FISHPONDMOSS *(Bryophyta)* AS ART PAPER

A SCIENCE INVESTIGATORY RESEARCH

PRESENTED TO THE FACULTY AND STAFF OF FRANCISCO RAMOS NATIONAL HIGH SCHOOL
(FORMERLY BUAYAN NATIONAL HIGH SCHOOL)

In Partial Fulfillment of the Requirements in Practical Research 1 under Science, Technology, Engineering, and Mathematics (STEM)

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Abstract

Using moss *(Bryophyta)* to make a paper will benefit both the research and farmer mosses gives problem yo fishpond owners since it continues to dominate the fishpond.

The purpose of this study, is to identify the capabilities of the moss *(Bryophyta)* from the fishpond as an alternative colored eco paper for office use, arts, and, crafts, the use of the moss *(Bryophyta)* as a substitute for trees(Lapinis) will not help decrease deforestation but also fishpond population.

This study, will lower the consumption of commercial colored paper or student. This study targeted to lessen the deforestation and aids in keeping the contaminated mosses allowing to growth new crafting. This study could help the environment by preserving trees. Lesser trees could be cut if there is an alternative form wood fibers.

The moss can entirely replace the commercial colored paper using the treatment 3 (250g) of fishpond moss.

Republic of the Philippines
Department of Education
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Division of Zamboanga Sibugay
FRANCISCO RAMOS NATIONAL HIGH SCHOOL
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Certificate of Committee Approval

In partial fulfillment of the requirements, this research paper entitled **MOSS *(Bryophyta)* FROM FISHPOND AS COLORED ECO PAPER** has been prepared by: **Suladay, Axelcris G., Tariao, Aera Jasmin M., Marcial, Leslie A., Torrico, Rhouie Loveine D., Deocares, Jeffmark A., and Cabalida, Zyril**

Approved by the Examining Committee:

RAMJAY J. CAINGLET
Committee Member

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Committee Member

Dedication

This research was truly dedicated to their beloved parents:

Mr. & Mrs. Rene B. Suladay

Mr. & Mrs. Machrima M. Tariao

Mr. & Mrs. Genaro A. Marcial

Mr. & Mrs. Louie T. Torrico

Mr. & Mrs. Edilyn N. Deocares

Mr. & Mrs. Noli D. Cabalida

Who had been their constant source of inspiration, for untiringly supporting their children and teaching them, that made the study accomplished and completely done on time.

This research study is also humbly dedicated to their Research teacher Mr. Daryl Jay B. Sanco for giving his full support, discipline, encouragement and duties with patience, love and determination.

Acknowledgement

The researchers wish to extent their extreme and candor appreciation to those who helped and support their research work especially to those who in one way contribute to the success of this study.

To Mr. Daryl Jay B. Sanco, their research teacher, for the patience, encouragement, concern, and intellectual guidance to finish this research.

To their parents, who send them to school, who support, who gave advises, who love them unconditionally and inspire them always.

To their classmates and friends, for helping in finding materials, for giving the teacher's inspiration, happiness, and time to treasure unforgettable moments of friendship.

To their teachers especially to Mrs. Daisy N. Media, Mr. Troy Michael R. Labra, Ms. Wendy Ellise Aucijo who helped and made corrections to their research work. Without them, their research will not be finalized.

And above all, to our Father God Almighty, for the blessings and guidance in the trials that come along their way from the start of this research until the final presentation of this work.

The Researchers

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Chapter I

Introduction

Background of the Study

Moss *(Bryophyta)* is a non-floral plant that can produce its own spores (Lepp, 2012). It is present on land even on water specifically in fishponds. Mosses can give problems to fish pond owners since it continues to dominate the fishpond until it becomes inhabitable.

According to Lepp (2012), in Commonwealth of Australian. Usually, the leaves of a dry moss plant are curled or folded into the stalks. Under such circumstances, when the plant becomes moist, the leaves unfold or uncurl. As a result, mosses can have very diverse looks in wet and dry conditions. There are some species, nevertheless, whose leaves continue to grasp the stem even in damp plants. The length of each individual leaf ranges from half a millimeter to three millimeters. They never have a small stalk; instead, they are always linked straight to the stem. The majority of genera have translucent leaves that are only one cell thick. The lengthy central axis of several of these genera' leaves are thickened. This thickening is referred to as a costa or nerve. A few taxa (including Sphagnum and Leucobryum) have leaves that are made up of several cells. Moss leaves often taper to the tip, though this can happen gradually or suddenly. A hairpoint is a lengthy extension of the tip that resembles hair that continues.

Using Moss *(Bryophyta)* to make a paper will benefit both the researcher and fermer, mosses gives problems to fishpond owners since it continues to dominate the fishpond, making paper out of moss will not only lessen the pollution in the fishpond but also lessen the cutting of trees. According to Counts (2023), 42% of global wood harvest is used to make paper contributing to global warming.

The purpose of this study, is to identify the capabilities of the moss *(Bryophyta)* from fishpond as an alternative colored eco paper, for office use , arts, and crafts, the use of the moss *(Bryophyta)* as a substitute for trees (lapnis) will not only help decrease deforestation but also fishpond pollution. The researcher used *(Bryophyta)* as colored eco paper from fishpond, and etc. for the production of paper for office use and that also comes in different colors for arts and

crafts and also contributes to the recurring problems for fishponds owners and deforestation.

Statement of the Problem

This study aimed to use Moss *(Bryophyta)* from Fishponds as an art paper, especially to answer the following questions:

- What test does Moss *(Bryophyta)* need to undergo in order to determine its feasibility?
- How feasible is it for Moss *(Bryophyta)* to turn in different colors that is crucial in making art paper?
- Does Moss *(Bryophyta)* can entirely replace wood as a raw material in making paper?

Statement of Hypothesis

Null Hypothesis H_o - There is no significant difference between the amount of moss and the texture, tensile strength, folding endurance, and adhesive grip test of the art paper.

Alternative Hypothesis H_a - There is a significant difference between the amount of moss and the texture, tensile strength, folding endurance, and adhesive grip test of the art paper.

Objectives

This study aims to use Moss from fish ponds as a main material in the production of art paper that targets the recurring environmental issues, specifically:

- to determine the tests needed to conduct in order to determine the feasibility of Moss to produce art paper;
- to determine the feasibility of Moss to produce art paper;
- to determine if Moss can be an alternative material in the production of art paper instead of traditional wood fibers.

Significance of the Study

This study aims to contribute on indigenous way of making art paper and is significant to:

Students and School. Instead of buying, this study will lower the consumption of commercial colored papers for students. Thus, the students are also helping the society amidst deforestation.

Society. Likewise, instead of using wood as papers, the society can utilize this product in order to contribute greatly in the preservation of trees. This study targets to lessen deforestation, promote the use of fishpond moss fibers in art paper production, and promote fishpond moss as art paper.

Fishpond Farmers. Since polluted mosses don't serve as fish food, they can't be collected from this types of fishponds. In this important manner, it aids in keeping the contaminated mosses, allowing new growth to flourish.

Paper Industry. Moreover, this could contribute to paper industries for them to contribute the wood fibers for paper crafting.

Environment. If they will use this gradually, it will decrease the volume and production of commercialized paper craft and utilize moss from fishponds instead. It is also significant to the environment and will be highly benefited trees have vital function in our environment. This study could help the environment by preserving the trees. Lesser trees could be cut if there is an alternative for wood fibers.

Scope and Delimitation

This study focuses on making art paper from fishpond moss. This study is limited only on fishpond moss. The size of the product varies from the frame. This study mainly focuses and delimited on the physical properties of the product such as its texture, tensile strength, folding endurance, and adhesive grip test.

The researchers study was conducted at Francisco Ramos National High School's

Science Laboratory, and in Suladay's Residence where all the materials were gathered.

Definition of Terms

Bryophyta - a scientific term that refers to Moss.

Fishpond - a controlled pond, artificial lake, or reservoir that is stoked with fish and is used in aquaculture for fish farming.

Eco Paper - results from a manufacturing process where respect for the environment and sustainability had been taken into account.

Moss - a small flowerless, non-flowering, non-vascular green plant.

Colored Paper - a non white sheet of paper.

Adhesive - able to stick fast to a surface or object.

Folding Endurance - measure the durability of paper when repeatedly folded under constant load.

Fiber - a thread or filament from a vegetable tissue mineral substance, or textile is formed.

Chapter II

Review of Related Literature

Moss (Bryophyta)

According to Britannica (2023), similar to other bryophytes, mosses exhibit metagenesis, or the alternating generation between the dependent sporophyte generation that generates spores and the independent gametophyte generation that produces sperm, eggs, and sex organs. Mosses vary mostly from one another in the way that their sporangia (spore casings) are organized and specialized. The gametophytic (sexual) development of moss plants is made up of stem- and leaf-like structures. The gametophyte gives rise to the sporophytic (asexual) generation, which is characterized by an elevated stalk called a seta that ends in a sporangium. The sporangium still depends, in different amounts, on the gametophyte for nutrition and water. Mosses reproduce by creating spores, branching and fragmenting, and regenerating from microscopic fragments of photosynthetic tissues. The protonema, a branching green thread, is created when the spore germinates and expands under the right circumstances.

Adhesive

Adhesives are required to attach the coating to the pigments and paper/board. A coating composition typically contains 10% to 20% adhesives. Adhesives are divided into two categories: synthetic and natural. Among the natural adhesives are starch and protein. There are numerous varieties of soy protein of industrial grade available ("Encyclopedia of Materials: Science and Technology | ScienceDirect", 2011). Adhesive is the primary material used in arts and crafts to stick papers together. After knowing that some research able to use Adhesive grip test to test the property of the paper, the researchers added this test to this study.

Folding Endurance

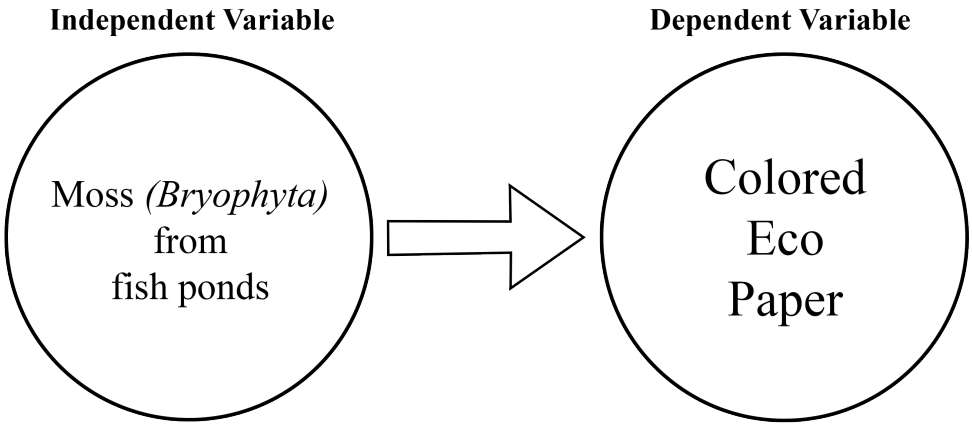
The ability of a piece of paper to endure folds before breaking is known as folding endurance. The ability of the paper to withstand repeated folding, bending, and creasing is determined by this physical property testing criterion. The most typical tests for this characteristic are conducted on routinely used papers. These materials include

receipts, newspapers, maps, historical records, wrapping paper, and more. The ability to fold well also allows paper manufacturers to assess a paper's aging properties both before and after it is subjected to an accelerated environment. Furthermore, it is an unmistakable sign of the evaluated paper's longevity. Greater folding endurance denotes slower aging and deterioration of the paper, whereas lower folding endurance denotes faster aging and deterioration.Refinement of the paper is the basis for folding endurance. As the paper is refined further, it gets better. Conversely, the folding endurance of paper is decreased when non-fibrous additives such as sizing, fillers, etc. are added to its surface ("Universal Engineering Corporation | Universal Engineering Corporation", n.d.). Many previous research uses the Folding endurance test to test the property of their produced paper.

