vocabulary (10 mins):** Presenting the information, creating Quizlet for review  
Life Cycle - Stages of life from birth to death

Egg Stage - First stage of the life cycle: small round eggs are laid on leaves



Larva Stage - Second stage in the life cycle: egg hatches into a caterpillar



Pupa Stage - The larvae creates this structure and transforms inside into a butterfly



**Challenge Word of the Day:**

Metamorphosis - Transformation from a young form to an adult form in multiple stages

**Activity (15 mins):**

Bring the class together and act out the monarch life cycle.

1. Squat, and form a ball to act out the egg. Butterflies lay eggs on specific plants, like milkweed for monarchs. Monarch butterfly eggs are very tiny, about the size of a pencil tip.
2. Next, stand up and open and close your hands in front of your face to mimic a large mouth. You are now caterpillars (larva) and eat constantly to grow quickly.
3. Then put your hands down and spin slowly. You are a now caterpillars (larva) and eat constantly to grow quickly.
4. Then put your hands down and spin slowly. You are a chrysalis spun from silk thread. Butterflies average about 2 weeks in chrysalis.
5. Lastly, gently move your arms up and down to mimic flapping wings- you are now a mature butterfly.

Once students know the four stages of a butterfly's life cycle and their corresponding actions, they are ready to play. Tell the students they are going to act out the life cycle of a butterfly but with a twist! Verify that all students know how to play Rock, Paper, Scissors. Review the rules (see sidebar) and when to "shoot" if needed.

Everyone starts as an egg. You must make your egg action (squat) until you find another egg to play against. Play Rock, Paper, Scissors. The winner moves onto the next stage of the life-cycle- caterpillar.

Continue playing rock, paper, scissors against someone else who is in the same stage of the life cycle as you. Make sure you make the corresponding motion for your life cycle stage and say it aloud.

If you win, you move up to the next stage until you are turned into a butterfly and stand to the side. If you lose, go back a level (caterpillar to egg, chrysalis to caterpillar). Eggs stay an egg.

**Debrief/Recap (10 mins):**

How many people became butterflies?

Who was first to become a butterfly?

For them specifically, what was a challenge they faced? (I.e. trying to wait for the next caterpillar so can play against them)

How many people were caterpillar?

How many people were crystallizes?

How many people remained an egg?

How many other eggs did you compete with but lost every time?

Discuss: The actual time frame in each part of the life cycle

Why do you think so people never advance in the life cycle?

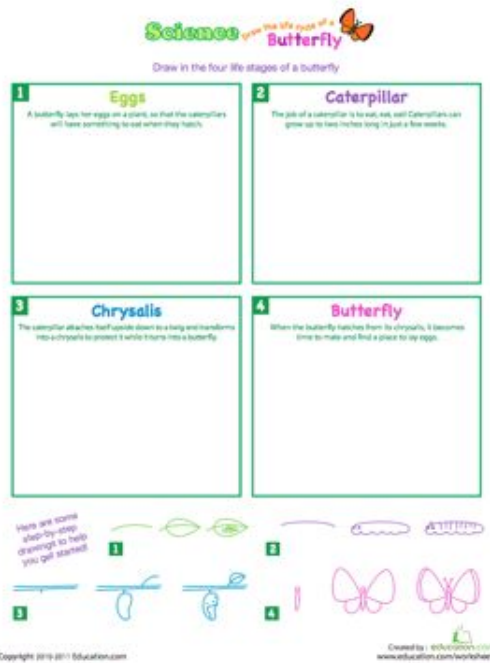
Discuss: weather conditions, nature, etc.

Any other comments or questions about a butterfly life cycle?

Did we like this activity?

Tomorrow we will talk more about how things evolve.

**Worksheet (in class team assignment):** Drawing and labeling the life cycle (color if time) *We are planning on facilitating the interactive rock/paper/scissors activity in class, however P.A.Y. asked that we leave worksheets with them for future use. This is the worksheet we will leave them with. It can also be completed by the students the next day during the homework hour if they don't have any homework.*



**Lesson Plan for Next day:**

Review lesson about butterfly life cycles from the day before and make the second day a comparison of butterfly life cycle to the life cycle of a frog (or some other animal listed on syllabus). Maybe start talking about food chains and basic ecology.

**Future Lessons:** Compare the similarities and differences of some externally visible features of the following invertebrates: ants, flies and butterflies

**Sources:**

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### A.3 - Pre-Assessment

Name: \_\_\_\_\_

Circle Your Grade: 5 6 7

**Write the following answers:**

1. What are the steps of the scientific method?
2. Do you know how to create a graph? If yes, what type of graph(s)?
3. What is matter? Can you give me an example of a phase of matter?
4. Name and describe one ecosystem.
5. What is a life cycle? Can you give me an example?
6. Name and describe a system of the human body.
7. What is energy? Can you give me an example of one type of energy?
8. Describe what engineering is.
9. What is one thing you are excited to learn/want to learn more about?
10. What is one thing you struggle with/one thing you want help on?

**For the following two questions CIRCLE yes or no:**

- |   |     |    |
|---|-----|----|
| 11. Would you be interested in participating in a science fair? | YES | NO |
| 12. Would you be interested in participating in a spelling bee? | YES | NO |

## **A.4 - Post Assessment**

To remove variables, this post-assessment is to be read aloud to students for consistency in how the pre-assessment was administered. Reading aloud helps English Learning Learners understand more easily and gives them the ability to ask questions or to have the administrator repeat or clarify what was said.

**Give students a blank sheet of lined paper and ask them to put their name, grade, and date at the top. All other items need to be put away except a pencil and/or eraser. Stress honesty and no cheating; the results will not affect their gradebooks.**

### **Format of the Post-Assessment: Three Questions for Each Week's Topic.**

- 1. General knowledge question to see if they can remember learning about X topic.** *The purpose is to see if the students were able to LEARN the basic concept/take-away.*
- 2. Activity related question to see if they can apply the concept to the activity we did.** *The purpose is to see which activities students remember the most, so they can be recommended for future use.*
- 3. Specific application question (ex. vocabulary definition question) to see if they really learned the material.** *The purpose is to see the depth of knowledge the student obtained.*

**Material:** Hold up the following instruments to see if the students can now identify basic science equipment. Students are asked to write down the name of the three following instruments:

1. Thermometer
2. Beaker
3. Graduated Cylinder

### **Week 1: Scientific Method**

4. Describe what the scientific method is used for, who uses it, and why. Write down the steps of the scientific method. *Compares to question #1 on the pre-assessment; What are the steps of the scientific method?*
5. Name an experiment we did and used the scientific method for.
6. Write an example of a hypothesis.

### **Week 2: Matter**

7. List the name of the three states of matter. *Compares to question #3 on the pre-assessment; What is matter? Can you give me an example of a phase of matter?*
8. What game did we play to learn what happens in each stage of matter? Describe the game/what each stage was.
9. What is an atom?

### **Week 3: Ecosystem (water cycle, ecosystem, biomes)**

10. Name the two parts of an ecosystem. Give an example of each. *Compares to question #6 on the pre-assessment; Name and describe one ecosystem.*

11. What did we do to share about biomes? Tell me about the biome you shared.  
*Compares to question #6 on the pre-assessment; Name and describe one ecosystem.*
12. What is precipitation?

**Week 4: Living Organisms I (Adaptations, Life Cycle, Food Chain/Web)**

13. Tell me the differences of a food chain and a food web.
14. Name one of the activities we did to learn about adaptations, life cycle, or food chains. What is something you created? *Compares slightly to question #4 on the pre-assessment; What is a life cycle?*
15. What is an omnivore?

**Week 5: Living Organisms II Human Body**

16. What is one system of the human body? *Compares to question #5 on the pre-assessment; Name and describe a system of the human body.*
17. Describe one activity we did to learn about the nervous system.
18. What is the windpipe? What body system is it apart of?

**Week 6: Holiday School**

19. Anything else you want to tell us?

*Note: We didn't ask questions related to questions #2 and #7 on the pre-assessment or on the topic of engineering because we did not cover those lessons.*

# A.5 - Student Survey








Name: \_\_\_\_\_

Date: \_\_\_\_\_

Circle Your Grade 5 6 7

## Activity Survey

For each activity we did, check ONE number that describes how much you enjoyed the activity:

Activity	 A You were NOT in class	 0 You don't remember the activity	 1 You hate the activity & never want to do it again	 2 You disliked it	 3 It was okay, you don't feel strong about liking it or not liking it	 4 You liked it	 5 You LOVE D it & want to do it again
Elephant Toothpaste							
Measurement Scavenger Hunt							
Engineer/Chemist/Geographer Stations							
Solid/Liquid/Gas Acting Game							
Melting an Ice Cube							
Water Cycle Song & Drama							
Abiotic and Biotic Observations Outside & Matching Cards							
Biome Research							
Writing Letters About Your Biome							
Biome Poster							
Adaptations Beak Game							
Life Cycle Rock Paper Scissor Game							
Create Your Own Food Chains							
Skeleton Measurements							
Nervous System Stations							
Lungs in a Bottle							



## A.6 - Sponsor Interview

Interview Guide for Feedback of WPI Students Curriculum Development and Lesson Facilitation at  
P.A.Y.

Date:

Time:

Director Name:

### 1. Qualitative Interview Introduction

Length: 30-40 minutes

Primary Goal: To learn more about the strengths and shortcomings of the team's lesson creation and facilitation from an observer's perspective and to evaluate the team's program for future recommendations. Please be as honest as possible because all feedback is useful feedback.

### 2. Background Information

- What's your background in education?
- What career choices have led you to work at P.A.Y.?
- How long have you been involved at P.A.Y.?
- What is your experience working with the 5-7th grade classroom?

### 3. Lesson Feedback Main points to cover in this section include: strengths and weaknesses of lessons, strengths and weaknesses of facilitation

- What activities in the class have you observed? Of those activities, what seemed to go well and what seemed to go poorly?
- Have any students have given you feedback about the lessons? Who? What have they said about the lessons?
- Have you heard negative feedback from any students or full time P.A.Y. staff members?
- What do you think has been the best part of our program so far?
- In what areas did you see us struggle as facilitators?
- What should we tell the next group to continue with?
- What have you observed that you would not want to see again?
- What should we tell the next group to change or improve upon?
- Any other comments in general?

## Appendix B - Collected Data

### B.1 - Teacher Questionnaire Responses

**Question 1: I have read the attached Informed Consent Agreement for Participation in a Research Study and have had all my questions answered.**

Respondent 1: *Yes; I have read the Informed Consent Agreement for Participation and agree to participate.*  
Respondent 2: *Yes; I have read the Informed Consent Agreement for Participation and agree to participate.*  
Respondent 3: *Yes; I have read the Informed Consent Agreement for Participation and agree to participate.*  
Respondent 4: *Yes; I have read the Informed Consent Agreement for Participation and agree to participate.*  
Respondent 5: *Yes; I have read the Informed Consent Agreement for Participation and agree to participate.*  
Respondent 6: *Yes; I have read the Informed Consent Agreement for Participation and agree to participate.*  
Respondent 7: *Yes; I have read the Informed Consent Agreement for Participation and agree to participate.*  
Respondent 8: *Yes; I have read the Informed Consent Agreement for Participation and agree to participate.*  
Respondent 9: *Yes; I have read the Informed Consent Agreement for Participation and agree to participate.*  
Respondent 10: *Yes; I have read the Informed Consent Agreement for Participation and agree to participate.*  
Respondent 11: *Yes; I have read the Informed Consent Agreement for Participation and agree to participate.*  
Respondent 12: *Yes; I have read the Informed Consent Agreement for Participation and agree to participate.*  
Respondent 13: *Yes; I have read the Informed Consent Agreement for Participation and agree to participate.*  
Respondent 14: *Yes; I have read the Informed Consent Agreement for Participation and agree to participate.*

**Question 2: How many years have you been teaching?**

Respondent 1: *17*  
Respondent 2: *23*  
Respondent 3: *12*  
Respondent 4: *15*  
Respondent 5: *28*  
Respondent 6: *21*  
Respondent 7: *12*  
Respondent 8: *13*  
Respondent 9: *17*  
Respondent 10: *33*  
Respondent 11: *17*  
Respondent 12: *1*  
Respondent 13: *17*  
Respondent 14: *24*

**Question 3: In what subjects are you certified to teach?**

Respondent 1: *Humanities*  
Respondent 2: *Elementary, middle school general science, high school biology*  
Respondent 3: *English*  
Respondent 4: *Art and Special Needs*  
Respondent 5: *Middle School Science*  
Respondent 6: *Science 5-12 and Special Education 5-12*  
Respondent 7: *Middle School Math*  
Respondent 8: *Science*  
Respondent 9: *Elementary-all subjects*  
Respondent 10: *K-3, 1-6, 5-9 general science, 9-12 physics*  
Respondent 11: *Elem, Spec Ed, MS, HS*  
Respondent 12: *Math (Grades K-8), General Curriculum (K-6)*  
Respondent 13: *Elementary 1-6*  
Respondent 14: *Elementary All Subjects*

**Question 4: What grade levels have you taught?**

Respondent 1: *Grades 6, 7, 8*

Respondent 2: *Grade 8*

Respondent 3: *Grade 8*

Respondent 4: *K-12 (Art), Gr. 9 World History*

Respondent 5: *Grade 7*

Respondent 6: *Both 7th and 8th*

Respondent 7: *Grade 8*

Respondent 8: *Grade 8*

Respondent 9: *Grade 5*

Respondent 10: *5, High School Physics/Rocketry (Summer Program) Adjunct Professor BSU (Physics)*

Respondent 11: *Grade 6*

Respondent 12: *Grade 5*

Respondent 13: *Grade 5 and Grade 3*

Respondent 14: *Elementary 3-8*

**Question 5: What do you find is the key to creating lessons that grade 5-8 students will remember?**

Respondent 1: *A hook that engages all learners.*

Respondent 2: *They remember the experiences they present to others.*

Respondent 3: *Keeping the material engaging, aligning standards with assessments, and varying instructional methods.*

Respondent 4: *Tapping into things that they love. If they're not excited about it, they don't remember it very well.*

Respondent 5: *Hands on, experiential with a product they can hold on to physically (model they built) or mentally (presentation they did).*

Respondent 6: *Creating lessons that are hands on experiences.*

Respondent 7: *It is always best if the lesson involves an activity that helps them understand/discover the concept that is being presented themselves. For instance, an activity that helps students understand the relationship between the different area formulas.*

Respondent 8: *Connect it to the world they currently live in and to their everyday routines.*

Respondent 9: *Combining mental activity with physical activity, regardless the content area.*

Respondent 10: *Engagement.*

Respondent 11: *They must be able to apply the lesson to their own experiences.*

Respondent 12: *Interactive lessons that are hands on with their peer groups.*

Respondent 13: *They must be relevant, make an emotional connection with students, and be hands-on.*

Respondent 14: *Engaging way to introduce subject matter.*

**Question 6: What type of activities do you find help the student grow and learn most effectively?**

Respondent 1: *Projects*

Respondent 2: *Projects*

Respondent 3: *Engaging class discussions*

Respondent 4: *Projects*

Respondent 5: *It's really a combination. Students don't always learn what you want them to learn with any work they do. You have to have specific goals in mind.*

Respondent 6: *All of the above*

Respondent 7: *Group Work*

Respondent 8: *Projects*

Respondent 9: *Group Work*

Respondent 10: *Group and partner projects (can only click one though)*

Respondent 11: *A combination of all of the above.*

Respondent 12: *Projects*

Respondent 13: *This depends on the student. In general, projects; but this answer greatly depends on the student's learning style and personality.*

