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# TABLE OF CONTENTS

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# TRANSFORMATIONAL LEADERSHIP OF SCHOOL LEADERS, 21ST CENTURY TEACHER ATTRIBUTES AND TEACHING READING COMPREHENSION: A CONVERGENT DESIGN

**Allan G. Rivera**
University of the Immaculate Conception
Davao City, Philippines

**ABSTRACT**

**This study employed mixed methods approach, convergent design, to determine the influence of transformational leadership of school leaders and 21st century teacher attributes on teaching reading comprehension. Respondents were the public elementary school teachers in Region XI, Philippines. Adapted and validated survey tools and interview guide were used to obtain data. In the quantitative phase, the mean, standard deviation, and multiple linear regression were used for data analysis. On the other hand, thematic analysis was employed for the qualitative phase. Findings in the quantitative phase revealed that transformational leadership of school leaders, 21st century teacher attributes, and teaching reading comprehension were very high. Further findings revealed that transformational leadership of school leaders and 21st century teacher attributes both significantly influenced teaching reading comprehension. The qualitative phase of the study revealed four essential themes based on the lived experiences of teachers, namely: encountering challenges during teaching reading comprehension, responding to the needs of the students, manifesting innovativeness, and ensuring a learning atmosphere. Further, essential themes regarding role of experiences in shaping the beliefs of the participants included essentiality of teaching capability enhancement and disclosing teachers as change agents. Moreover, the role of experiences in shaping the attitude of the participants, the themes extracted were becoming an empathetic teacher, demonstrating sensitivity to the needs of students, and manifesting positivity. Likewise, essential themes on the role of experiences in shaping the commitment of the participants, included radiating teacher professional accountability and being always an efficient teacher. The nature of data integration of findings revealed corroboration with each other, demonstrating merging-converging.**

*Keywords: Educational leadership, transformational leadership, 21st century teacher attributes, teaching reading comprehension, convergent design, Philippines*

## INTRODUCTION

Teaching reading comprehension in elementary students involves guiding them to understand, interpret, and engage with the meaning of texts through strategies that enhance vocabulary, critical thinking, and analytical skills (Joseph, 2018). However, fostering strong reading comprehension unfortunately remains a complex and often frustrating challenge for many educators. This difficulty arises from a convergence of diverse factors, from evolving technological distractions to the persistent presence of learning disparities (Rao & Kareem, 2015).

In New Zealand, considerable research on teaching reading comprehension has been published over the past 30 years, but scarce attention appears to have been paid to this matter which made the problem still existent (Chapman et al., 2015). In addition, over the past 40 years, the gaps in reading comprehension are still strikingly threatening up to the present (Spear-Swerling & Zibulsky, 2014). Also in Australia, the considerable weight of research evidence that has accumulated over time regarding teaching reading comprehension has not been successfully translated into practice in elementary school classrooms (Seidenberg, 2017). Likewise, in the United States, somehow teaching reading comprehension

implementation was not fully attained and the presence of some difficulties and challenges weakened its progress (McLanahan, 2015).

In the 2018 Programme for International Student Assessment (PISA) among the 79 participating countries and economies, the Philippines scored the lowest in reading comprehension (OECD, 2019) teacher's teaching reading comprehension must be given emphasis (Bullock, 2015). Similarly, in the Southeast Asia Primary Learning Metrics 2019 Survey, results showed that only 29 percent of learners in the country are able to read a range of texts and could comprehend what they are reading intended for their grade level.

Similarly in Baler, Aurora, teaching of reading comprehension and its relevant programs and support should be undertaken to eliminate reading difficulties of learners (Tomas et al., 2021). This problem is very alarming and of course associated with teaching reading comprehension (Balinbin, 2020). These findings collectively validate the predicament confronted teachers in various areas, emphasizing the importance of addressing the issues on teaching reading comprehension (Cox, 2015).

As well, in a study conducted in Mindanao, teachers were having a hard time teaching reading comprehension that resulted to inadequacy of reading comprehension skills of learners (Balinas et al., 2017). Also, it was revealed that there's a continuous inadequacy of teaching reading comprehension which resulted to poor literacy skills of kindergarten learners in the far-flung areas of Mindanao (Miñoza & Montero, 2019).

Several studies have highlighted the positive association of transformational leadership of school leaders to teaching reading comprehension. Transformational leadership has been acknowledged as having a positive general influence on knowledge management of the teachers leading to strategize teaching reading comprehension (Sandiasa, 2017). Likewise, Magno and Sambrano (2016), emphasized that teachers use their 21st century teacher attributes in order to be effective in teaching reading comprehension. Similarly, Buenvinida et al. (2020) revealed that there were significant relationships between and among the roles as well as the factors that affect them. This was further confirmed through regression analysis and found out that the 21st century attributes of a teacher significantly affect the teaching skills towards reading comprehension (Asio & de Dios, 2019).

From the literatures accessed by the researcher, it had been noted that some studies previously conducted dealt on variables like teaching decoding, and teaching comprehension, to name some, in relation to teaching reading comprehension as investigated by Smith et al. (2022), Balinbin (2020), McLean et al. (2021) and Tomas et al. (2021). These quantitative studies were bivariate in nature while the current study is a multivariate, utilizing mixed methods approach particularly convergent design to determine the influence of transformational leadership of school leaders and the 21st century teacher attributes towards teaching reading comprehension.

The researcher recognized the importance of studying the impact of transformational leadership and 21st-century teacher attributes on teaching reading comprehension among public elementary school teachers in Region XI. By integrating transformational leadership with modern teaching attributes, schools can create dynamic, student-centered learning environments that empower teachers and improve teaching reading comprehension. These insights can guide the development of policies and teaching programs that enhance leadership and teaching practices, leading to improved reading comprehension in schools.

To ensure wide dissemination and accessibility of the research work, the results of this study will be disseminated within the schools in Region XI through meetings, seminars, trainings, and workshops conducted by the Schools Division Offices in the entire region. Additionally, the researcher intends to present the findings in the local, national and international research conferences or forums and summits, reaching a broader audience. Furthermore, the researcher will explore the possibility of online publication to facilitate easy access and wide dissemination of the findings of the study.

The researcher, as a school principal with substantial experience in principled leadership and administer educational institutions dynamics, had been motivated to conduct a study exploring on the influence of transformational leadership and 21st century teacher attributes on teaching reading comprehension. Also, the researcher believed on the perception that transformational school leaders inspire teachers and leverage their 21st century attributes that embraces innovation, and adaptability on teaching reading comprehension and cultivate a love for learning.

As a pragmatist, the researcher integrated more than one research approach for collecting and analyzing data within the same study, specifically, using both quantitative and qualitative methods. Also, as

a pragmatist, the researcher was able to go deeper into the dataset to comprehend its meaning and utilize another method to confirm the findings of the other method. In the same manner, adopted a mixed-methods approach to delve deeper into the dataset and gain a comprehensive understanding of the relationship between transformational leadership of school leaders, 21st century teacher attributes and teaching reading comprehension.

This study was anchored on Transformational Leadership Theory by Burns (1978) and Attribution Theory by Weiner (1970). Transformational Leadership Theory plays a crucial role in enhancing teaching reading comprehension by fostering a positive and motivating environment where both teachers and students are encouraged to reach their highest potential. In the context of reading instruction, school leaders who embody transformational leadership inspire teachers to adopt innovative, student-centered approaches that actively engage students in the learning process. By promoting accountability and providing intellectual stimulation, these leaders empower teachers to utilize effective strategies that improve students' reading comprehension skills. The transformational leadership style fosters a collaborative, adaptive approach to teaching, ensuring that instructional practices evolve to meet the diverse needs of learners and contribute to the overall improvement of reading outcomes.

On the other hand, Attribution Theory plays a vital role in teaching reading comprehension by helping educators understand the various internal and external factors that affect a student's reading performance. By observing whether challenges are due to factors like effort, ability, or external influences such as task difficulty or environmental distractions, teachers can gain insights into why a student may struggle with comprehension. This understanding enables teachers to tailor interventions, whether by boosting a student's confidence, providing additional support, or modifying the task to better suit their needs. It encourages a more personalized approach to teaching, allowing educators to apply differentiated strategies that target specific barriers to learning. This theory helps foster a more adaptive and responsive teaching environment, improving students' reading comprehension outcomes.

## STATEMENT OF THE PROBLEM

The study determined the significant influence of transformational leadership of school leaders and the 21st century teacher attributes on teaching reading comprehension among public elementary school teachers of Region XI. Specifically, it sought answers to the following questions:

1. What is the status of transformational leadership, 21st century teacher attributes, and teaching reading comprehension?
2. Do transformational leadership and 21st century teacher attributes significantly influence teaching reading comprehension?
3. What are the lived experiences of the participants as regards their teaching reading comprehension?
4. How do these experiences shape the beliefs, attitude and commitment of the participants in their teaching reading comprehension?
5. To what extent do the qualitative findings corroborate with the quantitative data?

## METHODOLOGY

### Research Design

This study utilized mixed methods research particularly convergent design. Mixed methods research entails the deliberate mixing of methods for collecting data, analyzing data, and interpreting evidence. Mixed methods design involved collecting, analyzing, and integrating quantitative and qualitative data in a single study or a longitudinal program of investigation (Creswell & Creswell, 2018). Convergent design, also known as convergent parallel design, improved the results and mitigated the shortcomings of a single individual method. It allowed for a more in-depth and unique perspective on viewing, listening, and comprehending the situation's reality.

The study employed a descriptive correlational research design to explore the relationship between transformational leadership of school leaders, 21st century teacher attributes and teaching reading comprehension. It focused on describing the current state of teaching reading comprehension by examining the influence of transformational leadership and 21st-century teacher attributes. The correlational meth-

od was used to assess the degree of association between two or more variables, such as leadership practices and teaching outcomes.

Moreover, phenomenology is one of the fundamental traditions of qualitative inquiry that investigates human lived experiences. Phenomenology is a relevant philosophic methodology which the researcher utilized to depict the public elementary school teachers' experiences with different school leaders' transformational leadership, and their 21st century attributes to teaching reading comprehension. Both quantitative and qualitative data were analyzed separately, then compared/related to present thorough discussion and interpretation.

Using convergent design in this study on transformational leadership of school leaders, 21st century teacher attributes and teaching reading comprehension allows for integration of outcomes and increases the likelihood of a more unique and precise understanding than individually analyzing the data from both methods. It also allowed the researcher to assess the predictive value of several factors on transformational leadership of school leaders and 21st century teacher attributes to teaching reading comprehension.

**Locale of the Study**

This study was conducted in Region XI or also known as Davao Region, and is situated southeast of Mindanao, enclosing the Davao Gulf. Region XI encompasses the Davao Gulf and is limited on the north by the provinces of Surigao del Sur, Agusan del Sur, and Bukidnon; on the east by the Philippine Sea; and on the west by the provinces of Central Mindanao. Davao City is the administrative capital and the most populated city in Davao Region. The Region XI or Davao Region consists of five provinces: Davao de Oro, Davao Oriental, Davao del Norte, Davao Occidental, and Davao del Sur.

In addition, the schools chosen in this region are declared by DepEd as central schools and have complete elementary grade levels, have one of the highest number of teachers in the area, and are located in densely populated areas in the region making its proximity suitable to conduct the study. The researcher also made certain that all five provinces and six major cities found in the Davao Region have a representative central school as source of the respondents for the study.

**Participants**

For the quantitative aspect, the participants of the study were the public elementary school teachers of Region XI. A total of 300 teachers were selected using stratified random sampling. It is a sampling method where a study's population or chosen participants were sorted into smaller units according to a common feature. This process is called stratification (Nickolas, 2020). In implementing or performing the stratified random sampling, each division representative of the population is randomly selected after determining the representatives of each division.

For the qualitative part, A total of 17 public elementary school teachers were invited as participants. The researcher selected 10 public elementary school teachers for the In-Dept Interview (IDI) and seven public school elementary teachers for the Focus Group Discussion (FGD). Inclusion criteria used are as follows: currently teaching in the public elementary school and have taught for at least three years. The participants' rank status and performance ratings were not considered. The findings were utilized to detect emerging themes and trends, as well as answers based on their own experiences.

**Data Analysis**

In analyzing the quantitative data, statistical tools determined the influence to teaching reading comprehension by transformational leadership of school leaders and 21st century teacher attributes in this study. The research utilized the following statistical treatments for a more understandable interpretation and analysis of the quantitative data: mean was used to determine the level of transformational leadership of school leaders, 21st century teacher attributes and teaching reading comprehension. On the other hand, the standard deviation was computed to determine the dispersion of the mean of the three variables. Multiple regression analysis was used to examine the significance of the influence of transformational leadership of school leaders and 21st century teacher attributes on teaching reading comprehension.

In the qualitative data analysis, thematic analysis used to examine the responses from the IDI and FGD, this method identified and categorized the emergent codes and themes. The interviews were rec-

orded to collect the data and notes, and then evaluate using thematic analysis to identify emergent codes and themes.

## FINDINGS

### Quantitative Results

### Status of Transformational Leadership of School Leaders

The level of caring school leadership of school heads according to elementary teachers in public schools in Region XI, which was measured in terms of idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration. Computations yielded an overall mean of 4.57 with a description of very high. This implies that transformational leadership of school leaders is always manifested among school leaders as indicated by elementary school teachers in public educational institutions in Region XI.

**Table 1.1 Status of Transformational Leadership of School Leaders**

| | **Idealized Influence** | **Mean** | **SD** | **Description** |
|---|---|---|---|---|
| 1 | Demonstrating unusual competence | 4.26 | .90 | Very High |
| 2 | Celebrating their achievement. | 4.56 | .58 | Very High |
| 3 | Addressing crisis "head on" | 4.57 | .64 | Very High |
| 4 | Using power for positive gain. | 4.56 | .68 | Very High |
| | **Category Mean** | **4.49** | **.55** | **Very High** |
| **Inspirational Motivation** | | | | |
| 1 | Presenting an optimistic and attainable view of the future | 4.59 | .55 | Very High |
| 2 | Molding expectation and shapes meaning | 4.62 | .57 | Very High |
| 3 | Creating a sense of priorities and purpose | 4.61 | .58 | Very High |
| 4 | Reducing complex matters to key issues using simple language | 4.61 | .55 | Very High |
| | **Category Mean** | **4.61** | **.50** | **Very High** |
| **Intellectual Stimulation** | | | | |
| 1 | Encouraging them to re-examine assumptions | 4.58 | .55 | Very High |
| 2 | Willing to put forth or entertain seemingly foolish ideas | 4.37 | .91 | Very High |
| 3 | Creating a readiness for changes in thinking | 4.55 | .58 | Very High |
| 4 | Recognizing pattern that are difficult to imagine | 4.53 | .58 | Very High |
| 5 | Encouraging them to revisit problems | 4.59 | .58 | Very High |
| | **Category Mean** | **4.52** | **.53** | **Very High** |
| **Individualized Consideration** | | | | |
| 1 | Assigning projects based on individual needs and abilities | 4.64 | .55 | Very High |
| 2 | Being an active listener | 4.65 | .58 | Very High |
| 3 | Promoting self-development | 4.67 | .57 | Very High |
| 4 | Encouraging a two-way exchange of views | 4.65 | .57 | Very High |
| | **Category Mean** | **4.65** | **.51** | **Very High** |
| | **Overall Mean** | **4.57** | **.45** | **Very High** |

### Status of 21st Century Teacher Attributes

The status of 21st century teacher attributes is assessed by the two indicators, which has an overall mean rating of 4.59. It is described as very high which shows that the 21st century attributes of the teachers are always demonstrated. Further, its standard deviation is .42, meaning that the teachers' responses are clustered around the mean. Moreover, 21st century teacher attributes is assessed by the two dimensions such as, professional attributes and personal attributes.

**Table 1.2. Status of 21st Century Teacher Attributes**

| | **Professional Attributes** | **Mean** | **SD** | **Description** |
|---|---|---|---|---|
| 1 | Having mastery of the subject matter. | 4.62 | .54 | Very High |
| 2 | Modelling best teaching practice. | 4.55 | .58 | Very High |
| 3 | Working with the stakeholders (parents, community, school, and teachers) in the school setting. | 4.59 | .58 | Very High |
| 4 | Instructing children in classrooms with the best teaching practice. | 4.59 | .56 | Very High |
| 5 | Having characters and skills to approach all aspects of his/ her work. | 4.54 | .58 | Very High |
| 6 | Viewing "learning" as a lifelong process for everyone. | 4.68 | .58 | Very High |

| | | | | |
|---|---|---|---|---|
| 7 | Having the characters and skills for working towards improving his/ her teaching. | 4.64 | .59 | Very High |
| 8 | Having qualities and skills for working towards improving the school. | 4.54 | .58 | Very High |
| 9 | Having the knowledge to guide the science and art of his/ her teaching practice. | 4.49 | .59 | Very High |
| 10 | Perceiving himself/ herself as someone who can affect change. | 4.54 | .61 | Very High |
| 11 | Seeing to it that teaching is a noble profession. | 4.60 | .60 | Very High |
| 12 | Manifesting genuine enthusiasm and pride in teaching. | 4.62 | .57 | Very High |
| 13 | Participating in the continuing professional learning education program. | 4.60 | .60 | Very High |
| 14 | Using the teaching profession as a dignified means of earning a decent living. | 4.62 | .61 | Very High |
| 15 | Possessing a spirit of professional loyalty, mutual confidence, and faith in one another | 4.61 | .60 | Very High |
| | **Category Mean** | **4.59** | **.41** | **Very High** |
| | **Personal Attributes** | | | |
| 1 | Being passionate for teaching and cares for their students. | 4.70 | .55 | Very High |
| 2 | Entertaining in relating with students which stimulate a friendly relationship. | 4.64 | .61 | Very High |
| 3 | Modelling values and brings standards, code of ethics, and strong beliefs. | 4.66 | .58 | Very High |
| 4 | Promoting respect and trust between teachers and students. | 4.69 | .56 | Very High |
| 5 | Being fair and impartial in treating students which eliminates discrimination. | 4.60 | .59 | Very High |
| 6 | Being objective and unbiased in judging their work and performance. | 4.62 | .56 | Very High |
| 7 | Being sincere in showing their real self, without any dishonesties | 4.61 | .59 | Very High |
| 8 | Accepting mistakes and faults without cover-up. | 4.60 | .59 | Very High |
| 9 | Being upright and exemplary in behavior to earn respect and high esteem from students and colleagues. | 4.62 | .59 | Very High |
| 10 | Being patient with their students' limitations and difficulties. | 4.51 | .61 | Very High |
| 11 | Attending to difficult classroom situations with cool headedness. | 4.51 | .62 | Very High |
| 12 | Having full of energy and cheerfulness which is felt by children. | 4.52 | .66 | Very High |
| 13 | Being eager and excited, full of passion and love, which is observed by children. | 4.59 | .64 | Very High |
| 14 | Committing to perform the duties and responsibilities mandated by the laws and code of ethics of the profession. | 4.59 | .60 | Very High |
| 15 | Being able to perform all teaching and learning activities with consistency and selflessness to the best interest of the students. | 4.60 | .57 | Very High |
| | **Category Mean** | **4.60** | **.46** | **High** |
| **Overall Mean** | | **4.59** | **.42** | **High** |

## Status of Teaching Reading Comprehension

The status of teaching reading comprehension yielded an overall mean rating of 4.44, which is described as very high. This shows that teaching reading comprehension is always evident. It is also noticeable that the standard deviation is .47, implying that the responses of the teachers showed consistency. Teaching reading comprehension is measured in the following domains: language reading instruction, computer and library resources, reading difficulties, and assessment.

**Table 1.3. Status of Teaching Reading Comprehension**

| | Language Reading Instruction | Mean | SD | Description |
|---|---|---|---|---|
| 1 | Teaching reading as a whole-class activity. | 4.41 | .66 | Very High |
| 2 | Creating same-ability groups. | 4.39 | .64 | Very High |
| 3 | Creating mixed-ability groups. | 4.43 | .63 | Very High |
| 4 | Using individualized instruction for reading. | 4.52 | .60 | Very High |
| 5 | Students working independently on an assigned plan or goal. | 4.46 | .60 | Very High |
| 6 | Students working independently on a goal they choose themselves. | 4.45 | .64 | Very High |
| 7 | Using textbooks | 4.38 | .78 | Very High |
| 8 | Using workbooks or worksheets | 4.46 | .70 | Very High |
| 9 | Using children's newspapers and/or magazines | 4.23 | .89 | Very High |
| 10 | Using reading material on the Internet (Web pages) | 4.48 | .67 | Very High |
| 11 | Using a variety of children's books (e.g., novels, collections of stories, non-fiction | 4.43 | .69 | Very High |
| 12 | Using materials from other subjects | 4.45 | .65 | Very High |
| 13 | Using materials written by students | 4.33 | .86 | Very High |
| 14 | Reading short stories (e.g., fables, fairy tales, action stories, science fiction) | 4.49 | .70 | Very High |
| 15 | Reading longer books with chapters (fiction) | 4.26 | .75 | Very High |
| 16 | Reading poems | 4.20 | .79 | Very High |
| 17 | Reading descriptions and explanations about things, people, or events | 4.30 | .76 | Very High |
| 18 | Reading instructions or manuals about how things work | 4.37 | .75 | Very High |
| 19 | Reading charts, diagrams, graphs | 4.37 | .74 | Very High |
| 20 | Reading aloud to the class | 4.58 | .61 | Very High |
| 21 | Asking students to read aloud to the whole class | 4.58 | .61 | Very High |
| 22 | Asking students to read aloud in small groups or pairs | 4.51 | .64 | Very High |
| 23 | Asking students to read silently on their own | 4.46 | .65 | Very High |
| 24 | Asking students to read along silently while other students read aloud | 4.38 | .77 | Very High |

| | | | | |
|---|---|---|---|---|
| 25 | Giving students time to read books of their own choosing | 4.47 | .67 | Very High |
| 26 | Teaching or modelling for students different reading strategies (for example, skimming/ scanning, self-monitoring) | 4.48 | .66 | Very High |
| 27 | Teaching students strategies for decoding sounds and words | 4.52 | .61 | Very High |
| 28 | Teaching students new vocabulary systematically | 4.52 | .62 | Very High |
| 29 | Helping students understand new vocabulary in texts they are reading | 4.50 | .63 | Very High |
| 30 | Answering reading comprehension questions in a workbook or on a worksheet about what they have read. | 4.50 | .65 | Very High |
| 31 | Writing something about or in response to what they have read | 4.42 | .69 | Very High |
| 32 | Answering oral questions about or orally summarize what they have read | 4.45 | .71 | Very High |
| 33 | Talking with each other about what they have read | 4.42 | .69 | Very High |
| 34 | Doing a project about what they have read (e.g., a play or art project) | 4.37 | .75 | Very High |
| 35 | Taking a written quiz or test about what they have read | 4.50 | .61 | Very High |
| 36 | Identifying the main ideas of what they have read | 4.52 | .61 | Very High |
| 37 | Explaining or supporting their understanding of what they have read | 4.50 | .64 | Very High |
| 38 | Comparing what they have read with experiences they have | 4.49 | .61 | Very High |
| 39 | Comparing what they have read with other things they have read | 4.47 | .66 | Very High |
| 40 | Making predictions about what will happen next in the text they are reading | 4.52 | .62 | Very High |
| 41 | Making generalizations and draw inferences based on what they have read | 4.51 | .62 | Very High |
| 42 | Describing the style or structure of the text they have read | 4.49 | .73 | Very High |
| | **Category Mean** | **4.44** | **.48** | **Very High** |
| | **Computer and Library Resources** | | | |
| 1 | Looking up information on the Internet. | 4.44 | .74 | Very High |
| 2 | E-mailing or chatting with other students about what they are learning. | 4.33 | .96 | Very High |
| 3 | Reading stories or other texts on the computer. | 4.37 | .78 | Very High |
| 4 | Using instructional software to develop reading skills and strategies. | 4.16 | .86 | High |
| 5 | Using the computer to write stories or other texts. | 4.20 | .86 | Very High |
| 6 | Using the internet to do projects with students in other schools or countries. | 4.19 | .99 | High |
| | **Category Mean** | **4.30** | **.73** | **Very High** |
| 1 | Reading specialist are available to work in their classroom with those students | 4.40 | .75 | Very High |
| 2 | Reading specialist are available to work with those students. | 4.45 | .73 | Very High |
| 3 | Having teacher-aide or other adult available to work in their classroom with those students. | 4.36 | .74 | Very High |
| 4 | Having other professionals (e.g., learning specialist, speech therapist) are available to work with those students. | 4.47 | .76 | Very High |
| | **Category Mean** | **4.42** | **.67** | **Very High** |
| | **Computer and Library Resources** | | | |
| 1 | Using diagnostic reading tests (including miscue analysis). | 4.56 | .59 | Very High |
| 2 | Using classroom tests (for example, teacher-made or textbook tests). | 4.58 | .56 | Very High |
| 3 | Using national or regional achievement tests. | 4.44 | .68 | Very High |
| 4 | Using their professional judgment. | 4.54 | .62 | Very High |
| 5 | Using multiple-choice questions on material read | 4.54 | .58 | Very High |
| 6 | Using short-answer written questions on material read | 4.50 | .60 | Very High |
| 7 | Using paragraph-length written responses about what students have read | 4.42 | .72 | Very High |
| 8 | Using listening to students read aloud | 4.60 | .59 | Very High |
| 9 | Asking questions orally | 4.59 | .60 | Very High |
| 10 | Requiring students to give an oral summary/report of what they have read | 4.46 | .74 | Very High |
| 11 | Meeting with students to discuss what they have been reading and work they have done | 4.50 | .68 | Very High |
| | **Category Mean** | **4.52** | **.49** | **Very High** |
| | **OVERALL MEAN** | **4.44** | **.47** | **Very High** |

**Significance of the Influence of Transformational Leadership of School Leaders and 21st Century Teacher Attributes on Teaching Reading Comprehension**

Table 1 shows the results of the multiple regression analysis. Also, the standardized beta coefficients and t-statistics results of the influence of the independent variables namely: transformational leadership and 21st century teacher attributes, and the dependent variable which is teaching reading comprehension are presented. The level of significance is set at $\alpha = 0.05$.