Conceptual Framework

This section shows the Conceptual Framework of the study:

Figure 1
Representation of Conceptual Framework



This part focuses on the variables. This study was determined whether the strategies used in the experiment were reliable. The researchers found out that the fishpond Moss *(Bryophyta)* is independent variable whereas art paper as the dependent variable (Figure 1).

Chapter III

Methodology

This chapter deals with study design, locale, instruments, and method of data collection, as well as plan for data analysis. In the whole it gives general pattern for gathering and processing research data.

Research Method

Procedure in making the product:

First, Gather all the materials needed. Second, wash the moss in clean water then put it in a container. Then, grind the moss in to smaller pieces and put it in a clean container. Next, prepare a basin with 10 liters of water then soak the frame. After that, spread the Moss inside the frame. Next, let it soak for a while, shape it into the frame and make it even. Then, take out the frame out of the basin. After that, transfer it to a clean cloth then press with a sponge. Then, hang it slowly and let it dry. Lastly, the product is done.

Research Design

An Experimental design research was selected for the present study, where the researcher has attempted to manipulate the independent variable. The researcher wanted to determine the feasibility of Moss *(Bryophyta)* from fishpond as art paper.

Research Locale

The materials used by the researcher were available at Barangay Concepcion, Kabasalan, Zamboanga Sibugay. This study was conducted at Suladay's Residence Purok 2, Concepcion, Kabasalan, Zamboanga Sibugay. This study was carried at Francisco Ramos National High School for Arts and Crafts.

Research Instruments

Materials for making the product:

- Wood Frame
- Fishpond Moss
- Water
- Grinder
- Cloth
- Sponge
- Basin
- Hanger
- Hanger Clips

Treatment of the Study

Table 1

Measurement applied in every Treatments

	Treatment 1	Treatment 2	Treatment 3
Moss (g)	150	200	250
Water (ml)	500	500	500
Soaking time (Minutes)	15	15	15
Sodium Hypoclorite (%)	30	30	30

Data Collection Technique

There are three treatments with different measurements. In each treatment, there are three trials wherein the researchers will test the texture, tensile strength, folding endurance, and the adhesive grip test of the produced paper. To test the texture, the researchers conducted a survey where the researchers asked the respondents regarding the texture of the paper. To test the tensile strength, the researchers use weights of kilograms to determine how long it can carry until it is ripped off . To test the folding endurance, the researchers fold it in how many times until it is ripped off. For the adhesive test, the researchers use glue and weights are attached to determine how many grams(g) it can sustain until the joint separates.

Table 2
Tabular format for Tests

	Treatement 1 Moss: 150g Water: 500ml Soaking time: 15mins NaClO: 30% (150ml)	Treatment 2 Moss: 200g Water: 500ml Soaking time: 15mins NaClO: 30% (150ml)	Treatment 3 Moss: 250g Water: 500ml Soaking time: 15mins NaClO: 30% (150ml)
Trial 1			
Trial 2			
Trial 3			

Statistical Analysis

A single statistical test was used in the analysis of the quantitative data This was the one way Analysis of Variance. It was employed to determine if there is a relationship between the three treatments (treatment 1 , treatment 2 and treatment 3), and if the results are statistically significant. The confidence value chosen was 0.05.

The result of this test is ap value; if this is below the significance interval (0.05), the null hypothesis is rejected. If it is above the significance interval, the null hypothesis is accepted.

Chapter IV

Results and Discussion

This chapter includes the results of the experimentation and the interpretation of the results as well.

Texture
Table 3
Result of the texture that the researcher gathered

Respondents	T1	T2	T3
1	3	3	4
2	3	3	4
3	3	4	5
4	4	1	2
5	5	3	3
6	4	4	5
7	4	4	5
8	3	2	5
9	4	3	5
10	4	4	5
11	3	3	3
12	4	3	4
13	3	4	4
14	3	4	5
15	2	2	3
16	1	3	4
17	2	4	5
18	3	4	4
19	3	5	4
20	3	4	5
Mean	**3.2**	**3.35**	**4.2**

Legend:

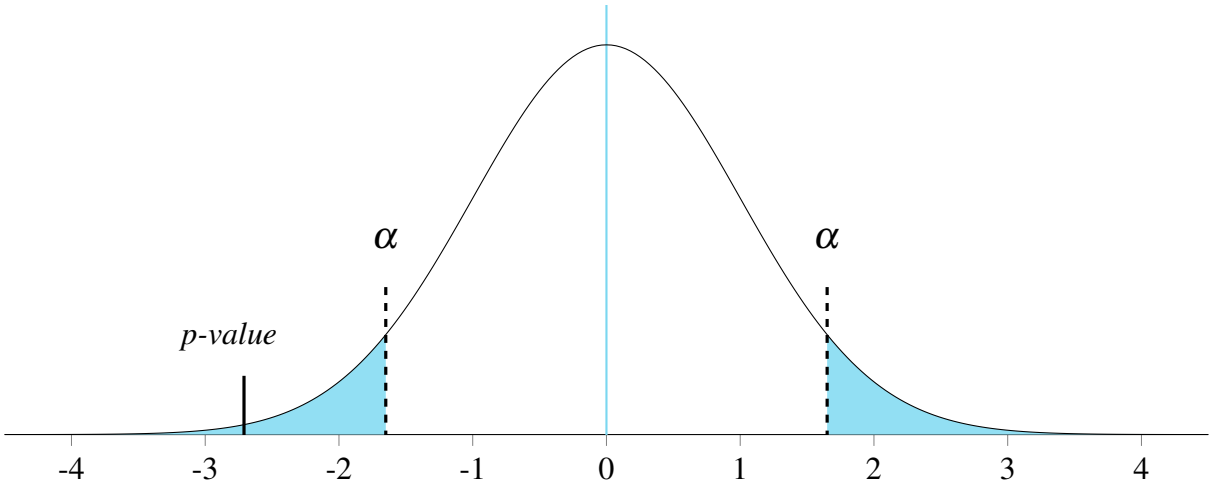
4.21 - 5.0 - Very Satisfied
3.41 - 4.20 - Satisfied
2.61 - 3.40 - Fair
1.81 - 2.60 - Poor
1.0 - 1.80 - Needs Improvement

In testing the texture of the art paper, the researchers conducted survey where 20 respondents are asked to rate the texture of the art paper using the Likert scale where five states

that the respondents are satisfied and one when the respondents suggests further improvements.

Figure 2

Visualization of the Kruskal-Wallis test (Texture)



Using the Kruskal-Wallis test in analyzing the data in table 3 resulted with the p-value of 0.00338. The visual representation of the result shows that the p-value falls on the rejections region (Figure 2). This implies that the null hypothesis is rejected. Hence, there is a significant difference between the amount of moss and the texture of the art paper.

Tensile Strength

Table 4

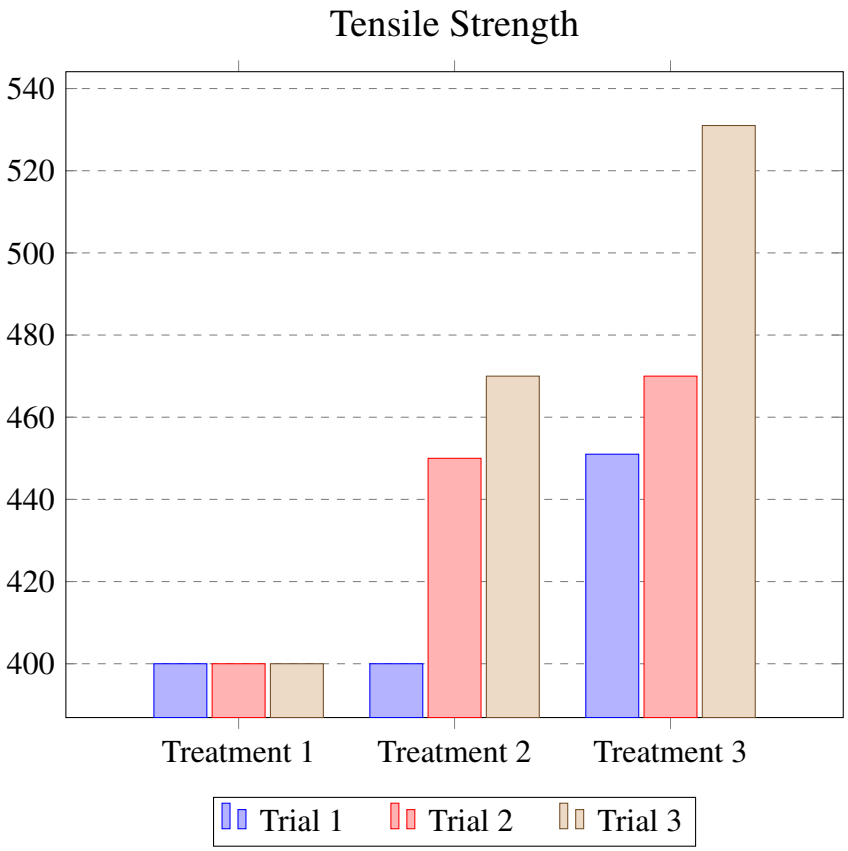
Tensile strength of art paper from different treatments

Treatment	Trial 1 (g)	Trial 2 (g)	Trial 3 (g)
Treatment 1	*399.5g*	*399.75g*	*400g*
Treatment 2	*400.10g*	*450g*	*470.20g*
Treatment 3	*451.20g*	*470g*	*530.5g*

The table shows the result of the tensile strength conducted on the art paper which is recorded in grams.

Figure 3

Graphical representation of tensile strength of art paper from different treatments



The graph shows that Treatment 3 has the higher tensile strength that can carry a maximum weight of 530.5 g until it rips off.