Respondent 14: *Group Work*

**Question 7: In your own opinion, what is the biggest challenge in working with students grades 5-8?**

Respondent 1: *Getting and keeping them engaged.*

Respondent 2: *The heterogeneous classroom. We have a huge range of abilities and motivational levels in one class.*

Respondent 3: *Lack of student effort.*

Respondent 4: *Keeping down time to an absolute minimum. They need to be busy for the entire class period.*

Respondent 5: *These days we compete with Fortnite. They'd rather do that then learn, so they come in tired from playing for hours without physical activity and then they want to be entertained at school.*

Respondent 6: *Hormones - there is such a wide span of maturity with this age group.*

Respondent 7: *There can be significant differences in mathematical ability/understanding of students in the same classroom.*

Respondent 8: *Their fear of failure.*

Respondent 9: *Helping to instill a growth mindset in students who are at a tough age, socially.*

Respondent 10: *Willingness on the part of the student to engage in the activity.*

Respondent 11: *Changing pace every 10-20 minutes.*

Respondent 12: *Small groups because of the changing personalities.*

Respondent 13: *Adolescence and the emotional roller coasters that come with it.*

Respondent 14: *Perseverance - (mindset) Students are quick to give up, wanting someone else to do the work.*

**Question 8: How do you get past this challenge?**

Respondent 1: *Mix up our activities and the ways we "get messy" with our content.*

Respondent 2: *Offer a menu option of ways to present your understanding.*

Respondent 3: *Keep students motivated, high energy teaching, varying assignment types, connecting with students.*

Respondent 4: *Students learn the classroom routines on Day 1 and are required to follow them - it quickly becomes second nature.*

Respondent 5: *Still working on it.*

Respondent 6: *Set goals for the top and differentiate when needed.*

Respondent 7: *Differentiated lessons and flexible grouping depending on the activity.*

Respondent 8: *Create an assessment system where that fear is removed and learning from one's mistakes is rewarded.*

Respondent 9: *Modeling a growth mindset mentality and relationship building.*

Respondent 10: *Bring it to their level by making it meaningful to them.*

Respondent 11: *Change the pace every 10-20 minutes.*

Respondent 12: *Teaching group norms prior to group settings with reminders when needed.*

Respondent 13: *I spend a lot of time at the beginning of the year establishing rapport and a personal relationship with each kid.*

Respondent 14: *Dialogue, show them I make mistakes, Mistakes don't mean failure - FAIL= First Attempt in Learning.*

**Question 9: What do you do if a student just doesn't grasp the concept?**

Respondent 1: *Try another way and use a layered approach to help all kids build a foundation.*

Respondent 2: *It depends on how many others also do not understand. If it's 10% of the class or lower, I must move on.*

Respondent 3: *Reassess my lesson and reteach. Provide lots of exemplars.*

Respondent 4: *I typically sit with that student and watch him/her go through the steps. I can usually see where they falter. Then I retrain as needed.*

Respondent 5: *The need to come in for extra help and tell me why they are having trouble. It usually comes down to being unfocused.*

Respondent 6: *Teach it again in a different fashion with different examples or activities.*

Respondent 7: *In 8th grade, typically I try to work with the student one-on-one.*

Respondent 8: *Find another avenue to take, look for another connection in their day-to-day lives, then, if that doesn't work work backwards to see what root concept they are struggling with. Trigonometry won't come easily to a student who does not understand the order of operations.*

Respondent 9: *I communicate clearly that they haven't mastered it yet, but will eventually.*

Respondent 10: *Find a new way to readdress it with the student.*

Respondent 11: *Remediation in the afternoon periods.*

Respondent 12: *Individually pull the student aside to review at another time after checking in with the student*

Respondent 13: *Revisit and reteach; try a different approach; don't give up on the student! --and ask colleagues for help.*

Respondent 14: *Partner them with a student that does grasp the concept to see if that student can explain the concept in a different way. If not propose the concepts in a simpler manner. ie: Explain concept to a student significantly younger student (3rd grader or lower) If possible take a brain break and then go back to the concept.*

#### **Question 10: Do you have a general lesson plan of how you conduct each lesson? If so, what is it?**

Respondent 1: *I always begin with the end in mind - where do I want us to end up and what is it that I want/need (based on the MA Frameworks) the kids to learn and understand. From there, I look at all my resources - text, read aloud possibilities, videos/video clips etc - and map out a plan to help kids dig in to the material. I try to mix up what we do and how often we're in the text to keep things fresh.*

Respondent 2: *1. Warm up, 2. Whole class instruction, 3. Small group activity, 4. Reflection/wrap up.*

Respondent 3: *Attention grabber, main instruction, closer.*

Respondent 4: *I show samples of the project, demonstrate it (or some of the first steps), have them work on it themselves, do the next demo, etc. While they're working I cruise the classroom and see what/how they're doing.*

Respondent 5: *I have a framework that I use each day that has the essential question of the unit (this is what we're working towards, usually developed from one or more science standards, I then have the objectives: Students will...housekeeping (these are reminders), and finally homework.*

Respondent 6: *No*

Respondent 7: *I generally have the students work through an activity that introduces the concept that ends with them typically summarizing the concept. I then present a few examples that so how the concept can be applied. The students are then given practice to do on their own.*

Respondent 8: *1 - Engage the students with something that hooks their interest and will act as a recurring theme throughout the entire lesson. 2 - Give clear and concise goals for the lesson and pre-assess their understanding of those goals. 3 - Connect the goals directly to standards that will be used to assess the student's final understanding of the material. 4 - Give clear information (notes, presentation, oral explanation, etc...) about the specific concepts being taught. 5 - Re-engage with a hands-on approach to the concepts. 6 - Review the goals and information provided and see if the students can apply them to other concepts (making connections). 7 - Assess level of understanding through a summative assessment. 8 - Review assessment and do an engaging closing activity.*

Respondent 9: *Warm-up, mini lesson, workshop (various activities with academic choice), wrap-up.*

Respondent 10: *No.*

Respondent 11: *The subject and skills to be grasped and later mastered.*

Respondent 12: *Yes, I always begin with the objective before outlining their job.*

Respondent 13: *Gradual release of responsibility--"I do, we do, you do"--this goes for every subject.*

Respondent 14: *State the Objective in student friendly language, Warm up of some sort (Activator, 1-4-minute video, exploration, game), Teach 15-minute lesson, Scaffold learning 1. "I do" - model, "We do" - group/class, "You do" - individual, De-brief to clear up any confusion, Exit ticket, closing activity.*

#### **Question 11: What educational games have your students been most excited about? And why do you think so?**

Respondent 1: *They like Quizlet games - probably because they love their electronics.*

Respondent 2: *Grudge ball is physical and competitive and Quizlet live is physical, collaborative and competitive.*

Respondent 3: *Scrabble. It's the only "game" we play. It gets competitive.*

Respondent 4: *N/A.*

Respondent 5: *Games I have students play use the program CPS; students work together to answer questions and it doesn't matter who is first. Accuracy is always more important in my class, not speed. I don't like the games from Quizlet and Kahoot. I don't feel students learn from them since they are based on speed.*

Respondent 6: *Quizlet and Kahoot. Probably because they are easy and really only touch on the beginnings of Bloom's Taxonomy*

Respondent 7: *Students are always excited about games that allow them to work in groups and are a little competitive. I have also used things like scavenger hunts and bingo.*

Respondent 8: *I created a game called penny slide that is used to review concepts before any assessments given. They like it because it is kinesthetic and is fast paced. It is competitive and challenging.*

Respondent 9: *Any activities that offer movement, student choice, and group work.*

Respondent 10: *Most recently - Kahoot 'games/quizzes' because they are computer based, interactive and can be done as a group.*

Respondent 11: *I think most games are a waste of time for students who need to learn. 10% will get it straight off, 70% will get it with practice, the rest need remediation. Games don't help any of these students.*

Respondent 12: *Mostly experiments because it is out of the norm.*

Respondent 13: *They love Kahoot, because it involves screens, it's competitive, and it's fast-paced. They have multiple opportunities to be successful, and can work alone, with a partner, or a small group.*

Respondent 14: *Math Games - Name that number, Make a Monster (gr Level), Boggle - Word games.*

**Question 12: If you could give one piece of advice to a new “teacher” what would you say to help them be more effective teachers?**

Respondent 1: *Take the time to build a community with your kids, to become a community of learners. And, don't be afraid to own up to what you don't know. They will respect you for owning a mistake.*

Respondent 2: *Take the first three days to clearly explain and practice your procedures. Manage your class rather than discipline your class.*

Respondent 3: *Connect with the students. Understand who they are and be mindful that your class / work is probably not the most important thing in the world to them. Be understanding and honest.*

Respondent 4: *Plan ahead and keep them busy. Show them how much you love your subject.*

Respondent 5: *Establish your expectations right away, not rules. Let them know what you stand for and what you won't stand for. I don't have any discipline issues with my 140 students. Each day I can focus on teaching, not discipline.*

Respondent 6: *Be excited about what you teach!*

Respondent 7: *Don't be afraid to make mistakes and be flexible.*

Respondent 8: *Although, what (the content) you teach your students is important the truth is that most students will retain a small fraction of the immense information you have provided them, about 1/10. At this age you are building minds that think critically, creatively, and collaboratively. Those minds won't be built out of facts, but out of experiences that they can draw upon.*

Respondent 9: *Facilitate student learning by providing opportunities to learn. Make sure that the students are the center of the classroom, not yourself.*

Respondent 10: *Listen to your students.*

Respondent 11: *Classroom management is the key. The best lesson plan is kaput if the classroom management is poor. The poorest lesson plan is okay if the classroom management is good. If both are good, you are golden.*

Respondent 12: *Always begging with the objective and conclude with an explicit exit ticket which will demonstrate their ability to reach the objective outlined.*

Respondent 13: *You must fight for the behavior you want before you can teach them anything. Spend much more time than you think is necessary establishing your expectations for behavior and making them practice.*

Respondent 14: *BREATHE! Take time to get to know your students, show them you make mistakes and admit you do not know it all, but that you are willing to work with them to find the answers.*

**Question 13: How do you foster an environment of trust with your students?**

Respondent 1: *Again, we spend the first few weeks NOT on curriculum but on building a community of learners, and I'm one of those learners.*

Respondent 2: *Do not embarrass or demean students in front of their peers.*

Respondent 3: *I try to be as sincere and genuine as possible. I like to celebrate little victories with my students and listen to them.*

Respondent 4: *I'm very straightforward with them and I try to always be fair and kind. I believe in the Hippocratic Oath: First, do no harm.*

Respondent 5: *Listen to their side of the story, always. Give them the benefit of the doubt. If you didn't see it, it probably didn't happen. Let them know you're on their side when it comes to what's best for them. You're tough when you need to be and soft when you need to be.*

Respondent 6: *Let them know when I'm having a bad day, that I'm human, and sometimes I may need their help.*

Respondent 7: *I try to be as honest as I can be and show them that it is ok not to know the answer and make mistakes.*

Respondent 8: *Treat them with the same respect you would expect them to treat you or any other adult with.*

Respondent 9: *I let them see me make mistakes and work through them. I take care to let them know that mistakes are vehicles through which they learn. I also try to use positive language as much as possible.*

Respondent 10: *By being honest and trustworthy myself*

Respondent 11: *I prove I am on their side by never getting off their backs.*

Respondent 12: *Getting to know the students personally*

Respondent 13: *Trust must be earned, and you have to show them that you are a person of integrity and teach them what it looks like.*

Respondent 14: *Show them I am human, share my own experiences with whatever subject I am teaching, LISTEN to what they have to say. I start every day with a "morning meeting" allowing students to share whatever is on their minds.*

#### **Question 14: How do you work with challenging students who simply don't want to participate?**

Respondent 1: *I try to meet each student where he/she is. I work hard to build relationships with each one. By taking the time to get to know them, most kids buy in and participate.*

Respondent 2: *I use classroom "pickers" where all students must answer with their card code. I spin the wheel "wheel decide" website- to call on students.*

Respondent 3: *Make the lesson fun enough to get them to want to participate.*

Respondent 4: *I usually have them meet me after class for a 1 on 1 talk and that usually works.*

Respondent 5: *Give them two choices in which one of the choices is always a much better choice. After you give the choices, say, "I hope you choose well." and then leave them to make the choice while you carry on. They want attention, even negative attention. Don't give them that kind of attention. If they make the good choice to participate, welcome them, but don't be effusive. If they make the wrong choice, say that maybe next time they'll make a better choice and have them live with the choice they made. They can turn back anytime and they are always welcome, but you are carrying on with the class.*

Respondent 6: *I don't ever really have this issue. Partner and group work usually fixes this.*

Respondent 7: *I have found that encouraging them and telling that they are capable goes a long way. Often those students are just looking for some attention.*

Respondent 8: *You don't. You can't work with someone who does not want to work with you. You will burn yourself out trying to appease a single student who just does not care while you ignore those that are ready and willing. This does not mean that a non-participative student will never participate. The hope is that the activities and lessons are so engaging that they won't be able to resist. If they become disruptive they will be asked to leave the room. I guess it's just a cold hard fact about the real world, some folks just don't care and there is nothing you can do about it.*

Respondent 9: *I find that even the most resistant students will engage in peer-driven activities or games. I talk to my kids to learn their interests so that I can come with activities to catch their attention.*

Respondent 10: *Let them come in at their own pace, make it look engaging so they will want to participate.*

Respondent 11: *We redo the work during recess and gym.*

Respondent 12: *Provide them with options*

Respondent 13: *Cajole, joke, find something they are interested in... there is always something. It is very rare for students to flatly refuse to participate on a regular basis.*

Respondent 14: *Work 1:1 or small group; assess orally through conversation.*

**Question 15: What are 3 -5 supplies your classroom can't live without?**

Respondent 1: *ALL of my books, computer, paper & markers for projects, sense of humor.*

Respondent 2: *Computer, Smartboard, Paper, Laptops.*

Respondent 3: *Overhead document camera, Google apps such as Documents, Drive, and Slides, a whiteboard.*

Respondent 4: *Pencils, paper, scissors.*

Respondent 5: *Notebook (students have to draw and write about their learning all the time), pencil (sometimes the chromebooks can be a distraction). You can't beat pencil and paper. Correcting pen (students make their own corrections so they can see what they did wrong and fix it. If another student or I fix it, they only focus on the grade. Earbuds (we listen to a lot of videos and their textbook reads to them). The text is written at a higher level, so listening helps a lot with comprehension.*

Respondent 6: *Paper, pencils, internet access.*

Respondent 7: *White board markers, colored folders/bins, clipboard, pencils.*

Respondent 8: *Check in system (license to learn), projector, computer, access to the woods/pond, green screen.*

Respondent 9: *Dice, number cards, music.*

Respondent 10: *I can teach with almost nothing, especially outdoor science. However, within my class the students like their chromebooks, manipulative for math, a novel to read and discuss, a personal excitement for teaching/learning.*

Respondent 11: *Pencils, paper, charged chromebooks, a working photocopier.*

Respondent 12: *Pencils, paper, scissors, glue sticks.*

Respondent 13: *10,000 pencils, markers, construction paper...and these days, Chromebooks.*

Respondent 14: *White boards, dry erase markers, sticky notes, dice, deck of cards.*

**Question 16: What are the top 3 life skills lessons that students grades 5-8 should be taught?**

Respondent 1: *Responsibility, increased independence, study skills.*

Respondent 2: *Don't be a bystander, Grit and perseverance, No excuses.*

Respondent 3: *Organization, respect, participation.*

Respondent 4: *Kindness, self-discipline, careful listening.*

Respondent 5: *How to organize your things in binders and notebooks, How to organize your space (locker and desk), Keeping track of materials (if you lose something, there isn't always one to borrow), Time management at school and especially at home, How to study most effectively  
How to stay focused and not be distracted by people or gadgets.*