The standardized beta coefficient of transformational leadership of school leaders is .290, with t-statistics of 4.942, and p-value of .000. This indicates that in individual capacity, transformational leadership of school leaders significantly influence teaching reading comprehension. Thus, for every unit increase in the transformational leadership of school leaders, there is a corresponding increase of .290 units in the teaching reading comprehension. The standardized beta coefficient of 21st century teacher attributes is .335, with t-statistics of 5.707, and p-value of .000. This indicates that in individual capacity, 21st century teacher attributes significantly influence teaching reading comprehension. Thus, for eve-

ry unit increase in the 21st century teacher attributes, there is a corresponding increase of .335 units in the teaching reading comprehension. Meanwhile, the R-square value is reported at .303 indicating that 30.3 percent in the variability of teaching reading comprehension can be explained by the predictors, transformational leadership of school leaders and 21st century teacher attributes. Relatively, 69.7 percent of the variation in the teaching reading comprehension can be attributed to other factors or independent variables that are not included in this study.

**Table 2. Significance of the Influence of Transformational Leadership of School Leaders and 21st Century Teacher Attributes on Teaching Reading Comprehension**

| Teaching Reading Comprehension | Standardized Coefficients Beta | t | P-value | Remarks |
|---|---|---|---|---|
| Transformational Leadership of School Leaders | .290 | 4.942 | .000 | Significant |
| 21st Century Teacher Attributes | .335 | 5.707 | .000 | Significant |

*Note: R=.555, R-square=.303, F= 65.945, p<.05*

## Qualitative Results

There are 10 participants for IDI and seven participants for FGD. They are teachers purposively chosen from public elementary schools. The researcher chose them to get the necessary salient information for the qualitative strand. Moreover, the participants of IDI were coded from IDI1, referring to the first participant of the in-depth interview to IDI10, referring to the last participant for the in-depth interview and participants for FGD were also coded from FGD1, which refers to the first participant of focus group discussion to FGD7, referring to the 7th participant for the focus group discussion. Likewise, the age of the participants ranges from 27, as the youngest to 55 years old as the oldest. They come from different divisions of the Davao Region: Davao del Norte, Davao de Oro, Davao Oriental, Panabo City, Mati City, Davao del Sur, Davao Occidental, Digos City and Davao City.

### Lived Experiences of Participants as regard Teaching Reading Comprehension

In the IDI and FGD, there are themes generated from the participants' lived experiences such as encountering challenges during teaching reading comprehension, responding to the needs of the students, manifesting innovativeness, and ensuring a learning atmosphere.

*Encountering Challenges during Teaching Reading Comprehension*. In the interview with the participants, I went into their lived experiences regarding teaching reading comprehension. They revealed that they were encountering challenges during teaching reading comprehension. Teachers experience challenges in teaching students who have poor vocabularies, lack activity participation, struggle to connect prior knowledge to new topics, are less responsive, and struggle as readers.

Participants utter the following:

> There are lots of challenges in teaching reading comprehension. It includes students with poor reading vocabularies, lack active participation in our class and less responsive to class discussions. (IDI3)

> Some of the challenges I face include managing students who are struggling readers and failed to connect to their prior knowledge of the topic discussed. (FGD1)

*Responding to the Needs of the Students*. This is one of the essential themes that emerged from the responses of the participants of this study. The teachers see to it that they respond to the needs of the students through employing reading-related instructional scaffolding by allowing students to read aloud individually or in groups, modeling effective reading behaviors, fostering a strong reading culture, engaging and motivating students, and emphasizing correct pronunciation of letters and vocabulary words.

Participants stated that:

> By using reading related instructional scaffolding to meet each student's needs, strengthens the reading culture in my class. (IDI8)

> I use scaffolding technique. I unlock difficulties of new words, discuss in class using related instructional aids to motivate students and get their interest. (IDI1)

*Manifesting Innovativeness*. Another essential theme identified from the responses of the participants in this study is manifesting innovativeness. Teachers emphasize connecting reading materials to real-life situations, incorporating technology like gamification, creatively preparing engaging class activities, using techniques like reading with facial expressions and varied tones, and utilizing interactive tools for an enriched classroom experience.

The responses revealed that:

> I connect reading materials to real life situations utilizing interactive tools for an enriched classroom teaching that promote motivation and interest of the learners. (IDI3)
>
> In teaching reading comprehension, you should have strategies to be used. For example, reading with facial expressions and various tones of voice. (FGD6)

*Ensuring a Learning Atmosphere*. The participants give emphasis on ensuring a learning atmosphere to effectively teach reading comprehension. Teachers accentuate that to ensure a learning atmosphere, they should expand vocabulary in all stories, use open-ended questions to connect with prior knowledge, provide remedial classes, extend time when needed, and maintain communication with students and parents.

Participants shared that:

> I always expand their vocabulary in all stories being read to promote understanding and guide my students to grasp meaning of the stories through asking open-ended questions. (IDI2)
>
> I ensure a learning atmosphere by communicating always with my students and their respective parents. (IDI9)

**Role of Experiences in Shaping the Beliefs of the Participants**

The role of experiences in shaping the beliefs of the participants is presented. These experiences help teachers in public elementary schools mold their beliefs to teaching reading comprehension. Furthermore, the beliefs of the participants were extracted into two themes: essentiality of teaching capability enhancement and disclosing teachers as change agents.

Essentiality of Teaching Capability Enhancement. This essential theme is formed from the responses of participants, which emphasized that adapting appropriate reading comprehension teaching approaches, embracing technology, continually upgrading teaching skills, and attending trainings and seminars for enhanced knowledge are essentialities of teaching capability enhancement.

Specific statements of the participants:

> Teachers must learn to adapt and apply appropriate approaches in teaching reading comprehension and be determined to learn new things utilizing technology. (IDI1)
>
> I believe that upgrading oneself is a necessity in enhancing my teaching skills, thus I attend trainings and seminars to be more knowledgeable. (FGD1)

*Disclosing Teachers as Agents of Change*. The participants expressed the importance of disclosing teachers as change agents. This essential theme encompasses having profound responsibilities to the students and the school, believing that teachers mold students, providing passionate and dedicated instruction, using students' difficulties as inspiration to improve reading comprehension teaching, and viewing experiences as opportunities for self-improvement.

The participants shared some of their thoughts:

I believe that teachers are molders of students and I should provide instruction to students with passion and dedication. (IDI4)

I deal with the difficulties of my students as a source of inspiration to deliver teaching reading comprehension better. (FGD6)

**The Role of Experiences in Shaping the Attitude of the Participants**

The role of experiences in shaping the attitudes of the participants on teaching reading comprehension generated the following themes from the discussions such as becoming an empathetic teacher, demonstrating sensitivity to the needs of students, and manifesting positivity.

Becoming an Empathetic Teacher. This is an essential theme that shaped the attitude of the participants, resulting in teachers becoming empathetic. When the participants were asked how valuable teach-

ing reading comprehension is for them, they have expressed those treating students as one's own children, recognizing and rewarding their efforts, demonstrating patience and perseverance, building inspiring relationships, and showing kindness are their attitude that made them an empathetic teacher.

Participants shared that:

> I usually recognize and reward the efforts of my students. (IDI2)
>
> I am patient and I persist and persevere to teach my students, which I think build an inspiring association with them. (IDI10)

*Demonstrating Sensitivity to the Needs of Students*. This is another essential theme in shaping the attitudes of the participants, with the statement tailoring teaching approaches to meet diverse student needs, creating a nurturing learning environment, fostering a love for reading, delivering lessons in a motivating manner, and driving students to understand their reading.

The participants shared some of their thoughts:

> As a teacher, I adjust and tailor my teaching approaches to meet the diverse needs of my students. (IDI5)
>
> I see to it that I create a nurturing learning environment through incorporating various teaching reading comprehension instructions. (IDI3)

*Manifesting Positivity*. The participants expressed the importance of manifesting positivity. This essential theme incorporates the teacher's attitude of overcoming challenges with eagerness in lesson preparation, maintaining a positive mindset, and embracing students' shortcomings.

Participants stated that:

> I am positive that I can overcome challenges that I encounter in teaching reading comprehension to my learners. (IDI4)
>
> I am always eager to prepare my daily lessons in teaching reading comprehension as an English teacher, and I have always a positive mindset that I can do it. (IDI10)

**Role of Experiences in Shaping the Commitment of the Participants**

The experiences that made the participants' commitment strong and with more vigor, mentioned that the experiences strengthen their commitment and allowed them to function effectively and efficiently. The essential themes generated included: radiating teacher professional accountability, and being always an efficient teacher.

Radiating Teacher Professional Accountability. The commitment of radiating teacher professional accountability manifests the participants outlook to embrace evidence-based teaching practices, collaborate with school heads, colleagues and parents, being open to suggestions for improving the reading program, rigorously training students in phonetics, spelling, vocabulary, and critical thinking, and sharing resources, knowledge, and best practices for teaching reading comprehension.

The participants stated that:

> I am willing to embrace evidence-based teaching practices for I am professionally accountable to my learners' development especially in their reading level. (IDI7)
>
> Maintaining collaboration ng teachers, school head at parents ang dapat para sa reading comprehension. Dapat open sa suggestions in planning activities para sa kaayuhan sa reading program. (FGD6)
>
> Maintaining collaboration of teachers, school head and parents for reading comprehension. It should be open to suggestions in planning activities for the good of reading program. (FGD6)
>
> I train students having a hard time in phonetics, spelling, vocabulary and critical thinking. (IDI3)

*Being always an Efficient Teacher*. This shapes the commitment of the participants; being always an efficient teacher by taking great responsibility for students' learning through providing a solid educational foundation, developing their reading competencies for lifelong learning, striving to teach reading comprehension effectively, and wholeheartedly dedicating oneself to teaching.

The participants expressed that:

> I take great responsibilities to the learning of my students and I provide my students proper educational foundation particularly in reading comprehension through diverse learning styles. (IDI5)

| | | | |
|---|---|---|---|
| Significance of the Influence of Transformational Leadership of school leaders and 21st Century Teacher Attributes on Teaching Reading Comprehension | The standardized coefficients and p-values indicate that transformational leadership of school leaders and 21st century teacher attributes significantly influenced teaching reading comprehension, with R-square=.303, F= 65.945, p<.05 | Transformational leadership by school leaders, combined with relevant 21st-century teacher attributes, can enhance the teaching of reading comprehension, resulting in more proficient learners. | **Merging-Converging** |

The quantitative phase of the study revealed that the transformational leadership of school leaders in public elementary schools was rated very high, indicating that it was consistently demonstrated through effective crisis management and the creation of a sense of purpose. School leaders encouraged self-development among teachers by promoting reflection on challenges, while demonstrating competence, influence, and motivation that inspired teachers intellectually and showed consideration for their opinions. Similarly, the study found that teachers exhibited very high levels of 21st-century teacher attributes, displaying enthusiasm, care for students, and fostering an environment of respect and trust. Additionally, the teachers' teaching reading comprehension was also rated very high, reflecting their consistent use of diverse reading strategies, instructional software, and diagnostic assessments to enhance students' reading skills. Regression analysis further confirmed that both transformational leadership and 21st-century teacher attributes significantly influence the effective implementation of teaching reading comprehension, highlighting their positive contributions to improving reading outcomes.

The qualitative findings reveal that teachers in public elementary schools tackle challenges in teaching reading comprehension by responding to students' needs, fostering innovation, and creating a positive learning environment. They employ strategies like instructional scaffolding, motivating students to develop a reading culture, and emphasizing vocabulary and pronunciation to address diverse learning needs. Teachers also enhance comprehension by connecting reading materials to real-life contexts, integrating technology, and designing engaging activities, while offering remedial sessions and maintaining communication with students and parents. Another key theme is the importance of continuous professional growth, as teachers see themselves as change agents dedicated to improving their teaching practices and shaping students' learning experiences. Furthermore, teachers demonstrate empathy, sensitivity to students' needs, and positivity, while maintaining professional accountability and efficiency, collaborating with colleagues, and embracing evidence-based practices to enhance reading comprehension.

The qualitative themes align closely with the quantitative findings, which indicate very high levels of transformational leadership by school leaders and the presence of 21st-century teacher attributes in teaching reading comprehension. These findings highlight the complementary relationship between quantitative and qualitative data, reinforcing the study's conclusions.

**Implication for Educational Practice**

The study highlights the significant impact of transformational leadership in improving reading comprehension instruction by fostering a collaborative and innovative school culture. School leaders who embody transformational leadership inspire teachers to adopt essential 21st-century attributes such as adaptability, creativity, and technological competence, aligning teaching methods with current educational demands. Furthermore, the integration of these teacher attributes, such as empathy, resilience, and lifelong learning, ensures educators are well-equipped to address challenges like struggling readers and low engagement. Together, transformational leadership and 21st-century teacher qualities create a dynamic, inclusive educational environment that enhances reading comprehension and prepares students with critical thinking and literacy skills for future success.

## CONCLUSION

The study concluded that the transformational leadership of school leaders in public elementary schools was rated very high, reflecting their ability to inspire and innovate, motivating teachers to exceed expectations and perform beyond their perceived capabilities. Similarly, the 21st-century teacher attributes of educators were consistently demonstrated, indicating their professional and personal commitment to teaching reading comprehension. Teachers willingly embraced diverse instructional roles, went beyond their responsibilities, and fostered student growth through effective teaching practices. Their dedication extended to investing personal and professional resources to enhance reading compre-

hension instruction. Moreover, the very high status of teaching reading comprehension revealed that teachers effectively employed techniques and strategies to help students derive meaning from texts, ranging from sentence-level understanding to comprehensive interpretation of entire passages.

Further, the findings revealed that the transformational leadership of school leaders and 21st century teacher attributes significantly influenced teaching reading comprehension. This finding further showed a positive significant effect of transformational leadership of school leaders and 21st century teacher attributes on teaching reading comprehension, this suggests that better transformational leadership of school leaders and enhanced 21st century teacher attributes would lead to an improved teaching reading comprehension. In like manner, an increase in 21st century teacher attributes influence an enhancement in the teaching reading comprehension. It further shows that an improved transformational leadership and enhanced 21st century teacher attributes reinforced teaching reading comprehension.

The lived experiences of teachers revealed four key themes: encountering challenges in teaching reading comprehension, responding to students' needs, manifesting innovativeness, and ensuring a supportive learning atmosphere. These experiences profoundly shaped their beliefs, attitudes, and commitment toward enhancing reading comprehension instruction. Teachers emphasized the importance of improving teaching capabilities and embracing their roles as change agents, while also highlighting the value of empathy, sensitivity to students' needs, and maintaining a positive attitude. Moreover, they stressed the significance of professional accountability and striving for efficiency to foster student success. The study found a merging and converging relationship between quantitative variables and qualitative themes, indicating a unified perspective on the interconnectedness of these factors in effective teaching practices.

The salient quantitative and qualitative findings of transformational leadership of school leaders and 21st century teacher attributes with regards to teaching reading comprehension revealed a substantiating result. This corroboration means that the quantitative and qualitative data merged and converged with each other.

## RECOMMENDATION

To enhance teaching reading comprehension, school leaders should create a supportive environment that fosters innovative teaching methods, provides diverse learning opportunities, and ensures essential resources and facilities are available. Administrators should assess teachers' professional and personal development needs, integrating technology, culturally relevant materials, and student-centered strategies to improve instructional effectiveness. Moreover, adopting transformational leadership principles and emphasizing 21st-century teacher attributes in institutional planning and policy-making can significantly influence teachers' ability to address diverse learner needs and improve reading comprehension outcomes.

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# INCLUSIVE EDUCATION POLICIES AND PARENTAL ENGAGEMENT IN SELECTED ELEMENTARY SCHOOLS IN LIAN, BATANGAS

**Danica May L. Cahinhinan**
Lipa City Colleges
Lipa City, Batangas

**ABSTRACT**

**The study explored the influence of inclusive education policies and parental engagement in selected elementary schools in Lian District. Employing a quantitative descriptive-correlational approach, the research aimed to understand the perceptions of teachers regarding the implementation of inclusive education policies and parental involvement. A sample of 20 teachers experienced in handling students with disabilities was selected, with the reliability of the survey instrument confirmed through a test-retest reliability test, yielding a Cronbach alpha reliability score of .881. Results indicated that teachers strongly supported the flexibility and resource allocation of inclusive education policies. They also endorsed the adaptation of curriculum to meet diverse student needs and the encouragement of open communication between school and parents. Additionally, teachers recognized the importance of parental involvement in both school-based activities and extracurricular engagements. The significant positive relationships uncovered between teachers' perceptions of inclusive education policies and their evaluations of parental engagement underscore a crucial interconnectedness. This symbiotic relationship highlights the pivotal role that parental involvement plays in reinforcing and amplifying the benefits of inclusive education practices. By actively participating in school-based activities and supporting extracurricular engagements, parents not only contribute to the holistic development of their children but also reinforce the ethos of inclusivity within the community. Building upon these insights, the study concluded with actionable recommendations designed to further bolster inclusive education policies and deepen parental engagement within the educational landscape of selected elementary schools in Lian District. These recommendations encompass a multifaceted approach aimed at fostering stronger collaboration between schools and parents. Ultimately, the goal is to nurture a learning ecosystem where every child feels empowered, included, and capable of achieving their full potential.**

*Keywords: inclusive education policies, parental engagement, elementary schools*

## INTRODUCTION

In recent years, a global shift towards inclusive education policies has emerged, acknowledging the right of every student worldwide to receive a fair and high-quality education, regardless of their background or abilities. This paradigm shift reflects a commitment to accommodating the diverse needs of all students, aiming to shape the future of education on a global scale (Paseka & Schwab, 2020). The success of inclusive education policies globally relies on the collaboration of various stakeholders, with parents playing a crucial role in their children's educational journey. Inclusive education, as an approach that strives to accommodate the diverse needs of all students, holds immense promise in shaping the future of our educational systems. Central to this shift was the understanding that inclusivity goes beyond the physical presence of students in regular classrooms; it also encompasses a holistic approach that fosters social, emotional, and academic growth. However, the successful implementation of inclusive education policies relies on the active engagement of various stakeholders, with parents playing a pivotal role in their children's educational journey (Francisco, 2020).

In the context of the Philippines, inclusive education policies have become a focal point, ensuring that all students, including those with disabilities and special needs, have equal access to education

(Bartolome et al., 2020). The research investigates the impact of inclusive education policies in the Philippine setting, examining policy implementation, strengths, and weaknesses. Additionally, the study explored the level of parental engagement, recognizing its crucial role in enhancing academic performance and overall development. The findings aim to inform local policymakers, educators, and parents about the effectiveness of current policies and the significance of parental involvement in achieving inclusive and equitable education for all Filipino students.

The Philippines has made significant strides in promoting inclusive education, but challenges remain. One major problem in inclusive education policies within the Department of Education (DepEd) is the insufficient resources and support for implementing inclusive practices in schools. This includes limited funding, inadequate teacher training, lack of accessibility, attitudinal barriers, and fragmented support systems. Overcoming these challenges requires a comprehensive approach involving adequate funding, ongoing training, accessible facilities, and efforts to promote positive attitudes and inclusive practices (Cucio & Roldan, 2020). This study sought to inform policymakers, educators, and parents about the effectiveness of current policies and the importance of parental engagement in ensuring the success of inclusive education practices. The findings of this research have the potential to shape the future of elementary education, ultimately contributing to a more inclusive and equitable educational landscape for all students.

Inclusive education policies, which advocate for the integration of students with diverse abilities and needs into mainstream classrooms, have gained traction globally as a means to provide equitable educational opportunities (Toquero, 2021). These policies were designed to dismantle barriers that hinder students from achieving their full potential, regardless of their individual circumstances (Ribeiro et al., 2021). The overarching goal of inclusive education was to nurture an environment that was not only accommodating but also conducive to meaningful learning experiences. Such an environment should cater to the needs of students with disabilities, while simultaneously benefiting their typically developing peers, thus promoting diversity, empathy, and a sense of belonging.

One of the fundamental tenets of inclusive education was the active involvement of parents in the educational process. Parental engagement was not only about attending parent-teacher conferences or school events; it encompasses a broader spectrum of activities, including participating in decision-making processes, supporting learning at home, and advocating for their children's needs. The significance of parental engagement cannot be overstated, as it forms a bridge between the home and school environments, where the foundations for a student's educational journey were laid.

The success of inclusive education policies was intrinsically linked to parental engagement. When parents were empowered to actively participate in their child's education, it fosters a collaborative partnership between the school and the home. This partnership can lead to enhanced communication, a deeper understanding of a student's unique needs, and the development of strategies that can bolster their academic and socio-emotional growth. Moreover, when parents were included in the decision-making process, they can advocate for policies that best serve their children's interests, contributing to more effective and responsive educational systems.

This study sought to shed light on the intricate relationship between inclusive education policies and parental engagement, and how this interaction ultimately influences student achievement in local context of Lian, Batangas. By investigating the extent to which inclusive policies were being effectively implemented in selected elementary schools, and the degree to which parents were actively engaged in their child's education, the study can gain valuable insights into the factors that either facilitate or hinder student success.

The study addressed a crucial and timely issue in the context of Philippine education. Inclusive education aims to provide quality learning opportunities for all students, regardless of their diverse backgrounds and abilities, fostering an environment where every child can thrive. Parental engagement was a vital component of a child's academic success, as the support and involvement of parents can significantly impact a student's educational journey.

**Statement of the Problem**

The study aimed to determine the influence of inclusive education policies and parental engagement within the context of selected elementary schools in Lian District. Specifically, this study pursues to answer the following questions:

1. What is the assessment of the respondents on inclusive education policies in terms of:

1.1 implementation; and
1.2 curriculum adaptation?
2. What is the assessment of the respondents on parental engagement in terms of:
2.1 school-based involvement; and
2.2 extracurricular involvement?
3. Is there any significant relationship between the assessment of the respondents on inclusive education policies and parental engagement?
4. What were the programs to be implemented to improve inclusive education policies and parental engagement in selected elementary schools in Lian District?

## METHODOLOGY

This chapter elucidates the methodological approach employed in this study, encompassing the research design, data sources, study population, instrumentation and its validation, procedure for data collection, ethical considerations, treatment of data, and data analysis techniques employed. The methodology employed in this research endeavor was expounded, covering the research strategy chosen to execute the study, extending through to the dissemination of results.

### Research Design

This research made use of quantitative design with descriptive-correlational approach, incorporating a survey tool to assess the influence of inclusive education policies and parental engagement in selected elementary schools in Lian district.

### Participants

The research centered its analysis on teachers who were currently employed from the selected elementary schools in Lian, Batangas. Through the utilization of Raosoft's formula, maximizing the confidence level of 95%, and a margin of error of 5%, the study has effectively determined an appropriate sample size of 20 teachers with relevant experience on handling students with disabilities and inclusive education from the selected elementary schools in Lian, Batangas.

### Research Instrument

The study employed a custom-designed survey, meticulously tailored to gauge the impact of inclusive education policies and parental engagement in these selected institutions. The research aims to assess the quality of inclusive education policies in two critical domains: their implementation and adaptation within the curriculum. The researcher gathered information about the respondents age, sex, and educational attainment as part of the qualitative data.

### Data Analysis

To interpret the data effectively, the researcher employed the following statistical treatments. Weighted mean, ranking and Pearson's r were utilized to interpret the data.

## RESULTS AND DISCUSSIONS

This chapter provides the presentation, analysis and interpretation of data based on the questions posited on the statement of the problem.

1. Assessment of the Respondents on Inclusive Education Policies
1.1. In Terms of Implementation.

**Table 1. Assessment of the Respondents on Inclusive Education Policies in Terms of Implementation**

| Items | Weighted Mean | Interpretation | Rank |
|---|---|---|---|
| The school effectively implements inclusive education policies. | 4.65 | Strongly Agree | 2.5 |
| There is clear communication about inclusive education policies to teachers | 4.65 | Strongly Agree | 2.5 |
| Adequate resources are provided to support the implementation of inclusive education policies | 4.50 | Strongly Agree | 4.5 |

| | | | |
|---|---|---|---|
| Professional development opportunities related to inclusive education are accessible | 4.50 | Strongly Agree | 4.5 |
| Inclusive education policies are flexible to accommodate the needs of diverse students. | 4.70 | Strongly Agree | 1 |
| **Composite Mean** | **4.60** | **Strongly Agree** | |

As stated in Table 1, the teacher-respondents strongly agreed that inclusive education policies are flexible to accommodate the needs of diverse students which made the highest weighted mean of 4.70 and the highest rank of 1. This finding indicated that teachers perceive these policies as adaptable and responsive, capable of addressing the varying requirements and challenges posed by students with diverse backgrounds, abilities, and learning styles.

1.2. In Terms of Curriculum Adaptation.

**Table 2. Assessment of the Respondents on Inclusive Education Policies in Terms of Curriculum Adaptation**

| Items | Weighted Mean | Interpretation | Rank |
|---|---|---|---|
| The curriculum is adapted to meet the needs of students with diverse abilities | 4.70 | Strongly Agree | 1.5 |
| There is sufficient flexibility in the curriculum to address individual student needs. | 4.65 | Strongly Agree | 3.5 |
| Appropriate instructional materials are available to support curriculum adaptation | 4.60 | Strongly Agree | 5 |
| Teachers receive training in adapting curriculum for diverse learners | 4.70 | Strongly Agree | 1.5 |
| The curriculum promotes a sense of belonging for all students | 4.65 | Strongly Agree | 3.5 |
| **Composite Mean** | **4.66** | **Strongly Agree** | |

As stated in Table 2, the teacher respondents strongly agreed that the curriculum is adapted to meet the needs of students with diverse abilities, and teachers receive training in adapting curriculum for diverse learners which gained the highest equal weighted means of 4.70 and equal ranks of 1.5. This indicated a recognition of the importance of curriculum flexibility in accommodating the diverse learning needs and abilities of students.