Table 5
ANOVA Data Analysis on Results of Tensile Strength

Anova: Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
T1	3	1199.25	399.75	0.0625
T2	3	1320.3	440.1	1302.01
T3	3	1451.7	483.9	1717.03

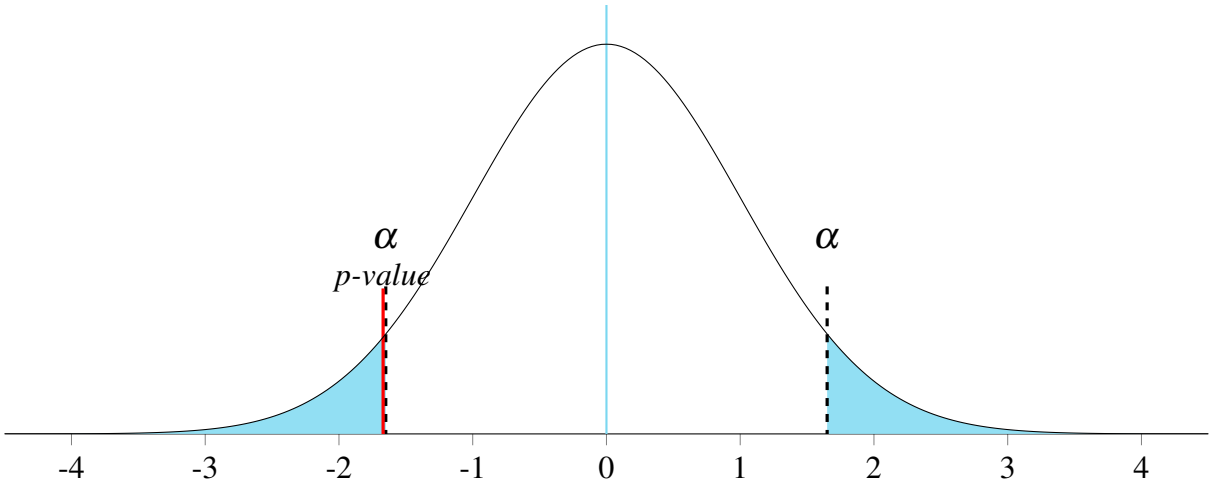
ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	10627.79	2	5313.893	5.28027	0.047559	5.143253
Within Groups	6038.205	6	1006.368			
Total	16665.99	8				

In table 5, the result shows at alpha level of 0.05 with 95% confidence level the *p-value* is equal to 0.047559 which is less than the alpha level. Therefore, the null hypothesis that there is no significant difference between the amount of moss and the tensile strength of the art paper is rejected. This implies that there is a significant difference between the amount of moss and the tensile strength of the art paper.

Figure 4

Visualization of P-value through Normal Distribution Graph (Tensile Strength)



After visualizing the data from table 5 graphically, it shows that the *p-value* falls on the rejection region. This implies that the null hypothesis is rejected and the result of figure 4 corresponds to table 4.

Folding Endurance Test

Table 6

Results on the number of repeatition of fold of Folding Endurance Test

	Treatement 1 Moss: 150g Water: 500ml Soaking time: 15mins NaClO: 30% (150ml)	Treatment 2 Moss: 200g Water: 500ml Soaking time: 15mins NaClO: 30% (150ml)	Treatment 3 Moss: 250g Water: 500ml Soaking time: 15mins NaClO: 30% (150ml)
Trial 1	14	56	60
Trial 2	32	44	81
Trial 3	27	55	68

In table 6, it shows the data of the Folding Endurance Test. In the first trial, treatment 1 is able to sustain the 14 repetition of folds without tearing. Then, treatment 2 sustained 56 folds. And Treatment 3 ascended to 60 folds. In trial 2, Treatment 1 able to sustain the 32 folds. Next, Treatment 2 sustained the 44 folds without breaking. And, treatment 3 did not break until the 81th fold. Lastly in trial 3, treatment 1 descended to 27 folds from the previous trial. Then, Treatment 2 able to sustain the 55 folds without breaking. And, Treatment 3 descended to 68 fold from the previous trial.

Table 7

ANOVA Data Analysis on Results of Folding Endurance Test

Anova: Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
T1	3	73	24.33333	86.33333
T2	3	155	51.66667	44.33333
T3	3	209	69.66667	112.3333

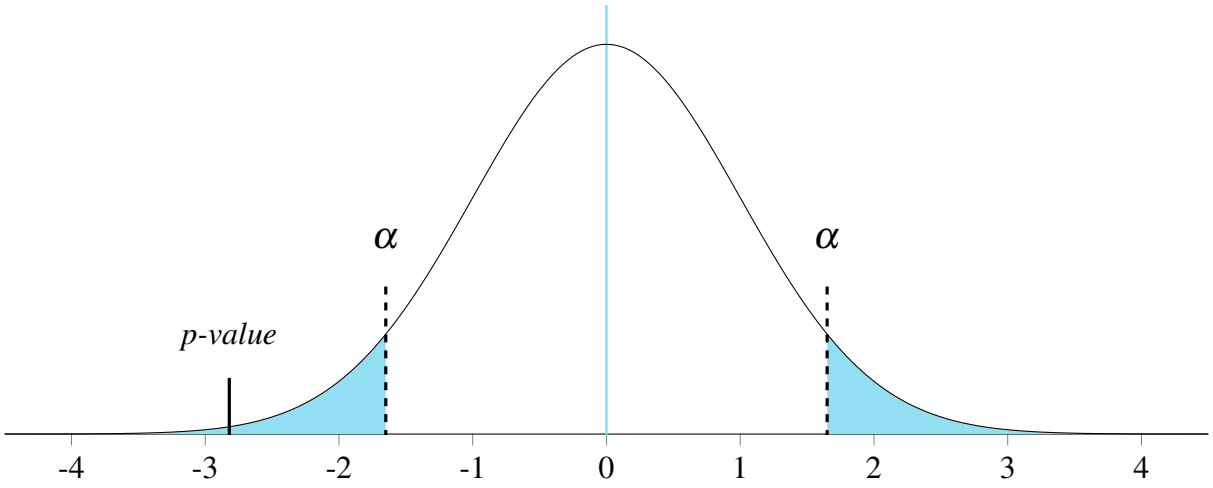
ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	3126.222	2	1563.111	19.29767	0.002435	5.143253
Within Groups	486	6	81			
Total	3612.222	8				

In table 7, the result shows at alpha level of 0.05 with 95% confidence level the *p-value* is equal to 0.002435 which is less than the alpha level. Therefore, the null hypothesis that there is no significant difference between the amount of moss and folding endurance test of the art paper is rejected. This implies that there is a significant difference between the amount of moss and folding endurance test of the art paper.

Figure 5

Visualization of P-value through Normal Distribution Graph (Folding Edurance Test)



After visualizing the data from table 7 graphically, it shows that the *p-value* falls on the rejection region. This implies that the null hypothesis is rejected and the result of figure 5 corresponds to table 7.

Adhesive Grip Test

Table 8

Results of Adhesive Grip Test

	Treatement 1 Moss: 150g Water: 500ml Soaking time: 15mins NaClO: 30% (150ml)	Treatment 2 Moss: 200g Water: 500ml Soaking time: 15mins NaClO: 30% (150ml)	Treatment 3 Moss: 250g Water: 500ml Soaking time: 15mins NaClO: 30% (150ml)
Trial 1	20g	1000g	1500g
Trial 2	1000g	2000g	1500g
Trial 3	1500g	1500g	1500g

In table 8, it shows the adhesive grip test of the colored eco paper from differ treatment, Treatment 1 have 20g in trial 1, trial 2 isa 1000g and in trial 3 have 1500g treatment 2 have

1000g in trial 1 trial 2 is 2000g and in trial 3 is 1500g. Treatment 3 have 1500g in trial 1 in trial 2 have also 1500g and trial 3 is also 1500g. The graph shows that the treatment 3 has the higher adhesive grip test.

Table 9
ANOVA Data Analysis on Results of Adhesive Grip Test

Anova: Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
T1	3	2520	840	566800
T2	3	4500	1500	250000
T3	3	4500	1500	0

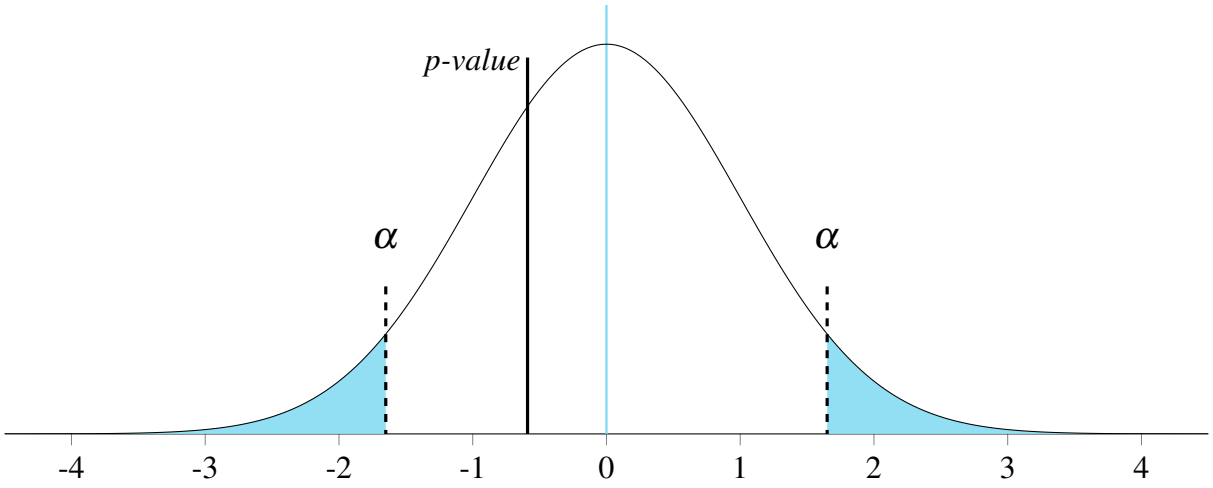
ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	871200	2	435600	1.599902	0.277407	5.143253
Within Groups	1633600	6	272266.7			
Total	2504800	8				

In table 9, the result shows at alpha level of 0.05 with 95% confidence level the *p-value* is equal to 0.277407 which is greater than the alpha level. Therefore, the null hypothesis is accepted. This implies that there is no significant difference between the amount of moss and adhesive grip test of the art paper.

Figure 6

Visualization of P-value through Normal Distribution Graph (Adhesive Grip Test)



After visualizing the data from table 9 graphically, it shows that the *p-value* falls on the acceptance region. This implies that the null hypothesis is accepted and the result of figure 6 corresponds to table 9.

Chapter V

Conclusion and Recommendation

In this chapter, the final decision of the researchers that was formed throughout the study and the suggestion of the researchers to enhance this research.

Conclusion

The following facts has been established the following analysis of results obtained from the experiments described in the above section. In summary:

- The researchers use the folding endurance test and adhesive test to determine the durability and the quality of the art paper.

- Fishpond moss (Bryophyta) is feasible to be a raw material in making the art paper through utilizing the least 250g of fishpond moss.

  However in testing the product, the result of the folding endurance test shows that *p-value* is less than the alpha level. Hence, rejecting the null and accept the alternative hypothesis that there is a significant difference between the amount of moss and the texture, tensile strength, adhesive grip, and folding endurance of the art paper and Adhesive Grip test show that *p-value* is greater than the alpha level resulting in the acceptance of the null hypothesis that there is no significant difference between the amount of moss and the texture, tensile strength, adhesive grip, and folding endurance of the art paper.