Respondent 6: *"Fair" doesn't mean the same for everyone, respect goes both ways, integrity.*

Respondent 7: *Perseverance, personal responsibility, time management.*

Respondent 8: *Collaborative working skills, question dissection and critical thinking, Steady hand skills (using tools).*

Respondent 9: *Self-awareness, empathy, diligence.*

Respondent 10: *Teamwork, study/work habits, empathy.*

Respondent 11: *Loving themselves, others, and mutual respect.*

Respondent 12: *Self-awareness, relationships.*

Respondent 13: *Emotional self-regulation skills, how to have a conversation (seriously) empathy (many kids are unbelievably narcissistic).*

Respondent 14: *Communication, perseverance, finance.*

**Question 17: Have you ever had a student-teacher shadow you?**

Respondent 1: *Yes*

Respondent 2: *No*

Respondent 3: *Yes*

Respondent 4: *No*

Respondent 5: *No*

Respondent 6: *Yes*



Respondent 7: *No*  
Respondent 8: *Yes*  
Respondent 9: *Yes*  
Respondent 10: *Yes*  
Respondent 11: *Yes*  
Respondent 12: *No*  
Respondent 13: *Yes*  
Respondent 14: *No*

**Question 18: What did you find was the most effective way to educate them? / When we switch roles what should we remember to be the best mentor teacher?**

Respondent 1: *Modeling and conversations are the most powerful. Being in the room and not being afraid to get involved and get messy with the kids and me. Jump in and be sincere.*  
Respondent 2: *No response.*  
Respondent 3: *Trial by fire.*  
Respondent 4: *No response.*  
Respondent 5: *No response.*  
Respondent 6: *Have them jump in and do. People learn from doing.*  
Respondent 7: *No response.*  
Respondent 8: *Model how the class functions on a daily basis and how lesson plans are designed and get them involved with the nitty gritty aspects of teaching (like those kids who just don't want to engage).*  
Respondent 9: *Be myself and proceed exactly as I do each day. Allow enough time at the end of the day to process the day's events/let them see reality, respond to questions and feedback with total honesty so that teachers know that teaching is a lifelong learning process.*  
Respondent 10: *We were all new once.*  
Respondent 11: *Have the student teacher watch and mimic.*  
Respondent 12: *No response.*  
Respondent 13: *As a mentor teacher, you are much more a coach than an evaluator. Be supportive; give constant constructive feedback; encourage improvement in small increments.*  
Respondent 14: *No response.*

**Question 19: Would you be willing to review one of our lesson plans?**

Respondent 1: *Yes*  
Respondent 2: *Yes*  
Respondent 3: *Yes*  
Respondent 4: *Yes*  
Respondent 5: *Yes*  
Respondent 6: *Yes*  
Respondent 7: *Yes*  
Respondent 8: *Yes*  
Respondent 9: *Yes*  
Respondent 10: *Yes*  
Respondent 11: *Yes*  
Respondent 12: *Yes*  
Respondent 13: *Yes*  
Respondent 14: *Yes*

**Question 20: Any other comments you would like to share?**

Respondent 1: *No response.*  
Respondent 2: *No response.*  
Respondent 3: *Can you have Mairead O'Neill email me please. She is obviously doing great if she attends WPI but I would like to hear from her.*

Respondent 4: *Please don't email me over school break (Feb. 18-22) as I'll be away and will mess up your timing.*

Respondent 5: *Your project sounds interesting and important.*

Respondent 6: *No response.*

Respondent 7: *No response.*

Respondent 8: *Hope this helps!*

Respondent 9: *No response.*

Respondent 10: *No response.*

Respondent 11: *No response.*

Respondent 12: *Remain patient with the students and remember you are their to teach them content, but your presence will be helping them become more socially aware as well. Best wishes!*

Respondent 13: *Best wishes for a successful and rewarding experience!*

Respondent 14: *No response.*

## **B.2 - Teacher Feedback in Order Collected**

### **Respondent 1:**

*Use the same terminology/vocabulary words throughout your lesson*

*They have the technology for doing Quizlet in their classrooms?*

*Label each STAGE*

*Make it clear the locations of those in the next level; designated location to go to?*

*A good question to ask in advance, to help them wrap their heads around the idea of the changes a butterfly goes through: Do humans look the same during their entire life?*

### **Respondent 2:**

*Energizer: I don't think you are going to get a full 5 minutes with this age group. This type of exercise is typically for 7-9 year olds.*

*Transition: Students of this age should be able to do word semantics. Using vocabulary words that describe various stages of humans would be the best. A great way to introduce English at the same time. They could make large cards with the words and work together with a partner or group to get them into the correct order. After the human timeline is done it will be easy to introduce the terms that go with the life of a butterfly. I would do these without the pictures first. Then introduce a random term at a time and let them rearrange their sequence.*

*Activity: I don't really know the demographics of where you will be all that well, but I don't know any American 12 year old that would want to play this game for 15 minutes. Again, this is really geared for 2nd or 3rd grade. I realize that activity is part of your curriculum, but I really don't know how to change this to be more age appropriate. If you are set on having/playing a game I might change it to something like a Simon Says or Mother May I sort of game.*

*Debrief: These are all great reflection questions. If you change the game they may need to be adjusted a bit. Could you play the game you created with dice instead of rock, paper, scissors?*

*Worksheet: Perhaps before drawing the phases on their own, they can practice with labeling first. The culminating activity might be the whole group working together to create a large mural of the cycle that can remain on a wall or blacktop somewhere.*

*Lesson Plan for Next Day: Food chains and webs are actually in the 7th grade standards for Massachusetts, so this seems a bit more age appropriate. Once a chain has been made each child can get a card with a consumer or producer written on it with some long strings attached. They can then walk around and attach their strings to either what they eat or what eats them, and then at the end they will have created an entire web.*

*Future Lesson: Again, this is a very elementary lesson. 7th graders are ready to learn how the physical characteristics and behaviors of these animals ensure their survival and ability to reproduce.*

### **Respondent 3:**

*Lesson plan looks great.*

*I would lose the colored markers and crayons. That will make it into an art project for some and an exercise in distraction for others. Make it a quick pencil drawing-no more than 2-3 minutes.*

### **Respondent 4:**

*Put the objectives in the student's perspective and announce at the beginning of class/display on the board*

**Respondent 5:**

*Objective: I like to have an Agenda on the whiteboard that briefly lists all the learning activities we cover that day. It puts a lot of kids at ease that have anxiety. I also like to post the Objectives using the overhead projector, that way I can save them and use it again next year.*

*Energizer: Love it. Anything that gets the kids out of their seats and active is great. You might run into a problem of the kids being to hyped up afterwards but it's worth it.*

*Transition: If students don't say anything prompt them with: Do humans look the same during their entire life? No, they don't because they too have their own life cycle.[PGI]  
[PGI]I would start with this instead of the what is a life cycle is.*

*Challenging: Google Documents free extension called Read & Write would be really helpful for kids. Look into it.*

*Activity: Post these rules on the whiteboard.*

*Debrief from Level I: Maybe have students do a brief written reflection first in which they answer some of these questions. Level II: The "moves" should somehow connect or relate to a specific aspect of the animal.*

*Overall: Overall, I'd say it's a very thorough lesson plan. It's always important to over plan. If you are nervous or the kids fly through a step in the lesson plan, you'd be stuck with unstructured class time which will turn into chaos. I think it's great that the kids are getting up and moving a lot, that's really important to me. Especially with a subject like life science, there are so many creative options you have at your disposal. Good stuff!*

**Respondent 6:**

*A few days before the lesson is launched have related books on display in an area where students can look at them ahead of time. This is a way to start piquing their interest, When presenting the posted objectives, have the students read them chorally to promote ownership of their learning goal. This would replace the teacher stating the objectives to the class.*

*The worksheet is fine, but the use of a Freyer Model sheet would provide a section to place the word metamorphosis or life-cycle in the middle of the squares. This will focus the students' attention on the relevant vocabulary.*

*When debriefing, have the kids read again the objectives chorally. Use a discrete method to check their understanding (e.g. 2-colored index cards with one color meaning I got it. The other would indicate uncertainty). These strategies will help the students develop the ability to reflect upon and assess their own understanding.*

**Respondent 7:**

*Your lesson plan is very cute and I did not see any flaws.*

**\*Reached Data Saturation\***

## B.3 - Video Feedback Analysis Notes

### I. Introduction to States of Matter Lesson: Volume

#### + We Did:

- Can you use the natural pauses more effectively, perhaps by posing "pause and think questions", to ensure students are making the thinking connections?
- Kinesthetic learning is a great way
- I would also allow more wait time after asking a question

#### + Recommendations:

- As many of the students are learning the English language, it is important to put new content vocabulary into context. Perhaps begin the discussion by asking students to raise their hand if they have ever heard of the word volume before. Then, the teacher should call on a student to share where they have heard this word before. Once a student uses the vocabulary word volume in an example sentence, students who may not know the definition already will have some contextual information to draw a predicted definition from. Another possibility is to have students turn and take to predict the definition of the word with a classmate after hearing the example definition. This conversation would engage more students while giving them an opportunity to negotiate the words meaning.
- After allowing students the opportunity to write down the provided definition, have students repeat the definition as a whole class. Then, have students turn and whisper the definition to a neighbor. The more times something is said, the more likely those facts will be stored in the memory. REPETITION = key take away, helps reinforce vocabulary
- To turn and talk, it may also help the shy kids who are afraid to answer or if people think their answers are incorrect. Helps reinforce vocabulary

#### - Not Applicable:

#### Interesting Points:

- I wonder how feedback from a Namibian teacher might differ from the feedback we are giving.

#### General Feedback:

- I am not sure if this was lost by cutting the video but was the transition marked between the activator and start of the lesson inside?
- *The last four comments were positive from various respondents which means they were leaving us on a high*

### II. Investigating State and Volume Changes

#### + We Did:

- “How did you figure that out?” Or “How do you know?” and you could ask the group if they agree or disagree with the answer so that more students are involved in the thinking/making sense of the question.

+ **Recommendations:**

- Throughout the lesson, it may be helpful to give students a chance to think about and share ideas at their tables before taking answers. That way more, and hopefully all, students will actively engage with the question.
- **Brainstorm** with the students what kinds of liquids you might measure using milliliters and what kinds of liquids you would measure using liters. **That may just provide some real life context for the lesson.** Also, in this discussion, you could highlight why, in some instances, it’s very important to have a precise measurement of liquid, which is why students need to pay attention to the scale on each beaker. Both of these points could help students to understand why they are learning about this topic and the practical implications for it. Key takeaway = adding context to the students lives
- Good to reproduce the three beakers drawn on the board (similar to the worksheet problems) so that each student (or each table) can see the scales and lines more clearly.

- **Not Applicable:**

- How could you make better use of the adults in the room?

**Interesting Points:**

- Students seem accustomed to providing choral responses. How can you use this, or other approaches and customs that students bring, to improve thinking, engagement and learning?
- What other academic words and phrases would help students to understand and have academic conversations with each other?

**General Feedback:**

### III. Investigating State and Volume Changes Activity

+ **We Did:**

- Expand content a bit further. Would it be beneficial to connect why the "red" (the mercury) will rise to the overall concept of changing matter? Since you are talking about the changing states of matter, have a discussion of when a state of matter warms the atoms have more energy therefore "moving more". This will causes the liquid to rise as the temperature of the matter it is measuring is increasing.

+ **Recommendations:**

- **Not Applicable:**

**Interesting points:**

### **General Feedback:**

- Similar comments and more compliments as lesson goes on for example; we utilized the teachers more

### **IV. Life Cycles:Rock Paper Scissors**

#### **+ We Did:**

- We used adults for example of game (point from before being utilized)
- Connecting energizer to the points of the lesson
- Would have them say the word more than once (ex. repeat once normal)

#### **+ Recommendations:**

#### **- Not Applicable:**

#### **Interesting points:**

#### **General Feedback:**

### **V. Life Cycle : Group Activity**

#### **+ We Did:**

- (1) How can you support students in being attentive while someone is providing directions or instructions? What are your routines for this? Hand signals? Cue words?
- Sit with the students

#### **+ Recommendations:**

#### **- Not Applicable:**

- There is a lot of movement in the classroom, specifically behind the teacher. What are some ways that you can decrease the amount of distractions happening? What can be done to better support the attention for your students?

#### **Interesting points:**

#### **General points:**

- Positives make us feel good: Within the first 10 of the lesson 3 separate teachers presented information to the students. This seemed seamless. This co teaching approach is only successful when all members involved trust the other teachers in the room. This is evident.

### **VI. Letters Activity**

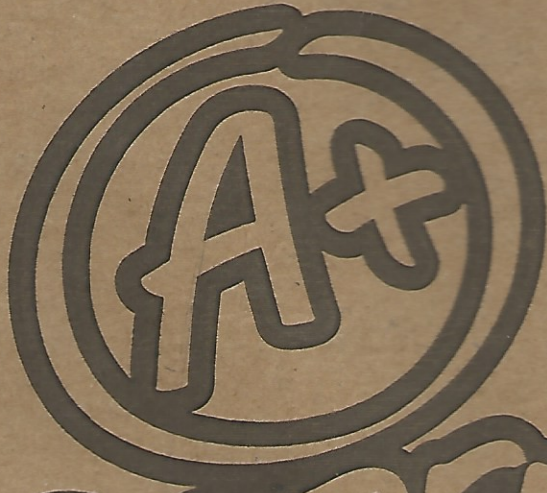
#### **+ We Did:**

- Providing a graphic organizer to help guide students as they do so?

#### **+ Recommendations:**

- Much of this session seemed to be designed as a brainstorming session. How can you set things up so that more of the ideas and thinking come from students?

#### **+ Not Applicable:**

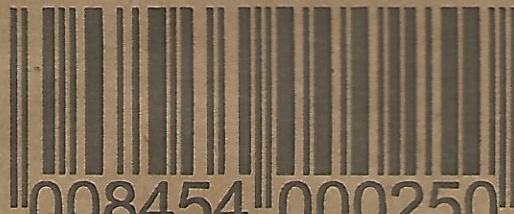


# PERFORMER

## A4 COLLEGE EXERCISE BOOK

Ndangi
7
Science
2019

A4 • 72 Pages • Feint & Margin



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# ① Questions

Hydrogen Peroxide

② Research

③ Hypothesis (predict what will happen) / gas

④ Conduct Experiment (Materials and procedure)

⑤ Results

⑥ Conclusion (right or wrong)

## Qualitative Data

→ What you saw/heard/smell

## Quantitative Data

→ What you can measure

→ N-numbers

( height )

Length - km / meter / cm

Mass - kg / grams

Thermometer Temperature - °Celsius

Time - minutes / hours / seconds

clock / watch

## Types of scientist

① Chemist → does experiments and research

② Engineer → design and build machines

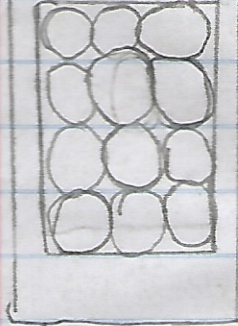
③ Geographer → Studies the features of earth

18-03-2019

## States of matter

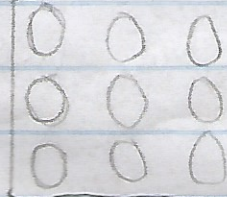
Solid

Same shape

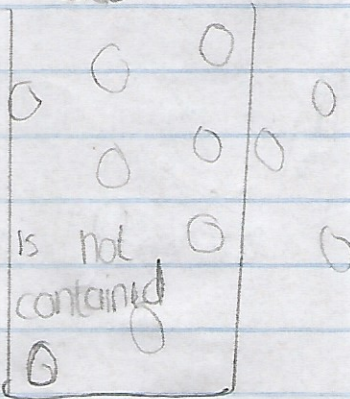


Liquid

Changes shape to container



Gas



Market 15:

\*Anything that has mass and takes up space

64 Circumference of ballon

Hypothesis: The ballon will <sup>64 cm</sup> small while in the fridge (Get slower)

Conclusion: <sup>62 cm</sup> My hypothesis was correct

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# The scientific method

## question

How do we make greener elephant toothpaste?