2. Assessment of the Respondents on Parental Engagement

2.1. In Terms of School Based Involvement.

**Table 3. Assessment of the Respondents on Parental Engagement in Terms of School Based Involvement**

| Items | Weighted Mean | Interpretation | Rank |
|---|---|---|---|
| Parents are encouraged to actively participate in school activities | 4.75 | Strongly Agree | 2.5 |
| The school provides clear information on how parents can get involved | 4.70 | Strongly Agree | 4.5 |
| Parent-teacher conferences are well-attended by parents | 4.70 | Strongly Agree | 4.5 |
| There are opportunities for parents to volunteer in the classroom | 4.75 | Strongly Agree | 2.5 |
| The school encourages open communication between teachers and parents. | 4.85 | Strongly Agree | 1 |
| **Composite Mean** | **4.75** | **Strongly Agree** | |

As reported in Table 3, the teacher-respondents strongly agreed that the school encourages open communication between teachers and parents which yielded the highest weighted mean of 4.85 and the highest rank of 1. The results demonstrated their commitment to building strong relationships with parents and recognizing parents as valuable partners in the educational process.

2.2. In Terms of Extra-Curricular Involvement.

**Table 4. Assessment of the Respondents on Parental Engagement in Terms of Extra-Curricular Involvement**

| Items | Weighted Mean | Interpretation | Rank |
|---|---|---|---|
| Parents are actively engaged in extracurricular such as sports events and cultural programs | 4.70 | Strongly Agree | 2.5 |
| The school provides information about extracurricular opportunities for parents to support. | 4.75 | Strongly Agree | 1 |
| Parental involvement in extracurricular activities positively impacts student participation | 4.70 | Strongly Agree | 2.5 |
| There are mechanisms for parents to contribute ideas for new extracurricular activities | 4.55 | Strongly Agree | 5 |
| The school values the contributions of parents in extracurricular events. | 4.65 | Strongly Agree | 4 |
| **Composite Mean** | **4.67** | **Strongly Agree** | |

As reflected in Table 4, the teacher-respondents strongly agreed that the school provides information about extracurricular opportunities for parents to support which produced the highest weighted mean of

4.75 and the highest rank of 1. This suggested that the school recognizes the value of involving parents in various aspects of student life and sought to facilitate their participation in extracurricular activities.

### 3. Relationships Between the Assessment of the Respondents on Inclusive Education Policies and Parental Engagement.

**Table 5. Relationships Between the Assessment of the Respondents.**

| Variables | r-value | p-value | Decision | Interpretation |
|---|---|---|---|---|
| **Inclusive Education Policies and Parental Engagement** | | | | |
| **Implementation versus:** | | | | |
| School Based Involvement | 0.89 | 1.50E-7 | Reject Ho | Highly Significant |
| Extracurricular Involvement | 0.62 | 0.00354 | Reject Ho | Highly Significant |
| **Curriculum Adaptation Versus:** | | | | |
| School Based Involvement | 0.93 | 0.00000 | Reject Ho | Highly Significant |
| Extracurricular Involvement | 0.69 | 0.00076 | Reject Ho | Highly Significant |

As gleaned in the above results cited in Table 5, when the responses of the teacher-respondents on the inclusive education policies in terms of curriculum adaptation were compared to their assessment on parental engagement, the computed r-values of 0.93 for school-based involvement and 0.69 for extracurricular involvement have corresponding p-values of less than 0.01, thus, rejecting the hypothesis.

### 4. Proposed Development Programs to Implemented and to Improve Inclusive Education Policies and Parental Engagement in Selected Elementary Schools in Lian District

**Table 6. Proposed Development Program**

| PROGRAM | OBJECTIVE | OUTPUT |
|---|---|---|
| **Resource Allocation for Curriculum Adaptation** | To provide educators with the necessary resources and support to adapt curriculum content effectively. | - Provision of instructional materials, assistive technologies, and specialized training for teachers.<br>- Increased ability of educators to adapt curriculum content to meet the needs of diverse learners. |
| **Parental Engagement Promotion Program** | To foster strong school-family partnerships and encourage active parental involvement in school activities. | - Clear communication about parental involvement opportunities, such as parent-teacher conferences and volunteer opportunities.<br>- Increased participation of parents in school events and activities. |
| **Creation of Supportive School Environments** | To establish inclusive and supportive environments where all students feel valued and supported. | - Implementation of inclusive policies and promotion of positive school culture.<br>- Establishment of support systems for students with diverse needs. |
| **Collaborative Approach to Extracurricular Activities** | To involve parents in planning and implementing extracurricular activities, enriching the school experience for all students. | - Mechanisms for soliciting input from parents on new extracurricular opportunities.<br>- Increased accessibility and inclusivity of extracurricular activities for all students. |
| **Parental Engagement Workshop Series** | Increase parental understanding of their role in supporting their children's education and to equip them with the necessary knowledge and skills to actively engage in their children's learning journey. | - Increased attendance and participation in school events and activities by parents.<br>- Improved communication between parents and teachers, leading to better collaboration and support for students.<br>- Enhanced academic performance and overall well-being of students as a result of increased parental involvement in their education. |
| **Parent-Teacher Partnership Program** | Strengthen the partnership between parents and teachers, enabling them to work together effectively in supporting student academic and socio-emotional development. | - Increased parental involvement in school activities and decision-making processes.<br>- Improved academic outcomes for students through targeted support and interventions agreed upon by parents and teachers.<br>- Enhanced trust and mutual understanding between parents and teachers, leading to a more positive and supportive school environment for students and families. |

Based on the results, Table 6 presented the proposed development programs. The table outlined five development programs aimed at enhancing inclusive education practices within educational institutions. Resource Allocation for Curriculum Adaptation aimed to provide educators with necessary resources for adapting curriculum content effectively. The Parental Engagement Promotion Program fostered strong school-family partnerships by encouraging parental involvement in school activities.

## CONCLUSIONS

The findings of this study shed light on the interconnectedness and importance of inclusive education policies, curriculum adaptation, and parental engagement in fostering a supportive and inclusive learning environment. The results indicated that respondents perceived inclusive education policies as essential frameworks that facilitated differentiated teaching strategies, accommodations, and the creation of inclusive learning environments. Moreover, the study highlighted the significance of continuous learning and skill development among educators to effectively implement inclusive practices.

Furthermore, the strong consensus among teacher respondents regarding curriculum adaptation underscored a commitment to promoting equity and excellence in education. This commitment was further supported by the emphasis on resource allocation and support systems to meet the diverse needs of students. Similarly, the study revealed a shared commitment among teachers to promote parental engagement through open communication, clear information dissemination, and active involvement in both school-based and extracurricular activities.

The study also suggested a symbiotic relationship between inclusive education policies, curriculum adaptation, and parental engagement. Schools that prioritized inclusivity were more likely to foster collaborative relationships with parents, ultimately benefiting students by ensuring their diverse needs were met holistically. Overall, these findings underscored the importance of creating inclusive and supportive school environments where all members of the community were actively engaged in promoting student success and well-being.

## RECOMMENDATIONS

Based on the findings of the study, several recommendations can be proposed to further enhance inclusive education policies, curriculum adaptation, and parental engagement.

1. Schools should prioritize providing continuous professional development opportunities for educators to enhance their understanding of inclusive education practices. Workshops, training sessions, and conferences focused on inclusive teaching strategies can help educators effectively implement differentiated instruction and accommodate diverse student needs.
2. The Department of Education (DepEd) should allocate sufficient resources to support curriculum adaptation efforts. This includes providing access to instructional materials, assistive technologies, and specialized training for teachers to adapt curriculum content to meet the needs of diverse learners.
3. Schools should actively promote parental involvement by encouraging open communication and collaboration between teachers and parents. Clear information dissemination about parental involvement opportunities, such as parent-teacher conferences and volunteer opportunities, should be provided to foster strong school-family partnerships.
4. Additionally, schools, with the assistance of Dep Ed, should strive to create inclusive and supportive environments where all students feel valued and supported. This can be achieved by implementing inclusive policies, promoting positive school culture, and providing support systems for students with diverse needs.
5. The Department of Education must mandate that schools should involve parents in the planning and implementation of extracurricular activities to enrich the school experience for all students. Mechanisms should be established to solicit input from parents on new extracurricular opportunities and to ensure that activities are accessible and inclusive for all students.
6. Further research should be conducted to assess the effectiveness of inclusive education policies, curriculum adaptation strategies, and parental engagement initiatives. Ongoing evaluation and feedback mechanisms should be established to monitor progress and identify areas for improvement.

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# INSTRUCTIONAL STRATEGIES AS CORRELATES TO STUDENT MOTIVATION IN NASUGBU CHRISTIAN FAITH ACADEMY, INC.: BASIS FOR AN ACTION PLAN

**Hazel Marie S. Delposo**
Lipa City Colleges
Lipa City, Batangas

**ABSTRACT**

**In the dynamic landscape of education, where pedagogical innovation intersected with technological advancement, enhancing student motivation was of paramount importance. This study aimed to explore the influence of instructional strategies on student motivation at Nasugbu Christian Faith Academy, Inc. Key questions revolved around the nature of instructional strategies, the extent of student motivation, and any significant relationships between the two. Employing descriptive and correlational research methods, the study surveyed 107 junior high school students, utilizing a researcher-designed questionnaire with a reliable Cronbach alpha score of .792. The findings of the study unveiled a noteworthy observation: students at Nasugbu Christian Faith Academy, Inc. perceived a significant utilization of various instructional strategies by their teachers. Among these strategies were constructivist, collaborative, integrative, deflective, and inquiry-based learning approaches. This suggests a diverse and dynamic teaching environment, where educators employed a range of techniques to engage their students actively in the learning process. The study revealed the dual nature of student motivation, with both external recognition and internal desire for self-improvement driving engagement. Correlation analyses showed that constructive, collaborative, integrative, deflective, and inquiry-based teaching methods correlated positively with both extrinsic and intrinsic motivation. This highlights the significance of these strategies in enhancing student engagement. The study underscores the need for further exploration of effective teaching techniques and the development of comprehensive programs to bolster student motivation and academic achievement. Aligning instructional strategies with student preferences can create a more effective learning environment. This study significantly adds to the understanding of instructional strategies and student motivation. Its practical findings provide valuable guidance for educators and administrators, not only at Nasugbu Christian Faith Academy, Inc., but also for educators globally who aim to improve student motivation and academic success through impactful teaching methods.**

*Keywords: instructional strategies, student motivation*

## INTRODUCTION

The global educational ecosystem was constantly evolving, shaped by a myriad of factors, from technological advancements to socio-cultural shifts. In this context, understanding and enhancing student motivation has emerged as a key priority for educators and administrators alike. Motivated students were more likely to engage in active learning, develop critical thinking skills, and achieve their full potential. In the dynamic landscape of modern education, the intricate relationship between student motivation and instructional strategies was an area of profound significance. The role of instructional strategies, on the other hand, was instrumental in shaping the learning environment and fostering the conditions necessary for motivation to thrive (Akram, 2019).

From a global perspective, understanding the effectiveness of instructional strategies transcends borders and cultures. As educational paradigms shift towards more inclusive and student-centered approaches worldwide, it becomes crucial to explore the global implications of instructional strategies on student motivation (Rahardjo& Pertiwi, 2020). This study delves into the intricate connection between student motivation and instructional strategies, aiming to shed light on the interplay of these critical factors in the educational realm. The overarching objective was to explore how instructional strategies prac-

tices can be optimized to foster and sustain student motivation, ultimately enhancing learning outcomes and overall educational success.

The study also recognized the importance of adapting instructional strategies to the diverse needs and preferences of students. Recognizing that different students have different motivations and learning styles, instructional leaders must be flexible in their approach. As such, this research considered the nuances of motivation across various age groups, cultures, and socio-economic backgrounds, offering insights into how instructional leaders can tailor their strategies to cater to the unique needs of their students.

The Philippines, a nation with a rich cultural heritage and diverse educational landscape, the study recognized the unique factors influencing instructional strategies and student motivation. The Philippines, like many countries, was grappling with the need to adapt its educational practices to meet the demands of a rapidly changing world (Tipon et al., 2019). By delving into the Philippine context, this research aims to identify instructional strategies that align with the country's educational goals and aspirations, providing a foundation for informed policy decisions and curriculum development. As the nation grapples with the challenges of adapting its educational practices to meet global standards, it becomes essential to delve into the specific Philippine context.

At the heart of this research was a commitment to identifying instructional strategies that resonate with the Philippines' educational goals and aspirations. The study recognized the need for educational practices that were not only globally relevant but also deeply rooted in the Filipino cultural ethos. By exploring how instructional strategies correlate with student motivation in Nasugbu Christian Faith Academy, Inc., the research aims to provide insights that can inform educational policies, curriculum development, and teaching methodologies tailored to the unique needs of Filipino students.

At the local level, Nasugbu Christian Faith Academy, Inc. serves as the microcosm for this study. The unique socio-economic and cultural dynamics of the region may influence the effectiveness of instructional strategies in motivating junior high school students. Understanding the local context was pivotal in tailoring educational interventions that address the specific needs and challenges faced by students. This study not only adds to the academic discourse on instructional strategies but also holds practical implications for educators, administrators, and policymakers, offering evidence-based recommendations to enhance student motivation and overall educational outcomes.

The study acknowledged the multifaceted nature of motivation and instructional strategies, and its relevance extends beyond the confines of academic excellence. The insights gleaned from this research can catalyze a broader transformation in the educational system, transcending the immediate goals of improved academic performance and nurturing well-rounded, self-motivated individuals.

The Philippines, like many nations, grapples with the complexities of adapting its educational system to meet the evolving demands of the 21st century. One of the prominent issues was the persistent struggle to strike a balance between global educational trends and the preservation of the unique cultural identity of the Philippines (Avila & Genio, 2020). As the country endeavors to align its educational practices with global standards, there was a risk of overlooking the rich cultural heritage that defines the Filipino experience. The tension between embracing global educational innovations and maintaining cultural authenticity poses challenges in crafting instructional strategies that resonate with the diverse student population.

Furthermore, the socio-economic disparities prevalent compound the challenges in fostering student motivation. The Philippines, characterized by a mix of urban and rural communities, faces disparities in access to educational resources, quality of infrastructure, and opportunities for academic and extracurricular engagement. In Nasugbu, these disparities become particularly pronounced, affecting the motivation levels of students who may not have equal access to educational tools and experiences that can enrich their learning journey.

In the broader Philippine context, the educational system has been grappling with issues such as overcrowded classrooms, limited resources, and outdated teaching methodologies. These challenges trickle down to Nasugbu, influencing the effectiveness of instructional strategies in motivating students. Overcrowded classrooms, for instance, can hinder personalized attention and tailored instructional approaches, impacting the engagement and motivation of students with varying learning needs and styles.

Moreover, the transition to a K-12 education system in the Philippines has introduced new challenges in curriculum implementation and instructional design. The need to align with international standards while catering to local needs has resulted in a complex educational landscape. Nasugbu, as part of this

evolving system, faces the task of navigating these changes, and understanding how instructional strategies align with the goals of the K-12 system was pivotal for ensuring the success of students.

In Nasugbu specifically, the geographic and cultural diversity poses challenges for educators in designing instructional strategies that were inclusive and effective for all students. The need for cultural sensitivity and relevance in teaching methodologies was heightened in a region with a rich tapestry of traditions and practices (Schönfelder & Bogner, 2020). This necessitates a closer examination of how instructional strategies can be adapted to embrace the cultural diversity in Nasugbu, ensuring that education becomes a bridge that connects students with their heritage rather than a force that alienates them.

The comprehensive study stems from a critical need to address the complex challenges facing the Philippine education system at both national and local levels. The Philippines was undergoing significant educational reforms amidst globalization, and Nasugbu serves as a representative microcosm, presenting unique challenges that require focused investigation. The study was motivated by a recognition of the delicate balance required to integrate global educational trends while preserving the rich cultural identity of the Philippines.

The research aimed to uncover how instructional strategies impact student motivation, where cultural diversity, socio-economic disparities, and the recent shift to a K-12 system pose distinct challenges. Additionally, the study responded to the urgency of addressing issues such as overcrowded classrooms, resource limitations, and the need for cultural relevance in instructional methodologies. By delving into these complexities, the research seeks to offer insights that can inform educational practices, policy decisions, and curriculum development not only in this institution but potentially across the broader Philippine educational landscape, contributing to the ongoing discourse on effective strategies for enhancing student motivation and educational outcomes.

**Statement of the Problem**

The study sought to assess the influence of instructional strategies on the landscape of student motivation in Nasugbu Christian Faith Academy, Inc. Specifically, this study pursues to answer the following questions:

1. What are the instructional strategies of the teachers assessed by the student respondents in terms of:
   1.1 constructivist;
   1.2 collaborative;
   1.3 integrative;
   1.4 deflective; and
   1.5 inquiry based learning?
2. What is the motivation of the student respondents in terms of:
   2.1. extrinsic motivation; and
   2.2 intrinsic motivation?
3. Is there any significant relationship between instructional strategies and student motivation?
4. What plan of action should be proposed to motivate the learning of the students?

## METHODOLOGY

This chapter provides a detailed explanation of the methodology employed in the study. It covers various aspects, such as the research design, data sources, the specific demographic being studied, the validation of research instruments, the process of data collection, ethical considerations, data handling, and the methods employed for data analysis. The research methodology utilized in this research project was expounded upon, starting with the selected research approach, and concluding with the presentation of the research outcomes.

**Research Design**

The research employed descriptive and correlational research methods and incorporated a survey instrument to evaluate how instructional strategies influences student motivation in Nasugbu Christian Faith Academy, Inc.

**Participants**

The primary focus of the research was on high school students currently attending Nasugbu Christian Faith Academy, Inc. Through the application of Raosoft's formula, utilizing 95% confidence level and a 5 % margin of error, the study has accurately calculated an appropriate sample size of 107 students from 250 estimated population of junior high school students in Nasugbu Christian Faith Academy, Inc.

**Research Instrument**

This research employed a researcher-designed questionnaire to examine how instructional strategies correlated with student motivation. The survey plays a crucial role in providing a comprehensive understanding of how instructional strategies can positively influence student motivation within a specific context.

**Data Analysis**

To provide an analysis of the data, the researcher applied the following statistical methodologies. The interpretation of data involved the use of weighted mean, ranking, and Pearson's r.

## RESULTS AND DISCUSSIONS

This chapter shared the presentation and analysis of the data gathered from the questionnaires answered by the respondents.

1. Instructional Strategies of the Teachers Assessed by the Student- Respondents

1.1 In Terms of Constructivist

**Table 1. Instructional Strategies of the Teachers Assessed by the Student-Respondents in Terms of Constructivist**

| Items | Weighted Mean | Interpretation | Rank |
|---|---|---|---|
| 1. I was encouraged to explore concepts independently. | 3.96 | Often | 4 |
| 2. My teachers involved me in discussions to construct my understanding of the subjects. | 4.54 | Always | 1 |
| 3. I was given opportunities to actively participate in hands-on learning activities that contribute to my understanding of the material. | 4.30 | Always | 2 |
| 4. I was supported in exploring alternative viewpoints and interpretations during class discussions. | 4.16 | Often | 3 |
| 5. I was provided the resources and guidance for self-directed learning outside of regular class assignments. | 3.91 | Often | 5 |
| **Composite Mean** | **4.17** | **Often** | |

As presented in Table 1, the student-respondents assessed that their teachers always involved them in discussions to construct their understanding of the subjects with the highest weighted mean of 4.54 and the highest rank of 1. This finding suggested that teachers frequently employ discussion-based approaches to facilitate learning, allowing students to actively participate in the process of knowledge construction.

1.2 In Terms of Collaborative

As reflected in Table 2, the student-respondents perceived that their teachers always implemented group projects to encourage collaboration among students, and teachers always balanced individual and group learning experiences with the highest equal weighted means of 4.53 and the highest ranks of 1.5.

**Table 2. Instructional Strategies of the Teachers Assessed by the Student- Respondents in Terms of Collaborative**

| Items | Weighted Mean | Interpretation | Rank |
|---|---|---|---|
| 1. My teachers implemented group projects to encourage collaboration among students. | 4.53 | Always | 1.5 |
| 2. I was required to work with my peers on assignments or activities during class. | 3.88 | Often | 5 |
| 3. My teacher created an environment that fosters teamwork and cooperative learning. | 4.21 | Always | 3 |
| 4. I was satisfied with the level of group participation and interaction facilitated by my teachers. | 4.17 | Often | 4 |
| 5. My teachers balanced individual and group learning experiences. | 4.53 | Always | 1.5 |
| **Composite Mean** | **4.26** | **Always** | |

1.3. In Terms of Integrative

**Table 3. Instructional Strategies of the Teachers Assessed by the Student-Respondents in Terms of Integrative**

| Items | Weighted Mean | Interpretation | Rank |
|---|---|---|---|
| 1. My lessons integrated various subjects to demonstrate real-life connections. | 4.20 | Always | 5 |
| 2. My teachers emphasized the interdisciplinary nature of the topics to study. | 4.25 | Always | 2 |
| 3. I was satisfied with the incorporation of real-world examples and applications in my lessons. | 4.32 | Always | 1 |
| 4. My teachers connected theoretical concepts to practical, everyday scenarios. | 4.21 | Always | 3.5 |
| 5. My teachers encouraged me to explore the cross-disciplinary aspects of the subjects I was studying. | 4.21 | Always | 3.5 |
| **Composite Mean** | **4.24** | **Always** | |

As revealed in Table 3, the student-respondents replied that they were satisfied with the incorporation of real-world examples and applications in their lessons with the highest weighted mean of 4.32 and the highest rank of 1. This suggested that teachers regularly integrate practical, real-life scenarios and contexts into their teaching, enhancing the relevance and applicability of the subject matter to students' everyday lives.

1.4. In Terms of Deflective

**Table 4. Instructional Strategies of the Teachers Assessed by the Student-Respondents in Terms of Deflective**

| Items | Weighted Mean | Interpretation | Rank |
|---|---|---|---|
| 1. My teachers posed questions that prompt critical thinking and analysis of information. | 4.24 | Always | 4 |
| 2. My teachers encouraged me to challenge conventional ideas and viewpoints. | 4.29 | Always | 2 |
| 3. I was satisfied with the opportunities provided to critically evaluate information and draw conclusions. | 4.25 | Always | 3 |
| 4. My teacher fostered an environment that stimulates reflective thinking. | 4.21 | Always | 5 |
| 5. My teachers supported my development of analytical skills through class activities and assignments. | 4.47 | Always | 1 |
| **Composite Mean** | **4.29** | **Always** | |

As gleaned in Table 4, the student-respondents answered that their teachers supported their development of analytical skills through class activities and assignments with the highest weighted mean of 4.47 and the highest rank of 1. This result suggested that educators consistently design learning experiences that challenge students to think critically, analyze information, and draw meaningful conclusions.

1.5. In Terms of Inquiry-Based Learning

**Table 5. Instructional Strategies of the Teachers Assessed by the Student- Respondents in Terms of Inquiry-Based Learning**

| Items | Weighted Mean | Interpretation | Rank |
|---|---|---|---|
| 1. My teachers engaged me in projects that require independent research and problem-solving. | 4.26 | Always | 3 |
| 2. My teachers provided guidance and resources for conducting independent inquiries. | 4.28 | Always | 2 |
| 3. I was satisfied with the level of autonomy given to explore topics of personal interest within the Curriculum. | 4.20 | Always | 4 |
| 4. My teachers facilitated my ability to develop research and problem-solving skills. | 4.33 | Always | 1 |
| 5. My teachers incorporated inquiry-based approaches to enhance my understanding of the subject matter. | 4.13 | Often | 5 |
| **Composite Mean** | **4.24** | **Always** | |

As gleaned in Table 5, the student-respondents answered that their teachers always facilitated their ability to develop research and problem-solving skills with the highest weighted mean of 4.33 and the

highest rank of 1. The findings suggested that the teachers consistently played a proactive role in guiding students to develop their research and problem-solving skills.

2. Motivation of the Student-Respondents.

2.1 In Terms of Extrinsic Motivation

**Table 6. Motivation of the Student- Respondents in Terms of Extrinsic**

| Items | Weighted Mean | Interpretation | Rank |
|---|---|---|---|
| 1. External recognition, such as praised from teachers or parents, motivated me to excel in school. | 4.43 | Always | 1 |
| 2. I was satisfied with the level of acknowledgment and rewards provided for my academic achievements. | 4.37 | Always | 2 |
| 3. The anticipation of external rewards influenced my effort and performances in class. | 4.11 | Often | 3 |
| 4. Competition with peers drive my motivation to succeed academically. | 4.00 | Often | 4 |
| 5. My teachers incorporated external motivators, such as competitions or recognition ceremonies, to encourage my academic performance. | 3.99 | Often | 5 |
| **Composite Mean** | **4.18** | **Often** | |

As presented in Table 6, the student-respondents replied that external recognition, such as praised from teachers or parents, always motivated them to excel in school which gained the highest weighted mean of 4.43 and the highest rank of 1. This result indicated that the student-respondents consistently felt motivated to excel in school when they received external recognition, such as praise from their teachers or parents.