- The moss is can entirely replace the commercial colored paper using treatment 3 (250g) of fishpond moss.

Moreover, to assure the folding endurance and the adhesive test of the colored eco paper, the product must be at least 250 grams of fishpond moss (Bryophyta) as art paper.

Recommendation

The aforementioned results are used by the researchers to generate suggestions for further improvements of this study. The researchers suggest to:

- conduct more test to determine the feasibility of Moss *(Bryophyta)* as Colored Eco Paper;
- conduct more studies to discover the other uses of *Bryophyta* and other non-vascular plants on our daily lives;
- to add fragrance to the product;
- to discover an organic alternative bleaching agent in whitening the paper;
- to discover an organic alternative dyeing agent in dyeing the paper;
- to conduct tests on product where it is exposed in varying soaking time.

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Appendices

Appendix A: Request for Permission to Conduct Research

Republic of the Philippines
Department of Education
Region IX, Zamboanga Peninsula
Division of Zamboanga Sibugay
FRANCISCO RAMOS NATIONAL HIGH SCHOOL
Concepcion, Kabasalan, Zamboanga Sibugay

TO: MA. HELEN S. JARCIA
Principal II
Francisco Ramos National High School

REQUEST FOR PERMISSION TO CONDUCT RESEARCH

Ma'am:

Good Day!

We are the Grade 11- STEM students of Francisco Ramos National High School. As stated to comply our research study in Practical Research 1 (Quantitative Research) under our Instructor Mr. Daryl Jay B. Sanco.

The proposed topic of our research paper is **MOSS *(Bryophyta)* FROM FISHPOND AS COLORED ECO PAPER**. We are hereby seeking your consent to conduct a research study in your prestigious school.

Your permission to conduct this study will be greatly appreciated.

Yours sincerely,

Axelcris G. Suladay
Aera Jasmin M. Tariao
Leslie A. Marcial
Rhouie Loveine D. Torrico
Jeffmark A. Deocares
Zyril Cabalida

Researchers

Noted by:

DARYL JAY B. SANCO

Research Teacher

Appendix B: Certification for Panel of Validation

Republic of the Philippines
Department of Education
Region IX, Zamboanga Peninsula
Division of Zamboanga Sibugay
FRANCISCO RAMOS NATIONAL HIGH SCHOOL
Concepcion, Kabasalan, Zamboanga Sibugay

CERTIFICATION FOR PANEL OF VALIDATION

This is to certify that the attached instrument has been validated and evaluated by the undersigned below and is found to be valid.

Validated/Evaluated by:

JOCELYN F. SERIMOGAN	**WENDY ELLISE AUCIJO**
Research Teacher	English Teacher

Appendix C: Raw Data, Tables, and Photos

Drying of the Eco Paper

Rinsing of bleached Moss

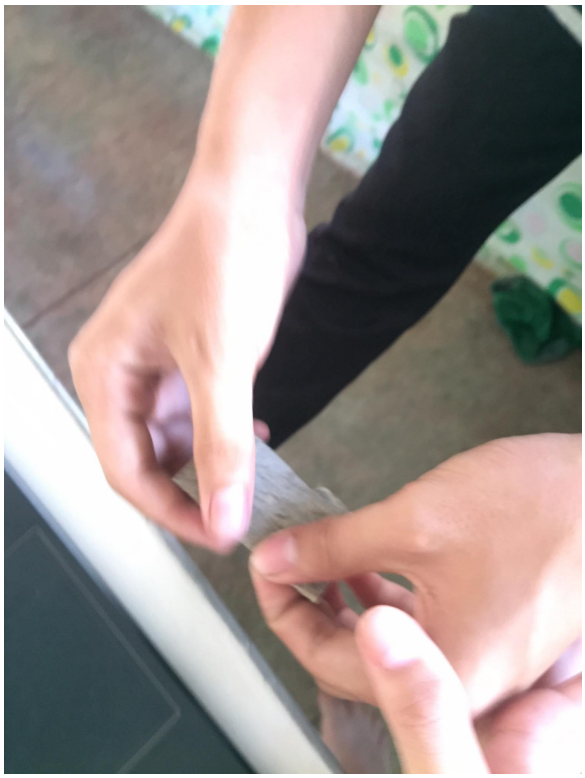
Bleaching of the Moss

Preparation of the bleaching solution

Coloring the Eco Paper

Grinding the bleached Moss

Testing the product using the Adhesive Grip Test



Testing the product using the Folding Endurance Test

Appendix D: LaTeX source code

```
\documentclass[a4paper,12pt,man,donotrepeattitle,floatsintext]{apa7}
\tolerance=9999
\emergencystretch=10pt
\hyphenpenalty=10000
\exhyphenpenalty=100
\usepackage[english=nohyphenation]{hyphsubst}
\usepackage[english]{babel}
\usepackage[utf8]{inputenc}
\usepackage[T1]{fontenc}
\usepackage[style=apa6,backend=biber,natbib=true]{biblatex}
\DeclareLanguageMapping{american}{american-apa}
\addbibresource{MOSS AS COLORED ECO PAPER.bib}

\usepackage[document]{ragged2e}
\usepackage{csquotes}
\usepackage{parskip}
\usepackage{float}
\usepackage{pdflscape}
\usepackage{rotating}
\usepackage{mathptmx}
\usepackage{makeidx}
\usepackage{amsmath,graphicx,tikz}
\usepackage{pgfplots}
\pgfplotsset{compat=1.18}
\usepackage{wrapfig}
\usepackage[firstpage=true]{background}
\backgroundsetup{
  scale=3,
  angle=0,
  firstpage=false,
  opacity=0.20,
  contents={\begin{tikzpicture}[remember picture,overlay]
      \node at ([yshift=10pt,xshift=0pt]current page.center)
      {\includegraphics[width=2in]{"FRNHS LOGO"}};
\end{tikzpicture} }}
\usepackage{setspace}
\usepackage{booktabs}
\usepackage{multicol}
\usepackage{multirow}

\usepackage{verbatim}

\usepgfplotslibrary{fillbetween}
%\tikzset{every node/.style={font=\sffamily}}

\definecolor{linecolor}{HTML}{7AD7F0}
\definecolor{Axelfav}{HTML}{228B22}
\definecolor{grad1}{HTML}{92DFF3}
\definecolor{grad2}{HTML}{B7E9F7}
\definecolor{grad3}{HTML}{DBF3FA}
```

```
\definecolor{grad4}{HTML}{F5FCFF}

\usepackage{xcolor}

\setlocalecaption{english}{contents}{Table of Contents}

\ title {\textbf{FISHPONDMOSS \textit{(Bryophyta)} AS ART PAPER} \linebreak \linebreak
    A SCIENCE INVESTIGATORY RESEARCH \linebreak \linebreak \linebreak PRESENTED TO
   THE FACULTY AND STAFF OF FRANCISCO RAMOS NATIONAL HIGH SCHOOL \\ (FORMERLY
    BUAYAN NATIONAL HIGH SCHOOL) \linebreak \linebreak In Partial Fulfillment of
   the Requirements in Practical Research 1 under \\ Science, Technology,
   Engineering, and Mathematics (STEM)}
\shorttitle{ }
\author{Axelcris G. Suladay \\ Aera Jasmin M. Tariao \\ Leslie A. Marcial \\
   Rhouie Loveine D. Torrico \\ Jeffmark A. Deocares \\ Zyril Cabalida}
\authorsaffiliations{Researchers}
\date{March 2024}

\begin{document}
  \begin{titlepage}
    \maketitle
  \end{titlepage}
  \newpage
  \pagenumbering{roman}
  \begin{spacing}{1.08}
    \begin{center}
      Republic of the Philippines \\ \textit{Department of Education} \\ Region
          IX, Zamboanga Peninsula \\ Division of Zamboanga Sibugay \\ \textbf{
         FRANCISCO RAMOS NATIONAL HIGH SCHOOL} \\ Concepcion, Kabasalan,
         Zamboanga Sibugay
    \end{center}
    \hspace*{0.5in}
    \ section {Certificate of Committee Approval}
    \hspace*{0.5in}
    \begin{justify}
      \hspace*{0.5in} In partial fulfillment of the requirements, this
         research paper entitled \textbf{MOSS \textit{(Bryophyta)} FROM FISHPOND
          AS COLORED ECO PAPER} has been prepared by: \textbf{Suladay, Axelcris
          G., Tariao, Aera Jasmin M., Marcial, Leslie A., Torrico, Rhouie
         Loveine D., Deocares, Jeffmark A., and Cabalida, Zyril}
    \end{justify}
    \vspace*{1in}
    \begin{justify}
      Approved by the Examining Committee:
    \end{justify}
    \vspace*{1in}
    \begin{figure}
      \begin{minipage}{0.5\textwidth}
        \begin{center}
          \ underline {\ textbf {RAMJAY J. CAINGLET}} \\
          Committee Member
```

```
      \end{center}
    \end{minipage}%
    \begin{minipage}{0.5\textwidth}
      \begin{center}
        \underline{\textbf{CASSANDHRA PEARL A. EMPERADO}} \\
        Committee Member
      \end{center}
    \end{minipage}
  \end{figure}
\end{spacing}
\begin{tikzpicture}[remember picture,overlay]
  \node at ([yshift=4in,xshift=2.75in]current page.center)
  {\includegraphics[width=1.0615in]{"FRNHS LOGO"}};
\end{tikzpicture}
\begin{tikzpicture}[remember picture,overlay]
  \node at ([yshift=4in,xshift=-2.75in]current page.center)
  {\includegraphics[width=1.0625in]{EDUKASYON LOGO}};
\end{tikzpicture}
\newpage
\section{Dedication}
\begin{justify}
  \hspace*{0.5in} This research was truly dedicated to their beloved parents
      :
\end{justify}
\begin{center}
  Mr. \& Mrs. Rene B. Suladay \\
  Mr. \& Mrs. Machrima M. Tariao \\
  Mr. \& Mrs. Genaro A. Marcial \\
  Mr. \& Mrs. Louie T. Torrico \\
  Mr. \& Mrs. Edilyn N. Deocares \\
  Mr. \& Mrs. Noli D. Cabalida
\end{center}
\begin{justify}
  \hspace*{0.5in} Who had been their constant source of inspiration, for
      untiringly supporting their children and teaching them, that made the
      study accomplished and completely done on time.

  \hspace*{0.5in} This research study is also humbly dedicated to their
      Research teacher Mr. Daryl Jay B. Sanco for giving his full support,
      discipline, encouragement and duties with patience, love and
      determination.
\end{justify}
\newpage
\section{Acknowledgement}
\begin{justify}
  \hspace*{0.5in}The researchers wish to extent their extreme and candor
      appreciation to those who
  helped and support their research work especially to those who in one way
      contribute to
  the success of this study.
```

```
  \hspace*{0.5in}To Mr. Daryl Jay B. Sanco, their research teacher, for the
     patience, encouragement, concern, and intellectual guidance to finish
     this research.

  \hspace*{0.5in}To their parents, who send them to school, who support, who
      gave advises, who love
  them unconditionally and inspire them always.

  \hspace*{0.5in}To their classmates and friends, for helping in finding
     materials, for giving the teachers inspiration, happiness, and time to
      treasure unforgettable moments of friendship.

  \hspace*{0.5in}To their teachers especially to Mrs. Daisy N. Media, Mr.
     Troy Michael R. Labra, Ms. Wendy Ellise Aucijo who helped and made
     corrections to their research work. Without them,
  their research will not be finalized.

  \hspace*{0.5in}And above all, to our Father God Almighty, for the
     blessings and guidance in the trials
  that come along their way from the start of this research until the final
     presentation of
  this work.

\end{justify}
\begin{flushright}
  The Researchers
\end{flushright}
\newpage
\tableofcontents
\listoffigures
\listoftables
\newpage
\pagenumbering{arabic}
\section{Chapter I}
\section{Introduction}
\subsection{Background of the Study}
\begin{justify}
  \hspace*{0.5in} Moss \textit{(Bryophyta)} is a non-floral plant that can
     produce its own spores \parencite{lepp_2012_what}. It is present on
     land even on water specifically in fishponds. Mosses can give problems
      to fish pond owners since it continues to dominate the fishpond until
      it becomes inhabitable.

  \hspace*{0.5in} According to \Citet{lepp_2012_what}, in Commonwealth of
     Australian. Usually, the leaves of a dry moss plant are curled or
     folded into the stalks. Under such circumstances, when the plant
     becomes moist, the leaves unfold or uncurl. As a result, mosses can
     have very diverse looks in wet and dry conditions. There are some
     species, nevertheless, whose leaves continue to grasp the stem even in
      damp plants. The length of each individual leaf ranges from half a
     millimeter to three millimeters. They never have a small stalk;
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    instead, they are always linked straight to the stem. The majority of
    genera have translucent leaves that are only one cell thick. The
    lengthy central axis of several of these genera' leaves are thickened.
     This thickening is referred to as a costa or nerve. A few taxa (
    including Sphagnum and Leucobryum) have leaves that are made up of
    several cells. Moss leaves often taper to the tip, though this can
    happen gradually or suddenly. A hairpoint is a lengthy extension of
    the tip that resembles hair that continues.

  \hspace*{0.5in} Using Moss \textit{(Bryophyta)} to make a paper will benefit
     both the researcher and fermer, mosses gives problems to fishpond
    owners since it continues to dominate the fishpond, making paper out
    of moss will not only lessen the pollution in the fishpond but also
    lessen the cutting of trees. According to \Citet{theworldcounts_2023_
    paper}, 42\% of global wood harvest is used to make paper contributing
     to global warming.

  \hspace*{0.5in} The purpose of this study, is to identify the capabilities
     of the moss \textit{(Bryophyta)} from fishpond as an alternative
    colored eco paper, for office use , arts, and crafts, the use of the
    moss \textit{(Bryophyta)} as a substitute for trees (lapnis) will not
    only help decrease deforestation but also fishpond pollution. The
    researcher used \textit{(Bryophyta)} as colored eco paper from fishpond,
     and etc. for the production of paper for office use and that also
    comes in different colors for arts and crafts and also contributes to
    the recurring problems for fishponds owners and deforestation.
\end{justify}

\subsection{Statement of the Problem}
\begin{justify}
  \hspace*{0.5in} This study aimed to use Moss \textit{(Bryophyta)} from
     Fishponds as a Colored Eco Paper, especially to answer the following
     questions:
  \begin{itemize}
    \item What test does Moss \textit{(Bryophyta)} need to undergo in order to
        determine its feasibility?
    \item How feasible is it for Moss \textit{(Bryophyta)} to turn in
       different colors that is crucial in making Colored Eco Paper?
    \item Does Moss \textit{(Bryophyta)} can entirely replace wood as a raw
       material in making paper?
  \end{itemize}
\end{justify}

\subsection{Objectives}
\begin{justify}
  \hspace*{0.5in} This study aims to use Moss from fish ponds as a main
     material in the production of Colored Eco Paper that targets the
     recurring environmental issues, specifically:
  \begin{itemize}
    \item to determine the tests needed to conduct in order to determine the
        feasibility of Moss to produce Colored Eco Paper;
```

```
    \item to determine the feasibility of Moss to produce Colored Eco Paper;
    \item to determine if Moss can be an alternative material in the
        production of Colored Eco Paper instead of traditional wood fibers.
  \end{itemize}
\end{justify}
\clearpage
\subsection{Significance of the Study}
\begin{justify}
  \hspace*{0.5in} This study aims to contribute on indigenous way of making
     colored eco paper and is significant to:

  Students and School. Instead of buying, this study will lower the
     consumption of commercial colored papers for students. Thus, the
     students are also helping the society amidst deforestation.

  Society. Likewise, instead of using wood as papers, the society can
     utilize this product in order to contribute greatly in the
     preservation of trees. This study targets to lessen deforestation,
     promote the use of fishpond moss fibers in colored eco paper
     production, and promote fishpond moss as colored eco paper.

  Fishpond Farmers. Since polluted mosses don't serve as fish food, they can
     't be collected from this types of fishponds. In this important manner
     , it aids in keeping the contaminated mosses, allowing new growth to
     flourish.

  Paper Industry. Moreover, this could contribute to paper industries for
     them to contribute the wood fibers for paper crafting.