## research/observation

Asked Ari

Mixing yellow and blue will make green.

## hypothesis

will make green.

## experiment

### materials

- Yellow and blue food coloring
- Yeast
- Water
- Hydrogen Peroxide ( $H_2O_2$ )
- Dish washing soap

### procedure

1. Mix soap, colors, and in graduate <sup>Cylinder</sup>
2. Mix water + yeast in beaker
3. Swirl both
4. Pour beaker to graduated cylinder
5. Stand back

## results

- It <sup>worked</sup> walked!!!
- I saw it rise
- It formed up <sup>foamed</sup>

## conclusions

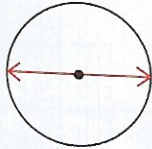
- The hypothesis was correct

## new questions/notes for next time

- We should not use yeast
- Try another color
- Why it makes <sup>foam</sup> forms?

Ndangi

## Classroom Scavenger Hunt

Find a book that has a height of 21.5 cm.  Book title: <u>Spain</u>	What is the height of 3 bricks?  Height: <u>29 cm</u>
What is the temperature of the water in the cup outside?  Temperature: <u>30.4 °C</u>	What is the height of one classroom chair?  Height: <u>78 cm</u>
What is the length of 4 tiles on the floor?  Length: <u>57 cm</u>	What is the length of the green scissors in the classroom?  Length: <u>13 cm</u>
What is the temperature of the water in the cup in the classroom fridge?  Temperature: <u>16 °C</u>	What is the temperature of the water in the cup in the classroom?  Temperature: <u>27 °C</u>
Find an object in the classroom that is between 10 and 20 cm in length.  Object: <u>Vedanta's finger</u>	What is the diameter of the plate? Hint: a diameter is the length across a circle   Diameter: <u>22.4 cm</u>
<b>Challenge Question</b> What is the height of Gavin?  Height: <u>262 mm</u>	<b>Challenge Question</b> What is the circumference of the plate? (Circumference = $3.14 \times \text{diameter}$ )  Circumference: <u>6.32 cm</u>

Name: Ndangj 7

## What's the Matter?



Tell whether each is a solid, liquid, or gas.

- |                   |               |   |                     |               |   |
|-------------------|---------------|---|---------------------|---------------|---|
| 1. milk -         | <u>Liquid</u> | ✓ | 2. cookie -         | <u>solid</u>  | ✓ |
| 3. oxygen -       | <u>gas</u>    | ✓ | 4. fish -           | <u>solid</u>  | ✓ |
| 5. pencil -       | <u>Solid</u>  | ✓ | 6. maple syrup -    | <u>liquid</u> | ✓ |
| 7. shampoo -      | <u>Liquid</u> | ✓ | 8. carbon dioxide - | <u>gas</u>    | ✓ |
| 9. ice cube -     | <u>Solid</u>  | ✓ | 10. paint -         | <u>liquid</u> | ✓ |
| 11. oil -         | <u>liquid</u> | ✓ | 12. salt -          | <u>solid</u>  | ✓ |
| 13. water vapor - | <u>gas</u>    | ✓ | 14. gasoline -      | <u>liquid</u> | ✓ |
| 15. helium -      | <u>gas</u>    | ✓ | 16. sand -          | <u>solid</u>  | ✓ |

Complete each sentence with the word solid, liquid, or gas.

A ~~gas~~ <sup>x</sup> solid has a definite shape. It does not take the shape of its container. It also has a definite volume because it can be measured.

A ~~solid~~ <sup>x</sup> liquid does not have a definite shape. It takes the shape of its container. It does have a definite volume because it can be measured.

A ~~liquid~~ <sup>x</sup> gas does not have a definite shape. It sometimes takes the shape of its container and sometimes flies freely around you. These particles are not connected to each other and takes up whatever space is available.

19 Maart 2019

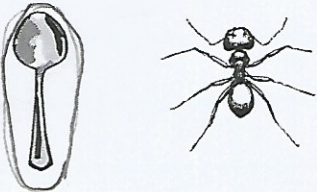
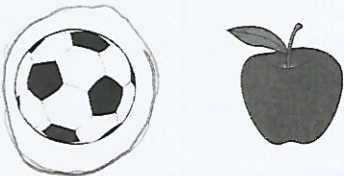
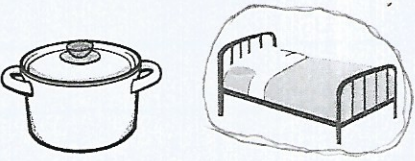
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# State and Volume Changes

What is volume?

Volume is the amount of space that an object takes up.

Circle the object that has a larger volume.

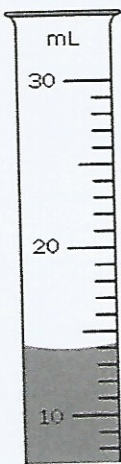
Spoon or Ant ✓ 	Soccer ball or Apple ✓ 	Pot or bed ✓ 
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How do we measure the volume of liquids?

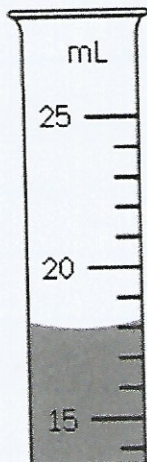
1000 mL = 1 L

Volume is measured using graduated cylinder and beaker.

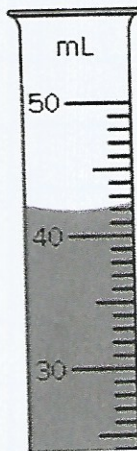
Write the volume of water in each graduated cylinder.



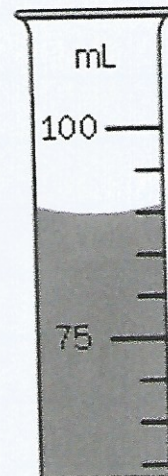
14 mL ✓



18 mL ✓



42 mL ✓

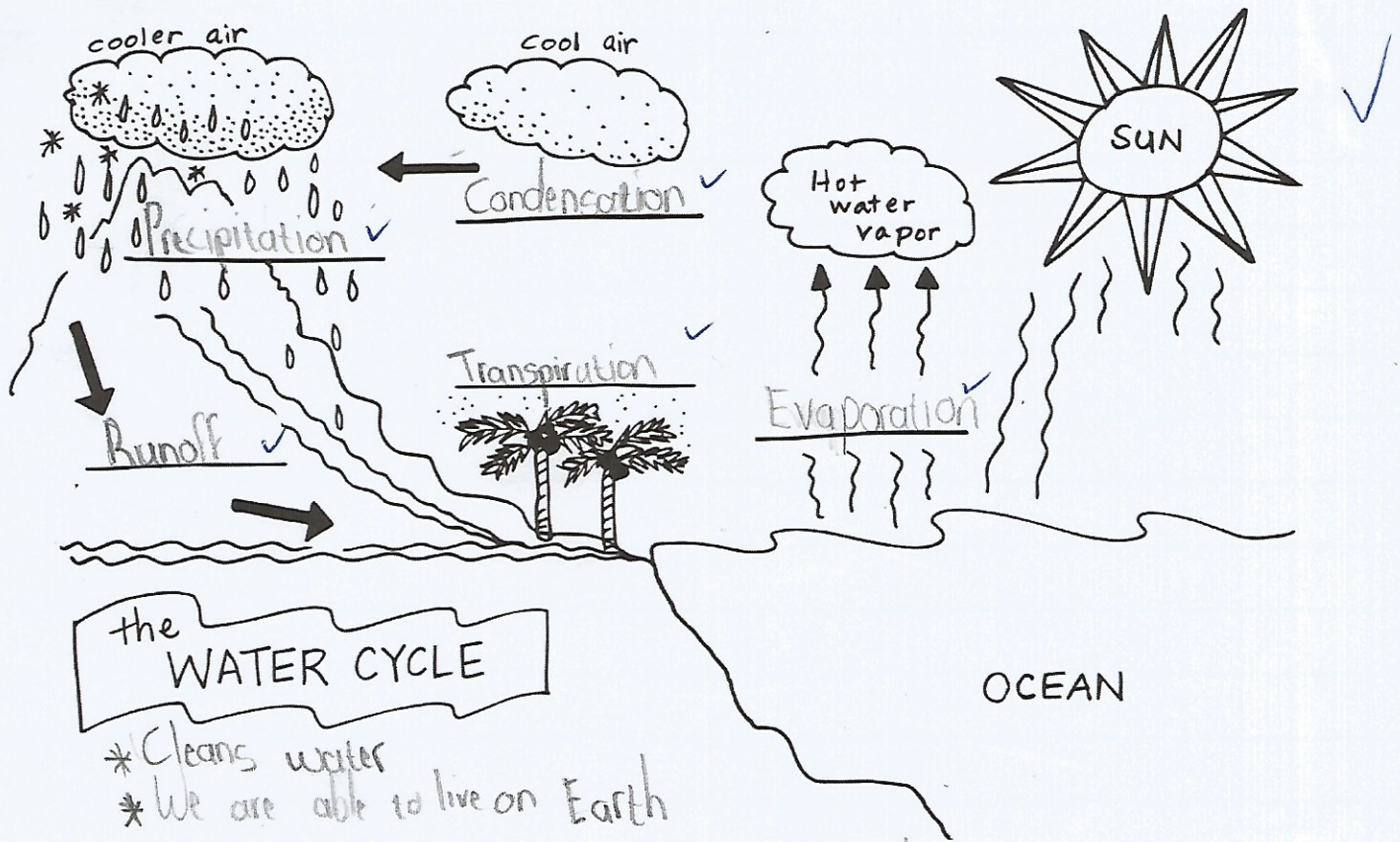


90 mL ✓

# State and Volume Changes Activity

<b>1. Question</b> What will happen to ice cubes when we put them in warm water? What will happen to the volume of the water?	<b>2. Research</b> I wrote it in my book.
<b>3. Hypothesis</b> If I add ice cubes to warm water, then the ice cubes will <u>melt</u> . The volume of the water will <u>get cooler</u> .	
<b>4. Materials</b> <ul style="list-style-type: none"><li>● warm water</li><li>● graduated cylinder or beaker</li><li>● ice cubes</li><li>● thermometer</li></ul>	<b>5. Procedure</b> <ol style="list-style-type: none"><li>1. Measure the volume of the warm water.</li><li>2. Use the thermometer to measure the temperature of the water.</li><li>3. Add the ice cubes to the warm water.</li><li>4. Observe what is happening to the ice cubes.</li><li>5. Measure the final volume of the water.</li></ol>
<b>6. Results</b> What is the volume of the water? <u>145</u> <u>ml</u> (units) What is the temperature of the water? <u>60</u> <u>°C</u> (units) What is happening to the ice? <u>The ice-cube is melting</u> <u>And it changed color.</u> What is the final volume of water? _____ (units) Did the volume change? Why?	
<b>7. Conclusion</b>	

← Finish worksheet



1. Evaporation: When water changes from liquid to gas ✓

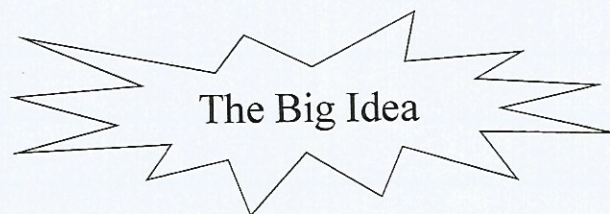
The factors that affect how fast water evaporates are Heat ✓, wind, and Surface area.

2. Transpiration: Evaporation from plants ✓

3. Condensation: Is when the water goes from gas back to a liquid. ✓

4. Precipitation: Liquid falls back down to earth's surface ✓

5. Runoff: When the rain collects and travels back into bodies of water ✓



Water moves continuously through evaporation, condensation, and precipitation as heat ✓ is added or taken away.



Ndangyi 7 4

### The Water Cycle Song

Water travels in a cycle, yes it does  
Water travels in a cycle, yes it does

It goes up as **evaporation**  
And forms clouds as **condensation**  
Then comes down as **precipitation**  
Yes it does!

Circle if the statement is True or False:

- ✓ 1. When energy from the sun heats up rivers, lakes, and oceans, it turns the water into vapor

True or false

- ✓ 2. Condensation creates rain.

True or false

- ✓ 3. Evaporation creates water vapor.

True or false

- ✓ 4. Runoff is excess water that runs back into rivers and lakes.

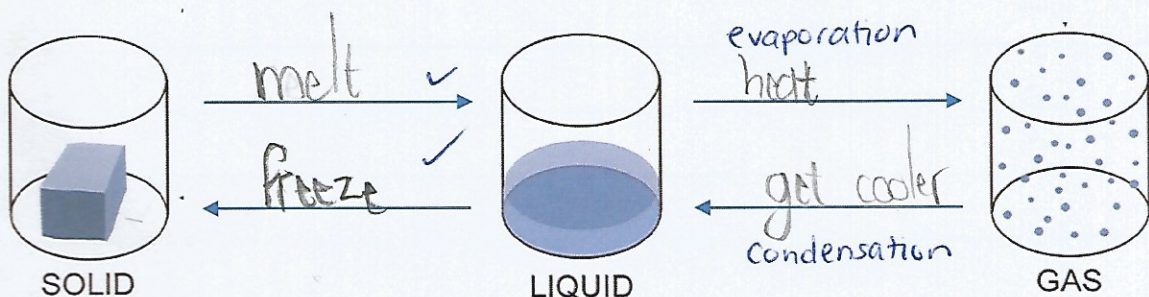
True or false

- ✓ 5. Transpiration comes from animals.

True or false

- ✓ 6. Without the water cycle, the plants and animals would not be able to live on the Earth.

True or false



26 March 2019

Ecology

While I was outside  
I observed:

- 1 7 huge trees
- 2 rocks
- 3 sand
- 4 3 containers
- 5 9 cars
- 6 2 classes
- 7 Ants
- 8 Clouds
- 9 a black camera
- 10 a red birds
- 11 Black shoes
- 12 grey byc
- 13 huge chess board
- 14 green fruits on a tree
- 15 one big lamp

27/03/2019

## Biome Research

- ① Plants:
- ② Animals:
- ③ Climate:

### Plants

- Dry seaweed
- Sea holly
- Yellow-horned poppy
- Sea lavender
- Sea-campain
- Scotts-lavage

- Tropical fish
- Sea turtle
- Humpback whale
- Moray Eel
- White shark

### Animals

- hermit-crab
- Star fish
- Sea-urchin
- brittle-star
- Common-jellyfish

- Tropical fish
- Sea turtle
- Humpback whale
- Moray Eel



### Climate

→ The temperature stays the same and the precipitation doesn't affect the animals.