2.2 In Terms of Intrinsic

**Table 7. Motivation of the Student-Respondents in Terms of Intrinsic**

| Items | Weighted Mean | Interpretation | Rank |
|---|---|---|---|
| 1. I found joy and satisfaction in the process of learning itself, independent of external rewards. | 4.25 | Always | 4 |
| 2. I was driven by personal curiosity when approaching new subjects or topics. | 4.34 | Always | 2 |
| 3. I was satisfied with the opportunities provided for self-directed exploration and learning within the Curriculum. | 4.21 | Always | 5 |
| 4. My desire for self-improvement influenced my engagement in class activities. | 4.35 | Always | 1 |
| 5. My teachers fostered an environment that nurtures my intrinsic motivation to learn and succeed academically. | 4.26 | Always | 3 |
| **Composite Mean** | **4.28** | **Always** | |

As shown in Table 7, the student-respondents agreed that their desire for self-improvement influenced their engagement in class activities which yielded the highest weighted mean of 4.35 and the highest rank of 1. This finding indicated that the student-respondents acknowledged the role of intrinsic motivation in their engagement with class activities.

3. Relationship Between Student Motivation and Instructional Strategies

**Table 8. Relationship Between the Student Motivation and Instructional Strategies**

| Variable | r-value | p-value | Decision | Interpretation |
|---|---|---|---|---|
| **Student Motivation Versus Instructional Strategies** | | | | |
| **Extrinsic Versus:** | | | | |
| Constructivist | 0.45 | 9.10E-7 | Reject Ho | Highly Significant |
| Collaborative | 0.40 | 1.63E-5 | Reject Ho | Highly Significant |
| Integrative | 0.53 | 0.00000 | Reject Ho | Highly Significant |
| Deflective | 0.40 | 1.63E-5 | Reject Ho | Highly Significant |
| Inquiry Based Learning | 0.44 | 1.69E-6 | Reject Ho | Highly Significant |

| | | | | |
|---|---|---|---|---|
| **Intrinsic Versus:** | | | | |
| Constructivist | 0.52 | 1.00E-8 | Reject Ho | Highly Significant |
| Collaborative | 0.53 | 0.00000 | Reject Ho | Highly Significant |
| Integrative | 0.62 | 0.00000 | Reject Ho | Highly Significant |
| Deflective | 0.61 | 0.00000 | Reject Ho | Highly Significant |
| Inquiry Based Learning | 0.67 | 0.00000 | Reject Ho | Highly Significant |

As written in Table 8, when the responses of the student-respondents on their extrinsic motivation were compared to the instructional strategies of their teachers, the computed r-values of 0.45 for constructivist, 0.40 for collaborative, 0.53 for integrative, 0.40 for deflective and 0.44 for inquiry-based learning approaches have corresponding p-values of less than 0.01, thus rejecting the hypothesis.

4. Proposed plan of action to Motivate the Learning of the Students

**Table 9. Proposed Action Plan**

| PROGRAM | OBJECTIVE | TARGET OUTPUT |
|---|---|---|
| **Student-Centered Approach** | Implement constructivist instructional methods to prioritize student engagement and critical thinking skills.<br><br>Foster an environment where students feel empowered to shape their own learning experiences.<br><br>Enhance student understanding by facilitating meaningful interactions and debates on course material. | - Design and implement class activities and assignments that encourage active participation and collaborative learning.<br><br>- Develop students' critical thinking skills through problem-solving tasks and discussions. |
| **Inclusive Learning Environment** | Create inclusive learning environments that cater to diverse learning preferences and promote a sense of belonging among students.<br><br>Foster a supportive classroom culture where all students feel valued and respected. | - Incorporate collaborative instructional strategies into lesson plans to provide opportunities for both individual and group work.<br><br>- Evaluate and adapt instructional strategies to ensure inclusivity and accessibility for all learners. |
| **Integrative Instructional Strategies** | Integrate real-world contexts into the curriculum and promote interdisciplinary learning experiences.<br><br>Encourage interdisciplinary approaches by incorporating elements from multiple subject areas into lesson plans. | - Develop lesson plans that connect theoretical concepts to real-world applications and scenarios.<br><br>- Provide opportunities for students to explore connections between different disciplines and apply their learning in practical contexts. |
| **Deflective Instructional Strategies** | Promote metacognitive development and reflective practice among students.<br><br>Foster a culture of reflection and continuous improvement within the classroom. | - Implement deflective instructional strategies such as journaling, self-assessment, and peer feedback activities.<br><br>- Create opportunities for students to reflect on their learning experiences and identify areas for growth. |
| **Intrinsic Motivation Cultivation** | Cultivate intrinsic motivation among students by providing opportunities for self-directed learning and personal growth.<br><br>Foster a growth mindset by emphasizing the importance of effort and persistence in achieving success. | - Encourage students to pursue personal interests and set goals for their learning journey.<br><br>- Provide opportunities for students to take ownership of their learning by allowing them to choose topics and projects that interest them. |
| **Extrinsic Motivation Utilization** | Utilize extrinsic motivators such as recognition ceremonies and competitions to celebrate students' achievements and reinforce positive behaviors.<br><br>Provide rewards and incentives to recognize and reinforce positive behaviors and achievements. | - Organize recognition ceremonies to publicly acknowledge and celebrate students' academic accomplishments.<br><br>- Evaluate the effectiveness of extrinsic motivators and adjust strategies as needed to maintain student engagement and motivation. |

Based on the results of the study, Table 9 showed the proposed action plan. The action plan entailed a comprehensive approach to enhance instructional practices and student engagement.

## CONCLUSIONS

1. Through an exploration of constructivist instructional methods, it became evident that educators prioritized student-centered approaches, fostering environments where learners actively shaped their educational journey.
2. Moreover, the study underscored the pivotal role of collaborative instructional strategies in creating inclusive learning environments. By seamlessly weaving together individual learning experiences with collaborative endeavors, educators ensured that students received personalized instruction tailored to their unique needs while fostering a sense of belonging and camaraderie within the classroom.
3. In parallel, the study highlighted the efficacy of integrative instructional strategies, which bridged the gap between theoretical knowledge and practical application. By contextualizing learning within real-world scenarios and interdisciplinary frameworks, educators ignited students' curiosity and inspired a deeper engagement with course material. This approach not only cultivated a holistic understanding of subjects but also instilled a sense of relevance and applicability, motivating learners to actively seek out connections beyond the confines of the classroom.
4. Deflective instructional strategies emerged as catalysts for metacognitive development and reflective practice among students. By creating opportunities for introspection and self-assessment, educators empowered learners to refine their thinking processes, identify areas for growth, and chart their own learning trajectories.
5. The study underscored the symbiotic relationship between student motivation and instructional strategies. Extrinsic motivators, such as external recognition and rewards, served as potent drivers of academic performance, bolstering students' self-esteem and fostering a culture of achievement. Conversely, intrinsic motivations rooted in personal goals and aspirations fueled a deeper engagement with learning, fostering a genuine passion for knowledge acquisition and self-discovery.
6. The weakest aspect of the study was the absence of specific empirical data or quantitative analysis to substantiate claims regarding the efficacy of instructional strategies on student motivation in Nasugbu, Batangas.

## RECOMMENDATIONS

To enhance instructional practices and promote student engagement and learning, several recommendations emerge from the conclusion drawn in the study.

1. Educators should continue to prioritize student-centered approaches, such as constructivist methods, wherein students actively participate in discussions and shape their learning experiences. Activities fostering collaboration, critical thinking, and problem-solving should be designed to empower students.
2. The Department of Education (DepEd) must mandate educational institutions to prioritize creating inclusive learning environments which was crucial. Integrating collaborative instructional strategies that offer both individual and group work opportunities caters to diverse learning preferences and fosters a sense of belonging among students.
3. Educators should incorporate integrative instructional strategies that connect theoretical concepts to real-world applications, promoting curiosity and relevance. Encouraging interdisciplinary approaches contextualizes learning, enhancing students' understanding.
4. Deflective instructional strategies promoting metacognitive development and reflective practice should be encouraged. Activities like journaling and self-assessment refine students' thinking processes and improve learning outcomes.
5. Regularly evaluating the effectiveness of instructional strategies through student feedback, assessments, and observations ensures adaptability to meet evolving student needs.

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# EFFECTS OF SOCIAL MEDIA TO THE SOCIAL BEHAVIOR IN THE DIGITAL AGE

**Jelyn S. Cahinhinan**
Lipa City Colleges
Lipa City, Batangas

**ABSTRACT**

**This study presents the effect of social media to the social behavior in the digital age. To serve the purpose of the study it will make use of the descriptive type of research involving survey questionnaire as the main instrument. It is believed that this type of research will help the researcher to describe, analyze, and interpret conditions that are real. From the results that will be established by the study, the research will develop an enhancement program relative the responsible use of social media which will also improve the social behavior of the respondents.**

## INTRODUCTION

Growing data points to social media's impacts on young people, especially considering that adolescence is a crucial stage of development. Teenagers' continued usage of social media has sparked worries about the psychological effects of the platform.

Social media has significantly lowered barriers between users and audiences in various ways, with potentially significant ramifications. Nowadays, almost all teenagers have an account on at least one social networking site. They communicate with friends, exchange stories, and introduce themselves to the public via social media. Social media sites like Twitter, Facebook, Instagram, Snapchat, and Facebook have revolutionized communication, self-expression, and information access, but they also come with concerns including the possibility of addiction, cyberbullying, and social comparison. It is projected that 4.9 billion individuals would use social media globally in 2023(Weir, 2023). For teenagers who have grown up with technology, those online communities are an integral part of who they are.

Numerous studies on the effects of social media have revealed that prolonged use of platforms like Facebook may be linked to negative emotions and signs of stress, anxiety, and depression. To effectively address the psychological effects of social media on teenagers, it's critical to comprehend how these platforms weigh both advantages and disadvantages. Understanding the complex relationships between using the internet and mental health is crucial for creating strategies that promote responsible usage and lessen any detrimental consequences on the well-being of teenagers.

Therefore, the purpose of this study is to learn more about how social media affects teens socially. This research aims to add to a thorough understanding of how social media platforms affect teens' social behavior in the current digital era by examining previous studies and the various effects of social media usage.

It is in the light of the foregoing study that the researchers would like to determine the effects of social media to the social behavior of the respondents in Tuy Senior High School. The researcher believes that the students from the mentioned school experience the various effects of social media towards their social behavior.

### Statement of the Problem

This study determined the effects of social media towards the social behavior of the respondents from Tuy Senior High School.

Specifically, it sought to answer the following questions:

1. What is the demographic profile of the respondents in terms of:
   1.1. age;
   1.2. sex;

1.3. social media platform commonly used; and
1.4. time spent in using social media

2. What is the social behavior of the respondents towards social media in terms of:
2.1. social media usage;
2.2. social capital;
2.3. social isolation; and
2.4. cyberbullying?

3. Is there a significant relationship between the profile of the respondents and their perceptions on the effects of social media towards social behavior?

4. What Enhancement Program can be suggested to further help the respondents towards the use of social media?

## METHODOLOGY

The methodology employed in this research journey was expounded, covering the research strategy chosen to execute the study, extending through the dissemination of results.

### Research Design

The researcher utilized quantitative methodology in research. The main goal of quantitative research was to use statistical analysis to study and portray the relationship between variables. The descriptive-survey method was utilized in this study because it served the purpose of the study.

### Participants of the Study

The participants of the study were the selected students from Tuy Senior High School, Tuy, Batangas. Definitely those who were aging from 15 years old to 18 years old and above. The researcher believed that they were the target samples of the study and gave great of help to answer the questions of the study. Respondents were selected through purposive quota - sampling.

### Research Instrument

In this study, a modified research questionnaire was used and modified through research. It contained two parts, the profile of the respondents and the items which measured the perceptions on the effects of social media on the social behavior of the teenagers.

### Data Analysis

To process the gathered data, the researcher used the following statistical tools:

1. frequency counting and the percentage distribution;
2. Weighted mean and ranking;
3. Pearson's r; and,
4. t-test.

## RESULTS AND DISCUSSION

This chapter shows the presentation of the data gathered from the questionnaires answered by the respondents. Such presentation is in accordance with the specific questions posited on the objectives of the study.

### 1. Profile of the Respondents

**Table 1. Profile of the Respondents**

| Variables | Frequency | Percentage | Rank |
|---|---|---|---|
| **Age:** | | | |
| 15 - 17 years old | 77 | 70.00 | 1 |
| 18 years old and above | 33 | 30.00 | 2 |
| **Total** | **110** | **100** | |

| | | | |
|---|---|---|---|
| **Sex:** | | | |
| Male | 51 | 46.36 | 2 |
| Female | 59 | 53.64 | 1 |
| **Total** | **110** | **100** | |
| **Social Media Platform Commonly Used:** | | | |
| Facebook | 33 | 30.00 | 1 |
| Instagram | 2 | 1.82 | 9.5 |
| Tiktok | 6 | 5.45 | 5 |
| Others | 1 | 0.91 | 12 |
| Facebook, Instagram | 12 | 10.91 | 4 |
| Facebook, Tiktok | 27 | 24.55 | 2 |
| Facebook, Others | 3 | 3.73 | 7.5 |
| Facebook, Instagram, Tiktok | 14 | 12.73 | 3 |
| Facebook, Tiktok, Twitter | 1 | 0.91 | 12 |
| Facebook, Tiktok, Others | 2 | 1.82 | 9.5 |
| Facebook, Instagram, Tiktok, Twitter | 3 | 2.73 | 7.5 |
| Facebook, Instagram, Tiktok, others | 5 | 4.55 | 6 |
| Facebook, Instagram, Tiktok,Twitter, others | 1 | 0.91 | 12 |
| **Total** | **110** | **100** | |
| **Time Spent in Using Social Media :** | | | |
| 1 - 2 hours | 26 | 23.64 | 3 |
| 3 - 4 hours | 34 | 30.91 | 1.5 |
| 5 - 6 hours | 34 | 30.91 | 1.5 |
| 7 hours and above | 16 | 14.55 | 4 |
| **Total** | **110** | **100** | |

As stated in Table 1, out of 110 total-respondents, 77 of them or 70% at rank 1 came from the age range of 15 - 17 years old while 33 or 30.00% at rank 2 were from the age range of 18 years old and above.

For the respondents' sexes, 59 or 53.64% at rank 1 were female seated at rank 1 while 51 or 46.36% at rank 2 were male.

In terms of the respondents' social media platform commonly used, facebook got the highest frequency count of 33 or 30% at rank 1. Meanwhile, facebook tiktok and twitter as well as Facebook, Instagram, Tiktok,Twitter, others made equal frequency counts of one or 0.91% at ranks 12.

With respect to the time spent by the respondents' in using social media, 3 - 4 and 5 - 6 hours gained the highest equal frequency counts of 34 or 30.91% at ranks 1.5 whereas 7 hours and above made the least frequency count of 16 or 14.55% at rank 4.

## 2. Perception of the Respondents on the Effects of Social Media Towards their Social Behavior.

### 2.1 In Terms of Social Media Usage.

**Table 2. Perception of the Respondents on the Effects of Social Media towards their Social Behavior in Terms of Social Media Use**

| Items | Weighted Mean | Interpretation | Rank |
|---|---|---|---|
| 1.Social media is part of my everyday activity. | 3.36 | Strongly Agree | 1 |
| 2.Social media has become part of my daily routine. | 3.27 | Strongly Agree | 2 |
| 3.I feel out of touch when I have not logged onto social media for a while. | 2.71 | Agree | 6 |
| 4.I feel sorry if social media shutdown. | 2.83 | Agree | 5 |
| When I encounter difficulty, I focus on my set goals using social media. | 2.84 | Agree | 4 |
| 6.I use social media to share new idea. | 3.05 | Agree | 3 |
| **Composite Mean** | **3.01** | **Agree** | |

As presented in Table 2, the respondents strongly agreed that social media is part of their everyday activity with the highest weighted mean of 3.36 and the highest rank of 1. The popularity of social media keeps increasing, especially among young adults and teenagers. Information and knowledge exchange, collaboration, and communication are the pillars of social media. Simultaneously, social media's ascent is linked to its assimilation into the activities of daily existence. Many may be acquainted with reaching for their smartphones first thing in the morning to check the newest social media posts, checking in periodically during the day, and then clicking and scrolling until they fall asleep. This is one example of how social media becomes a part of an individual's everyday activity.

## 2.2 In Terms of Social Capital

**Table 3. Perception of the Respondents on the Effects of Social Media Towards their Social Behavior in Social Capital**

| Items | Weighted Mean | Interpretation | Rank |
|---|---|---|---|
| Through the use of social media… | | | |
| 1.it is easy for me to hear about the latest news and trends. | 3.49 | Strongly agree | 1 |
| 2.Interacting with people makes me curious about things and places outside of my daily life. | 3.23 | Agree | 6 |
| 3.I am willing to spend time to support school activities | 3.27 | Strongly agree | 5 |
| 4.I interact with people who are quite different from me. | 2.92 | Agree | 8 |
| 5.I am interested in what goes on in my community. | 3.06 | Agree | 7 |
| 6.My community is a good place to be. | 3.32 | Strongly agree | 4 |
| 7.Interacting with people makes me want to try new things. | 3.37 | Strongly agree | 3 |
| 8.Interacting with people makes me feel like part of a larger community. | 3.43 | Strongly agree | 2 |
| **Composite Mean** | **3.26** | **Strongly agree** | |

As revealed in Table 3, the respondents strongly agreed that through the use of social media, it is easy for them to hear about the latest news and trends which got the highest weighted mean of 3.49 and the highest rank of 1. Social media influences news delivery and the way people discuss politics and trends, among other facets of society.

## 2.3. In Terms of Social Isolation

**Table 4. Perception of the Respondents on the Effects of Social Media Towards their Social Behavior In Terms of Social Isolation**

| Items | Weighted Mean | Interpretation | Rank |
|---|---|---|---|
| Without social media… | | | |
| 1.I feel empty because I do not have anyone to play/communicate with. | 3.05 | Agree | 1 |
| 2.I feel alone and separated from people. | 2.64 | Agree | 3 |
| 3.I have no one I can trust | 2.32 | Disagree | 7 |
| 4. I lack means of socializing with people. | 2.55 | Agree | 4 |
| 5.I feel restless or irritable especially when somebody wants to be friend with me. | 2.44 | Disagree | 6 |
| 6.I feel irritable. | 2.53 | Agree | 5 |
| 7.I feel lonely especially when I need a company to talk with. | 2.67 | Agree | 2 |
| **Composite Mean** | **2.60** | **Agree** | |

As displayed in Table 4, the respondents agreed that without social media, they feel empty because they do not have anyone to play/communicate with which made the highest weighted mean of 3.05 and the highest rank of 1. The everyday activities now revolve on social media. It is simpler to communicate with people now that social media is available.

## 2.4. In Terms of Cyberbullying

**Table 5. Perception of the Respondents on the Effects of Social Media Towards their Social Behavior in Terms of Cyberbullying**

| Items | Weighted Mean | Interpretation | Rank |
|---|---|---|---|
| 1.Social media is prone to students cyberbullying. | 3.28 | Strongly Agree | 1 |
| 2.Social media affects the academic performances of students who are victims of cyberbullying. | 3.26 | Strongly Agree | 2 |
| 3. Harassment in the social media is rampant to students | 3.18 | Agree | 3 |
| 4.I am thinking to stop using electronic gadgets to avoid bullying. | 2.73 | Agree | 7 |
| 5.The nasty messages creates unpleasant feeling to students. | 3.09 | Agree | 5.5 |
| 6.The rumors circulating online create feelings of anxiousness | 3.15 | Agree | 4 |
| 7.I feel annoyed when somebody steals my posts, pictures and others in a social media. | 3.09 | Agree | 5.5 |
| **Composite Mean** | **3.11** | **Agree** | |

As gleaned in Table 5, the respondents strongly agreed that social media is prone to students' cyberbullying with the highest weighted mean of 3.28 and the highest rank of 1. One major public health concern that might raise the risk of mental health problems is cyberbullying. Numerous behaviors can be considered kinds of cyberbullying, such as distributing false information, misrepresenting oneself online, harassing or discriminating against others, spreading personal insults, social exclusion, and cyberstalking.

### 3. Social Behavior of the Respondents Towards Social Media

**Table 6. Social Behavior of the Respondents Towards Social Media**

| Items | Weighted Mean | Interpretation | Rank |
|---|---|---|---|
| **Social media influences the students to…** | | | |
| 1.play online games instead of studying | 2.29 | Disagree | 3 |
| 2.have lack of attention towards school activities | 2.45 | Disagree | 1 |
| 3.engage in cheating or any malpractice in school | 2.16 | Disagree | 5 |
| 4.exhibit aggressive behavior | 2.13 | Disagree | 8 |
| 5.involve in any cyberbullying cases. | 2.14 | Disagree | 7 |
| 6.disobey school rules and regulations | 2.15 | Disagree | 6 |
| 7.move with bad peers | 2.18 | Disagree | 4 |
| 8.become addicted in social media games | 2.33 | Disagree | 2 |
| 9.engage in fraud or any illegal acts | 2.12 | Disagree | 9 |
| 10. make false statements | 2.06 | Disagree | 10 |
| **Composite Mean** | **2.20** | **Disagree** | |

As stated in Table 6, the respondents disagreed that social media influences the students tohave lack of attention towards school activities which got the highest weighted mean of 2.45 and the highest rank of 1. Based from the respondents, social media usage and school-related stuff found to be not connected to each other.

### 4. Relationship between the Variables of the Study

#### 4.1. Social Behavior and Effects of Social Media.

**Table 7.1 Relationship Between the Social Behavior and Effects of Social Media**

| Variable | r-value | p-value | Decision | Interpretation |
|---|---|---|---|---|
| **Social Behavior and Effects of Social Media** | | | | |
| Social Media Use | 0.13 | 0.17586 | Failed to Reject Ho | Not Significant |
| Social Capital | 0.20 | 0.03618 | Reject Ho | Significant |
| Social Isolation | 0.07 | 0.46743 | Failed to Reject Ho | Not Significant |
| Cyberbullying | 0.23 | 0.01564 | Reject Ho | Significant |

As written in Table, when the responses of the respondents on their social behavior were compared to the effects of social media, the computed r-values of 0.20 for social capital and 0.23 for cyberbullying have corresponding p-values of less than 0.05, thus rejecting the hypothesis. On the other hand, the computed r-values of 0.13 for social media use and 0.07 for social isolation have corresponding p-values of more than 0.05, thus failing to reject the hypothesis.

#### 4.2.In Terms of Profile of the Respondents and their Social Behavior and Effects of Social Media.

**Table 7.2 Relationship between the Profile of the Respondents and their Social Behavior and Effects of Social Media**

| Variable | r-value | p-value | Decision | Interpretation |
|---|---|---|---|---|
| **Profile Versus Social Behavior and Effects of Social Media** | | | | |
| **Age:** | | | | |
| Social Media Use | 0.22 | 0.02092 | Reject Ho | Significant |
| Social Capital | 0.13 | 0.17586 | Failed to Reject Ho | Not Significant |
| Social Isolation | 0.03 | 0.75571 | Failed to Reject Ho | Not Significant |

| | | | | |
|---|---|---|---|---|
| Cyberbullying | 0.20 | 0.03618 | Reject Ho | Significant |
| Social Behavior | 0.01 | 0.91742 | Failed to Reject Ho | Not Significant |
| **Sex:** | | | | |
| Social Media Use | 0.10 | 0.29860 | Failed to Reject Ho | Not Significant |
| Social Capital | 0.10 | 0.29860 | Failed to Reject Ho | Not Significant |
| Social Isolation | 0.01 | 0.91742 | Failed to Reject Ho | Not Significant |
| Cyberbullying | 0.11 | 0.25263 | Failed to Reject Ho | Not Significant |
| Social Behavior | 0.04 | 0.67822 | Failed to Reject Ho | Not Significant |
| **Social Media Platform Commonly Used:** | | | | |
| Social Media Use | 0.03 | 0.75571 | Failed to Reject Ho | Not Significant |
| Social Capital | 0.01 | 0.91742 | Failed to Reject Ho | Not Significant |
| Social Isolation | 0.19 | 0.04680 | Reject Ho | Significant |
| Cyberbullying | 0.24 | 0.01156 | Reject Ho | Significant |
| Social Behavior | 0.14 | 0.14463 | Failed to Reject Ho | Not Significant |
| **Time Spent in Using Social Media:** | | | | |
| Social Media Use | 0.24 | 0.01156 | Reject Ho | Significant |
| Social Capital | 0.07 | 0.46743 | Failed to Reject Ho | Not Significant |
| Social Isolation | 0.06 | 0.53351 | Failed to Reject Ho | Not Significant |
| Cyberbullying | 0.03 | 0.75571 | Failed to Reject Ho | Not Significant |
| Social Behavior | 0.05 | 0.60394 | Failed to Reject Ho | Not Significant |

As gleaned in Table 7.2, when the responses of the respondents on the effects of social media and social behavior were compared based on their ages, the computed r-values of 0.22 for social media use, and 0.20 for cyberbullying have corresponding p-values of less than 0.05, thus rejecting the hypothesis. On the contrary, the computed r-values of 0.13 for for social capital, 0.03 for social isolation, and 0.01 for social behavior have corresponding p-values of more than 0.05, thus failing to reject the hypothesis.