  Environment. If they will use this gradually, it will decrease the volume
     and production of commercialized paper craft and utilize moss from
     fishponds instead. It is also significant to the environment and will
     be highly benefited trees have vital function in our environment. This
      study could help the environment by preserving the trees. Lesser
     trees could be cut if there is an alternative for wood fibers.
\end{justify}
\subsection{Scope and Delimitation}
\begin{justify}
  \hspace*{0.5in} This study focuses on making colored eco paper from
     fishpond moss. This study is limited only on fishpond moss. The size
     of the product varies from the frame. This study mainly focuses and
     delimited on the physical properties of the product such as its
     folding endurance and adhesive bond test.

  \hspace*{0.5in} The researchers study was conducted at Francisco Ramos
     National High School's Science Laboratory, and in Suladay's Residence
     where all the materials were gathered.
\end{justify}

\subsection{Definition of Terms}
\begin{justify}
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  \textbf{Bryophyta} - a scientific term that refers to Moss. \\
  \textbf{Fishpond} - a controlled pond, artificial lake, or reservoir that
     is stoked with fish and is used in aquaculture for fish farming. \\
  \textbf{Eco Paper} - results from a manufacturing process where respect
     for the environment and sustainability had been taken into account. \\
  \textbf{Moss} - a small flowerless, non-flowering, non-vascular green
     plant. \\
  \textbf{Colored Paper} - a non white sheet of paper. \\
  \textbf{Adhesive} - able to stick fast to a surface or object. \\
  \textbf{Folding Endurance} - measure the durability of paper when
     repeatedly folded under constant load. \\
  \textbf{Fiber} - a thread or filament from a vegetable tissue mineral
     substance, or textile is formed.
\end{justify}
\newpage
\section{Chapter II}
\section{Review of Related Literature}
\subsubsection{Moss \textit{(Bryophyta)}}
\begin{justify}
  \hspace*{0.5in} According to \Citet{britannica_2023_moss}, similar to
     other bryophytes, mosses exhibit metagenesis, or the alternating
     generation between the dependent sporophyte generation that generates
     spores and the independent gametophyte generation that produces sperm,
      eggs, and sex organs. Mosses vary mostly from one another in the way
     that their sporangia (spore casings) are organized and specialized.
     The gametophytic (sexual) development of moss plants is made up of
     stem- and leaf-like structures. The gametophyte gives rise to the
     sporophytic (asexual) generation, which is characterized by an
     elevated stalk called a seta that ends in a sporangium. The sporangium
      still depends, in different amounts, on the gametophyte for nutrition
      and water. Mosses reproduce by creating spores, branching and
     fragmenting, and regenerating from microscopic fragments of
     photosynthetic tissues. The protonema, a branching green thread, is
     created when the spore germinates and expands under the right
     circumstances.
\end{justify}

\subsubsection{Adhesive}
\begin{justify}
  \hspace*{0.5in} Adhesives are required to attach the coating to the
     pigments and paper/board. A coating composition typically contains 10\
     % to 20\% adhesives. Adhesives are divided into two categories:
     synthetic and natural. Among the natural adhesives are starch and
     protein. There are numerous varieties of soy protein of industrial
     grade available \parencite{a2011_encyclopedia}. Adhesive is the
     primary material used in arts and crafts to stick papers together.
     After knowing that some research able to use Adhesive grip test to
     test the property of the paper, the researchers added this test to
     this study.
\end{justify}
```

```
\subsubsection{Folding Endurance}
\begin{justify}
  \hspace*{0.5in} The ability of a piece of paper to endure folds before
      breaking is known as folding endurance. The ability of the paper to
      withstand repeated folding, bending, and creasing is determined by
      this physical property testing criterion. The most typical tests for
      this characteristic are conducted on routinely used papers. These
      materials include receipts, newspapers, maps, historical records,
      wrapping paper, and more. The ability to fold well also allows paper
      manufacturers to assess a paper's aging properties both before and
      after it is subjected to an accelerated environment. Furthermore, it
      is an unmistakable sign of the evaluated paper's longevity. Greater
      folding endurance denotes slower aging and deterioration of the paper,
       whereas lower folding endurance denotes faster aging and
      deterioration.Refinement of the paper is the basis for folding
      endurance. As the paper is refined further, it gets better. Conversely
      , the folding endurance of paper is decreased when non-fibrous
      additives such as sizing, fillers, etc. are added to its surface \
      parencite{universal}. Many previous research uses the Folding
      endurance test to test the property of their produced paper.
\end{justify}

\subsection{Conceptual Framework}
\begin{justify}
  \hspace*{0.5in} This section shows the Conceptual Framework of the study:
\end{justify}
\begin{figure}
  \centering
  \caption{Representation of Conceptual Framework}
  \label{fig:conceptual-framework}
  \includegraphics[width=\linewidth]{"Conceptual Framework"}
\end{figure}
\begin{justify}
  \hspace*{0.5in} This part focuses on the variables. This study was
      determined whether the strategies used in the experiment were reliable
      . The researchers found out that the fishpond Moss \textit{(Bryophyta)}
      is independent variable whereas Colored Eco Paper as the dependent
      variable (Figure \ref{fig:conceptual-framework}).
\end{justify}

\subsection{Statement of Hypothesis}
\begin{justify}
  \textbf{H$_o$ (Null Hypothesis)} - There is no significant difference
      between the usage of different treatment of moss and the adhesive grip
      , and folding endurance of the Colored Eco Paper.

  \textbf{H$_a$ (Alternative Hypothesis)} - There is a significant
      difference between the usage of different treatment of moss and the
      adhesive grip, and folding endurance of the Colored Eco Paper.
\end{justify}
\newpage
```

```
\section{Chapter III}
\section{Methodology}
\begin{justify}
  \hspace*{0.5in} This chapter deals with study design, locale, instruments,
      and method of data collection, as well as plan for data analysis. In
     the whole it gives general pattern for gathering and processing
     research data.
\end{justify}
\subsection{Research Method}
\begin{justify}
  Procedure in making the product:

  \hspace*{0.5in} First, Gather all the materials needed. Second, wash the
     moss in clean water then put it in a container. Then, grind the moss
     in to smaller pieces and put it in a clean container. Next, prepare a
     basin with 10 liters of water then soak the frame. After that, spread
     the Moss inside the frame. Next, let it soak for a while, shape it
     into the frame and make it even. Then, take out the frame out of the
     basin. After that, transfer it to a clean cloth then press with a
     sponge. Then, hang it slowly and let it dry. Lastly, the product is
     done.
\end{justify}

\subsection{Research Design}
\begin{justify}
  \hspace*{0.5in} An Quasi-Experimental design research was selected for the
      present study, where the researcher has attempted to manipulate the
     independent variable. The researcher wanted to determine the
     feasibility of Moss \textit{(Bryophyta)} from fishpond as Colored Eco
     Paper.
\end{justify}
\subsection{Research Locale}
\begin{justify}
  \hspace*{0.5in} The materials used by the researcher were available at
     Barangay Concepcion, Kabasalan, Zamboanga Sibugay. This study was
     conducted at Suladay's Residence Purok 2, Concepcion, Kabasalan,
     Zamboanga Sibugay. This study was carried at Francisco Ramos National
     High School for Arts and Crafts.
\end{justify}

\newpage
\subsection{Research Instruments}
\begin{spacing}{1.08}
  \begin{justify}
    \hspace*{0.5in} Materials for making the product:

    \begin{itemize}
      \item Wood Frame
      \item Fishpond Moss
      \item Water
      \item Grinder
```

```
      \item Cloth
      \item Sponge
      \item Basin
      \item Hanger
      \item Hanger Clips
    \end{itemize}
  \end{justify}
\end{spacing}

\subsection{Treatment of the Study}

\begin{table}[htbp]
  \centering
  \caption{Measurement applied in every Treatments}
  \begin{tabular}{|c|c|c|c|}
    \hline
    & Treatment 1 & Treatment 2 & Treatment 3 \\
    \hline
    Moss (g) & 150 & 200  & 250 \\
    \hline
    Water (ml) & 500 & 500  & 500 \\
    \hline
    Soaking time (Minutes) & 15 & 15   & 15 \\
    \hline
    Sodium Hypoclorite (\%) & 30 & 30   & 30 \\
    \hline
  \end{tabular}
  \label{tab:T-Table2}
\end{table}

\subsection{Data Collection Technique}
\begin{justify}
  \hspace*{0.5in} There are three treatments with different measurements. In
      each treatment, there are three trials wherein the researchers will
    test the folding endurance and the adhesive grip test of the produced
    paper. To test the folding endurance, the researchers fold it in how
    many times until it is ripped off. For the adhesive test, the
    researchers use glue and weights are attached to determine how many
    grams(g) it can sustain until the joint separates.
\end{justify}

\newpage
\begin{table}[H]
  \centering
  \caption{Tabular format for Tests}
  \begin{tabular}{|c|c|c|c|}
    \hline
    & Treatement 1 & Treatment 2 & Treatment 3 \\
    & Moss: 150g & Moss: 200g & Moss: 250g \\
    & Water: 500ml & Water: 500ml & Water: 500ml \\
    & Soaking time: 15mins & Soaking time: 15mins & Soaking time: 15mins \\
```

```
    & NaClO: 30\% (150ml) & NaClO: 30\% (150ml) & NaClO: 30\% (150ml) \\
    \hline
    Trial 1 &     &       &  \\
    \hline
    Trial 2 &     &       &  \\
    \hline
    Trial 3 &   &       &  \\
    \hline
  \end{tabular}
  \label{tab:T-Table1}
\end{table}

\subsection{Statistical Analysis}
\begin{justify}
  \hspace*{0.5in} A single statistical test was used in the analysis of the
     quantitative data
  This was the one way Analysis of Variance. It was employed to determine if
  there is a relationship between the three treatments (treatment 1 ,
     treatment 2 and
  treatment 3), and if the results are statistically significant. The
     confidence value
  chosen was 0.05.

  \hspace*{0.5in} The result of this test is ap value; if this is below the
     significance interval
  (0.05), the null hypothesis is rejected. If it is above the significance
     interval,
  the null hypothesis is accepted.
\end{justify}

\newpage
\section{Chapter IV}
\section{Results and Discussion}
\begin{justify}
  \hspace*{0.5in} This chapter includes the results of the experimentation
     and the interpretation of the results as well.
\end{justify}

\subsection{Folding Endurance Test}
\begin{table}[H]
  \centering
  \caption{Results of Folding Endurance Test}
  \begin{tabular}{|c|c|c|c|}
    \hline
    & Treatement 1 & Treatment 2 & Treatment 3 \\
    & Moss: 150g & Moss: 200g & Moss: 250g \\
    & Water: 500ml & Water: 500ml & Water: 500ml \\
    & Soaking time: 15mins & Soaking time: 15mins & Soaking time: 15mins \\
    & NaClO: 30\% (150ml) & NaClO: 30\% (150ml) & NaClO: 30\% (150ml) \\
    \hline
    Trial 1 & 14    &   56    & 60 \\
```

```
    \hline
    Trial 2 &   32   &    44  & 81 \\
    \hline
    Trial 3 &  27    &   55   & 68 \\