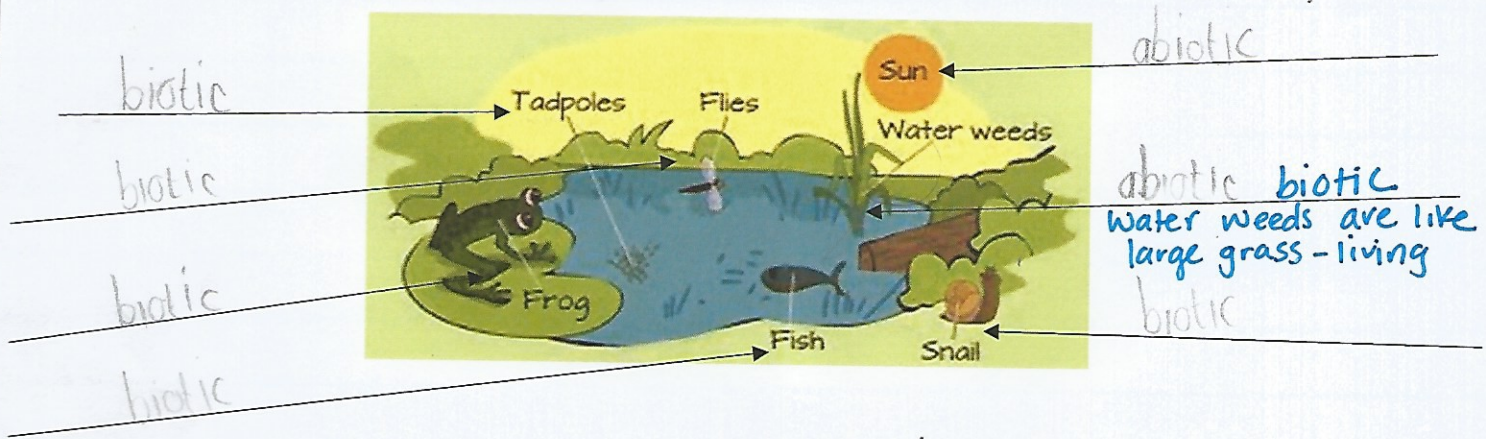
Name Ndangi

Date 26/03/19

## Ecosystems

Living Organisms	Non-Living Organisms
<ul style="list-style-type: none"> <li>• also called <u>biotic</u> ✓</li> <li>• things that contain all 5 characteristics:</li> <li>1. <u>Respiration</u></li> <li>2. <u>Grow</u></li> <li>3. <u>Movement</u></li> <li>4. <u>feeding or eating</u></li> <li>5. <u>Reproduce</u></li> </ul>	<ul style="list-style-type: none"> <li>• also called <u>abiotic</u> ✓</li> <li>• things that can <u>not</u> ✓ grow, feed, reproduce, move and breathe</li> </ul>
<p>Examples</p>  <p style="text-align: center;">Fish</p>	<p>Examples</p>  <p style="text-align: center;">House</p>

Label the diagram with living and non-living organism.



Ecosystem: are made of abiotic and biotic components that interact ✓ with each other.

Example of interaction: I observed a Linus ✓ (biotic or abiotic component)

interacting with a book ✓ (biotic or abiotic component). It was

writing in a book ✓. good job!

Name Ndangj

Date 27/03/2019

### Biomes

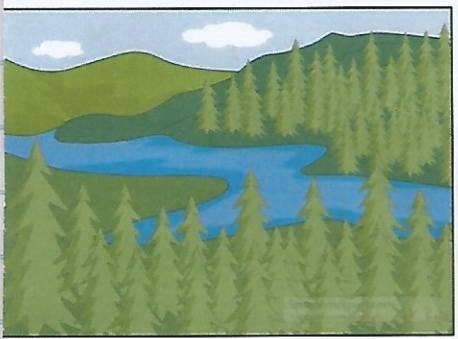
Biome is a large geographic area with specific abiotic (nonliving) and biotic (living) components. They are defined by their varying characteristics including plants, animals and climate. There are    different biomes around the world.

Fill in the name of each biome.

A) Forest

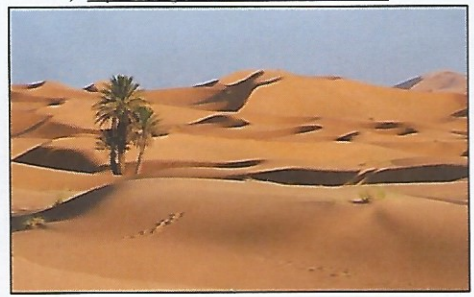
B) Tundra

C) Ocean



D) Desert

E) Grassland



Match the biome with their correct description by filling in the correct letter.

1. E Kind of place with large, open and windy places mostly covered by grass
2. A Kind of place most of the vegetation consists of trees
3. D Kind of place where rain hardly ever falls
4. B Kind of place where it is cold, dry land near top of high mountains
5. C Kind of place filled with water, largest biome of them all

Namibia is made up of:

Savanna is the largest biome in Namibia which is an example of grassland.

Namib Desert is an example of Desert.

Orange River and Walvis Bay are an example of Oceans.

28 March 2019

Dear Marcus

My name is Ndangi and I am from Namibia in grade 7

Namibia is a country in Africa, it is close to Atlantic ocean. In Namibia we have eight periods at school. Our president's name is Hage Geingob, his the third president of Namibia.

My hobbies are reading, playing soccer, cycling, science and math. My favourite food is steak and spaghetti. This week I learnt about ecosystem, biomes and water cycle. Ecosystem is when biotic and abiotic (living and non-living) interact. Biomes are large geographic area with specific abiotic and biotic components. My favourite topic was about Biomes







- How many periods or hours do you have at school?
- Can you slide on snow?
- Which school do you go to?
- What do you like doing during your freetime?
- Have you ever heard about Namibia?
- What is your favourite sport, food?
- What is your favourite color?
- Who is your favourite artist?

Sincerely,  
Ndangi

Ndangi

7 ✓



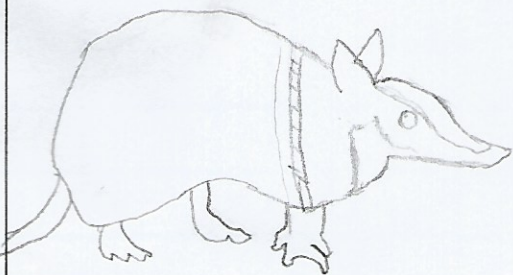
### Bird Beak Activity

Beak Type	Food Type					
	Worm	Corn	Rice	Marshmallow	Large candy	Dry pasta
					14	19
		10				
				21		
	3					
					14	
			14			

Name: Ndangi

## Adaptations

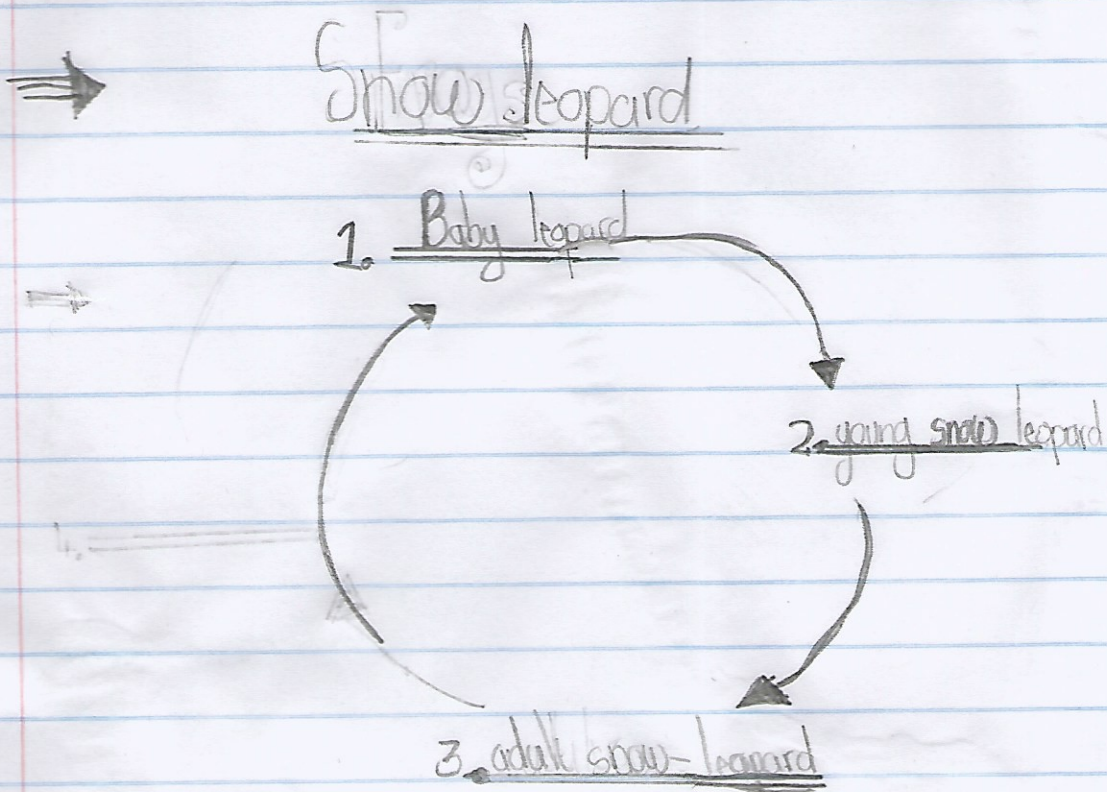
Adaptations are a body part, a body covering, or a behaviour that helps an animal survive in its environment.

<p>Structural adaptations are <u>Physical features (in the body)</u>.</p>	<p>Behavioral adaptations are <u>actions used to survive</u>.</p>
<p>Example 1: Fish ⇒ gills that allow them to breathe in water.</p> 	<p>Example 1: Skunks ⇒ release a stinky spray from under their tails when there is a predator near.</p> 
<p>Example 2: Armadillos ⇒ have a coat of armor on their backs which keeps predators from eating them.</p> 	<p>Example 2: Possums ⇒ play dead to confuse their predators.</p>



02 April 2019

- Animal
- Life cycle of animal
- Movement of each stage



1. Crawls
2. Moves slow
3. Moves faster

Name: Ndangi

Date: 2/04/2019

**Insect's Body** (Tune: "Head, Shoulders, Knees, and Toes")

Head (Point to head.)  
Thorax (Point to chest.)  
Abdomen – abdomen! (Point to stomach.)  
Head, thorax, abdomen – abdomen!  
Two eyes (Point to eyes.)  
Six legs (Wiggle 3 fingers on each hand.)  
Two antennae (Stick 2 fingers up.)  
Maybe wings (flap arms as wings.)  
Head, thorax, abdomen – abdomen!

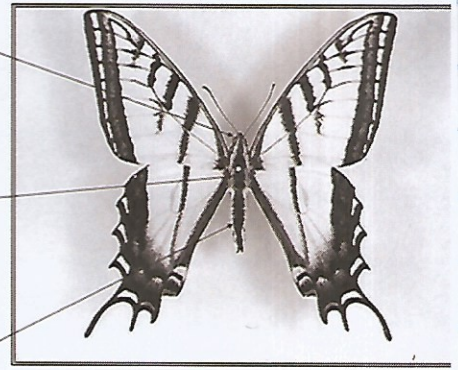
**Head**

- Proboscis
- Eyes
- Antennae

**Thorax**



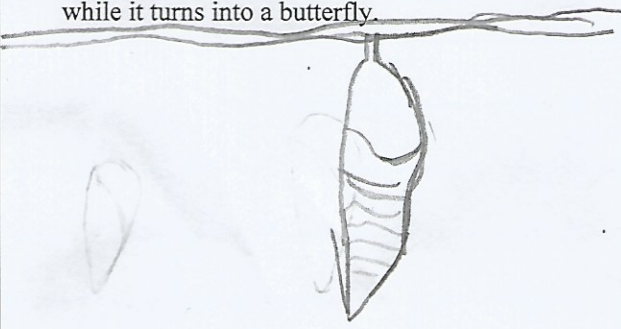
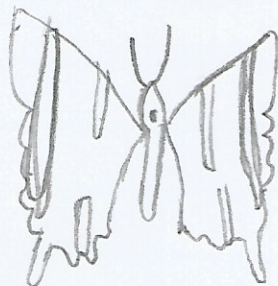
- Wings
- Legs

**Abdomen**



Life Cycles are stages of life from birth to death ✓

**Fill in the life cycle of a butterfly:**

<p>1. <u>Eggs</u> ✓ A butterfly lays her eggs on a plant so that the caterpillars will have something to eat when they hatch.</p> 	<p>2. <u>Caterpillar/larva</u> ✓ The job of a caterpillar is to eat, eat! Caterpillars can grow up to two inches long in just a few weeks.</p> 
<p>3. <u>Chrysalis/pupa</u> ✓ The caterpillar attaches itself upside down to a twig and transforms into a chrysalis to protect it while it turns into a butterfly.</p> 	<p>4. <u>Butterfly</u> ✓ When the butterfly hatches from its chrysalis, it becomes time to mate and find a place to lay eggs.</p> 

Another name for a butterfly life cycle is Metamorphosis.

Food chain

Food web

Producer

Herbivores

Carnivores

Omnivores

Decomposer

When you have time  
add examples!

### **Consumer Song**

Written Monica Abarca  
(To the tune of "Jingle Bells")

#### **Carnivore, Carnivore**

Eating all the meat,  
Oh' watch out for my sharp teeth  
I'll eat you, head to feet.

#### **Herbivore, Herbivore**

Eating all the plants  
Leaves and lettuce, grass and trees  
Are all my ~~favorite~~ <sup>favorite</sup> treats.

#### **Omnivore, Omnivore**

Eating plants and meat  
Oh' what fun it is to munch  
And chew up all my lunch.

11,

Ndangi

08<sup>th</sup> April 2019

## The Skeletal System



The skeletal system forms the structure of our human bodies. This system has two main functions. First, bones support the whole body. Without bones, we wouldn't be able to stand or walk or dance. Second, bones protect our organs. For example, our skulls act like a helmet for our brains.

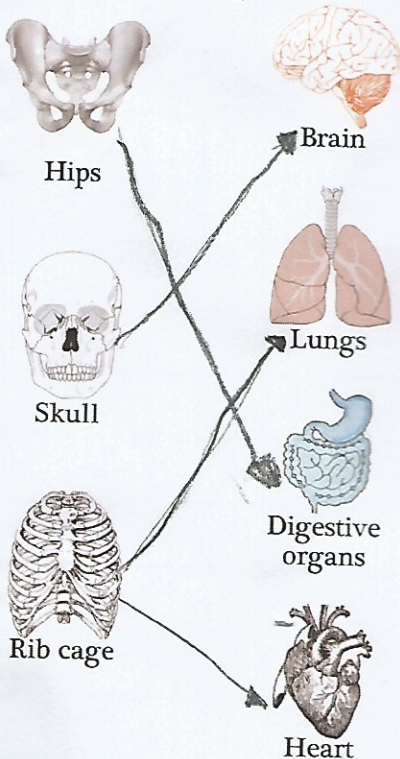


Without bones we would look like blobs. Yikes!

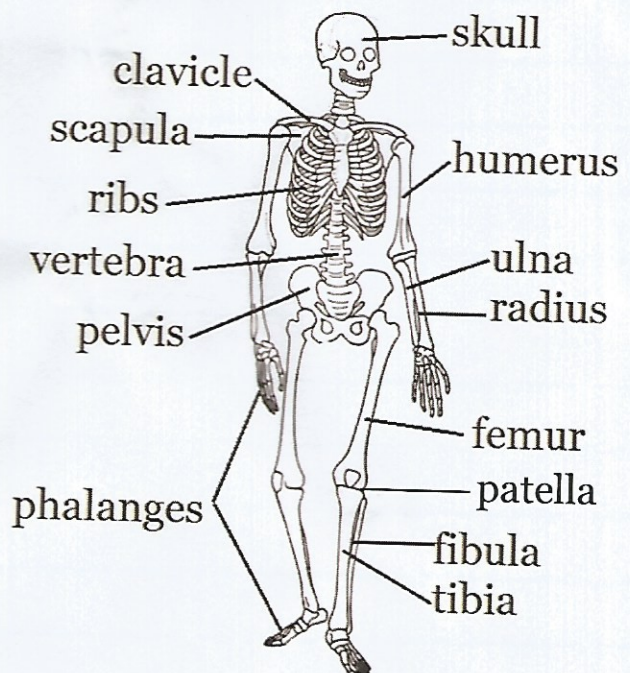
Summarize: key functions of the skeletal system

1. Bones - Support the whole body C
2. Bones - Protect our organs

Match the bone to the organ that it protects.