**5. What Enhancement Program can be suggested to further help the teenagers towards the use of social media?**

| Suggested/enhancement intervention program | Objective/s | Expected outcome |
|---|---|---|
| Intensive Teacher Professional Development Program that Focus on the 21st Century Instruction | To help the educators integrate critical thinking and communication in the different learning areas and instruction. | Different Instructional Materials (Modules, Books, etc.) focused on the 21st Century Instruction |
| Build capacity | To create an environment of differentiated professional learning, risk taking, and collaborative relationships among faculty and administrators. | Team Building Activities that enhances the 21st Century Characteristics of an Educators |
| Engage the college of education for 21st century skills leadership training | To develop faculty members for the leadership of state colleges of education that addresses 21st century skills. | Faculty and College of Education Development Plan that address the needs of the 21st Century Education |
| Seminars and Trainings on the Integration of 21st century skills into teaching standards | To develop the skills on how to integrate 21st century skills into teaching standards to ensure that teachers are able to teach and assess critical thinking and problem solving skills. | Course Syllabi aligned to the 21st Century Education |
| Invest in ICT (information communications technologies) | To equip the teachers in the skills on how to use and integrate ICT in the classroom. | State of the Art ICT Facilities for faculty and students |

Social media recommendations (https://www.apa.org/monitor/2023/09/protecting-teens-on-social-media?fbclid=IwAR1bnSYeXMZEZteRnuLkg_oKcncYVsaz2IJe5nRjR9tJBLkC_7Qw7tMxED)

APA's Health Advisory on Social Media Use in Adolescence makes these recommendations based on the scientific evidence to date:

1. Youth using social media should be encouraged to use functions that create opportunities for social support, online companionship, and emotional intimacy that can promote healthy socialization.
2. Social media use, functionality, and permissions/consenting should be tailored to youths' developmental capabilities; designs created for adults may not be appropriate for children.
3. In early adolescence (i.e., typically 10–14 years), adult monitoring (i.e., ongoing review, discussion, and coaching around social media content) is advised for most youths' social media use; autonomy

may increase gradually as kids age and if they gain digital literacy skills. However, monitoring should be balanced with youths' appropriate needs for privacy.

4. To reduce the risks of psychological harm, adolescents' exposure to content on social media that depicts illegal or psychologically maladaptive behavior, including content that instructs or encourages youth to engage in health-risk behaviors, such as self-harm (e.g., cutting, suicide), harm to others, or those that encourage eating-disordered behavior (e.g., restrictive eating, purging, excessive exercise) should be minimized, reported, and removed; moreover, technology should not drive users to this content.
5. To minimize psychological harm, adolescents' exposure to "cyberhate" including online discrimination, prejudice, hate, or cyberbullying especially directed toward a marginalized group (e.g., racial, ethnic, gender, sexual, religious, ability status), or toward an individual because of their identity or allyship with a marginalized group should be minimized.
6. Adolescents should be routinely screened for signs of "problematic social media use" that can impair their ability to engage in daily roles and routines, and may present risk for more serious psychological harms over time.
7. The use of social media should be limited so as to not interfere with adolescents' sleep and physical activity.
8. Adolescents should limit use of social media for social comparison, particularly around beauty- or appearance-related content.
9. Adolescents' social media use should be preceded by training in social media literacy to ensure that users have developed psychologically-informed competencies and skills that will maximize the chances for balanced, safe, and meaningful social media use.
10. Substantial resources should be provided for continued scientific examination of the positive and negative effects of social media on adolescent development.

**ENHANCEMENT PROGRAM IN RESPONSIBLE USE OF SOCIAL MEDIA FOR TEENAGERS**

| Enhancement Plan Item | SMART GOALS | Output | Action Steps | Time Period | Monitoring System | Person-in-Charge | Budget Source | Remarks |
|---|---|---|---|---|---|---|---|---|
| 1. **Orientation on the use of Social Media**<br><br>**(Classroom-based)** | • Familiarize on the use of social media. | Well – oriented/informed students | a. Attend the orientation to be conducted by the Guidance Counselor or Officer Designate.<br>b. Materials will also be provided for more dissemination of information | First Quarter of the School Year | ✓ Persons involved will use checklist as an instrument to measure the different updates on the orientation and dissemination of information.<br>✓ Updated check – up of the monitoring tool and other assigned personnel.<br>✓ Attendance | Guidance Officer or Designate<br>Class Adviser<br>School Principal | EsP Fund/ Canteen Fund | |
| 2. **Symposium on The Gender Role on Using Social Media Platforms (Classroom-based)** | • Determine the specific roles in using the social media in terms of gender. | Identified Roles on Using Social Media Platforms | a. Join the symposium to be conducted by the Guidance Counselor or Officer Designate.<br>b. Materials will also be provided for more dissemination of information | Second Quarter of the School Year | ✓ Checklist<br>✓ Attendance<br>✓ Reflection paper from the participants | Guidance Officer or Designate<br>Class Adviser<br>School Principal | EsP Fund/ Canteen Fund | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 3. **Campaign Responsible Use of Social Media and Related Factors** | • Inform the participants on the responsible usage of social media and other related factors. | Well – informed students | a. Actively participate on the campaign about the responsible use of social media platforms by the Guidance Counselor or Officer Designate.<br>b. Materials will also be provided for more dissemination of information | Whole Year round activity | ✓ Checklist<br>✓ Attendance<br>✓ Feedbacks from the participant | Guidance Officer or Designate Class Adviser School Principal | EsP Fund/ Canteen Fund | |
| 4. **Counselling Session for Students with Problems in Social Behavior** | • Counsel the students who are in need of guidance and some sort of comfort | Consoled Students | a. Identify the students who experience related problems.<br>b. Endorse to the Guidance Officer<br>c. Undergo the Counselling session<br>d. Attend follow – ups for better results | Whole Year round activity | ✓ Observation form<br>✓ Counselling Form<br>✓ Feedback form | Guidance Officer or Designate Class Adviser Subject teacher School Principal | EsP Fund/ Canteen Fund | |
| 5. **Understanding Social Isolation** | Comfort and inform the students who are in need of guidance and some sort of comfort about social isolation | Consoled and informed Students | a. Remind the students about the advantage and disadvantage of social isolation.<br>b. Inform the students of the pros and cons.<br>c. Identify the students who met some problems about social isolation<br>d. Endorse to the Guidance Counselor.<br>e. Encourage to undergo counselling if possible<br>f. Monitor the counselling | Whole Year round activity | ✓ Observation form<br>✓ Counselling Form<br>✓ Feedback form | Guidance Officer or Designate Class Adviser Subject teacher School Principal | EsP Fund/ Canteen Fund | |
| 6. **Overcoming and Facing Cyberbullying** | Comfort and inform the students who are in need of guidance and some sort of comfort about social isolation | Strong and independent Students | a. Recap to the students about the effects cyberbullying<br>b. Inform the students of the pros and cons of cyberbullying.<br>c. Identify the students who met some problems about cyberbullying<br>d. Endorse to the Guidance Counselor.<br>e. Encourage to undergo counselling if possible<br>f. Monitor the counselling | Whole Year round activity | ✓ Observation form<br>✓ Counselling Form<br>✓ Feedback form | Guidance Officer or Designate Class Adviser Subject teacher School Principal | EsP Fund/ Canteen Fund | |

**Prepared by:**

**JELYN S. CAHINHINAN**

## CONCLUSIONS

After interpreting and statistically analyzed the results, the following conclusions are drawn:

1. The result indicated that social media plays a significant role in the daily lives of the respondents. This study demonstrates that the respondents are amenable on the use of social media and making them as part of their lives towards their social behavior.

2. The study participants reported that social media appears to fulfill an important social need for these respondents.

3. The prevailing sentiment among the respondents was that social media does not significantly influence students' attention in school activities. The result suggests it was the most endorsed response. It's important to note that this finding might be unexpected, and further research might be needed to understand this specific group of respondents.

4. The study found that social media use has a weak or negligible relationship with social isolation and students' perceived effects of social media. This means that the respondents' social media use doesn't necessarily predict their feelings of isolation or their overall perception of social media's impact.

5. Overall, the study highlights that factors like age and the chosen social media platform might influence how people experience social media's impact, particularly regarding social media use, cyberbullying, and social isolation. However, gender and social behavior in general seem to have less influence on these perceptions.

## RECOMMENDATIONS

Based on the findings of the study, here are the recommendations which are hereby advanced by the researcher:

1. Discover the optimistic facets of social media use: The study recommends social media fulfills a social need for many respondents. Further research could explore how social media raises positive social connections and community building, especially among those who might feel isolated otherwise.

2. Consider the link between social capital and cyberbullying: The positive correlation between social capital and cyberbullying is interesting. Future studies could delve deeper into this association. Why are students with stronger social connections online also more likely to experience cyberbullying? Are they targeted more or simply more aware of it?

3. Understand the unexpected finding on attention in school activities: The study found that respondents disagreed that social media significantly impacts attention in school activities. This is an unexpected result and warrants further investigation. Perhaps the study could be replicated with a larger sample or with a focus on specific academic contexts where social media use might be more distracting.

4. Examine the influence of age and social media platform: The age and social media platform seem to influence how people experience social media. Future research could explore these factors in more detail. How do experiences on different platforms vary for different age groups? Are there specific platforms that pose a higher risk of cyberbullying or social isolation for certain age groups?

5. Longitudinal studies on social media habits: This study provides a snapshot of social media use at a particular point in time. Longitudinal studies that track participants over time could provide valuable insights into how social media habits and perceptions change as people mature and their online behavior evolves.

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# LEVEL OF PROFICIENCY AND CULTURAL AWARENESS IN PUBLIC HIGH SCHOOL LANGUAGE LEARNING IN MABINI DISTRICT

**Joanne May B. Dalisay**
Lipa City Colleges
Lipa City, Batangas

**ABSTRACT**

**This study delves into the intricacies of language education in public high schools, focusing on proficiency levels and cultural awareness among Grade 7 students in Mabini, Batangas. Employing a robust methodology, the research uses a reliable self-made questionnaire and a statistically sound sample size of 171 students selected through simple random sampling. Noteworthy findings indicate strong student-teacher support in bilingual education, high cultural awareness, and the effectiveness of language programs in enhancing proficiency, grammar skills, and practical language applications. Correlation analyses challenge conventional assumptions, revealing a significant relationship (r = 0.70) between bilingual proficiency and cultural awareness. Correlations with the utilization of bilingual education in language learning, including language proficiency (r = 0.57), grammar (r = 0.67), and application of language skills (r = 0.60), all lead to the rejection of respective hypotheses. These challenges preconceived notions, urging further exploration of the intricate relationships between language proficiency, cultural awareness, and pedagogical strategies. In conclusion, the study unfolded a nuanced understanding of language education dynamics, emphasizing the pivotal role of teachers, effective language programs, and practical applications in shaping a holistic language learning experience. The rejection of certain hypotheses calls for deeper exploration and underscores the need for ongoing research, interventions, and enhancements in language education programs within public high schools. As the educational landscape evolves, this study provides valuable insights, opening avenues for continued improvement and development in language education practices.**

*Keywords: proficiency, cultural awareness, language learning, public high school*

## INTRODUCTION

In the tapestry of global education, language learning in public high schools stands as a pivotal domain, intricately interwoven with cultural, social, and educational dimensions.

The global landscape of language education has undergone a paradigm shift, driven by the forces of globalization and technological advancement. In an interconnected world, language proficiency was no longer merely advantageous but has become imperative for academic, professional, and personal success (Fox et al., 2019). The ability to communicate effectively across linguistic and cultural boundaries was a requisite skill, highlighting the need for language education that transcends traditional notions of linguistic competence. Beyond grammar and vocabulary, a holistic approach must integrate cultural awareness to equip students with the tools to navigate the complexities of a globalized society (Onishchuk et al., 2020).

Turning focus to the Philippine context, the nation faces a distinctive set of challenges in the realm of language education. The Philippines was characterized by linguistic diversity, boasting a multitude of languages and dialects. The two official languages, English and Filipino, serve as mediums of instruction in schools. However, the proficiency levels in these languages vary across regions, reflecting historical, socio-economic, and geographic factors. The enduring legacy of colonialism has left an indelible mark on the education system, influencing language policies, and shaping the dynamics of language learning.

Within this complex linguistic landscape, the study aimed to dissect the impact of historical legacies on language proficiency and cultural awareness in public high schools within Mabini District. The colo-

nial imprint on language education policies and practices continues to influence the experiences of students, educators, and communities Quinones Jr & Mayrena, 2020). Unraveling these historical threads was essential to understand the present challenges and opportunities faced by language learners in Mabini District.

At the local level, Mabini District emerges as a microcosm, encapsulating the rich diversity and unique challenges present in the broader Philippine context. Nestled in a region marked by linguistic plurality, Mabini District was a vibrant tapestry of cultures and languages. The effectiveness of language education here was intricately tied to the local socio-cultural fabric, presenting both challenges and opportunities that require tailored interventions. Understanding the local nuances was paramount for crafting educational strategies that resonate with the cultural diversity of Mabini District, fostering a more inclusive and effective learning environment.

One of the primary challenges that this study sought to address was the pervasive disparity in language proficiency levels among students. The roots of this inequity extend beyond the classroom, often intertwined with socio-economic factors. While some students may have the privilege of exposure to multiple languages at home, others may face linguistic barriers due to limited resources. This disparity can create an uneven playing field in classrooms, hindering effective communication and impeding academic progress (Romero et al., 2023). By addressing this issue head-on, the research aims to contribute to the development of targeted interventions that bridge the linguistic gap among students, fostering a more equitable and inclusive learning environment.

Furthermore, the study aimed to assess the integration of cultural awareness into language education. Language learning was not a vacuumed process; it was inseparable from the cultural contexts that shape communication. Culturally responsive teaching was critical in fostering not only language skills but also an appreciation for diversity and a sense of belonging among students. Understanding the cultural backgrounds of students can enhance the effectiveness of language education, making it more relevant and engaging (Alzeebaree & Zebari, 2021). The research endeavored to evaluate the current state of cultural awareness within language education in Mabini District and propose strategies to strengthen its incorporation into the curriculum.

In addition, the study acknowledged the influence of evolving educational policies and methodologies on language learning. The advent of technology and innovative pedagogical approaches has reshaped the landscape of education globally. Integrating these advancements into language education can enhance the overall learning experience for students. However, it was crucial to assess the feasibility and effectiveness of these strategies within the specific socio-cultural context of Mabini District. The study aimed to explore the extent to which technology and modern pedagogical methods were integrated into language education, identifying areas for improvement and potential challenges.

This study stemmed from the critical need to address the multifaceted challenges within the realm of language education. In an era of globalization, where effective communication across linguistic and cultural boundaries was essential, understanding the nuances of language learning becomes paramount. By examining language proficiency and cultural awareness at the global, Philippine, and local levels, the researcher aimed to identify and comprehend the intricacies that shape the educational landscape.

This research was motivated by a commitment to equitable education, recognizing the disparities in language proficiency among students and the impact of historical legacies on language policies. Mabini District serves as a microcosm, offering insights into localized challenges influenced by linguistic diversity and cultural richness. The study pursued to provide actionable recommendations for educators, policymakers, and stakeholders to enhance language education practices, fostering a more inclusive and effective learning environment. Ultimately, this research was grounded in the belief that a holistic approach to language education, encompassing both proficiency and cultural awareness, was instrumental in preparing students to navigate a globalized world with competence and cultural sensitivity.

**Statement of the Problem**

The study aimed to determine the level of proficiency and cultural awareness in the context of public high school language learning in selected high schools in Mabini, Batangas. Specifically, this study pursued to answer the following questions:

1. What was the level of proficiency of the respondents in bilingual education?
2. What was the level of cultural awareness of the respondents?

3. What was the level of utilization of bilingual education in language learning of the respondents in terms of:
   3.1 language use;
   3.2 grammar; and
   3.3 Application of language skills?
4. was there any significant relationship between:
   4.1 level of proficiency and level of cultural awareness;
   4.2 level of proficiency and level of utilization of bilingual education; and
   4.3 level of cultural awareness and level of utilization of bilingual education
5. What intervention program should be proposed to enhance language learning through bilingual education?

## METHODOLOGY

The research methodology implemented in this research project was elaborated upon, beginning with the chosen research approach and continuing through to the presentation of the research findings.

### Research Design

The study employed descriptive and correlational research methods, integrating a survey instrument to evaluate the influence of proficiency and cultural awareness on high school language learning in selected high schools in Mabini, Batangas.

### Participants

The study centered its interest on Grade 7 public high school students currently enrolled in selected institutions in Mabini, Batangas. Through the application of Raosoft's formula, with a confidence level of 95% and 5% margin of error, the research has successfully determined an appropriate sample size of 171 students from the estimated population of 555 Grade 7 students in Mabini, Batangas.

### Research Instrument

In this study, a self-made questionnaire furnished by the researcher was used to gauge the level of proficiency and cultural awareness on public high school language learning. This survey plays a crucial role in providing a comprehensive insight into how proficiency and cultural awareness can have a positive influence on high school language learning in a specific context.

### Data Analysis

To provide an analysis of the data, the researcher applied the following statistical methodologies. The interpretation of data involved the use of the weighted mean, ranking, and Pearson's r.

## RESULTS AND DISCUSSIONS

This part of the study showed the presentation, analysis, and interpretation of the gathered data from the questionnaires answered by the respondents. Such presentation was in accordance with the specific questions posited on the objectives of the study.

### 1. Level of Bilingual Education Proficiency

**Table 1. Level of Bilingual Education Proficiency of the Respondents**

| Items | Weighted Mean | Interpretation | Rank |
|---|---|---|---|
| 1. I feel confident in my proficiency in languages covered by our bilingual education programs. | 3.59 | Often | 10 |
| 2. The instructional methods used in bilingual education effectively enhance my language skills. | 4.22 | Always | 4 |
| 3. The assessments in bilingual education accurately reflect my language proficiency. | 3.92 | Often | 9 |
| 4. Bilingual education adequately prepares me for real-world language use. | 4.24 | Always | 3 |

| | | | |
|---|---|---|---|
| 5. I receive sufficient support from teachers to excel in bilingual education. | 4.46 | Always | 1 |
| 6. My language proficiency, developed through bilingual education, instills confidence in my communicative abilities. | 4.16 | Often | 6 |
| 7. The diverse instructional methods employed in bilingual education consistently elevate my language competencies. | 3.97 | Often | 8 |
| 8. The assessments in bilingual education serve as accurate indicators of my evolving language skills. | 4.13 | Often | 7 |
| 9. Bilingual education not only teaches language but equips me with practical language Applications for real-world scenarios. | 4.20 | Always | 5 |
| 10. The comprehensive support provided by teachers significantly enhances my success in bilingual education. | 4.36 | Always | 2 |
| **Composite Mean** | **4.13** | **Often** | |

As seen in Table 1, the student-respondents replied that they always receive sufficient support from teachers to excel in bilingual education which got the highest weighted mean of 4.46 and the highest rank of 1. This implies that the students feel adequately assisted and guided by their teachers to succeed in a learning environment that involves the use of two languages.

## 2. Level of Cultural Awareness

**Table 2. Level of Cultural Awareness of the Respondents**

| Items | Weighted Mean | Interpretation | Rank |
|---|---|---|---|
| 1. The school's curriculum enhances my understanding of different cultures. | 4.26 | Always | 1.5 |
| 2. Classroom discussions contribute to my awareness and appreciation of cultural diversity. | 4.23 | Always | 5 |
| I feel comfortable discussing cultural differences with my classmates. | 4.15 | Often | 6 |
| School activities and events positively contribute to building cultural awareness. | 4.25 | Always | 3 |
| I am encouraged to explore and learn about cultures beyond my own. | 3.91 | Often | 10 |
| The curriculum goes beyond facts, fostering a profound understanding of diverse cultures. | 4.26 | Always | 1.5 |
| Dynamic classroom discussions were instrumental in broadening my awareness and fostering a deep appreciation of cultural diversity. | 4.24 | Always | 4 |
| I find it easy and natural to engage in conversations about cultural differences with my classmates. | 3.92 | Often | 9 |
| School activities and events actively contribute to creating an environment rich in cultural awareness. | 4.02 | Often | 8 |
| The encouragement to explore and learn about different cultures was an integral part of the school's ethos, ensuring a holistic cultural experience. | 4.08 | Often | 7 |
| **Composite Mean** | **4.13** | **Often** | |

As seen in Table 2, the student-respondents assessed that the school's curriculum always enhances their understanding of different cultures, and the curriculum always goes beyond facts, fostering a profound understanding of diverse cultures which got the highest equal weighted means of 4.26 and the highest equal ranks of 1.5.

## 3. Level of Utilization of Bilingual Education in Language Learning

### 3.1 In Terms of Language Use

As displayed in Table 3, the student-respondents answered that the language programs at their school often effectively enhance their overall language proficiency which yielded the highest weighted mean of 4.14 and the highest rank of 1. This indicates a positive perception among the students regarding the efficacy of language programs in contributing to their linguistic skills.

**Table 3. Level of Utilization of Bilingual Education in Language Learning In Terms of Language Use**

| Items | Weighted Mean | Interpretation | Rank |
|---|---|---|---|
| 1. I feel confident in my overall language proficiency. | 4.00 | Often | 2 |
| 2. I believe my language skills adequately meet the requirements of real-life communication. | 3.99 | Often | 3 |
| 3. The language programs at our school effectively enhance my overall language proficiency. | 4.14 | Often | 1 |
| I am comfortable expressing myself in different language settings. | 3.70 | Often | 5 |
| The assessments accurately reflect my actual language proficiency level. | 3.96 | Often | 4 |
| **Composite Mean** | **3.96** | **Often** | |

Furthermore, the said group of respondents also replied that they were often comfortable expressing themselves in different language settings which gained the least weighted mean of 3.70 and least rank of 5. This suggests that the bilingual education programs at their school not only contribute to their language proficiency but also foster a sense of confidence in using multiple languages.

### 3.2. In Terms of Grammar

**Table 4. Level of Utilization of Bilingual Education in Language Learning In Terms of Grammar**

| Items | Weighted Mean | Interpretation | Rank |
|---|---|---|---|
| 1. I feel confident in my understanding and Application of grammar rules. | 4.05 | Often | 4 |
| 2. Grammar exercises and lessons significantly contribute to improving my language skills. | 4.23 | Always | 1 |
| 3. I find that the grammar assessments in our language programs accurately measure my knowledge. | 4.05 | Often | 4 |
| The instructional methods effectively enhance my grasp of grammar concepts. | 4.22 | Always | 2 |
| I believe my grammar skills were well-developed due to the language education provided. | 4.05 | Often | 4 |
| **Composite Mean** | **4.12** | **Often** | |

As gleaned in Table 4, the student-respondents displayed that grammar exercises and lessons always significantly contribute to improving their language skills which made the highest weighted mean of 4.23 and the highest rank of 1. This result highlighted the perceived importance and effectiveness of grammar-focused activities in contributing to their language proficiency.

### 3.3. In Terms of Application of language Skills

**Table 5. Level of Utilization of Bilingual Education in Language Learning in Terms of Application of Language Skills**

| Items | Weighted Mean | Interpretation | Rank |
|---|---|---|---|
| 1. I can apply my language skills effectively in practical, real-life situations. | 4.38 | Always | 1 |
| 2. The language learning materials contribute to my ability to use language in diverse contexts. | 4.19 | Often | 3 |
| 3. Assessments in our language programs assess my ability to apply language skills practically. | 3.95 | Often | 5 |
| The instructional methods in language education enhance my practical language Application. | 4.11 | Often | 4 |
| Overall, I feel well-prepared to use my language skills in various real-world scenarios. | 4.26 | Always | 2 |
| **Composite Mean** | **4.18** | **Often** | |

As gleaned in Table 5, the respondents agreed that they can always apply their language skills effectively in practical, real-life situations which made the highest weighted mean of 4.38 and the highest rank of 1. This acknowledgment suggests a high level of confidence among the respondents in their ability to transfer and utilize the language competencies they acquired through their education in real-world scenarios.

## 4. Relationship Between the Variables of the Study

**Table 6. Relationship Between the Variables of the Study**

| Variables Compared | r-value | p-value | Decision | Interpretation |
|---|---|---|---|---|
| Bilingual Proficiency versus Cultural Awareness | 0.70 | 0.00000 | p<0.01, Reject Ho | Highly Significant |
| Bilingual Proficiency versus: | | | | |
| Language Proficiency | 0.57 | 0.00000 | p<0.01, Reject Ho | Highly Significant |
| Grammar | 0.67 | 0.00000 | p<0.01, Reject Ho | Highly Significant |
| Application of Language Skills | 0.60 | 0.00000 | p<0.01, Reject Ho | Highly Significant |
| Cultural Awareness versus | | | | |
| Language Proficiency | 0.57 | 0.00000 | p<0.01, Reject Ho | Highly Significant |
| Grammar | 0.71 | 0.00000 | p<0.01, Reject Ho | Highly Significant |
| Application of Language Skills | 0.67 | 0.00000 | p<0.01, Reject Ho | Highly Significant |

As given in Table 6, when the responses of the student-respondents on their level of bilingual proficiency and cultural awareness were compared, the computed r-value of 0.70 has a corresponding p-value of less than 0.01, thus rejecting the hypothesis.

## 5. Proposed Intervention Program to Enhance Language Learning through Bilingual Education

**Table 7. Intervention Program**

| PROGRAM | OBJECTIVE | TARGET OUTPUT | ESTIMATED BUDGET | TIMEFRAME |
|---|---|---|---|---|
| Effective Teaching Methodologies Workshop | Enhance educators' proficiency in employing effective teaching methodologies for bilingual education, ensuring consistent language exposure and fostering students' confidence in language | Improved teaching strategies, increased teacher competence, and enhanced student confidence in language acquisition. | Php 200,000 | 3 months |
| Cultural Diversity Integration Initiative | Expand and integrate diverse cultural perspectives into the curriculum, fostering a deeper understanding of various cultures among students and promoting a more inclusive educa- | Enriched curriculum materials, increased cultural diversity awareness, and a more inclusive learning environment. | Php 150,000 | 6 months |
| Practical Language Application Symposium | Provide educators with practical tools and methodologies to integrate real-life language application exercises into the curriculum, enhancing students' practical language skills. | Development of practical language application modules, increased student engagement in real-life language scenari- | Php 180,000 | 4 months |
| Ongoing Research and Assessment Program | Establish a continuous research and assessment program to monitor the dynamics between bilingual proficiency, cultural awareness, and language skills, informing evidence-based im- | Research reports, assessment tools, and data-driven insights for curriculum enhancements. | Php 250,000 | 12 months |
| Linguistic Diversity Support System | Develop a support system to address the unique needs of students with varying language backgrounds, ensuring a responsive and inclusive bilingual education program. | Support resources, training modules for addressing linguistic diversity, and improved student experiences. | Php 20,000 | 5 months |

As shown on table 7, the proposed development programs aimed to elevate the quality of bilingual education in junior high schools through targeted interventions. The Effective Teaching Methodologies Workshop focuses on empowering educators with innovative strategies, ensuring a supportive learning environment. The Cultural Diversity Integration Initiative enriches the curriculum, fostering a more inclusive atmosphere that prepares students for a globalized world.