    \hline
  \end{tabular}
  \label{tab:T-Table1FoldingEndurance}
\end{table}

\begin{justify}
  \hspace*{0.5in} In table \ref{tab:T-Table1FoldingEndurance}, it shows the
     data of the Folding Endurance Test. In the First Trial, Treatment 1 is
      able to sustain the 14 repetition of folds without tearing. Then,
     Treatment 2 sustained 56 folds. And Treatment 3 ascended to 60 folds.
     In trial 2, Treatment 1 able to sustain the 32 folds. Next, Treatment
     2 sustained the 44 folds without breaking. And, Treatment 3 did not
     break until the 81th fold. Lastly in trial 3, Treatment 1 descended to
      27 folds from the previous trial. Then, Treatment 2 able to sustain
     the 55 folds without breaking. And, Treatment 3 descended to 68 fold
     from the previous trial.
\end{justify}

\newpage
\subsection{Adhesive Grip Test}
\begin{table}[H]
  \centering
  \caption{Results of Adhesive Grip Test}
  \begin{tabular}{|c|c|c|c|}
    \hline
    & Treatement 1 & Treatment 2 & Treatment 3 \\
    & Moss: 150g & Moss: 200g & Moss: 250g \\
    & Water: 500ml & Water: 500ml & Water: 500ml \\
    & Soaking time: 15mins & Soaking time: 15mins & Soaking time: 15mins \\
    & NaClO: 30\% (150ml) & NaClO: 30\% (150ml) & NaClO: 30\% (150ml) \\
    \hline
    Trial 1 & 20g    &   1000g   & 1500g \\
    \hline
    Trial 2 &   1000g  &    2000g & 1500g \\
    \hline
    Trial 3 &  1500g   &   1500g  & 1500g \\
    \hline
  \end{tabular}
  \label{tab:T-Table1Adhesive}
\end{table}

\begin{justify}
  \hspace*{0.5in} In table \ref{tab:T-Table1Adhesive}, it shows the adhesive
     grip test of the colored eco paper from differ treatment, Treatment 1
     have 20g in trial 1, trial 2 isa 1000g and in trial 3 have 1500g
     treatment 2 have 1000g in trial 1 trial 2 is 2000g and in trial 3 is
     1500g. Treatment 3 have 1500g in trial 1 in trial 2 have also 1500g
```

```
    and trial 3 is also 1500g. The graph shows that the treatment 3 has
    the higher adhesive grip test.
\end{justify}


\newpage
\begin{table}[H]
  \centering
  \caption{Results of Folding Endurance}
  \begin{tabular}{|c|c|c|c|}
    \hline
    & Treatement 1 & Treatment 2 & Treatment 3 \\
    & Moss: 150g & Moss: 200g & Moss: 250g \\
    & Water: 500ml & Water: 500ml & Water: 500ml \\
    & Soaking time: 15mins & Soaking time: 15mins & Soaking time: 15mins \\
    & NaClO: 30\% (150ml) & NaClO: 30\% (150ml) & NaClO: 30\% (150ml) \\
    \hline
    Trial 1 & 14    &   56    & 60 \\
    \hline
    Trial 2 &   32   &    44  & 81 \\
    \hline
    Trial 3 &  27    &    55   & 68 \\
    \hline
  \end{tabular}
  \label{tab:T-Table1FoldingEndurance2}
\end{table}

\begin{table}[H]
  \centering
  \caption{ANOVA Data Analysis on Results of Folding Endurance Test}
  \begin{tabular}{lrrrrrr}
    Anova: Single Factor &    &      &      &      &      & \\
    &      &      &      &      &      & \\
    SUMMARY &     &      &      &      &     & \\
    \cmidrule[2pt]{1-5}  \multicolumn{1}{c}{\textit{Groups}} & \multicolumn{1}{c
        }{\textit{Count}} & \multicolumn{1}{c}{\textit{Sum}} & \multicolumn{1}{c
        }{\textit{Average}} & \multicolumn{1}{c}{\textit{Variance}} &  &  \\
    \cmidrule{1-5}  T1    & 3    & 73   & 24.33333 & 86.33333 &    &  \\
    T2    & 3    & 155   & 51.66667 & 44.33333 &    &  \\
    T3    & 3    & 209   & 69.66667   & 112.3333  &      &  \\
    \cmidrule[2pt]{1-5}       &      &      &      &      &      &  \\
    &      &      &      &      &      & \\
    ANOVA &     &      &      &      &     & \\
    \midrule[1.5pt]
    \multicolumn{1}{c}{\textit{Source of Variation}} & \multicolumn{1}{c}{\textit
        {SS}} & \multicolumn{1}{c}{\textit{df}} & \multicolumn{1}{c}{\textit{MS}}
        & \multicolumn{1}{c}{\textit{F}} & \multicolumn{1}{c}{\textit{P-value}} &
        \multicolumn{1}{c}{\textit{F crit}} \\
    \midrule
    Between Groups & 3126.222 & 2  & 1563.111 & 19.29767 & 0.002435 &
        5.143253 \\
```

```
    Within Groups & 486 & 6   & 81 &       &       &  \\
    &       &       &       &       &       &  \\
    Total & 3612.222 & 8   &       &       &       &  \\
    \bottomrule[2pt]
  \end{tabular}%
  \label{tab:ANOVAFoldingEndurance}%
\end{table}%
\begin{justify}
  \hspace*{0.5in} In table \ref{tab:ANOVAFoldingEndurance}, the result shows
     at alpha level of $0.05$ with 95\% confidence level the \textit{p-
     value} is equal to 0.002435 which is less than the alpha level.
     Therefore, the null hypothesis that there is no significant difference
      between the usage of different treatment of moss and the adhesive
     grip, and folding endurance of the Colored Eco Paper is rejected. This
      implies that there is a significant difference between the usage of
     different treatment of moss and the adhesive grip, and folding
     endurance of the Colored Eco Paper.
\end{justify}

\begin{figure}[H]
  \centering
  \caption{Visualization of P-value through Normal Distribution Graph (
     Folding Edurance Test)}
  \begin{tikzpicture}
    \begin{axis}[
      width = 17.5cm,
      height = 7.25cm,
      xmin = -4.5, xmax = 4.5,
      ymin = 0,
      axis x line* = bottom, % the * suppresses the arrow tips
      hide y axis,
      xtick = {-4,-3,-2,-1,0,1,2,3,4},
      % xtick = {0},
      % tick label style = {color=white}, % uncomment this line and change
         all other
      % xtick tags to remove x-axis markings
      xtick align = outside,
      xticklabels = {-4,-3,-2,-1,0,1,2,3,4}, % comment this if uncomment
         above;
      %commenting this without uncommenting above makes markings integers
      ]
      % This draws the vertical lines
      \pgfplotsinvokeforeach {-1.65} {
        \draw[black,very thick,dashed] (axis cs: #1,-1)
        -- (axis cs: #1,{(1/sqrt(2*pi))*exp((-1/2)*(#1)^2)+0.05});
      }

      \pgfplotsinvokeforeach {0} {
        \draw[linecolor,thick] (axis cs: #1,-1)
        -- (axis cs: #1,{(1/sqrt(2*pi))*exp((-1/2)*(#1)^2)+0.05});
      }
```

```
\pgfplotsinvokeforeach {-2.82} {
  \draw[black,very thick] (axis cs: #1,-1)
  -- (axis cs: #1,{(1/sqrt(2*pi))*exp((-1/2)*(#1)^2)+0.05});
}

\pgfplotsinvokeforeach {1.65} {
  \draw[black,very thick,dashed] (axis cs: #1,-1)
  -- (axis cs: #1,{(1/sqrt(2*pi))*exp((-1/2)*(#1)^2)+0.05});
}



% This draws the main curve
\addplot [
domain = -4.5:4.5,
samples = 251,
color = black,
name path = dist
]
{(1/sqrt(2*pi))*exp((-1/2)*x^2)};

% This is necessary for the filling later
\path [name path = base] (\pgfkeysvalueof{/pgfplots/xmin},0)
-- (\pgfkeysvalueof{/pgfplots/xmax},0);

% This labels each section
% \node at (axis cs: -0.5,0.15) {34\%};
% \node at (axis cs: 0.5,0.15) {34\%};
% \node at (axis cs: -1.5,0.058) {13.5\%};
% \node at (axis cs: 1.5,0.058) {13.5\%};
% \node[inner sep=0, pin={[pin edge={lightgray}]90:2.35\%}] at (axis
    cs: -2.5,0.0) {};
% \node[inner sep=0, pin={[pin edge={lightgray}]90:2.35\%}] at (axis
    cs: 2.5,0.0) {};
% \node[inner sep=0, pin={[pin edge={lightgray}]90:0.15\%}] at (axis
    cs: -3.5,0) {};
% \node[inner sep=0, pin={[pin edge={lightgray}]90:0.15\%}] at (axis
    cs: 3.5,0) {};

\node[inner sep=0,] at (axis cs: -1.65,0.2) {\large$\alpha$};
\node[inner sep=0,] at (axis cs: 1.65,0.2) {\large$\alpha$};

\node[inner sep=0,] at (axis cs: -2.82,0.1) {\textit{p-value}};

% This is where we fill in the regions
%\addplot [white] fill between [of = dist and base, soft clip = {
    domain=-4:4}];
%\addplot [grad4] fill between [of = dist and base, soft clip = {
    domain=-3:3}];
```

```
      %\addplot [grad3] fill between [of = dist and base, soft clip = {
          domain=-2:2}];
      \addplot [grad1] fill between [of = dist and base, soft clip = {domain
          =-4:-1.65}];
      \addplot [grad1] fill between [of = dist and base, soft clip = {domain
          =1.65:4}];
    \end{axis}
  \end{tikzpicture}
  \label{fig:BellCurve for Folding Endurance Test}
\end{figure}
\begin{justify}
  \hspace*{0.5in} After visualizing the data from table \ref{tab:
      ANOVAFoldingEndurance} graphically, it shows that the \textit{p-value}
      falls on the rejection region. This implies that the null hypothesis
      is rejected and the result of figure \ref{fig:BellCurve for Folding
      Endurance Test} corresponds to table \ref{tab:ANOVAFoldingEndurance}.
\end{justify}

\newpage
\begin{table}[H]
  \centering
  \caption{Results of Adhesive Grip Test}
  \begin{tabular}{|c|c|c|c|}
    \hline
    & Treatement 1 & Treatment 2 & Treatment 3 \\
    & Moss: 150g & Moss: 200g & Moss: 250g \\
    & Water: 500ml & Water: 500ml & Water: 500ml \\
    & Soaking time: 15mins & Soaking time: 15mins & Soaking time: 15mins \\
    & NaClO: 30\% (150ml) & NaClO: 30\% (150ml) & NaClO: 30\% (150ml) \\
    \hline
    Trial 1 & 20g    &   1000g   & 1500g \\
    \hline
    Trial 2 &   1000g  &    2000g & 1500g \\
    \hline
    Trial 3 &  1500g   &   1500g  & 1500g \\
    \hline
  \end{tabular}
  \label{tab:T-Table1Adhesive2}
\end{table}

\begin{table}[H]
  \centering
  \caption{ANOVA Data Analysis on Results of Adhesive Grip Test}
  \begin{tabular}{lrrrrrr}
    Anova: Single Factor &    &      &      &      &      & \\
    &      &      &      &      &      & \\
    SUMMARY &      &      &      &      &      & \\
    \cmidrule[2pt]{1-5}  \multicolumn{1}{c}{\textit{Groups}} & \multicolumn{1}{c
        }{\textit{Count}} & \multicolumn{1}{c}{\textit{Sum}} & \multicolumn{1}{c
        }{\textit{Average}} & \multicolumn{1}{c}{\textit{Variance}} &  &  \\
    \cmidrule{1-5}  T1    & 3    & 2520 & 840  & 566800 &      &  \\
```

```
    T2    & 3     & 4500 & 1500 & 250000 &      &  \\
    T3    & 3     & 4500 & 1500 & 0      &      &  \\
    \cmidrule[2pt]{1-5}        &       &       &       &       &  \\
    &       &       &       &       &       &  \\
    ANOVA &       &       &       &       &  \\
    \midrule[1.5pt]
    \multicolumn{1}{c}{\textit{Source of Variation}} & \multicolumn{1}{c}{\textit
        {SS}} & \multicolumn{1}{c}{\textit{df}} & \multicolumn{1}{c}{\textit{MS}}
        & \multicolumn{1}{c}{\textit{F}} & \multicolumn{1}{c}{\textit{P-value}} &
        \multicolumn{1}{c}{\textit{F crit}} \\
    \midrule
    Between Groups & 871200 & 2  & 435600 & 1.599902 & 0.277407 & 5.143253
        \\
    Within Groups & 1633600 & 6  & 272266.7 &      &       &  \\
    &       &       &       &       &       &  \\
    Total & 2504800 & 8   &       &       &       &  \\
    \bottomrule[1.5pt]
  \end{tabular}%
  \label{tab:ANOVAAdhesive}%
\end{table}%
\begin{justify}
  \hspace*{0.5in} In table \ref{tab:ANOVAAdhesive}, the result shows at alpha
       level of $0.05$ with 95\% confidence level the \textit{p-value} is
      equal to 0.277407 which is greater than the alpha level. Therefore,
      the null hypothesis is rejected. This implies that there is no
      significant difference between the usage of different treatment of
      moss and the adhesive grip, and folding endurance of the Colored Eco
      Paper.
\end{justify}

\begin{figure}[H]
  \centering
  \caption{Visualization of P-value through Normal Distribution Graph (
      Adhesive Grip Test)}
  \begin{tikzpicture}
    \begin{axis}[
      width = 17.5cm,
      height = 7.25cm,
      xmin = -4.5, xmax = 4.5,
      ymin = 0,
      axis x line* = bottom, % the * suppresses the arrow tips
      hide y axis,
      xtick = {-4,-3,-2,-1,0,1,2,3,4},
      % xtick = {0},
      % tick label style = {color=white}, % uncomment this line and change
          all other
      % xtick tags to remove x-axis markings
      xtick align = outside,
      xticklabels = {-4,-3,-2,-1,0,1,2,3,4}, % comment this if uncomment
          above;
      %commenting this without uncommenting above makes markings integers
```

```
]
% This draws the vertical lines
\pgfplotsinvokeforeach {-1.65} {