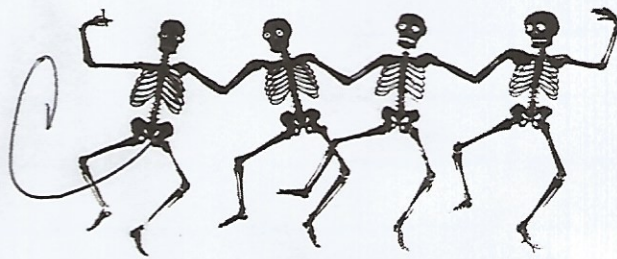


Main bones in the skeleton



Ndangy

# Skeleton Measurements



Scientists use **maths** to gather information about skeletons. Work in partners and use rulers or tape measures to gather information about your skeleton.

Part of Skeleton to measure		Where do I measure to and from?	Measurement in centimeter (cm)	Measurement in meters (m)
Common Name	Scientific Name			
Head	Skull	Top of head to base of head	18 cm	0.18 m
Clavicle	Collar bone	Left shoulder to right shoulder	36 cm	0.36 m
Ribs	Rib cage	Left chest to right chest	25 cm	0.25 m
Back	Spine	Base of skull to tail bone	46 cm	0.46 m
Hips	Pelvis	Left hip to right hip	31 cm	0.31 m
Thigh bone	Femur	Right hip to right knee	46 cm	0.46 m
Knee	Patella	Top of knee to bottom of knee	10 cm	0.10 m
Shin bone	Fibula/Tibia	Right knee to right ankle	39 cm	0.39 m
Foot	Metatarsals and phalanges	Heel to big toe	22 cm	0.22 m
Hand	Metacarpals & phalanges	Wrist to middle finger	16 cm	0.16 m
Arm	Humerus & ulna	Shoulder to wrist	44 cm	0.44 m

**Think!**

Using the data that you collected, calculate your approximate height.

My approximate height = skull + spine + femur + patella + fibula/tibia  
 My approximate height = 160 cm

Now measure your actual height using a measuring tool.

My actual height = 147 cm

Good work! 😊

Name: Ndangi

Date: 10-04-2019

## The Nervous System Stations

### Station 1: Brain Dominance

I think I am right hand dominance  
brain

- I was right I'm right brain dominance  
Are often good at Doing several things at once

C

### Station 2: Color Words

18 seconds

100 seconds

Speed of processing theory the interference occurs because words are read faster than colors are named

C

### Station 3: Reflexes

Reflexes are involuntary, used to protect the body, and are faster reactions. Reflexes are usually a negative feedback.

- Visual      Auditory      Tactile  
# 0.17      # 0.08      # 0.08

= Visual easier for me to see

C

### Station 4: Brain Puzzle

- Frontal Lobe

← thinking, memory behaviour and movement

C

### Station 5: The Nervous System Components

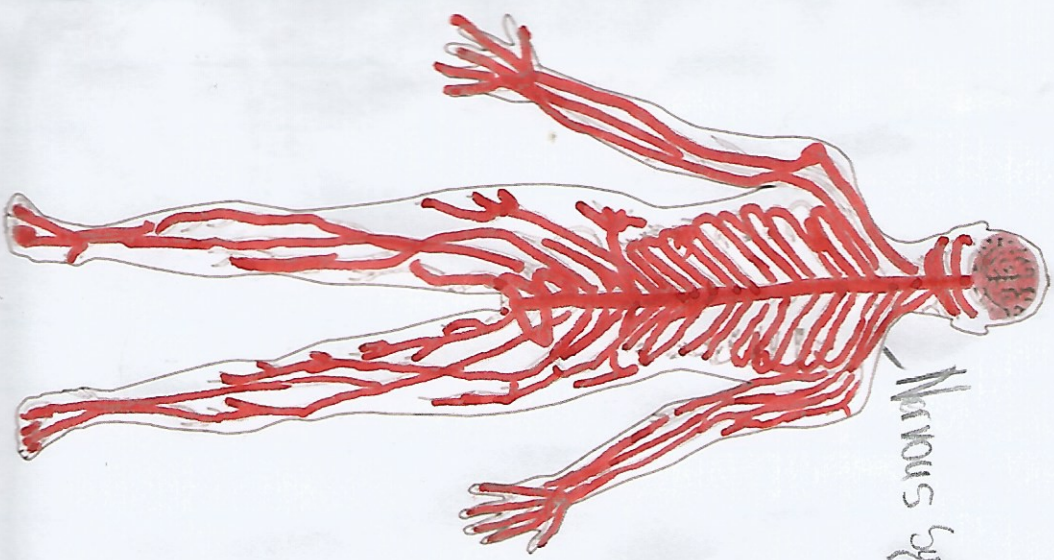
The nervous system is made up of brain, nerves and spinal cord.  
One fact about the nervous system is to think.

C

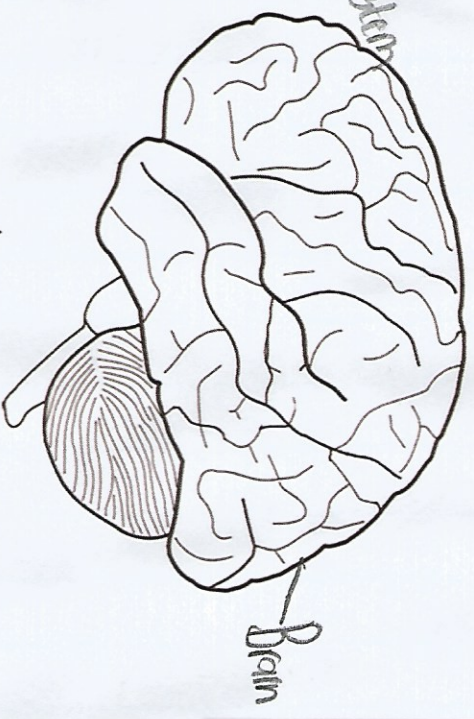
Name: Wang

Date: \_\_\_\_\_

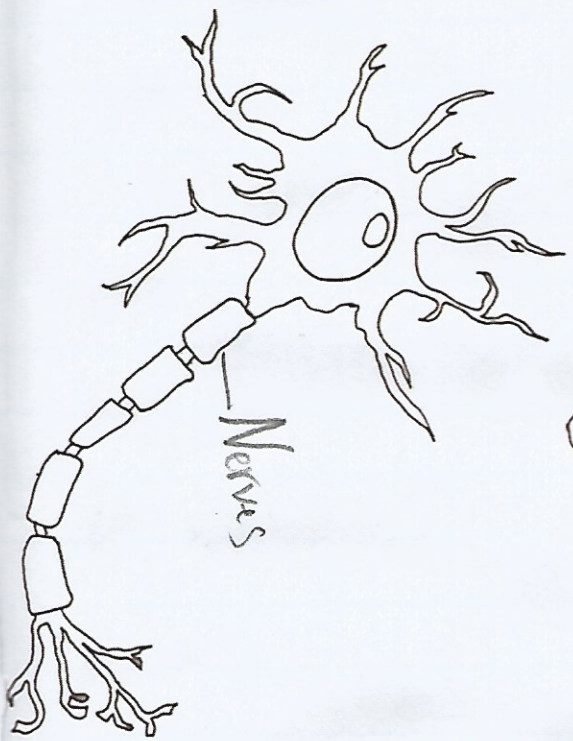
# The Nervous System



Nervous system

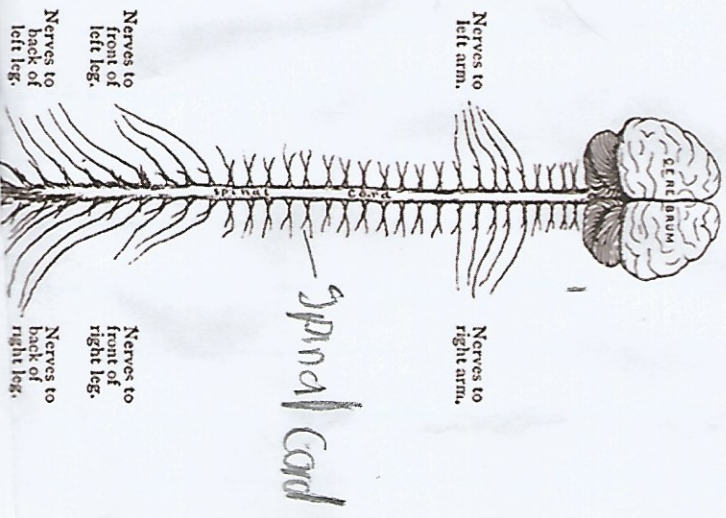


Brain



Nerves

Brain  
Spinal cord  
Nerves

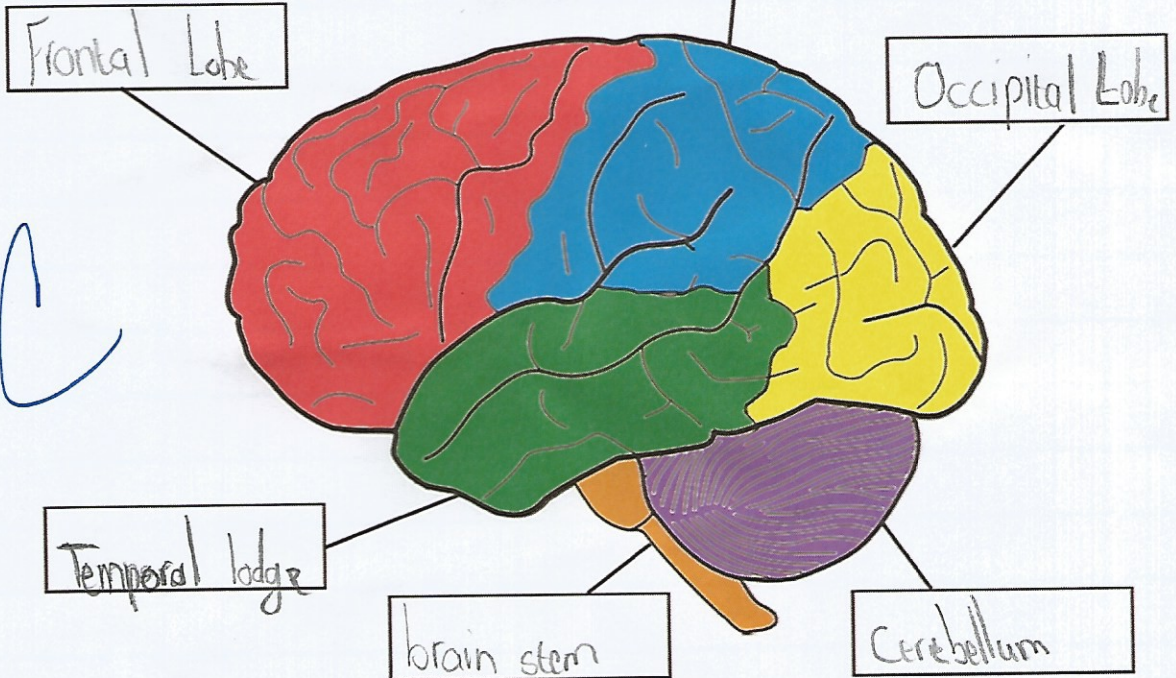


Spinal Cord

# The BRAIN

game!

Ndangi



www.FileFolderFun.com

Images (c) elker Creative Commons

Name: Ndangi

Date: \_\_\_\_\_

SUBJECT	VISUAL		AUDITORY		TACTILE	
	Ndangi <b>#1</b>	11 cm	14 cm	4 cm	0 cm	2 cm
	20 cm	16 cm	0 cm	2 cm	4 cm	0 cm
<b>#2</b>						
<b>AVERAGE</b>	?					

time ?

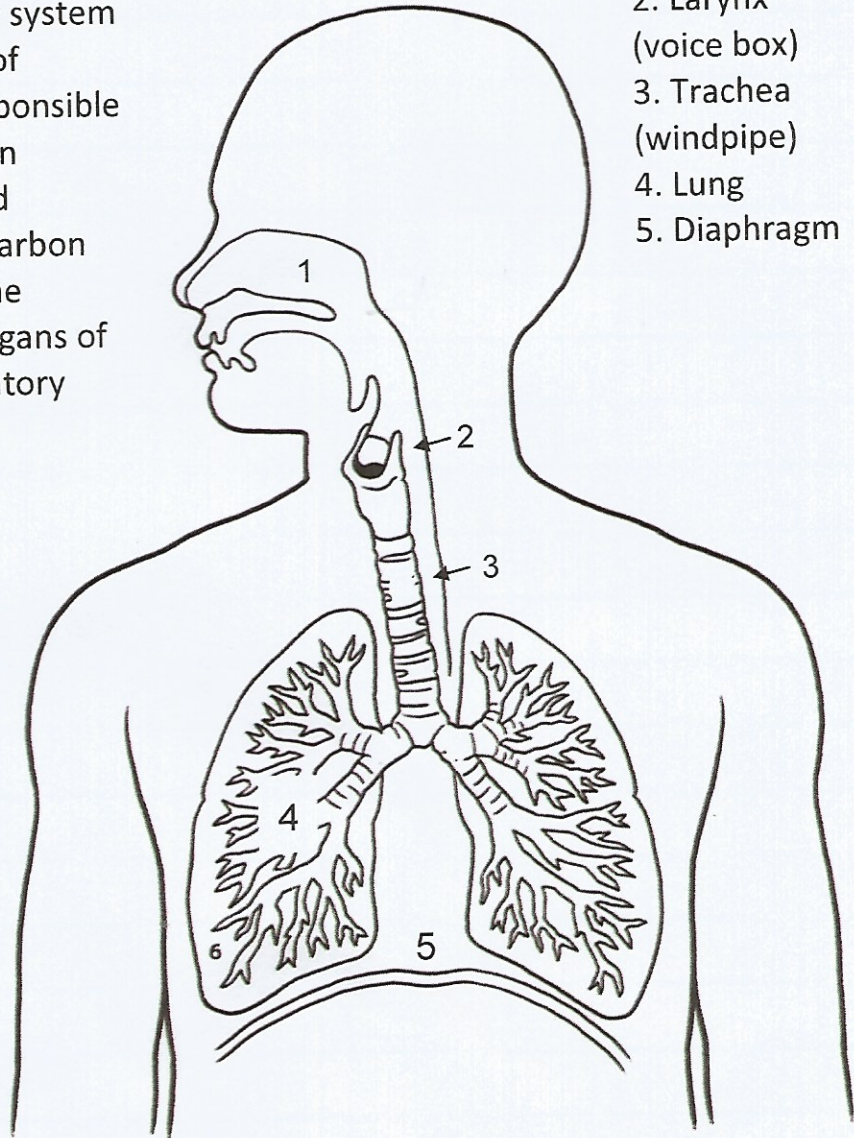


Ndangi

## Respiratory System

The human respiratory system is a series of organs responsible for taking in oxygen and expelling carbon dioxide. The primary organs of the respiratory

1. Nasal cavity
2. Larynx (voice box)
3. Trachea (windpipe)
4. Lung
5. Diaphragm



### Definitions:

1. Nasal cavity: It cleans the air we breath in
2. Larynx (voice box): Contains the vocal cord and helps us talk
3. Trachea (windpipe): It connects the voice box to the lungs.
4. Lung: Puts oxygen into the body and removes carbon dioxide
5. Diaphragm: Muscle that helps the lungs expand and contract

## **B.5 - Sponsor Interview Transcriptions**

### **B.5.1 Interview with Ursula Matzopoulos**

Interviewer: Ariana Rozen

Interviewee: Ursula Matzopoulos

Date: 12 PM April 4, 2019

Location: Physically Active Youth, 5-7th Grade Classroom

Ariana Rozen: What's your background in education?