## CONCLUSIONS

This study delves into the intricate connection between pedagogy, cultural awareness, and linguistic proficiency in a bilingual education setting. Navigating through student perceptions, teacher support, and the holistic impact of bilingual education, the research unveils the symbiotic relationship between language acquisition, cultural understanding, and the broader educational experience. The study concluded, highlighting the integral role of educators in shaping a bilingual educational environment that transcends conventional boundaries, offering valuable insights for fostering a more enriched and inclusive educational landscape.

The study's findings on the Level of Bilingual Education Proficiency of the Respondents revealed a noteworthy perspective from students regarding the support and resources provided by their teachers within a bilingual educational setting. The positive perception pointed towards the integral role of educators in facilitating an environment that empowered students to excel in language learning. This confi-

dence exhibited by the students was likely a result of effective teaching methodologies that prioritized consistent language exposure, fostering a sense of competence and self-assurance in their linguistic abilities within the framework of their bilingual education programs.

Moving on to the level of cultural awareness among the respondents, the results suggested that the educational program went beyond imparting factual knowledge, actively encouraging a deeper and more meaningful understanding of diverse cultures. The emphasis on cultural awareness aligned with broader educational goals that sought to instill in students a sense of tolerance, global perspective, and appreciation for diversity. The study's exploration of various cultures signified a commitment to exposing students to a wide range of perspectives, fostering a rich cultural tapestry within the educational environment.

Examining the level of utilization of bilingual education in language learning, particularly concerning language use, grammar, and application of language skills, underscored the effectiveness of the curriculum and teaching methods in contributing significantly to students' linguistic development. The practical application of language skills and well-integrated grammar exercises were identified as key contributors to enhancing students' language proficiency. This practical approach went beyond theoretical instruction, providing students with ample opportunities to actively use and practice the languages they were learning, resulting in a more comprehensive and practical language learning experience.

In contrast, the weakest finding in the study lies in the absence of exploration into potential challenges faced by students in achieving bilingual proficiency and cultural awareness. While positive perceptions and effective teaching methodologies are highlighted, the study overlooks potential obstacles in students' language learning journey or in developing cultural understanding. Identifying such challenges could provide valuable insights for educators to address gaps and enhance the effectiveness of bilingual education programs. Without addressing potential weaknesses, the study's conclusions may lack comprehensive insight into the complexities of bilingual education implementation.

The analysis of relationships between bilingual proficiency and cultural awareness, as well as language proficiency, grammar, and application of language skills, revealed strong connections. This emphasized that students demonstrating higher levels of bilingual proficiency were more likely to effectively utilize bilingual education in enhancing their overall language proficiency, understanding grammar rules, and practically applying language skills. Additionally, the study highlighted the integral role of cultural awareness in the utilization of bilingual education, showcasing the interconnectedness of language acquisition, cultural understanding, and the holistic impact of bilingual education on students' language abilities. In summary, the study underscored the success of the educational institution in fostering bilingual proficiency, cultural awareness, and practical language skills among the student population.

Overall, the findings underscored the success of the institutions in fostering bilingual proficiency, cultural awareness, and practical language skills, providing valuable insights for enriching and broadening the educational landscape.

## RECOMMENDATIONS

Based on the comprehensive insights derived from the study, several recommendations can be proposed to further enhance the educational experience within a bilingual setting.

1. Educators should continue prioritizing effective teaching methodologies that provide consistent language exposure to students. This involves creating an environment that not only imparts linguistic knowledge but also fosters a sense of competence and self-assurance in language learning.
2. The emphasis on cultural awareness should be sustained and expanded. Educational programs should actively encourage a deeper understanding of diverse cultures, fostering a sense of tolerance, global perspective, and appreciation for diversity. Incorporating diverse cultural perspectives into the curriculum can enrich students' learning experiences and contribute to a more inclusive educational environment.
3. The practical application of language skills and well-integrated grammar exercises should remain central to the curriculum. Educators should continue providing ample opportunities for students to actively use and practice the languages they were learning, contributing to a more comprehensive and practical language learning experience.

4. There was a need for ongoing research and assessment to understand the evolving dynamics between bilingual proficiency, cultural awareness, and language skills. This can inform continuous improvements in curriculum design, teaching methodologies, and cultural integration efforts.
5. The Department of Education (DepEd) and the school administrators should collaborate to create a supportive and inclusive educational environment that acknowledges and celebrates linguistic diversity. This involves recognizing and addressing the unique needs of students with varying language backgrounds, ensuring that the bilingual education program remains responsive to the changing linguistic landscape.
6. By implementing these recommendations, educational institutions can further cultivate a bilingual educational setting that not only enhances linguistic proficiency but also nurtures cultural awareness, providing students with a holistic and enriching learning experience.

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# DEVELOPMENT AND ACCEPTABILITY OF SALUYOT *(Corchorus olitorius)*- BASED FOOD PRODUCTS

**Florepe C. Butaya**
Graduate Student, Surigao del Norte State University, Surigao City

**Edwin E. Gibertas, PhEdD**
Graduate School Professor, Surigao del Norte State University, Surigao City

**ABSTRACT**

**This study aimed to develop and evaluate the sensory acceptability of sweet food products using Saluyot (Corchorus Olitorius) leaves as the primary raw material. Specifically, it focused on formulating and processing three potential products: Saluyot Jam, Saluyot Gummy Candy, and Saluyot Greenies. The research assessed these products' sensory qualities, including appearance, texture, odor, and taste, as perceived by two respondent groups: food experts and consumers. Employing an experimental-developmental research design, the study conducted multiple trials to optimize product formulations. The sensory evaluations were conducted using an Acceptance Test-Sensory Evaluation questionnaire, with data analyzed through statistical tools such as Mean, Standard Deviation, and ANOVA to determine significant differences in product acceptability. Results revealed that Saluyot leaves could be successfully developed into innovative food products with appealing sensory attributes. Each product displayed varying levels of acceptability across the sensory parameters. Saluyot Jam was noted for its rich appearance and texture, while Saluyot Gummy Candy and Saluyot Greenies gained favorable feedback for their unique taste and odor profiles. Statistical analysis highlighted significant differences in acceptability among the three products, suggesting consumer preferences vary based on product type. These findings underscore the potential of Saluyot as a versatile ingredient for creating marketable, health-oriented sweet food products, with implications for addressing dietary and nutritional needs.**

*Keywords: Saluyot based food products, Developmental study, Perceptions, Assessment*

## INTRODUCTION

In recent years, there has been a growing interest in expanding the variety of culinary products that utilize traditional and locally sourced ingredients, particularly Saluyot (Corchorus Olitorius). Despite its acknowledged nutritional composition and culinary versatility, comprehensive research exploring the integration of Saluyot into modern diets through innovative food product development remains limited. Establishing a connection between the traditional uses of Saluyot and its potential applications in contemporary culinary practices is essential for promoting its benefits and enhancing its role in nutrition.

Saluyot, commonly known as jute mallow, is a leafy green vegetable celebrated for its significant nutritional advantages. It is rich in essential nutrients such as iron, vitamins B and C, calcium, and dietary fibers, making it a valuable addition to various diets (Medical Health Guide, 2016). Furthermore, Saluyot possesses pharmacological properties including antioxidant, anti-inflammatory, and gastro protective effects. Studies by Hassan et al. (2014), Mensah et al. (2008), and Chanda et al. (2011) have highlighted these benefits, while a recent review by Biswas et al. (2022) emphasizes Saluyot's potential in both food and pharmacology due to its rich phytoconstituents.

Despite the recognized health benefits of Saluyot, there is a notable gap in literature regarding the creation and evaluation of novel food products derived from this plant. While multiple studies have underscored its nutritional content and medicinal properties, the transition from traditional culinary applications to modern innovations—such as Saluyot Jam, Gummy Candy, and Greenies—has not been thoroughly explored. The existing research primarily focuses on Saluyot's antioxidant capabilities attributed to its phenolic compounds and it’s potential to alleviate inflammation and protect against various health

issues (Hossain et al., 2013; Chanda et al., 2011). This indicates a need for systematic investigation into how Saluyot can be effectively incorporated into new food products.

This research aims to address the identified gaps by focusing on two primary objectives: first, to develop recipes for Saluyot-based products such as Jam, Gummy Candy, and Greenies while ensuring they meet taste and safety standards; second, to evaluate consumer acceptability by assessing preferences, attitudes, and willingness to incorporate these innovative products into their diets. The study will adhere to a structured timeline with specific goals for product development followed by consumer acceptance evaluations. This methodical approach will facilitate a comprehensive understanding of Saluyot's potential in modern culinary applications while contributing to food security and sustainable agricultural practices.

## STATEMENT OF THE PROBLEM

This study aimed to develop Sweet food products made from Saluyot (Corchorus Olitorius) as the raw materials and evaluate the acceptability its potential products.

Specifically, it sought to answer the following questions:

1. What are the formulations and Processes of the three potential products using saluyot leaves, namely:
   1.1 Saluyot Jam;
   1.2 Saluyot Gummy Candy; and
   1.3 Saluyot Greenies?
2. What is the Perceptions of the respondents on the level of sensory acceptability of the developed three potential food products namely: Saluyot Jam, Saluyot Gummy Candy, and Saluyot Greenies in terms of:
   2.1. Appearance;
   2.2. Texture;
   2.3. Odor; and
   2.4. Taste?
3. What is the over-all acceptability of the developed three potential food products namely: Saluyot Jam, Saluyot Gummy Candy, and Saluyot Greenies?
4. Is there a significant difference in the level of acceptability of the three Saluyot products?

## RESEARCH METHODOLOGY

### Research Design

The study employed the experimental-developmental research design methodology to create food products, including Saluyot Jam, Saluyot Gummy Candy, and Saluyot Greenies, using Saluyot Leaves. The mixed methods research design aims to ascertain the sensory qualities of the processed Saluyot leaves. The sensory acceptability of food products, including Saluyot leaves, such as Saluyot Jam, Saluyot Gummy Candy, and Saluyot Greenies, will be evaluated based on their appearance, texture, odor, taste, and nutritional content.

### Research Environment

The developmental research study on Saluyot products will be carried out in Food Technology Innovation Center in one of the state university in CARAGA Region.

### Respondents

This study involved a total of 60 respondents. It consist of 10 (16.6%) are Panel/Food Experts to evaluate the sensory attributes of the food products in terms of appearance, texture and odor, 50 (83.3%) are Consumers/ Housewives will evaluate the acceptability of the food products such as Saluyot Jam, Saluyot Gummy Candy, and Saluyot Greenies, using Saluyot Leaves.

**Research Instrument**

This study focuses exclusively on the development of a product. The study will adopt a questionnaire called "Acceptance Test – Sensory Evaluation" to assess the product's acceptability. A survey questionnaire will be the study's primary tool for gathering information about participants' opinions after the tasting method from the food products made from Saluyot leaves.

The panel of experts and consumers participating in the evaluation will be selected through a purposive random sampling. Several experiments will be conducted to attain the desired outcome.

**Data Analysis**

This study utilized the statistical tools in analyzing the data such as Mean and Standard Deviation. These tools were used to determine the sensory attributes and acceptability of the food products made from Saluyot Leaves using the perceived qualitative descriptions used in the instrument (appearance, texture, and odor) and ANOVA. This tool will determine significant differences between the four products regarding sensory acceptability.

## RESULTS AND DISCUSSION

**Formulations and Processes in the development of the three potential products made from Saluyot (*Corchorus Olitorius*) such as Saluyot Gummy Candy, Saluyot Jam and Saluyot Greenies**

The following are the formulations and procedural steps in the development of the Saluyot Gummy Candy, Saluyot Jam and Saluyot Greenies.

### Saluyot Gummy Candy

**Ingredients**:

2 cups of boiled saluyot water
1/2 kg. of refined sugar
2 tbsp. of unflavored gelatin
1 box of green or pandan flavored gelatin sugar for dusting procedure.

**Procedures in making Saluyot Gummy Candy:**

1. Boil 500 grams of saluyot leaves into 2 cups of water.
2. In a saucepan, mix the boiled saluyot water in a bain-marie with the unflavored and flavored gelatins.
3. When it boils, stir for about 5 minutes and turn off the heat (the mixture should be liquid and homogeneous).
4. In a mold greased with butter or margarine, pour the mixture and let it rest for about 24 hours so it takes on a firm consistency (you can cover the mold with a kitchen towel if you want).
5. The next day, take the dough out of the mold, cut it into small pieces and give it the shape you want.
6. To finish, pass the gummy candy through the sugar and wait for it to dry.
7. If you prefer the gummies to be more consistent, just wait for another 2 days (after this last step) to test the gummies.

### Saluyot Jam

**Ingredients**:

250 grams saluyot leaves
1 cup water
1 1/2 cup of white sugar
2 tbsp. calamansi juice

2 tbsp. clear gelatin powder as thickener

**Procedures in making Saluyot Jam:**

1. Cut saluyot leaves into small pieces.
2. Boil saluyot leaves in 1 cup of water for 2 minutes until leaves become tender.
3. Put the white sugar into the mixture. Stir constantly until it dissolves.
4. Add the calamansi juice.
5. Then, add the gulaman powder to thicken the mixture.
6. Put into the sterilized jar while it is hot.
7. Seal and label.

## Saluyot Greenies

**Ingredients:**

1 cup of powdered saluyot leaves
1 cup All-purpose flour
1 tsp baking powder
1 tsp baking soda
2 large eggs
1/2 cup milk
1/2 cup melted butter
1/2 cup chocolate chips

**Procedures in making Saluyot Greenies:**

1. To powdered the saluyot leaves. First is to wash and drain the saluyot. Second is to put in the oven for toasting. Third is to pound it in a mortar and pestle.
2. Mix the flour and the powdered saluyot in a mixing bowl. Add also the remaining dry ingredients.
3. Add the liquid ingredients one by one such as the milk, eggs, and melted butter.
4. Put the mixture into pan and bake for 50 minutes.
5. Allow to cool and serve.

**Perceptions of the respondents on the level of sensory acceptability of the developed three potential food products namely: Saluyot Jam, Saluyot Gummy Candy, and Saluyot Greenies**

| | Mean | SD | D |
|---|---|---|---|
| 1. The color of Saluyot Jam is visually appealing. | 8.35 | 0.76 | LE |
| 2. The consistency of Saluyot Jam is visually satisfying. | 8.47 | 0.77 | LE |
| 3. The packaging of Saluyot Jam is attractive and appealing. | 8.47 | 0.83 | LE |
| 4. The overall presentation of Saluyot Jam is eye-catching. | 8.43 | 0.83 | LE |
| **APPEARANCE** | **8.43** | **0.74** | **LE** |
| 1. The overall taste of Saluyot Jam is enjoyable. | 8.33 | 0.84 | LE |
| 2. The sweetness level of Saluyot Jam is just right. | 8.25 | 0.86 | LE |
| 3. The tartness level of Saluyot Jam is well-balanced. | 8.27 | 0.84 | LE |
| 4. The flavor profile of Saluyot Jam is unique and exciting. | 8.43 | 0.67 | LE |
| 5. Saluyot Jam has a distinct and pleasant taste. | 8.42 | 0.79 | LE |
| **TASTE** | **8.34** | **0.74** | **LE** |
| 1. The texture of Saluyot Jam is smooth and pleasant. | 8.3 | 0.83 | LE |
| 2. The thickness of Saluyot Jam is satisfying. | 8.25 | 0.77 | LE |
| 3. The presence of any seeds or fibers in Saluyot Jam enhances the overall experience. | 8.45 | 0.68 | LE |
| 4. The spread ability of Saluyot Jam is convenient. | 8.43 | 0.67 | LE |
| **TEXTURE** | **8.36** | **0.69** | **LE** |
| 1. The aroma of Saluyot Jam is inviting. | 8.38 | 0.76 | LE |
| 2. The scent of Saluyot Jam complements its taste. | 8.45 | 0.68 | LE |
| 3. The fragrance of Saluyot Jam is appealing. | 8.4 | 0.79 | LE |
| **AROMA** | **8.41** | **0.71** | **LE** |

**Table 1.**

| Parameters | Verbal Interpretation |
|---|---|
| 8.12 – 9.00 | Liked Extremely (LE) |
| 7.23 – 8.11 | Liked Very Much (LVM) |
| 6.44 – 7.22 | Liked moderately (LM) |
| 5.45 – 6.33 | Liked slightly (LS) |
| 4.56 – 5.44 | Neither like nor dislike (N) |
| 3.67 – 4.55 | Dislike slightly (DS) |
| 2.78 - 3.66 | Dislike moderately (DM) |
| 1.89 – 2.77 | Dislike very much (DVM) |
| 1.00 -1.88 | Dislike extremely (DE) |

Table 1 showed that the most significant level of acceptability on appearance was Statements 2 and 3, "The consistency of Saluyot Jam is visually satisfying." (M=8.47, SD= 0.77), "The packaging of Saluyot Jam is attractive and appealing." (M=8.47, SD= 0.83) verbally interpreted as ―Liked extremely. Statement 1 (M=8.35, SD= .76), "The color of Saluyot Jam is visually appealing." has the lowest mean among the four statements, verbally interpreted as ―Liked extremely. Overall, the average acceptability level of Processed Saluyot Jam is "high" (M=8.43, SD= 0.74), verbally interpreted as "Liked Extremely," wherein the respondents strongly agree on the appearance of processed Saluyot Jam. According to the study, respondents highly accepted the appearance of Saluyot Jam, giving solid positive feedback on its visual consistency and packaging attractiveness. All statements assessing appearance received mean scores, suggesting a high overall acceptability level. This indicates that the visual aspects of Saluyot Jam, including its color, consistency, and packaging, are effectively appealing to consumers.

The sensory properties of saluyot Jam, including appearance, Taste, texture, and aroma, can be influenced by various factors such as ingredient composition and processing methods. Research on jam formulations incorporating different ingredients like fruits, vegetables, and grains highlights the impact on sensory attributes. Studies on pineapple jam with cucumber and Jatropha leaf show significant differences in appearance, Aroma, and spread ability based on ingredient proportions (Ogori et al., 2021). Additionally, using black rice in jam preparation addresses retro gradation issues, enhancing appearance and Taste (Ming et al., 2018). Furthermore, adding inulin to pineapple jam improves sensory acceptability without significant differences in attributes like Taste and Texture, indicating the potential for enhancing nutritional composition (Fei, 2017).

**Table 2. Level of Acceptability on the Appearance, Taste, Texture, and Aroma of Saluyot Gummies**

| | Mean | SD | D |
|---|---|---|---|
| 1. The color of Saluyot Gummy Candy is visually appealing. | 8.42 | 0.77 | LE |
| 2. The shape and design of Saluyot Gummy Candy are attractive. | 8.72 | 0.52 | LE |
| 3.The packaging of Saluyot Gummy Candy is visually pleasing. | 8.68 | 0.54 | LE |
| 4. The overall presentation of Saluyot Gummy Candy is eye-catching. | 8.65 | 0.61 | LE |
| **APPEARANCE** | **8.62** | **0.46** | **LE** |
| 1. The overall taste of Saluyot Gummy Candy is enjoyable. | 8.73 | 0.52 | LE |
| 2. The sweetness level of Saluyot Gummy Candy is just right. | 8.68 | 0.54 | LE |
| 3. The flavor profile of Saluyot Gummy Candy is unique and interesting. | 8.68 | 0.54 | LE |
| 4. Saluyot Gummy Candy has a distinct and pleasant taste. | 8.67 | 0.54 | LE |
| 5. The taste of Saluyot Gummy Candy lingers pleasantly. | 8.67 | 0.54 | LE |
| **TASTE** | **8.69** | **0.43** | **LE** |
| 1. The texture of Saluyot Gummy Candy is chewy and satisfying. | 8.65 | 0.63 | LE |
| 2. The consistency of Saluyot Gummy Candy is pleasant. | 8.75 | 0.51 | LE |
| 3. Saluyot Gummy Candy is not too sticky or gooey. | 8.75 | 0.51 | LE |
| 4. The mouthfeel of Saluyot Gummy Candy is enjoyable. | 8.72 | 0.56 | LE |
| 5. Chewing Saluyot Gummy Candy is a satisfying experience. | 8.72 | 0.56 | LE |
| **TEXTURE** | **8.72** | **0.51** | **LE** |
| 1. The aroma of Saluyot Gummy Candy is inviting. | 8.68 | 0.62 | LE |
| 2. The scent of Saluyot Gummy Candy complements its taste. | 8.63 | 0.64 | LE |
| 3. The fragrance of Saluyot Gummy Candy is appealing. | 8.57 | 0.72 | LE |
| **AROMA** | **8.63** | **0.63** | **LE** |

| Parameters | Verbal Interpretation | Parameters | Verbal Interpretation | Parameters | Verbal Interpretation |
|---|---|---|---|---|---|
| 8.12 – 9.00 | Liked Extremely (LE) | 5.45 – 6.33 | Liked slightly (LS) | 2.78 - 3.66 | Dislike moderately (DM) |
| 7.23 – 8.11 | Liked Very Much (LVM) | 4.56 – 5.44 | Neither like nor dislike (N) | 1.89 – 2.77 | Dislike very much (DVM) |
| 6.44 – 7.22 | Liked moderately (LM) | 3.67 – 4.55 | Dislike slightly (DS) | 1.00 -1.88 | Dislike extremely (DE) |

Table 2 indicates that the most significant level of acceptability regarding the appearance of Saluyot Gummy Candy was for the statement about its shape and design being attractive (Statement 2), with a mean score (M) of 8.72, verbally interpreted as "Liked Extremely." The statement about the color of the gummy candy being visually appealing (Statement 1) had the lowest mean score of 8.42. However, it was still interpreted as "Liked Extremely". Overall, the average acceptability level for the appearance of Saluyot Gummy Candy is high, with a mean score of 8.62, indicating substantial agreement among respondents on the positive appearance of the gummy candy. According to the survey, respondents showed a high level of favorability towards the appearance of Saluyot Gummy Candy, with the shape and design receiving the highest level of acceptability. Although the color scored the lowest among the appearance-related statements, it was still positively received. Overall, the average acceptability level for

the appearance of Saluyot Gummy Candy is high, indicating a strong consensus among respondents about the visual appeal of the candy.

Saluyot gummies can be designed to achieve ideal appearance, flavor, consistency, and smell by considering several factors. According to research on gummy candies, the proportion of glucose syrup to sucrose, the inclusion of starch, and the amount of gelatin significantly impact the consistency, color, and sensory attributes of gummies (Yadav et al., 2016). Furthermore, studies on yogurt beverages indicate that reducing sugar content while maintaining a balance between aroma, flavor, and texture interactions can result in healthier products without compromising consumer acceptance (Tireki, 2021). Also, the effect of candy texture on aroma and taste perception dynamics underscores the importance of texture in influencing flavor experiences during consumption, with firmer textures leading to reduced aroma and taste intensities (Thun, 2022).

**Table 3. Level of Acceptability on the Appearance, Taste, Texture, and Aroma of Saluyot Greenies**

| | Mean | SD | D |
|---|---|---|---|
| 1. The color of Saluyot Greenies is visually appealing. | 8.78 | 0.56 | LE |
| 2. The shape and design of Saluyot Greenies are attractive. | 8.78 | 0.56 | LE |
| 3. The packaging of Saluyot Greenies is visually pleasing. | 8.78 | 0.56 | LE |
| 4. The overall presentation of Saluyot Greenies is eye-catching. | 8.85 | 0.44 | LE |
| **APPEARANCE** | **8.80** | **0.50** | **LE** |
| 1. The overall taste of Saluyot Greenies is enjoyable. | 8.83 | 0.46 | LE |
| 2. The sweetness level of Saluyot Greenies is just right. | 8.90 | 0.30 | LE |
| 3. The flavor profile of Saluyot Greenies is unique and interesting. | 8.77 | 0.56 | LE |
| 4. Saluyot Greenies has a distinct and pleasant taste. | 8.78 | 0.56 | LE |
| 5. The taste of Saluyot Greenies is refreshing. | 8.78 | 0.56 | LE |
| **TASTE** | **8.81** | **0.47** | **LE** |
| 1. The texture of Saluyot Greenies is crisp and satisfying. | 8.90 | 0.40 | LE |
| 2. The consistency of Saluyot Greenies is pleasant. | 8.77 | 0.56 | LE |
| 3. Saluyot Greenies are too hard or too soft. | 8.77 | 0.56 | LE |
| 4. The mouthfeel of Saluyot Greenies is enjoyable. | 8.77 | 0.56 | LE |
| 5. Chewing Saluyot Greenies is a satisfying experience. | 8.77 | 0.56 | LE |
| **TEXTURE** | **8.79** | **0.48** | **LE** |
| 1. The aroma of Saluyot Greenies is inviting. | 8.78 | 0.56 | LE |
| 2. The scent of Saluyot Greenies complements its taste. | 8.92 | 0.33 | LE |
| 3. The fragrance of Saluyot Greenies is appealing. | 8.78 | 0.56 | LE |
| **AROMA** | **8.83** | **0.45** | **LE** |

| Parameters | Verbal Interpretation | Parameters | Verbal Interpretation | Parameters | Verbal Interpretation |
|---|---|---|---|---|---|
| 8.12 – 9.00 | Liked Extremely (LE) | 5.45 – 6.33 | Liked slightly (LS) | 2.78 - 3.66 | Dislike moderately (DM) |
| 7.23 – 8.11 | Liked Very Much (LVM) | 4.56 – 5.44 | Neither like nor dislike (N) | 1.89 – 2.77 | Dislike very much (DVM) |
| 6.44 – 7.22 | Liked moderately (LM) | 3.67 – 4.55 | Dislike slightly (DS) | 1.00 -1.88 | Dislike extremely (DE) |

Table 3 indicates that the most significant level of acceptability regarding the appearance of Saluyot Greenies was Statement 4, which suggests that the overall presentation of Saluyot Greenies is eye-catching. This statement received a high mean score (M=8.85) and was verbally interpreted as "Liked Extremely." Overall, the average acceptability level for the appearance of processed Saluyot Greenies is high, with a mean score of 8.80, indicating substantial agreement among respondents regarding the appealing appearance of the product. Respondents found the visual appeal of Saluyot Greenies to be very attractive, especially the overall presentation. Statement 4 was the most favored, rated as "Liked Extremely," with an average score of 8.85. Generally, the average satisfaction level for the appearance of processed Saluyot Greenies is high, with an average score of 8.80, showing a strong consensus among respondents about the product's attractive appearance.