  \draw[black,very thick,dashed] (axis cs: #1,-1)
  -- (axis cs: #1,{(1/sqrt(2*pi))*exp((-1/2)*(#1)^2)+0.05});
}

\pgfplotsinvokeforeach {0} {
  \draw[linecolor,thick] (axis cs: #1,-1)
  -- (axis cs: #1,{(1/sqrt(2*pi))*exp((-1/2)*(#1)^2)+0.05});
}

\pgfplotsinvokeforeach {-0.59} {
  \draw[black,very thick] (axis cs: #1,-1)
  -- (axis cs: #1,{(1/sqrt(2*pi))*exp((-1/2)*(#1)^2)+0.05});
}

\pgfplotsinvokeforeach {1.65} {
  \draw[black,very thick,dashed] (axis cs: #1,-1)
  -- (axis cs: #1,{(1/sqrt(2*pi))*exp((-1/2)*(#1)^2)+0.05});
}



% This draws the main curve
\addplot [
domain = -4.5:4.5,
samples = 251,
color = black,
name path = dist
]
{(1/sqrt(2*pi))*exp((-1/2)*x^2)};

% This is necessary for the filling later
\path [name path = base] (\pgfkeysvalueof{/pgfplots/xmin},0)
-- (\pgfkeysvalueof{/pgfplots/xmax},0);

% This labels each section
% \node at (axis cs: -0.5,0.15) {34\%};
% \node at (axis cs: 0.5,0.15) {34\%};
% \node at (axis cs: -1.5,0.058) {13.5\%};
% \node at (axis cs: 1.5,0.058) {13.5\%};
% \node[inner sep=0, pin={[pin edge={lightgray}]90:2.35\%}] at (axis
    cs: -2.5,0.0) {};
% \node[inner sep=0, pin={[pin edge={lightgray}]90:2.35\%}] at (axis
    cs: 2.5,0.0) {};
% \node[inner sep=0, pin={[pin edge={lightgray}]90:0.15\%}] at (axis
    cs: -3.5,0) {};
% \node[inner sep=0, pin={[pin edge={lightgray}]90:0.15\%}] at (axis
    cs: 3.5,0) {};
```

```
      \node[inner sep=0,] at (axis cs: -1.65,0.2) {\large$\alpha$};
      \node[inner sep=0,] at (axis cs: 1.65,0.2) {\large$\alpha$};

      \node[inner sep=0,] at (axis cs: -1,0.38) {\textit{p-value}};

      % This is where we fill in the regions
      %\addplot [white] fill between [of = dist and base, soft clip = {
          domain=-4:4}];
      %\addplot [grad4] fill between [of = dist and base, soft clip = {
          domain=-3:3}];
      %\addplot [grad3] fill between [of = dist and base, soft clip = {
          domain=-2:2}];
      \addplot [grad1] fill between [of = dist and base, soft clip = {domain
          =-4:-1.65}];
      \addplot [grad1] fill between [of = dist and base, soft clip = {domain
          =1.65:4}];
    \end{axis}
  \end{tikzpicture}
  \label{fig:BellCurve for Adhesive Grip Test}
\end{figure}
\begin{justify}
  \hspace*{0.5in} After visualizing the data from table \ref{tab:
      ANOVAAdhesive} graphically, it shows that the \textit{p-value} falls on
      the acceptance region. This implies that the null hypothesis is
      accepted and the result of figure \ref{fig:BellCurve for Adhesive Grip
      Test} corresponds to table \ref{tab:ANOVAAdhesive}.
\end{justify}

\newpage
\section{Chapter V}
\section{Conclusion and Recommendation}
\begin{justify}
  \hspace*{0.5in} In this chapter, the final decision of the researchers
      that was formed throughout the study and the suggestion of the
      researchers to enhance this research.
\end{justify}

\subsection{Conclusion}
\begin{justify}
  \hspace*{0.5in} The following facts has been established the following
      analysis of results obtained from the experiments described in the
      above section. In summary:

  \begin{itemize}
    \item The researchers use the folding endurance test and adhesive test
        to determine the durability and the quality of the colored eco paper
        .

    \item Fishpond moss (Bryophyta) is feasible to be a raw material in
        making the colored eco paper through utilizing the least 250g of
        fishpond moss.
```

```
    \begin{justify}
      \hspace*{0.5in} However in testing the product, the result of the
          folding endurance test shows that \textit{p-value} is less than the
          alpha level. Hence, rejecting the null and accept the alternative
          hypothesis that there is a significant difference between the
          usage of different treatment of moss and the adhesive grip, and
          folding endurance of the Colored Eco Paper and Adhesive Grip test
          show that \textit{p-value} is greater than the alpha level resulting
           in the acceptance of the null hypothesis that there is no
          significant difference between the usage of different treatment of
           moss and the adhesive grip, and folding endurance of the Colored
          Eco Paper.
    \end{justify}

    \item The moss is can entirely replace the commercial colored paper
        using treatment 3 (250g) of fishpond moss.
  \end{itemize}

  \hspace*{0.5in} Moreover, to assure the folding endurance and the adhesive
       test of the colored eco paper, the product must be at least 250 grams
       of fishpond moss (Bryophyta ) as colored eco paper.
\end{justify}

\subsection{Recommendation}
\begin{justify}
  \hspace*{0.5in} The aforementioned results are used by the researchers to
      generate suggestions for further improvements of this study. The
      researchers suggest to:

  \begin{itemize}
    \item conduct more test to determine the feasibility of Moss \textit{(
        Bryophyta)} as Colored Eco Paper;
    \item conduct more studies to discover the other uses of \textit{Bryophyta
        } and other non-vascular plants on our daily lives;
    \item to add fragrance to the product;
    \item to discover an organic alternative bleaching agent in whitening
        the paper;
    \item to discover an organic alternative dyeing agent in dyeing the
        paper;
    \item to conduct tests on product where it is exposed in varying soaking
         time.
  \end{itemize}
\end{justify}

\clearpage
\justifying
\printbibliography[title=Bibliography,heading=bibintoc]

\newpage
\section{Appendices}
```

```
\subsection{Appendix A: Request for Permission to Conduct Research}
\begin{spacing}{1.08}
  \begin{center}
    Republic of the Philippines \\ \textit{Department of Education} \\ Region
        IX, Zamboanga Peninsula \\ Division of Zamboanga Sibugay \\ \textbf{
       FRANCISCO RAMOS NATIONAL HIGH SCHOOL} \\ Concepcion, Kabasalan,
       Zamboanga Sibugay
  \end{center}
  \hspace*{0.5in}
  \begin{flushleft}
    \textbf{TO: MA. HELEN S. JARCIA} \\
    Principal II \\
    Francisco Ramos National High School
  \end{flushleft}
  \hspace*{0.5in}
  \begin{center}
    \textbf{REQUEST FOR PERMISSION TO CONDUCT RESEARCH}
  \end{center}
  \begin{flushleft}
    Maam: \\
    \hspace*{0.5in} \\
    Good Day!
  \end{flushleft}
  \begin{justify}
    We are the Grade 11- STEM students of Francisco Ramos National High
       School. As stated to comply our research study in Practical Research
        1 (Quantitative Research) under our Instructor Mr. Daryl Jay B.
       Sanco.

    The proposed topic of our research paper is \textbf{MOSS \textit{(Bryophyta
       )} FROM FISHPOND AS COLORED ECO PAPER}. We are hereby seeking your
       consent to conduct a research study in your prestigious school.
    \hspace*{0.5in} \\ \hspace*{0.5in} \\
    Your permission to conduct this study will be greatly appreciated.
  \end{justify}
  \vspace*{0.25in}
  \begin{figure}
    \begin{minipage}{0.5\textwidth}
      \begin{flushleft}
        Yours sincerely,
      \end{flushleft}
      \vspace*{24pt}
      \begin{center}
        \textbf{Axelcris G. Suladay \\ Aera Jasmin M. Tariao \\ Leslie A.
           Marcial \\ Rhouie Loveine D. Torrico \\ Jeffmark A. Deocares \\
           Zyril Cabalida} \\
        \rule{2in}{2pt}\\
        Researchers
      \end{center}
    \end{minipage}%
```

```
    \begin{minipage}{0.5\textwidth}
      \begin{flushleft}
        Noted by:
      \end{flushleft}
      \vspace*{24pt}
      \begin{center}
        \textbf{DARYL JAY B. SANCO} \\
        \rule{2in}{2pt}\\
        Research Teacher
      \end{center}
    \end{minipage}
  \end{figure}
\end{spacing}
\begin{tikzpicture}[remember picture,overlay]
  \node at ([yshift=3.35in,xshift=2.75in]current page.center)
  {\includegraphics[width=1.0615in]{"FRNHS LOGO"}};
\end{tikzpicture}
\begin{tikzpicture}[remember picture,overlay]
  \node at ([yshift=3.35in,xshift=-2.75in]current page.center)
  {\includegraphics[width=1.0625in]{EDUKASYON LOGO}};
\end{tikzpicture}

\newpage
\subsection{Appendix B: Certification for Panel of Validation}
\begin{spacing}{1.08}
  \begin{center}
    Republic of the Philippines \\ \textit{Department of Education} \\ Region
        IX, Zamboanga Peninsula \\ Division of Zamboanga Sibugay \\ \textbf{
       FRANCISCO RAMOS NATIONAL HIGH SCHOOL} \\ Concepcion, Kabasalan,
       Zamboanga Sibugay
  \end{center}
  \hspace*{0.5in}
  \begin{center}
    \textbf{CERTIFICATION FOR PANEL OF VALIDATION}
  \end{center}
  \begin{justify}
    \hspace*{0.5in} This is to certify that the attached instrument has been
        validated and evaluated by the undersigned below and is found to be
        valid.
  \end{justify}
  \vspace*{0.25in}
  \begin{flushleft}
    Validated/Evaluated by:
  \end{flushleft}
  \begin{figure}
    \begin{minipage}{0.5\textwidth}
      \vspace*{24pt}
      \begin{center}
        \textbf{JOCELYN F. SERIMOGAN} \\
        \rule{2in}{1.5pt}\\
        Research Teacher
```

```
      \end{center}
    \end{minipage}%
    \begin{minipage}{0.5\textwidth}
      \vspace*{24pt}
      \begin{center}
        \textbf{WENDY ELLISE AUCIJO} \\
        \rule{2in}{1.5pt}\\
        English Teacher
      \end{center}
    \end{minipage}
  \end{figure}
\end{spacing}
\begin{tikzpicture}[remember picture,overlay]
  \node at ([yshift=3.75in,xshift=2.75in]current page.center)
  {\includegraphics[width=1.0615in]{"FRNHS LOGO"}};
\end{tikzpicture}
\begin{tikzpicture}[remember picture,overlay]
  \node at ([yshift=3.75in,xshift=-2.75in]current page.center)
  {\includegraphics[width=1.0625in]{EDUKASYON LOGO}};
\end{tikzpicture}

\newpage
\subsection{Appendix C: Raw Data, Tables, and Photos}
\vspace*{12pt}
\begin{figure}[h]
  \begin{minipage}{0.5\textwidth}
    \centering
    \includegraphics[width=3in
       ]{440356210_3823478981215599_8648955234526331735_n}
    \vspace*{12pt}
    \begin{center}
      Drying of the Eco Paper
    \end{center}
  \end{minipage}%
  \begin{minipage}{0.5\textwidth}
    \centering
    \includegraphics[width=3in
       ]{440372318_437640708954155_8426019329091649252_n}
    \vspace*{12pt}
    \begin{center}
      Rinsing of bleached Moss
    \end{center}
  \end{minipage}
\end{figure}
\vspace*{12pt}
\begin{figure}[H]
  \begin{minipage}{0.5\textwidth}
    \centering
    \includegraphics[width=3in
       ]{440382462_803118868397232_8630365627802886055_n (1)}
    \vspace*{12pt}
```

```
    \begin{center}
      Bleaching of the Moss
    \end{center}
  \end{minipage}%
  \begin{minipage}{0.5\textwidth}
    \centering
    \includegraphics[width=3in
       ]{440516486_723897389957762_556979843821074636_n}
    \vspace*{12pt}
    \begin{center}
      Preparation of the bleaching solution
    \end{center}
  \end{minipage}
\end{figure}

\begin{figure}[H]
  \begin{minipage}{0.5\textwidth}
    \centering
    \includegraphics[width=3in
       ]{440543751_1147211116611873_2859263494959795886_n}
    \vspace*{12pt}
    \begin{center}
      Coloring the Eco Paper
    \end{center}
  \end{minipage}%
  \begin{minipage}{0.5\textwidth}
    \centering
    \includegraphics[width=3in
       ]{440768750_318384347750083_8586101886767533169_n}
    \vspace*{12pt}
    \begin{center}
      Grinding the bleached Moss
    \end{center}
  \end{minipage}
\end{figure}
\vspace*{12pt}
\begin{figure}[H]
  \begin{minipage}{0.5\textwidth}
    \centering
    \includegraphics[width=3in]{received_1163877828195671}
    \vspace*{12pt}
    \begin{center}
      Testing the product using the Adhesive Grip Test
    \end{center}
  \end{minipage}%
  \begin{minipage}{0.5\textwidth}
    \centering
    \includegraphics[width=3in]{received_1591261998377783}
    \vspace*{12pt}
    \begin{center}
      Testing the product using the Folding Endurance Test
```

```
      \end{center}
    \end{minipage}
  \end{figure}
\end{document}
```