Ursula Matzopoulos: I'm a trained teacher. I started in teaching 1978, so this year it would've been 41 years but indirectly the last, 5 years at PAY, 12 years I worked for Reasons Rossington Foundation which also assisted with education so I indirectly even though I wasn't in a class, then I started facilitating workshops, helped teachers with grading, teaching apparatus, and then I landed here at PAY.

Ariana Rozen: Did you always know you wanted to go into education?

Ursula Matzopoulos: Ah, you know like I said, I'm a child of apartheid. There weren't many opportunities for us. You could either become a nurse, a teacher, or a policewoman. I opted to become a teacher. It wasn't just by divine intervention, you know those were the options. But whatever I did, at the end of the day I love teaching.

Ariana Rozen: What is your experience working with the 5-7th grade classroom?

Ursula Matzopoulos: I've taught the 5-7s at least 18 years, at least. Could be more but I'd say roughly 18 years.

Ariana Rozen: Have you mostly been the main teacher in PAY's classroom?

Ursula Matzopoulos: I'm the only qualified teacher. Thuba's a train sports science coordinator. Thuba does sports science, I did teaching, that's it. Rose administration but I'm the only trained teacher.

Ariana Rozen: What activities in the class have you observed?

Ursula Matzopoulos: Okay, I observed the lessons on the adaptations. I popped in and out.

Ariana Rozen: The first week was the scientific method.

Ursula Matzopoulos: Yes the scientific method. I think that was really important because they didn't have a clue really. I don't know whether they have one know, maybe a vague one. But because they've never really done practical work it is difficult to talk about the hypothesis. I think they might have known the word hypothesis or heard it but never put it in practical terms where the young scientist project. I normally help them with projects when they come, but it's just randomly. It's not everybody. Somebody will just come and say "oh I have a project." Sometimes the child hasn't even gotten a criteria what to do. It's just "oh I must do a project" and I say "on what?" "Anything." So anything is just so vague and vast so we would always just choose something interesting and then obviously on what we have resources. So yes I would just assist them individually with projects. It's also very difficult then to teach, you can imagine, now I have maybe one child and I say "is there someone from the same school who has a project?" Maybe I would be lucky. Sometimes I wouldn't be an then it would just be one child, But the

rest of the children are still there so it is like really juggling. It's really difficult now and sometimes I said "when is the due date?" and they said "tomorrow." And then I get angry within and so I can't get too angry and show the child because it's not the child's fault. I just have to do it because otherwise if they go tomorrow, they will get a zero if nothing is done. Now you can imagine if the child hadn't been at PAY. Number one maybe the mother is there unemployed. You can imagine they hardly have food at home. For example if they do recycling project, they don't even have tins to recycle or plastics. If I go shopping, I also shop for boxes. I pick up some things around, bring it around. That's why the class looks like a storeroom. So I always think "oh maybe I can use this." I was thinking my brother brought those egg boxes and he said 'do you want them?' At first, ah no maybe not but then I said maybe. I have used them at least four times. But it's so many. And then I always say "oh let me hang onto it because I might need it." And then obviously they wouldn't even have stationary, they wouldn't have scissors. Yeah, it's just hard.

Ariana Rozen: You said that you observed a little bit from the scientific method. The next week we covered matter. Did you see any of the lessons on that?

Ursula Matzopoulos: Oh yes, I saw matter because they have done matter already so I thought it was a good revision lesson. When you also did the water cycle I think children always think 'I know the water cycle but there were a lot of terminology that they didn't know like precipitation. They didn't know say from moving from a gas to a liquid, solid, etc. They know the concepts but then what is needed if something is in a solid form. A few of them would get it and say, like the Erikka's, oh I need heat to go back to a liquid form. But when I went around you could pick up that they struggles but I think it was a necessary review. I don't think there was a lesson that you did that was unnecessary. AND I also believe no learning is wasted. So whether they've done the work before, it is good revision. If they haven't done the work, plus one for them. And then what also was very good; your worksheets they were interesting, they were also at different levels. It wasn't just a straightforward answer, but there were some in depth questions where they had to think of it to get to the questions not just name name. They had to deduce, so I looked at the type of question that you set.

Ariana Rozen: Were there any activities that you saw go poorly?

Ursula Matzopoulos: You know you're not trained teachers and I promise you I've been in classrooms. And then I would tell the teacher "shame on you, you're in charge" because I can remember I was once in a class and I couldn't even hear myself. Your children were very disciplined. Now if there isn't discipline you can't teach them anything. But on the other hand PAY children are disciplined, but they will only be disciplined if they know that you are prepared. I've also seen other volunteers here. The minute I hear someone's voice is too high, I know something is very wrong, not well prepared, or if you start shouting at the children. I can remember this term I walked into a class and she was talking more and the children were just lost. And you know, also once I lodged a complaint about the computers where they taught the children the inside of the computer, the parts. I said, "I don't know that parts, I'm not interested in the parts." Just teach them the basics, how to use it. Let them, even if I work in groups or pairs or threes. We don't have enough computers and then at once we also suggested because there's a lack of numbers of computers so don't take the whole class. Take half of the class and then the other half is occupied, and the next week the other one. Then you get quality teaching instead of everyone is there, now you sit six at the computers. That's a first century school guys.

Ariana Rozen: Sometimes our class got a little loud.

Ursula Matzopoulos: Loud, but you know I watched them. They would go loud but with excitement but it wasn't loud in the sense that it was chaotic. And then I would just say "guys cool down."

Ariana Rozen: What students have given you feedback and what have they said?

Ursula Matzopoulos: The girls obviously Saima, Erikka, Victoria. The new girl Annaly. If they're new they're still in their shell. Jakapeta strangely also mentioned something because she is all in her shell. Those were specifically some of the girls. The boys, Gherard and Ndangi because when they cleaned here the stoep, so I would make them clean the patio, AND I said "Oh how was the lesson today?" They wouldn't come to me, I had to go. The boys do that. They were all excited about the lessons, even coming for the next day. And I said oh it's not the American's again because last year we had a big problem. My children came to me and said they don't ever want to go to computer classes. I couldn't believe the child says the don't to come to computer classes. My grandsons we have to drag them away from the computer. They said they don't want to go there, it's boring. They would rather do math. I said to myself, something is very wrong. SO here with you I think one said to me, oh we miss you. One. So yeah if all was taken my job away, but if it's for the better, fine.

Ariana Rozen: Have any students have given you feedback about the lessons?

Ursula Matzopoulos: No, nothing. There was no bribing, like you give them this or that. Only with the adaptation game. But even through that game, and also what I like I think your young spirit helps. I think sometimes I must move on out of education. I'm very strict and where you take breaks with them. You know to me, I always have in my head that these children are so behind, there isn't time to waste and we must just work work work work, but all work and no play makes Jack a dull boy. SO maybe I'll do that next time when you're gone. I'll say, okay let's take a break. You know what I do specifically in that group, whatever job needs to be done it's very easy to go to them, so I always feel like they became my little slaves. But no, no one said anything.

Ariana Rozen: Do you think there has been a highlight of our program so far?

Ursula Matzopoulos: Just having science here. Science was never here, especially for that group 5 to 7. Personally for me, I never touched science. I used to run the national science fair and I used to do projects with children and I could take them to international competitions so you can imagine at what level that was. So when I came here and I said to myself it is such a mammoth task and the reading is lacking and the math is lacking and I still want to do science on top of it. So when Professor Pete arrived, I said "science." He said "math or science" and I said "science." At least maybe there's a spark now. Thuba's always saying to me "it would be so cool if we just have one science project." Because you know doing a science project is no joke if you want to do it well, and it has to be an investigative project. And it can't just be a little study where I read something and regurgitate, give it back. That's easy. I can just tell them to read the book and give it back, but it's like the whole method from the objective to the hypothesis, experimental work, challenges during your experimental work... To me here, to be honest I said I can't do it. Say for example the three of you would do a project, what would I do with the other twenty plus?

Ariana Rozen: I think what's been nice for us is having four people.

Ursula Matzopoulos: Oh yes, oh yes. I looked at you guys and I said "lucky them. Four in a class"

Ariana Rozen: We've kept that in mind and we've been trying to design the lessons so that if there's only one teacher it's not impossible. It's challenging because we know we do have four people but it definitely comes into play with the projects. Victoria came with two assignments that she needed help with and I was able to sit aside with her while...

Ursula Matzopoulos: So you see if you had been alone..

Ariana Rozen: Yeah, yeah. So,

Ursula Matzopoulos: And the background is not that good where now they say oh I want to google. I said do you know how to google. What site are you going on, so it can be such a waste of time sitting around the computer. I said why don't you just take a book. They are not keen to take a book even if a book is there....Here after I run around just to get the food ready, I'm tired.

Ariana Rozen: In what areas did you see us struggle as facilitators?

Ursula Matzopoulos: I can remember Sammi one day, you were here maybe for the first week, and I think also it was because maybe you didn't know the children's names, and the children were taking chances and i could see she was really telling them off and "you shouldn't do this." I said "okay that's fine, that's part of the story." The minute you started getting to know their names it just calmed down. At first I thought, let me write the names for you and then I said, "no no I must not write the names." If they are really interested they will learn the names, and when they know the names children also know, she knows my name.

Ariana Rozen: What should we tell the next group to continue with? We did a broad scope of trying to touch on multiple subjects across the syllabus to kind of understand what the students knew.

Ursula Matzopoulos: I think it is just good, these poor children are not exposed to almost anything. When I take the grades one to fours to Swakopmund, I always think I should do that for the grades five to sevens but I make the teachers read because obviously the teachers don't know the desert environment. So I make them read about the Namib, the vegetation especially in the Swakop River. Camels are not native to Namibia, but there are camels for tourist purposes so I give somebody just something to read up about camels. We had an Iranian-German girl so obviously she knew her camels so I made her in charge of the camels. Uhm Annika did the birds. I did the vegetation but not everything because I know some of the plants quite well in the Swakop River and obviously the dunes. It's difficult because they are only grade one to four, but if you are on top of the dune you can see the shape of the dune whether they're linear dunes. But you just mention it. I always believe even if they're young, you mention it and maybe it's going to stick in somebody's head. So the trip is not just a trip. The teachers had to inform them, they had to read something and then they had a little booklet. When we got to the camels then the german girl did the thing on the camels and they had to take notes. Notes were not perfect, but at least a sentence, a picture, some observation. And then we went into the river and they had to take a sample of the plants. You should actually ask Jordan. Jordan was quite excited about that. Then also the sand because the sand in the desert is slightly...the grains are larger and then you compare it with the different soils, sandy soil. Then we go over the road and go to the ocean. They had to know it's the Atlantic Ocean. The grade fours, we just introduced the Benguela current, that's why it's so cold. I always hope for a dead carcass because it is immediately just your lesson. So you either find a dead seal there or bird. We saw flamingos, we saw pelicans, and Annika was quite good. She said, "remember we read about it and there's the bird." So it was learn, learn, learn all the way. Until we got to the aquarium. It wasn't a stingray fish it was a

“sting-a-ray” We said no it’s not a sting-a-ray fish, it’s a stingray. Yes, if you talk about a sting ray or whatever they will remember.

Ariana Rozen: So would you say that continuing with practicals and just very hands-on...

Ursula Matzopoulos: Yes, hands-on practicals, hands-on practicals.

Ariana Rozen: And then worksheets with different levels?

Ursula Matzopoulos: Different levels, but you find even when I assist them in the class or I teach a lesson I just pitch the lesson sometimes even at the grade seven level. For the grade seven it might be a revision. For the grade five it’s completely perhaps new. You sink or you swim. Something like that, yeah. But I think most of the times everybody takes home something.

Ariana Rozen: What have you observed that you would not want to see again?

Ursula Matzopoulos: There’s not really something that I could see. Your books were good. The books where you pasted stuff in, so I really really appreciated it. At least now they have a dedicated science book so whoever comes can just carry on with the science book. So the books were good. And it’s also good for monitoring and evaluation. Say if the Board Member would come we could give it and say “this is what WPI did” or a parent or the Ministry of Education people just pop in and then we can say “this is what we do at P.A.Y.” which I know doesn’t happen at school.

Ariana Rozen: Is there anything else you can think of that we should we tell the next group to change or improve upon?

Ursula Matzopoulos: It’s a pity that one could not split them into fifth grade, sixth grade and seventh grade. Sometimes I think that it is not fair because you really pressurize the fifth graders, but on the other hand I don’t think that they fell completely off the wagon. Some of them did struggle a bit. But some of them struggle because they are just poor students. It’s easy to take one of the students and say oh you will only work with Michael, but that’s such a privilege and I feel that it is such a waste of a resource where everybody could’ve had the human resource and then I give it to one person. I was thinking if I have another german coming I would put them one-on-one with the real struggling children.

Ariana Rozen: Do you think it would be helpful for a group of students to focus in one subject. Say take just matter and go thoroughly into depth on that and try to create units or continue the broad?

Ursula Matzopoulos: I think the broad one because otherwise you make the children very bored after the third week of still doing matter. You know it’s difficult if you get the two bright ones and do a project with them. Let’s market not for this year but for next year so you can be enrolled maybe just the regional science fair. We don’t say now you must go to the national science fair but at least the regional level. Even if they don’t obtain the bronze or

Ariana Rozen: And then finally, are there any other comments in general?

Ursula Matzopoulos: I’m very happy we are here. And I promise you just especially this Obama thing that came upon us and there’s so many other little things that came up. Without you I don’t know how we would’ve done it. Sometimes what I used to do, I would take the best of the senior learner and say please go sit in the class, but that’s not what it’s supposed to be. You see on the other hand it’s also a story about how P.A.Y. is here just assist homework but we go one step further. You make sure that they are

constructively occupied and I'm not an entertainer. It is really something that is in line with the syllabus or above the syllabus. Is that the last question?

Ariana Rozen: Yes, thank you so much for your time.

Ursula Matzopoulos: Pleasure.

### **B.5.2 Interview with Thubaelihle Sibanda**

Interviewer: Ariana Rozen

Interviewee: Thubaelihle Sibanda:

Date: 10 AM April 12, 2019

Location: Physically Active Youth, 5-7th Grade Classroom

Ariana Rozen: This probably won't take more than thirty minutes, um, probably will only take 15 to 20. The goal for us is to learn more about the strengths and some of the shortcomings of our program so that um we can make better recommendations for the next group that comes in so um just be as honest any constructive criticism any negative feedback we want to hear it um but we will start with background information. So what is your background in education or in background in general?

Thubaelihle Sibanda: My background is actually in sports science coaching is my first degree and then I have um masters degree in international um in sports management and sports management law. And yeah that is my background.

Ariana Rozen: So what lead you to come to pay?