Saluyot Greenies, a nutritious product, can be improved by considering how Appearance, Taste, Texture, and Aroma (ATTA) interact to increase consumer acceptance (Yi et al., 2022; Li et al., 2010). Understanding the influence of these sensory aspects when creating attractive and healthy products is essential. Research into taste and appearance indicates that people develop preferences based on self-image and motivations, striking a balance between conformity and individuality (Tournier et al., 2007). Furthermore, the study on facial image recognition underscores the significance of integrating overall texture characteristics with specific features for effective image representation, underscoring the importance of comprehensive approaches in sensory assessment (Kwoon, 2007).

**Over-all acceptability of the developed three potential food products namely: Saluyot Jam, Saluyot Gummy Candy, and Saluyot Greenies**

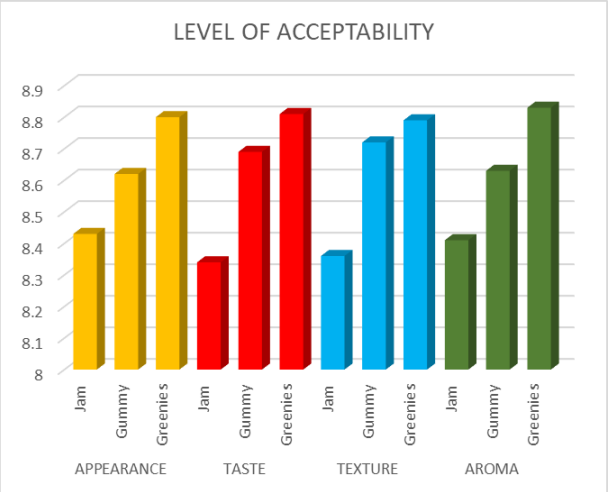


***Figure 2. Level of Acceptability of the three processed Saluyot products***

The figure reveals that among the three processed Saluyot products, Saluyot Greenies achieved the highest level of acceptability across appearance, taste, texture, and aroma. In terms of appearance, Greenies had the highest level of acceptability, followed by Saluyot Gummy Candy and Saluyot Jam. Similarly, this trend was observed for taste, texture, and aroma, where Saluyot Greenies consistently outperformed Saluyot Gummy Candy and Saluyot Jam, securing the highest level of acceptability across all categories.

## Mean Differences on the Level of Acceptability of the Three Processed Saluyot Products

**Table 4. Mean Differences on the Level of Acceptability of the Three Processed Saluyot Products**

| DV | IV | F | p | Decision | Interpretation |
|---|---|---|---|---|---|
| Appearance | Jam Gummies Greenies | 5.53 | 0.005 | Reject Ho | Significant |
| Taste | | 8.65 | < .001 | Reject Ho | Significant |
| Texture | | 8.31 | < .001 | Reject Ho | Significant |
| Aroma | | 7.65 | < .001 | Reject Ho | Significant |

The table 4 present the comparison indicates significant differences in the level of acceptability of appearance among the three Saluyot products: Saluyot Jam, Saluyot Gummies, and Saluyot Greenies ($p<0.05$; $p=0.005$). Consequently, the hypothesis suggesting no significant differences was rejected. This implies that the respondents perceived noticeable distinctions in the appearance of the three Saluyot products, indicating varying levels of acceptability among them.

The comparison indicates significant differences in taste acceptance among the three Saluyot products: Saluyot Jam, Saluyot Gummies, and Saluyot Greenies ($p<0.05$; $p<0.001$). Consequently, the hypothesis suggesting no significant differences was rejected. This implies that respondents perceived substantial distinctions in the taste acceptability of the three Saluyot products, indicating varying levels of taste satisfaction among them.

The comparison reveals significant differences in texture acceptability among the three Saluyot products: Saluyot Jam, Saluyot Gummies, and Saluyot Greenies ($p<0.05$; $p<0.001$). Consequently, the hypothesis suggesting no significant differences was rejected. This indicates that respondents perceived substantial distinctions in the texture acceptability of the three Saluyot products, suggesting varying levels of satisfaction with the texture across the different products.

The comparison reveals significant differences in aroma acceptability among the three Saluyot products: Saluyot Jam, Saluyot Gummies, and Saluyot Greenies ($p<0.05$; $p<0.001$). Consequently, the hypothesis suggesting no significant differences was rejected. This indicates that respondents perceived

substantial distinctions in the aroma acceptability of the three Saluyot products, suggesting varying levels of satisfaction with the aroma across the different products.

When it comes to jam products, the inclusion of fruit peels in addition to pulp had a noteworthy effect on consumer approval. Pineapple jam scored higher than mango jam (Henrilyn et al., 2021). In the case of gummy candies, incorporating natural plant extracts such as Lemon, peppermint, Tamarind, Red Roselle, and date fruits resulted in high overall likability ratings among the evaluators (Mona et al., 2022). Furthermore, using Clitoriaternatea flower extract in gummy candies improved their color and appearance, with Treatment 3 (30 grams) being the most preferred across different age groups (Hye-Jeong et al., 2020). Additionally, adding kappa-carrageenan to gummy guyabano candy enhanced their physical and chemical properties and sensory acceptability, and all versions were generally well-received by consumers (Ijioma, 2017). These studies collectively highlight the significance of natural additives and extracts in improving the likability of jams, gummy candies, and other confectionery items.

## CONCLUSIONS

The study successfully developed three potential food products—Saluyot Jam, Saluyot Gummy Candy, and Saluyot Greenies—demonstrating the versatility and applicability of Saluyot (Corchorus Olitorius) in innovative food formulations. Each product showcased unique qualities and sensory appeal, with Saluyot Greenies consistently achieving the highest acceptability scores in appearance, taste, texture, and aroma. Respondents particularly appreciated the visual presentation and balanced flavor profiles of all products, highlighting their potential marketability. Significant differences in sensory parameters among the three products suggest varied consumer preferences, emphasizing the importance of tailoring formulations to target specific sensory attributes. Overall, the study affirmed that Saluyot-based products could cater to diverse consumer tastes while leveraging the plant's nutritional and functional benefits.

Further research is recommended to optimize these formulations for commercial production and explore the health benefits associated with Saluyot consumption. Incorporating natural additives, as demonstrated in similar studies, could further enhance the sensory qualities and nutritional value of these products. Additionally, examining shelf stability and scaling production processes would support the development of these products for broader market distribution. This investigation highlights the potential of Saluyot as a functional ingredient in novel food products, contributing to sustainable food innovation and offering consumers healthful, enjoyable alternatives.

## RECOMMENDATIONS

1. To further enhance the sensory appeal and consumer acceptability, consider experimenting with different ingredient proportions, such as sugar levels, gelatin types, or alternative flavor enhancers. Conduct sensory trials to identify the optimal balance between nutritional benefits and consumer preferences for each product.
2. Incorporate natural additives like fruit extracts, spices, or herbal flavors to diversify the flavor profiles of Saluyot products. For example, blending Saluyot with complementary ingredients like citrus or berry flavors could elevate taste and aroma while maintaining the products' nutritional value.
3. Invest in visually appealing and eco-friendly packaging to enhance the marketability of the products. Highlight unique selling points, such as the health benefits of Saluyot, through branding and labeling to attract health-conscious consumers.
4. Conduct awareness campaigns to educate potential consumers about the nutritional and health benefits of Saluyot-based products. Partner with community events, schools, or health organizations to promote these products as healthy and innovative food choices.
5. Explore additional product variations such as Saluyot-based beverages, snacks, or baked goods to reach broader consumer segments. Conduct market testing in various demographics to gather feedback, refine products, and tailor marketing strategies to specific target markets

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# EFFECTIVENESS OF THE DEVELOP ANIMATED INSTRUCTIONAL MATERIALS IN THE PERFORMANCE OF GRADE 10 DRESSMAKING LEARNERS

**Lina B. Galido**
Graduate Student, Surigao del Norte State University, Surigao City

**James M. Dumaguit, RME, PhD**
Graduate School Professor, Surigao del Norte State University, Surigao City

## ABSTRACT

**This study investigates the effectiveness of instructional materials with animation in teaching dressmaking, focusing on learners' perceptions and performance across competencies such as planning designs, taking measurements, drafting patterns, cutting and assembling patterns, sewing, and applying finishing touches. It evaluates the instructional material's effectiveness based on content quality, usability, visual appeal, and impact on learning outcomes. Employing a mixed-methods research design, specifically developmental and descriptive approaches, the study developed animated learning materials to enhance Grade 10 dressmaking instruction. Data were collected from 50 students of one of the secondary schools in Surigao, using adapted questionnaires and analyzed through statistical methods, including mean, standard deviation, regression analysis, and paired t-tests. The findings indicate that most Grade 10 students initially exhibited limited proficiency in dressmaking, with many falling into the novice or developing category. However, the animated instructional materials proved highly effective, significantly improving learners' competencies, as shown by marked differences in pretest and posttest results. The materials received high ratings in content quality, usability, and visual appeal, contributing to their positive impact on learning outcomes. Statistical analyses confirmed the program's effectiveness, highlighting a significant improvement in performance after the intervention. Additionally, the instructional materials were deemed highly acceptable in terms of usability, functionality, efficiency, and portability, underscoring their potential as valuable tools for teaching dressmaking.**

*Keywords: Animated Learning Materials, Teaching and Learning Dressmaking, Developmental Study, Perceptions, Assessment*

## INTRODUCTION

Over the last two decades, technology has profoundly transformed education, enhancing communication, collaboration, and teacher-student interactions. Tools like virtual reality (VR) headsets have created immersive learning experiences, while assessment software has provided educators with valuable insights into student performance (Morris, 2023). Technology also supports diverse learning styles, enabling students who struggle in traditional classrooms to succeed. It fosters increased engagement, collaboration, creativity, and productivity, equipping students with essential skills for future careers while streamlining teaching processes such as lesson planning and grading (Grand Canyon University, 2023). Multimedia, as a key technological innovation, integrates text, graphics, sound, animation, and video to create dynamic educational resources that enhance learning across various disciplines.

Despite the advancements in technology, challenges remain, particularly in the Philippine educational system's Technology and Livelihood Education (TLE) program. Gregorio (2016) identified significant gaps, including a lack of equipment, materials, and facilities needed to support students effectively. These resource shortages often hinder teaching in specialized areas such as dressmaking, where hands-on practice and appropriate instructional materials are critical. Although multimedia offers promising solutions, its potential remains underutilized in many schools due to limited access and development of tailored resources, highlighting an urgent need for innovative instructional tools.

To address these gaps, this study aims to develop an instructional material with animation specifically designed for teaching dressmaking. This resource seeks to augment the scarcity of learning tools in TLE and evaluate its effectiveness in improving teaching and learning outcomes in the subject. By creating an animated module, this research contributes to the limited body of knowledge on TLE instructional resources and provides valuable insights for future studies. Ultimately, the study aims to support educators and empower students by enhancing the learning experience in dressmaking.

## STATEMENT OF THE PROBLEM

This study aimed to determine the effectiveness of using an instructional material with animation in teaching dressmaking as well as to know the learners perceptions on its use. Specifically, it seeks to answer the following:

1. What are the performance of learners across all competencies in dressmaking in terms of:
   1.1 Planning Designs;
   1.2 Getting Measurements and Drafting Patterns;
   1.3 Cutting Patterns;
   1.4 Assembling and Sewing Patterns; and
   1.5 Applying Finishing Touches?
2. What is the level of effectiveness of the instructional material with animation in dressmaking as perceived by learners in terms of:
   2.1Quality of the content;
   2.2Usability;
   2.3 Visual appeal; and
   2.4 Impact on Learning Outcomes?
3. To what extent is the usage of instructional material with animation in dressmaking improved the learners in terms of:
   3.1 Planning Designs;
   3.2 Getting Measurements and Drafting Patterns;
   3.3 Cutting Patterns;
   3.4 Assembling and Sewing Patterns; and
   3.5 Applying Finishing Touches?
4. Is there a significant difference in the pretest and posttest results of the Grade 10 learners?

## RESEARCH METHODOLOGY

### Research Design

This study will make use of a mixed method research design, specifically descriptive and developmental. Developmental research design is deemed appropriate for this study since this research will delve on developing an instructional material with animation that will be used to improve teaching dressmaking/tailoring in Grade 10 Dressmaking. Descriptive survey research design will also be used to evaluate the effectiveness of such material in improving teaching and learning based on certain criteria through the use of questionnaires as well as to gather data which will help in enhancing the instructional material that is developed.

### Respondents

The respondents of the study were 50 Students of Grade 10 Dressmaking of one of the secondary schools in Surigao del Norte. The sample was determined using the purposive sampling technique by considering the homogeneity of the students' ability (No superior class system).

### Research Environment

This study will be conducted in one of the secondary schools in Surigao del Norte which offers Junior High School and Senior High School. It has a total of 2,800 students.

## Research Instrument

This research will make use of researcher made instructional materials with animation based on standardized modules. The instructional material will be validated by experts such as Master teacher, subject coordinators and TLE subject experts, as well as expert programmers. Pre-test and Post-test results will be used to measure the effectiveness of the instructional material with animation which will be gathered by the researcher upon the conduct of this study. The pre-test scores will be gathered before the implementation of the developed instructional material to assess the participants' baseline knowledge and skills in dressmaking. The post-test would be administered after the intervention to measure the learning outcomes and compare them with the pre-test results.

An evaluation rubrics created by the researcher based on various resources like related researches, articles, books on the subject matter, curriculum guides will also be used to evaluate the performance of the learner based on certain parameters like: planning designs, getting measurements and drafting patterns, cutting patterns, assembling and sewing patterns and applying finishing touches aside from their pretest and posttest scores.

## Data Analysis

The data that will be gathered in this study will be analyzed using the following statistical tool: Mean and Standard Deviation will be used to analyze the data on the learner's performance in dressmaking. Regression analysis will also be used to analyze the data on the extent of how the use of digitalized learning modules in dressmaking improved the learners as well as level of the effectiveness of the digitalized module. Paired t-test will also be utilized to analyze the data on the significant difference between pretest and posttest results of the learners.

# RESULTS AND DISCUSSIONS

## Performances of learners in Dressmaking

**Table 1. Level of performances, based from Rubrics for Evaluating Learners' Performance**

| Topics | Level of performance at N=50 | | | |
|---|---|---|---|---|
| | Novice | Developing | Proficient | Advance |
| Planning Designs | 17 | 14 | 2 | 0 |
| Getting Measurements and Drafting Patterns | 39 | 9 | 2 | 0 |
| Cutting Patterns | 36 | 11 | 3 | 0 |
| Assembling and Sewing Patterns | 40 | 6 | 4 | 0 |
| Applying Finishing Touches | 38 | 10 | 2 | 0 |

The data reflects that the majority of learners are struggling with the basic to intermediate skills in dressmaking, as most are classified in the Novice and Developing categories across all topics. Few learners have achieved Proficient status, and none have reached the Advanced level in any topic. This suggests that additional instructional support, practice, and possibly curriculum adjustments may be needed to help learners progress in their performance, particularly in the more advanced aspects of dressmaking.

## Effectiveness of the Developed Instructional Materials in dressmaking

**Table 2. Level of the Effectiveness of the Developed Instructional Materials in dressmaking**

| QUALITY OF CONTENT | Median | Verbal Interpretation |
|---|---|---|
| 1. The instructional material in dressmaking provided comprehensive, accurate, well-organized and easy to navigate contents. | 4 | Very Acceptable |
| 2. The material's content was presented in a clear and understandable manner and is adaptable to different learning needs and styles. | 4 | Very Acceptable |
| 3. The learning activities in the instructional materials effectively reinforce my understanding of dressmaking concepts because it provided a comprehensive understanding of the use of sewing tools, measurements, design creation, maintenance, and occupational safety and health. | 5 | Excellent |
| 4. The material's content was relevant, applicable to real-world dressmaking scenarios and was effectively supported by multimedia elements such as videos, images, and interactive features. | 4 | Very Acceptable |
| 5. The instructional material's content was engaging and increased as well as maintained my interest throughout the learning process and increased confidence in dressmaking skills. | 4 | Very Acceptable |

| | | |
|---|---|---|
| **USABILITY** | | |
| 1. The instructional materials is easy to navigate and use, allowing me to access the content efficiently. | 4 | Very Acceptable |
| 2. The instructions within the instructional materials are clear and understandable, helping me to engage with the dressmaking concepts effectively. | ***5*** | Excellent |
| 3. I find the instructional tools and materials simple and easy to handle, enhancing my learning experience in dressmaking. | ***5*** | Excellent |
| 4. The material considers the nature of the learner, making it suitable for students with varying levels of prior knowledge in dressmaking. | ***4*** | Very Acceptable |
| 5. The instructional learning material can be used even when the learner does not have any background in the content area of dressmaking, facilitating an inclusive learning environment. | ***5*** | Excellent |
| **VISUAL APPEAL** | | |
| 1. The visual elements within the instructional materials, such as images and videos, are engaging and enhance my understanding of dressmaking concepts. | ***5*** | Excellent |
| 2. The overall design of the instructional material is visually appealing and makes the learning experience enjoyable and interesting. | ***5*** | Excellent |
| 3. The use of color schemes and layout within the instructional material is effective in presenting dressmaking content in a visually engaging manner. | ***4*** | Very Acceptable |
| 4. The visual components of the materials contribute to a better grasp of dressmaking techniques and garment design principles. | ***5*** | Excellent |
| 5. The visual appeal of the instructional material's content makes it easier for me to retain and recall dressmaking information. | ***5*** | Excellent |
| **IMPACT ON LEARNING OUTCOMES** | | |
| 1. The instructional material effectively conveys the desired learning outcomes in dressmaking. | ***4*** | Very Acceptable |
| 2. The format of the instructional material is excellent and contributes to effective learning. | ***4*** | Very Acceptable |
| 3. The use of the instructional material has improved my performance in dressmaking tasks. | ***5*** | Excellent |
| 4. The instructional material enhances my understanding of complex dressmaking concepts. | ***5*** | Excellent |
| 5. The content is suitable for the intended level of development and free of biases. | ***5*** | Excellent |

*(5) As Excellent; (4) as Very Acceptable; (3) as Acceptable; (2) as Moderately Acceptable; and, (1) as Barely Acceptable, Dela Torre 2018, International Journal of Engineering Research and Reviews ISSN 2348-697X*

The table 2 presents the evaluation of the effectiveness of the developed instructional materials in dressmaking, categorized into four areas: content, usability, visual appeal, and impact on learning outcomes. Each statement was rated based on a median score, with verbal interpretations reflecting the degree of effectiveness.

The participants rated the instructional material highly for its content. Statements about the material being comprehensive, accurate, and well-organized received a median score of **4**, indicating it was deemed **very acceptable**. The content was also clear and adaptable to different learning needs, receiving the same rating. Notably, the activities were highly rated with a **5**, or **excellent**, for effectively reinforcing understanding of core dressmaking concepts such as sewing tools, measurements, and occupational safety. The relevance of the content to real-world dressmaking scenarios, supported by multimedia elements, was also considered very acceptable, with a median of **4**.

The usability of the instructional materials was rated highly. The ease of navigation and clarity of instructions were consistently rated **4** (**very acceptable**), except for a few items. Specifically, the ease of handling instructional tools and the clarity of instructions received a median score of **5**, rated as **excellent**, highlighting their effectiveness in facilitating learning. The materials were also praised for being inclusive, catering to learners with varying levels of prior knowledge in dressmaking, which was rated **5** (excellent).

The visual appeal of the materials was a major strength, with most statements receiving a median score of **5**, interpreted as **excellent**. Participants found the visual elements such as images and videos engaging, which enhanced their understanding of dressmaking concepts. The overall design, including the use of color schemes and layout, contributed to an enjoyable and visually appealing learning experience. This area significantly contributed to the retention and recall of information, reflecting the instructional material's effectiveness in presenting the content in an engaging manner.

The instructional materials also had a positive impact on the learning outcomes of participants. The median scores for statements about improving performance in dressmaking tasks and enhancing understanding of complex concepts were rated **5** (excellent). The materials effectively conveyed the desired learning outcomes and were free of biases, also rated excellent. However, the general effectiveness of the format and its contribution to learning were rated as **very acceptable** with a score of **4**.

Overall, the instructional materials in dressmaking were highly effective, particularly in terms of their usability, visual appeal, and impact on learning outcomes, providing a well-rounded and engaging educational tool for learners.

## Competency of Participants in dressmaking

**Table 3. Level of Competency of Participants in dressmaking**

| | N | M | SD | Descriptive Rating |
|---|---|---|---|---|
| PRETEST | 50 | 8.12 | 1.36 | Moderate |
| POSTTEST | 50 | 12.47 | 1.31 | High |

Table 3 presents the level of competency of the participants in dressmaking, based on their performance in both pretest and posttest assessments. The results indicate that prior to the intervention (pretest), the mean score (M) of the participants was 8.12 with a standard deviation (SD) of 1.36, which corresponds to a moderate level of competency. This suggests that before the instructional program, participants possessed a moderate understanding and skill in dressmaking.

Following the instructional intervention, the posttest results show a significant improvement in competency levels. The mean score increased to 12.47, with a slightly lower standard deviation of 1.31. This score corresponds to a high level of competency, indicating that the participants' skills and understanding in dressmaking had notably advanced after the using the instructional materials. The lower standard deviation in the posttest also suggests a more consistent level of competency across participants after the intervention, demonstrating the effectiveness of the instructional program in enhancing dressmaking skills.

## Significant difference in the pretest and posttest results of the Grade 10 learners

**Table 4. Significant difference in the pretest and posttest results of the Grade 10 learners**

| | N | df | t-value | p-value | Decision |
|---|---|---|---|---|---|
| Pretest<br>Posttest | 50 | 49 | 22.29 | 1.00E-6 | **Rejected** |

The table 4 presents the statistical analysis of the pretest and posttest results of 50 Grade 10 learners to determine whether there is a significant difference in their performance before and after the instructional intervention. The analysis was conducted using a t-test, and the table provides the values for the sample size (N), degrees of freedom (df), t-value, and p-value, along with the decision on whether to reject or accept the null hypothesis.

The total number of learners involved in the study was 50 (N = 50). The degrees of freedom (df) were calculated as 49, which is standard for a paired t-test when comparing two related samples, in this case, the pretest and posttest scores of the same group of learners.

The t-value obtained from the analysis is 22.29, which indicates a large difference between the pretest and posttest scores. A higher t-value typically reflects a more substantial effect, meaning that the learners' performance showed significant improvement after the intervention. The large magnitude of the t-value suggests that the instructional materials or teaching methods applied in the intervention had a strong impact on the learners' posttest results compared to their pretest scores.

The p-value is reported as 1.00E-6, which is a very small value. This p-value is much lower than the standard significance level of 0.05, indicating that the difference between the pretest and posttest results is statistically significant. In other words, there is a very small probability that the observed difference occurred by chance, further reinforcing the conclusion that the intervention effectively improved the learners' performance.

Given that the p-value is significantly lower than 0.05, the decision was to reject the null hypothesis. The null hypothesis in this context would suggest that there is no significant difference between the pretest and posttest results. However, since the null hypothesis is rejected, it can be concluded that there is a significant improvement in the learners' performance after the instructional intervention.

The data clearly indicates a significant positive effect of the instructional materials or teaching methods used during the intervention. The learners' posttest scores were significantly higher than their pretest scores, as evidenced by the high t-value and extremely low p-value. This suggests that the intervention effectively enhanced the learners' knowledge and skills in dressmaking, leading to improved academic performance.

## CONCLUSIONS

In conclusion, the findings reveal that most Grade 10 learners struggled with basic dressmaking skills, as evidenced by their performance in various dressmaking topics, with the majority categorized as Novice or Developing. However, the developed instructional materials were found to be highly effective, receiving high ratings in content, usability, and visual appeal, which contributed to a significant improvement in learners' understanding and performance. The posttest results showed a marked increase in competency levels, confirming the positive impact of the instructional intervention. Additionally, the materials were evaluated positively across usability, functionality, efficiency, and portability, with an overall rating of very acceptable. The statistical analysis further supports the effectiveness of the instructional program, showing a significant difference in learners' performance before and after the intervention.

## RECOMMENDATIONS

Based on the findings, the following recommendations are made for higher education, school administrators, teachers, and students:

**Higher Education**: Institutions offering dressmaking and related technical programs should integrate instructional materials that are proven to be effective in enhancing practical skills. Curriculum developers should consider providing more structured support in areas where students commonly struggle, such as pattern cutting and assembling, and continue to improve teaching methods through research-based interventions.

**School Administrators**: Administrators should prioritize the implementation of instructional materials that are comprehensive and adaptable to various learning styles. They should ensure that teachers have access to effective resources and offer professional development opportunities to enhance their instructional delivery, particularly in technical and vocational subjects like dressmaking.

**Teachers**: Teachers should incorporate the highly rated instructional materials into their teaching practices and provide additional focus on areas where learners are struggling, such as Planning Designs and Sewing Patterns. Continuous assessments and targeted practice sessions are recommended to help students move from the Novice to Proficient levels.