Okay so what led me to Pay was the desire to work in sports for social changed. SO the interest in using sports as the tool or the medium to um to take young people off the street and teach them a thing or two and see where it takes them and transforms their lives and stuff like that. I have been working a lot for the past ten years in the development of working in different schools in Zimbabwe as well as in Norway in Europe and coming back to Namibia. So I always knew what field I wanted to work in and I always knew I was good at working with young people, I just needed to know how to integrate my sports science background and my interest or passion in sports integrate it with making a difference in young people's lives I basically googled PAY, googled institutions that where working with youth development and using sports and I found PAY. I brought to them I sent my CV through and got coding and basically started as volunteer and worked my way all the way up and so I mean. Since I have been here I have been able to directly impact like the programming participation model and really see how to integrate the life skills component with the sports but also how to create a conducive atmosphere for young people that when they come here from the get go everybody its kinds of like a culture i would say how the conducive culture of PAY and um kind of influence of everybody that goes through the same door that works with the young people.

Ariana Rozen: So how many years, how long have you been at PAY now?

So this is my fifth year.

Ariana Rozen: Ok fifth year and have you ever, what is your experience specific 5-7th graders. Have you ever been in the classroom or just in the field?

Thubaelihle Sibanda: I have worked with them a lot actually yeah. You know at PAY you always have to fill the gap fill the role and stuff and I have worked with them a lot. I have also taken them to camp. I have taken them to camp for the last two years. So this will be the third year that we go. Before we so I am responsible for life skills and sports so I am directly involved in their life skills but before we never had comprehensive life skills program for them so I have been working a lot on developing modules for them for their life skills content. Kind of linking all the way of what we do in the camps and before we never used to have a camp for them but we didn't realize it is the foundations and it is critical to make sure the foundations are set. It is easier to get them when they are this young before they start experimenting with stuff and you know you probably have a better chance with them than the high school. So that is my experience with working with them. I really think um they are a good batch of kids. I really love that most of them have been with us for more than three years so you can see the continuity. So I think this group is a true reflection of what we I mean the impact of the program and where we are hoping to take them and the leadership in this room is amazing. In terms of Sima and stuff like that I really friece young young girls and is the same reservation is reciprocated in the camps and these are the people that are typically so yeah it is a good group of kids.

Ariana Rozen: Yeah very good. So now we will move on to our specific program and lessons. So you sit outside of our class and probably usually hear what is going on. So what activities going on in the class have you observed?

Thubaelihle Sibanda: Can I just tell them to be quiet?

Ariana Rozen: Oh yeah that is fine. What activities have you observed in the class that your remember?

Thubaelihle Sibanda: I think actually haven't really observed too many of them. But i did observe the early ones for example the elephant toothpaste was the main one I observed. So I did see, I mean having any form of experienenets is going well because form this side we don't really have activities like that. The fact that they are interactive and the kids can try them out themselves is incredible because it really shows that they are involved in and won't forget easy and the other thing that is commendable with it is they went on to do it in their schools like Erikka and Gerhard and that is incredible that they even have the confidence to go there and what I am laughing at is when Gerhard come back and I ask what are you doing in a work man suit and he said I was doing an experiment and it is my lab coat and I was like oh really interesting to see. I mean walking in the classroom and most of the time trying not to interrupt anything I was trying to check something. It is good to see noise from the classroom it's good to hear them give feedback back and the questions they answer like they truly know. Like Tuli has answered so many times and he is only grade five, and I am like woah. If he knows this and know and I have commented a lot that a lot of this my seniors don't even know and don't even have a chance to do and haven't had the chance to do all these experiments all their lives so that is um not that we don't have it in



mind, it is because we wanted to start here at foundational level. This group is our pilot group to have them go through it and see how it shifts their primary and education mindset and ability to learn and so why we chose this group and it still does makes sense. And that is what we are looking for in the future . The more students we bring in and really develop and develop the science curriculum, hands-on experiments and fun activities and throughout the whole age group at PAY is really critical for us at PAY. And you know it brings out all the things we need to bring out, you know the critical thinking, the observation skills, the ability to say okay this is what happens when add this, and just how they reflect back on what they have learned and that is what we want to emphasize and have them learn. And that is what happens in all the sessions that I have observed or listened in or just passing by or whatever. Being able to see they are really engaged, and that they are really active and they are giving feedback. And being able to see their work on the wall and shows there are a lot of output that is being projective out of all the lessons we did.

Ariana Rozen: So you said kids give feedback which I know means when we ask a question they answer but do any kids come to you with feedback? I know Ursula mentioned but she is also like taught them more so I wasn't sure if any students have come to you with any feedback positive or negative?

Thubaelihle Sibanda: I have actually asked them them a few but more like are you having fun, are you learning anything? And it has always been positive. Yes we are, yes we are happy. And they are. You can't fake being happy. They really are having fun. I remember yesterday we were having a very beautiful busy crazy day and I was like they were so happy with their balloons and I was like oh gosh balloons but they were super duper happy. And I say this is what keeps you coming to PAY everyday. Seeing them grow, seeing them learn, seeing them become so much more and its just that you know. Parents come and there is a parent that directly referred to this activity and said what are you guys doing? I see there is a lot of people around you. Is this an academy? Is this a project? What is going on in this space? I think this is one of the most positive impacts of having you guys here, it's been people start to notice what we do because most of what activities you are doing you also do outside. They are catchy, fun, its visible, its clear that stuff is happening and it is visible to everyone who comes in and sees you on your laptop working or passing by and this is the room grades five through seven it's clearly visible work is being done. Stuff is being done massively. And that is really the biggest take away from all of how work ethic and reflect back on how it has impacted overall how the organization looks to everyone else. Parents, sponsors, visitors, that pop in pop out which there is always plenty of. And generally your experiments and stuff, I am sure you have seen, because we don't see this everyday actually we don't see it at all. Everyone is just excited to have seen it and you know it is beautiful to see.

Ariana Rozen: Any negative feedback from students or the PAY staff?

Thubaelihle Sibanda: To be honest, no. And I think the biggest positive, I mean I keep saying big, but another positive is like example with the meals you guys have eaten every meal even if it was pap everyday you have eaten it and we don't really see that a lot. And everyone has just been really happy and been like they are so cool and you know open minded and drove street into what needed to be done. And the same comment from yesterday just seeing you with the different soccer groups in the sun and I am

complaining that it is so hot and I want to go indoors but then someone who isn't even used to this type of weather is still out there from day one to the end of it all. Is really all positive.

Ariana Rozen: Okay, um thank you. Do you have any, what do you think has been the highlight so far? I don't know if it is redundant but do you think there has been one thing?

Thubaelihle Sibanda: Um, not really. I mean I can emphasize on the fact that I don't know we also don't get many interns actually this is the first year we haven't gotten interns. We have gotten you guys, the communication interns, we have had social workers type of interns. But all the times we have gotten interns in this type of space, we always massively needed to straight to get them to do their chore and it is really draining. With you guys we never felt, I never felt the need to you know, you just went hands on and prepared from the get go and without supervisions. You have flighed since day one, you didn't even have Ursula in the room the first two days, so that is really commendable that is a high emphasis because I spent so much time just correcting and I don't know just correcting and editing the things interns produce and get them off their phones and working. And I never had to do that with you.

Ariana Rozen: Okay, in what areas did you see us struggle as teachers or facilitators?

Thubaelihle Sibanda: Oo, I think that maybe, it is also about the environment that you said. I mean sometime the noise was just too loud in this room, maybe it is just the element of control. And um sometimes they are signing, and you have really naughty characters so that is really tough to deal with and so sometimes I am sitting there trying to get some work done and I'm like ah it is so loud, but at the same time there is a balance of saying there is an atmosphere that you have to create working with this age group. So there is a line saying there is noise or productive. There is productive output from everything that is happening. There is productive from everything that is happening. So I don't think so I think it is just the gernal classroom control, which i think has to do with the nature of the activity and has to do with the kids themselves and the mood their in that particular day because that fluctuates very much. So many elements are under it. So I don't consider it a struggle to be honest, I just found the noise a bit too much but them Im like uhh but also understand it is part of what you are doing in the room with that age group which is why I never really needed to mention it unless you did do massive screaming and dancing and people on the tables and jumping up and down I probably would have said hey guys, but I never thought it was ever massively out of control.

Ariana Rozen: Ok, I definitely think that setting stricter rules form the beginning. I don't know. What about moving the room to the other one since we too sometimes felt we were making a lot of noise.

Thubaelihle Sibanda: I get that and I mean I was thinking about that yesterday when the balloons were popping and I was jumping with every balloon pop because I am really weird and I think it is worth considering, I had actually moved there before you came with the life skills Susan. I moved her to the other side because we are party, we are ready, and they would go from 0 to 100 in seconds. Which is okay because for that age group because the games, activites, and lesson are to keep them engaged and active. So yeah that is worth considering to move the room. Especially for sessions were we are normally loud. The only issue is the control of where you are, far from everything then it is easy to lose. And yeah they

feel like no one is watching them now and then they are ready to really go crazy. But I understand because just the proximity to the kind of office space type of environment.

Ariana Rozen: Yeah and the lack of ability to close the door if we know we will be loud. And yeah did you find when we would go out to the chess area to play a game was that distracting?

Thubaelihle Sibanda: I am not sure about the class outside, the grades 8-9, but I never received any complaints so I don't think so. Okay, maybe just spark interest of what are they doing and have people peek through the window.

Ariana Rozen: Okay, the next question is what should we tell the next group to continue with?

Thubaelihle Sibanda: Oo, so there is obviously two elements to all of this. How are we looking to grow it from all this here, it was either going to reinforce what we have been doing, evaluate it and kind of build form there, but at the same time develop modules right across all levels, so it could either be that or have them come work in areas grade 1-4 and develop same curriculum and then we pull it all together into some manual for grades 1-4, grades 5-7 from WPI. I think it depends on a lot of elements. I think that it depends on what you leave with us and how we are able to implement it. We have to try because obviously we won't be able to match the standard that you were able to set. For starters, we won't be able to have four teachers in the room, and we won't have some of the materials constantly, but what we want to do is commit to try an experiment every two weeks, or an experiment every month and have someone who really goes through the videos and the tutorials that really does take them through the year. So we want to use everything that you have developed and use it. So say next year, maybe the team evaluates it or maybe it is too early and the group will develop another manual so in two years when we finish developing manuals for the whole center then they come and evaluate and adapt. So I think it is still very much in the air and we are um what we would be. I think the main preparation you need to do for the next group is basically give them a sense of context, the context I think is important coming from you guys since you have been here. And that is part of why obviously we ask before you leave that for us. Kind of gives us a sense of feedback of what worked and what didn't work. And we are trying to do much through our blog and making more awareness and making sure it is safe since that is a big element. To get more people aware of what we do here, since um not a testimonial, but a more giving a review to our friends about the place and type of place PAY and Namibia are and what's the work environment should they expect and all those elements in preparation is key.

Ariana Rozen: Ok, the recommendations we leave you with. So we are getting down to the last few. What is something you have observed that you don't want to see again?

Thubaelihle Sibanda: Oo, nothing. Honestly nothing.

Ariana Rozen: So the next group, something maybe they would continue with, which is a year from now so the need or what you want may want to change. But is there something from our program that they should change or improve upon? I know you have already touched upon with the different grades, maybe working with them but is there anything you want changed or improved on?

Thubaelihle Sibanda: Nothing. But I know something I would want improved on is like maybe impossible, the length of time. Aside from that I don't think so. Just the length of internship. I mean you guys have been involved in everything from academics, sports and life skills, I really didn't get a chance to be in the life skills but I have seen you work with the sports doing the most you can with everything we do and all the crappy balls we give you. You have made the most of what you can. And that is another key is improvising and why it is key to improvise and what they should expect and what they should expect. Because it is different then where they come from and what they envision. Even with you guys I am sure you came with thoughts in your head and being on the ground you can see it is really really different. And obviously being flexible across the changes with such a dynamic organization like this one. And working in a system like Namibia. and also depends on the time they come work here because in March it is still fine because it is the first time, not much pressure for exams, second term goes crazy because writing exams and is very tough period of time especially with the high school and upper primary in a way and will determine what they can do more realistically. If another group comes at the end of the year then they can work with the grades 1-4 since that means untouched in means of exams and elements.

Ariana Rozen: So the third term goes from what month to what month?

Thubaelihle Sibanda: The third term goes from September to November. And it is just exams basically for certain grades. It is really high intensity exams.

Ariana Rozen: Are there any other comments in general?

Thubaelihle Sibanda: I mean I don't know in terms of documentations, I don't know how you have been keeping tracking of every element that you do. I think that is a critical element of um I remember talking to Jim about it, did you get chosen here. He said no not really, so when they come they should really come with a camera, a way to document everything they do. Because the visuals matter to us and that is akey. And obviously the text, the manual, the tangible thing you leave behind will help us carry on what you are trying to do. And as far as materials, I don't know if it would be easy to bring materials or I don't know if there are things you already thought should bring. That is also a recommendation to put out there. Anything you need to bring should bring. And just from my own travel experience when you think you should carry something and then you dont you are like oh dam. I don't know if you will be involved in the preparation period

Ariana Rozen: Oh we will whether they want us to or not

Thubaelihle Sibanda: I would massively endorse that you are elements of the process because you know what it takes. With an organization like us we are really skeptical bringing people in contrary to what it may look like because it may still look like a lot of people in doing different things but we still try to size them up massively before letting them in because you know the namibian, the Katuraa child is already heavily impacted by things and unstable conditions, violent, every element you can think of despite how they look here because of how much work we put in to make the space what it is but i am sure sometimes you can notice oh that child doesn't look good today and maybe something did happen at home and something that um so we do have all levels of children and all levels of stuff they are dealing with things at home. We do have for example HIV students and um it just something you really don't see because it is

so protective and such a bubble we are trying to keep them in so that you can't tell from just looking at them and because of that we are skeptical of who we bring in here and who comes in here determines so much massively. Because who comes in here we trust them with everything, we left you guys in this room with 40 kids and just prayed that you won't be broken in spirit for life with the words because words matter that were spoken. From the get-go you were at their level, sitting at their tables, talking to them like humans, not pitying them like oh oh i am so sad poor children from africa but treating them like human beings and that is critical for us and for whoever comes in here. What I would like to see more focus on interactives, outside, just five minutes, outside of just the work environment. I like that you were able to interact with the high school which is important for me because they are just two or three years younger than you and looking to go into this field. Now there is a boy who was just accepted to Yale program and he is from Okanja park with no electricity, no water, shack environment, single parent, mother doesn't even make \$100USD a month. He has been doing his forms now because he is going to do a program in Ghana now for 3 weeks and if he gets enough grades he can really apply to Yale after high school and be accepted to go because of the program, it is a Yale program leadership development for African Students promising african students so you know these are the kids we need to expose to you more in terms of just their day to day interactions and what they are skeptical about and what they want to ask and Rachel before going to the states what she wanted to ask and she is doing really well. Its all those elements though that they need to know you aren't just teaching but ipen to science curriculum during the day but so many elements in the whole environment that require them to be just fill gap and talk to people and yeah.

Ariana Rozen: Yeah we will be very hands on when they come.

Thubaelihle Sibanda: They really do attached to people easily. That is part of the change really, whenever someone is leaving they have to say bye and another one is gone and stuff. That is another element of things, that if you can keep some form of contact with your group lets get that to happen even if it is work into a skype call. I now that time zones are different and you will be busy but writing letters I mean not letters since we can't post them but emails across and saying this is my email . I promise you they will sit down the victoria's and will sit on the computer to do this thing. They will be able to do this thing. So please do and keep in touch with them. You will be surprised what it looks like at the end of two years of communicating. And would be nice for us to trace too. So yeah all those elements.

Arian Rozen: Awesome, thank you for taking the time out of your morning.