**Students**: Students should actively engage with the instructional materials, taking advantage of the multimedia and interactive features to enhance their understanding. Those struggling with certain skills should seek additional practice and guidance, aiming to improve competency levels through consistent use of the materials.

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# GROWTH PERFORMANCE AND YIELD RESPONSE OF CUCUMBER (*Cucumis sativus L.)*APPLIED WITH DIFFERENT LEVELS OF FERMENTED WATER HYACINTH (*Eichhornia crassipes*) AS ORGANIC FERTILIZER

**Oliva Galanida Reporial**
Graduate Student, Surigao del Norte State University, Surigao City

**Erma C. Taer**
Graduate School Professor, Surigao del Norte State University, Surigao City

**ABSTRACT**

**This study investigated the growth and yield responses of cucumber (*Cucumis sativus L.*) to varying concentrations of fermented water hyacinth (FWH) as an organic fertilizer. Conducted from February to April 2024 in the Caraga Region, Philippines, the experiment employed a Randomized Complete Block Design (RCBD) with four treatments: 300 ml $L^{-1}$, 400 ml $L^{-1}$, 500 ml $L^{-1}$ FWH, and a control. Data were collected on growth parameters such as vine length, number of leaves, and number of branches at 15 and 30 days after planting (DAP). Additionally, reproductive metrics including days to 50% flowering and fruiting, as well as yield attributes like fruit length, diameter, weight, and total fruit count, were analyzed. Fertilizer treatments were applied weekly, beginning seven days after transplanting, with the FWH prepared through a 14-day fermentation process using water hyacinth and molasses. Results revealed statistically significant improvements in vine length, number of leaves, and branches among FWH-treated plants compared to the control. Notably, higher FWH concentrations accelerated days to 50% flowering and fruiting. For yield characteristics, significant differences were observed in fruit length and weight, while variations in fruit diameter were not statistically significant. The application of FWH demonstrated its potential as an eco-friendly and cost-effective organic fertilizer, enhancing cucumber growth and yield under tropical conditions. This study highlights the value of FWH in sustainable agriculture and its capacity to repurpose invasive aquatic plants into beneficial agricultural inputs.**

*Keywords: Organic fertilizer, Growth and yield response, Cucumber, Fermented water hyacinth, Experimental study*

## INTRODUCTION

Water hyacinth (*Eichhornia crassipes*), an invasive aquatic plant native to the Amazon Basin, poses significant ecological and economic challenges across various countries. This species forms dense mats on water surfaces, which obstructs sunlight, reduces water flow, and diminishes oxygen levels, ultimately leading to the degradation of aquatic habitats and the displacement of native flora and fauna (Degaga, 2019; Gupta & Yadav, 2020). The proliferation of water hyacinth has been linked to severe consequences for local ecosystems, including increased asphyxiation of aquatic life, reduced biodiversity, and heightened risks of vector-borne diseases due to the creation of breeding grounds for mosquitoes (Corn et al., 2021; Hailu Degaga et al., 2018). Despite these negative impacts, the plant's rich nutrient composition presents an opportunity for its use in sustainable agricultural practices.

Research indicates that water hyacinth is particularly high in essential nutrients such as nitrogen, phosphorus, and potassium, which can be harnessed to produce organic fertilizers (Jafari, 2010; Mitan, 2019). Organic fertilizers have been shown to enhance crop quality and yield by improving soil fertility and structure (Gupta & Hussain, 2014; Liu et al., 2024). While various organic fertilizers have been extensively studied, the potential of fermented water hyacinth as a viable organic fertilizer remains underexplored. Initial studies suggest that fertilizers derived from water hyacinth can boost the growth and

yield of crops like maize and cucumbers (Rohmawan et al., 2020; Gosal et al., 2022). However, there is a notable lack of research focused specifically on the optimal concentration of fermented water hyacinth for maximizing cucumber growth.

Cucumber (*Cucumis sativus L.)* is a commercially important vegetable crop that faces challenges such as low soil fertility and high costs associated with chemical fertilizers (Deepa et al., 2018; Okafor & Yaduma, 2021). Given these constraints, exploring alternative fertilization methods is crucial for enhancing cucumber production sustainably. The existing literature highlights a gap in understanding how different concentrations of fermented water hyacinth affect cucumber growth and yield. This knowledge is essential for developing practical applications that can mitigate the negative impacts of invasive species while promoting agricultural sustainability.

This study aims to address this knowledge gap by investigating the growth and yield responses of cucumber plants to varying levels of fermented water hyacinth. By determining the optimal application rates that positively influence cucumber development, this research seeks to contribute to sustainable agricultural practices while providing a strategic approach to managing invasive water hyacinths. The findings will be beneficial not only for farmers looking to improve crop yields but also for policymakers and environmental managers seeking innovative solutions that promote ecological balance while leveraging the potential benefits of this invasive species.

## STATEMENT OF THE PROBLEM

This research aimed to investigate the cucumber (Cucumis sativus L.) growth and yield response when applied with different varying levels of fermented water hyacinth as an organic fertilizer. Specifically, it sought to answer the following sub-problems:

1. What is the effect on growth performance of Cucumber whem applied with fermented water hyacinth (FWH) different treatments at 15 and 30 DAP in terms of:
   1.1 vine length;
   1.2 number of leaves; and
   1.3 number of branches?
2. What is the effect of develop fermented water hyacinth (FWH) fertilizer in different concentrations levels on the average number of days to 50% flowering and 50% fruiting in Cucumber plants?
3. What is the effect on yield characteristics of Cucumber when applied with fermented water hyacinth (FWH) different treatments at 15 and 30 DAP in terms of:
   3.1 fruit length;
   3.2 diameter;
   3.3 weight; and
   3.4 total number of fruits produced?

## RESEARCH METHODOLOGY

### Location of the Study

From February to April 2024, the study was conducted at the Horticulture Garden of one of the state university in CARAGA region, Philippines. The climatic condition of the area is classified as tropical rainforest (Af) according to the Köppen climate classification, characterized by significant rainfall throughout the year, 2,500 mm annual rainfall, 24°C to 30°C temperature and 80% to 90% relative humidity.

### Study Design

The study employed a Randomized Complete Block Design (RCBD) to evaluate the effects of fermented water hyacinth (FWH) on Cucumber production. The RCBD was chosen to minimize variability within the experimental units by accounting for environmental heterogeneity across the study area, such as soil fertility and microclimatic conditions. The detailed treatment combinations are presented in Table 1.

**Table 1. Treatment combination employed in the experiment**

| Code | Level of FWH (ml) | Level of water (L) | Combinations |
|---|---|---|---|
| T1 | 300 ml | 1 lit | 300ml $L^{-1}$ |
| T2 | 400 ml | 1 lit | 300ml $L^{-1}$ |
| T3 | 500 ml | 1 lit | 300ml $L^{-1}$ |
| T4 | 0 | 0 | Control |

**Experimental field and plot layout**

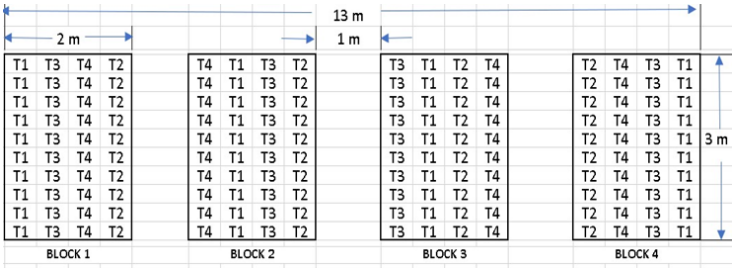


*Figure 2. Field layout of the experiment*

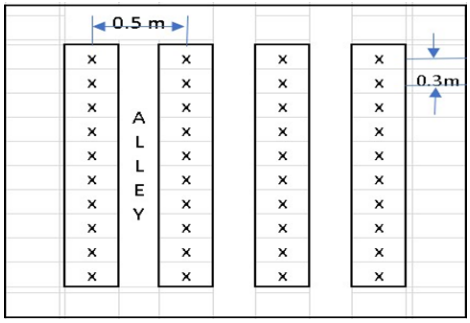


*Figure 3. Plot layout of the experiment containing four treatment rows with ten hills*

## Field preparation

The study's field preparation was conducted on an approximately 70-square-meter area within the Horticultural Garden of the said university. The preparation began with repeated ploughing and harrowing to loosen the soil and break it down into fine aggregates. After achieving a fine soil texture, the field was divided into plots corresponding to the experimental design. Each plot was carefully staked and marked to delineate the four blocks containing four treatment rows.

## Cucumber Planting

The seeds of the "ASUKA F1" Cucumber variety were sourced from a certified seed store in the locality. The planting distance was 30 cm between hills and 50 cm between rows, the hole was dug to a depth of 2-5 cm, and 1-2 seeds were sown per hole to ensure that at least one seedling would emerge per hill. At precisely seven days after planting (DAP), extra seedlings within a single hill were removed to maintain the experimental design's uniformity of one plant per hill.

## Gathering of water hyacinth

Freshwater hyacinth plants were collected in bulk from the lakeshore of Mainit Lake, Mainit, Surigao del Norte, the primary site of infestation in the region. After collection, the plants were thoroughly cleaned to remove debris, mud, and other impurities. The roots were also carefully removed to standardize the plant material used in the fermentation process. Once cleaned, the water hyacinth plants were packed into empty feed bags and then transported to the Horticulture Garden of the university, where they were prepared for fermentation.

## Fermentation of Water Hyacinth

The collected water hyacinth plants were chopped into small 1 cm sizes and then placed into an empty plastic barrel with a capacity of 200 liters. The fermentation was done by mixing the water hyacinth material with molasses in a 2:1 weight-to-volume ratio (2 parts of water hyacinth to 1 part of molasses), and the mixture was blended to ensure even distribution of the molasses. The container was covered with cellophane and set aside in a dark room at a temperature range between 28-30 degrees Celsius. After seven days, the mixture was stirred thoroughly and covered again to continue fermentation for another seven days. After 14 days of fermentation, the mixture was strained to separate the solid residues and liquid was collected and stored in plastic gallon containers ready for experimentation.

## Fertilizer Treatment Application

The prepared fermented water hyacinth (FWH) solution was diluted with water according to the specified treatment concentrations. The first application of the FWH treatments was carried out seven days after transplanting (DAT) was administered to the soil around the base of the Cucumber plants. Subsequent applications were at 7-day intervals, resulting in four applications throughout the study.

## Data Gathering

**Growth responses**. Vine length, number of leaves, and number of branches were gathered simultaneously 15 days after planting and repeated at 30 DAP. Vine length was measured from the base of the plant to the tip of the main vine using a meter stick in centimetres. The number of healthy, intact, and fully expanded leaves on the main vine was counted. All lateral branches fully expanded and emerging from the main vine were counted as the number of leaves.

**Days to 50% flowering**. The number of days until the onset of flowering for each Cucumber plant and the first appearance of the flower were also noted. After that, the total number of flowers in caged fruits was recorded daily. If more than half of the nodes had flowers, the plants were deemed 50% flowering, and the total number of days it took for each Cucumber plant to be 50% flowering was noted.

**Days to 50% fruiting**. In the same manner as flowering, the stages of fruiting in each Cucumber plant and the date the first fruit was observed were done. It was assumed that the Cucumber plant had ripe when at least fifty per cent of the nodes had fruited in the Cucumber plant, and the number of days taken for each Cucumber plant to ripen was noted.

**Fruit length**. Fruit length was measured from the base of the fruit at the point of attachment to the plant to the tip, following a straight line along the longest axis from the ten longest fruits for every treatment. Using the ruler, the measurements were recorded in centimeters.

**Fruit diameter**. The fruit diameters were measured using a digital calliper at the widest point from the ten widest fruits per treatment. Measurements were taken perpendicular to the length of the fruit, and the values were recorded in millimeters.

**Weight and number of fruits**. For each collection (every 72 hours), the fruits of each treatment group were hand-picked and counted, and the total weight of the fruit in each bag was taken using a digital weighing balance of up to one gram. The weight of individual fruits was also ascertained to compute the average fruit weight in every treatment.

## Statistical analysis

Growth responses of the Cucumber plants, including days to 50% flowering and fruiting, fruit length, and fruit diameter, were statistically analyzed using appropriate methods. The growth responses, fruit length, and diameter were analyzed by one-way ANOVA, followed by Tukey's HSD test for multiple comparisons. Descriptive statistics were used to summarize the data for days to 50% flowering and fruiting. Fruit weight and the number of fruits were analyzed using Friedman's test due to the non-normal distribution of data. Significant differences identified by Friedman's test were further examined using a Stepwise Step-down comparison to assess specific group differences. All statistical analyses were conducted using SPSS for Windows, ensuring that appropriate statistical procedures were applied to evaluate the effects of different treatments on Cucumber growth and yield parameters.

## RESULTS AND DISCUSSIONS

## GROWTH PERFORMANCE OF CUCUMBER WHEN APPLIED WITH FERMENTED WATER HYACINTH (FWH) DIFFERENT TREATMENTS AT 15 AND 30 DAP

### Effectiveness of fermented water hyacinth (FWH) varying treatments on "VINE LENGTH" of Cucumber at 15 and 30 DAP

**Table 1. Effect of fermented water hyacinth (FWH) varying treatments on vine length of Cucumber at 15 and 30 DAP**

| Treatment | Vine length (cm) | |
|---|---|---|
| | 15 DAP | 30 DAP |
| 300ml $L^{-1}$ | 43.85 | $62.65^{ab}$ |
| 400ml $L^{-1}$ | 44.90 | $70.05^{bc}$ |
| 500ml $L^{-1}$ | 47.85 | $76.85^{c}$ |
| Control | 43.85 | $62.15^{a}$ |
| Chi-Square | 0.40 | 15.67 |
| Asymp. Sig. | $0.94^{ns}$ | 0.001* |

*Column means of different letters are significantly different at 0.05 level*
**Significant* $^{ns}$ *Not significant*

The vine length of Cucumber shows no statistically significant differences among the treatments at 15 DAP (Table 2). However, at 30 DAP, significant differences emerged among the treatments ($p = 0.001$), showing 500ml $L^{-1}$ FWH treatment resulted in the longest vines (76.85 cm), which was significantly higher than the control (62.15 cm) and the 300ml $L^{-1}$ treatment (62.65 cm). The 400ml $L^{-1}$ treatment also showed improved vine length (70.05 cm) compared to the control but was not significantly different from the 300ml $L^{-1}$ or 500ml $L^{-1}$ treatments. These results suggest that applying FWH as an organic fertilizer positively affects Cucumber vine growth, particularly at higher concentrations and as the plants mature. The lack of significant differences at 15 DAP indicates that the effects of FWH on vine length become more pronounced over time, possibly due to the gradual release and uptake of nutrients from the organic fertilizer (Diacono & Montemurro, 2011; Shaji et al., 2021).

The increase in vine length upon FWH concentration could result from enhanced nutrient supply and soil quality due to the effects of the organic fertilizer. More nutrient contents reportedly present in water hyacinths include nitrogen, phosphorus and potassium, which are essential for plant growth (Reddy et al., 1989; Lekshmi & Viveka, 2011; Bondoc, 2020). Reports on the biomass composition obtained through solid-state fermentation for rice bran reveal that the proteins, fibre, lipids, minerals and phenol compounds are boosted by this process, as highlighted by Ribeiro et al. (2017). Through fermentation, which is applied in biofertilizers, nutrients are made more readily available to the plants, increasing the nutrient content and the rate at which they are released (Suthar et al., 2017). Also, fermentation enables the enhancement of micronutrient status by losses of antinutrients such as phytates and tannins in plants, which are known to hinder micronutrient absorption (Samtiya et al., 2021).

Moreover, applying organic matter in FWH may have improved soil structure, water retention, and microbial activity, contributing to better plant growth conditions. Accordingly, long-term application of organic matter, including manure, significantly increases soil stability by enhancing the proportion of soil macro-aggregates, which improves soil porosity and structure (Tuo et al., 2017; Yang et al., 2023). This improved structure also enhances the soil's water retention capacity, reducing leaching and providing consistent moisture for plant roots (Wen et al., 2017). In addition, microbial consumption of organic matter stimulates greater microbial growth and improved microbial quality, which is vital in nutrient recycling as well as the health of the soil (Dong et al., 2005; Waguespack et al., 2022). Therefore, applying organic matter enhances plants' optimum growth in a range of ways that affect the soils' physical, chemical, and biological properties. These factors could explain the enhanced vine growth observed in the FWH-treated plants, particularly at higher concentrations.

The results align with previous studies that have demonstrated the positive effects of organic fertilizers on Cucumber growth. For instance, Rohmawan et al. (2020) found that using liquid organic fertilizer (LOF) derived from water hyacinth improved several growth parameters of Cucumbers, such as leaf number, shoot weight, and fruit size. Nur & Gani (2023) demonstrated that water hyacinth compost, especially when combined with chicken manure, significantly enhanced the growth and production of Jap-

anese Cucumber. Similarly, Go et al. (2011) reported that water hyacinth-based compost, combined with mineral fertilizer, increased vine length, leaf area, and fruit yield in Cucumber plants.

## Effectiveness of fermented water hyacinth (FWH) varying treatments on "NUMBER OF LEAVES" of Cucumber at 15 and 30 DAP

**Table 2. Effect of fermented water hyacinth (FWH) treatment on number of leaves of Cucumber at 15 and 30 DAP**

| Treatment | Number of leaves | |
|---|---|---|
| | 15 DAP | 30 DAP |
| 300ml $L^{-1}$ | 44.40 | 52.55 |
| 400ml $L^{-1}$ | 52.25 | 60.20 |
| 500ml $L^{-1}$ | 60.95 | 69.25 |
| Control | 45.05 | 53.85 |
| Chi-Square | 7.16 | 6.28 |
| Asymp. Sig. | $0.067^{ns}$ | $0.098^{ns}$ |

*$^{ns}$ Not significant*

Table 2 also shows the interaction of concentrations of FWH on the number of leaves of the Cucumber plants at 15 and 30DAP. At 15 DAP, the number of leaves ranged from 44.40 in the 300ml $L^{-1}$ FWH treatment to 60.95 in the 500ml $L^{-1}$ treatment. The control treatment resulted in 45.05 leaves, while the 400ml $L^{-1}$ treatment produced 52.25 leaves. Contrary to the above results, an increase in FWH concentration led to a perceived increase in the number of leaves formed, but the differences were not significantly different (p = 0. 067). Similar results were recorded in the case of the leaf count at 30 DAP, which varied between 52. 55 in the 300ml $L^{-1}$ treatment and 69. 25 in the 500ml $L^{-1}$ treatment. The control and 400ml $L^{-1}$ average for leaves were 53. 85 and 60. 20, respectively. The differences were not statistically significant (p = 0,098).

Although not statistically significant, the data suggest a potential positive effect of FWH application on leaf production in Cucumber plants, particularly at higher concentrations. The 500ml $L^{-1}$ treatment consistently showed the highest number of leaves at both time points, with an increase of approximately 37% compared to the control at 15 DAP and 29% at 30 DAP. Despite the apparent trends, the lack of statistical significance could be due to several factors. First, there may be high variability among individual plants, which is common in agricultural experiments. Second, the sample size or the duration of the experiment may not have been sufficient to detect statistically significant differences. Lastly, the effect of FWH on leaf number might be more subtle than its effect on other growth parameters, such as vine length.

Plants have limited resources (e.g., nutrients, water, and energy) that they can allocate to various growth processes. When an organic amendment like FWH is applied, specific growth parameters may be enhanced more noticeably than others. For instance, an increase in vine length could result from improved water retention, enhanced nutrient availability, or increased microbial activity around the root zone, which promotes root development and supports more vigorous vertical growth. In contrast, the number of leaves might not increase proportionately because leaf production is typically more regulated and depends on other factors such as the plant's developmental stage, hormonal balance, and environmental conditions (Kerstetter&Poethig, 1998; Li et al., 2007; Bar & Ori, 2014). This could explain why changes in leaf number are more subtle compared to vine length.

## Effectiveness of fermented water hyacinth (FWH) varying treatments on "NUMBER OF BRANCHES" of Cucumber at 15 and 30 DAP

**Table 3. Effect of fermented water hyacinth (FWH) treatment on number of branches of Cucumber at 15 and 30 DAP**

| Treatment | Number of leaves | |
|---|---|---|
| | 15 DAP | 30 DAP |
| 300ml $L^{-1}$ | 7.95 | 10.65 |
| 400ml $L^{-1}$ | 7.80 | 10.85 |
| 500ml $L^{-1}$ | 7.45 | 10.60 |
| Control | 7.75 | 10.55 |
| Chi-Square | 2.52 | 0.772 |
| Asymp. Sig. | $0.472^{ns}$ | $0.856^{ns}$ |

Table 3 presents the effects of different concentrations of fermented water hyacinth (FWH) on the number of branches in Cucumber plants at 15 and 30 days after planting (DAP). The results indicate that the FWH application did not significantly impact branch development in Cucumber plants at either time. At 15 DAP, the number of branches ranged from 7.45 in the 500ml $L^{-1}$ FWH treatment to 7.95 in the 300ml $L^{-1}$ treatment. The control and 400ml $L^{-1}$ treatments resulted in 7.75 and 7.80 branches, respectively. These differences were not statistically significant ($p = 0.472$).

Similarly, at 30 DAP, the number of branches showed minimal variation among treatments, ranging from 10.55 in control to 10.85 in the 400ml $L^{-1}$ treatment. The 300ml $L^{-1}$ and 500ml $L^{-1}$ treatments resulted in 10.65 and 10.60 branches, respectively. Again, these differences were not statistically significant ($p = 0.856$). The lack of significant differences in branch number across treatments suggests that applying FWH, regardless of concentration, did not substantially influence the branching pattern of Cucumber plants during the early growth stages. This observation is particularly notable when considered alongside the results from Tables 1 and 2, which showed some positive trends in vine length and leaf number with FWH application.

Several factors could explain the absence of a significant effect on branch numbers. First, branching patterns in Cucumber s are primarily determined by genetic factors (Grumet et al., 2022; Cramer & Wehner, 2000). The cultivar used in this study may have a relatively stable branching habit less influenced by environmental factors or nutrient availability. Second, the observation period (up to 30 days after planting, DAP) may have been too short to detect significant differences in branching, as Cucumber plants typically develop most of their branches during later growth stages (Su et al., 2024). The regulatory effects of strigolactone, which inhibits lateral branching by altering auxin and cytokinin levels, may not be fully evident in the early stages of growth, further supporting the need for a more extended observation period to detect significant changes (Su et al., 2024). Previous studies also suggest lateral branch development is closely tied to later stages of plant growth, reinforcing that a more extended period is necessary to observe these effects clearly (Cramer & Wehner, 2000).

Additionally, plants may have prioritized resources for primary vine elongation and leaf production over branch development, especially during the early growth stages. While FWH likely provided additional nutrients, the balance of these nutrients might not have been optimal for stimulating branch development. Branching in Cucumbers is influenced by the balance of various nutrients, particularly nitrogen and potassium (Alan, 1989; Cardoso et al., 2017). Finally, other environmental conditions, such as light intensity, temperature, and plant spacing, which were not manipulated in this study, can significantly influence branching in Cucumber plants (Kerstetter&Poethig, 1998; Li et al., 2007; Bar & Ori, 2014).

**Effectiveness of develop fermented water hyacinth (FWH) fertilizer in different concentrations levels on the average number of days to" 50% FLOWERING AND 50% FRUITING" in Cucumber plants**

**Table 4. Effect of fermented water hyacinth (FWH) treatment on the average number of days to 50% flowering and 50% fruiting of Cucumber**

| Treatment | Days to 50% flowering | | | Days to 50% fruiting | | |
|---|---|---|---|---|---|---|
| | Mean | Minimum | Maximum | Mean | Minimum | Maximum |
| 300ml $L^{-1}$ | 37.50 | 35 | 42 | 48.25 | 46 | 54 |
| 400ml $L^{-1}$ | 37.25 | 35 | 42 | 48.00 | 46 | 53 |
| 500ml $L^{-1}$ | 38.50 | 34 | 42 | 48.50 | 42 | 53 |
| Control | 41.75 | 40 | 43 | 52.75 | 52 | 53 |
| CV% | 8.61 | 7.72 | | | | |
| p-Value | 0.204$^{ns}$ | 0.249ns | | | | |

$^{ns}$ *Not significant*

Table 4 presents the effects of different fermented water hyacinth (FWH) concentrations on the average number of days to 50% flowering and 50% fruiting in Cucumber plants. The results indicate that while there are some observable trends, the differences among treatments were not statistically significant for either flowering or fruiting times. For days to 50% flowering, the mean values ranged from 37.25 days in the 400ml $L^{-1}$ FWH treatment to 41.75 days in the control treatment. The 300ml $L^{-1}$ and 500ml $L^{-1}$ treatments resulted in mean flowering times of 37.50 and 38.50 days, respectively. Despite the apparent trend of earlier flowering in FWH-treated plants compared to the control, these differences were not statistically significant ($p = 0.204$). Similarly, for days to 50% fruiting, the mean values ranged

from 48.00 days in the 400ml $L^{-1}$ treatment to 52.75 days in the control. The 300ml $L^{-1}$ and 500ml $L^{-1}$ treatments resulted in mean fruiting times of 48.25 and 48.50 days, respectively. Again, while there appears to be a trend towards earlier fruiting in FWH-treated plants, these differences were not statistically significant ($p = 0.249$). The data also show variability within treatments, as indicated by the minimum and maximum values. For flowering, the range was narrowest in the control (40-43 days) and widest in the 500ml $L^{-1}$ treatment (34-42 days). For fruiting, the control showed the narrowest range (52-53 days), while the 500ml $L^{-1}$ treatment had the widest range (42-53 days).

Although not statistically significant, the observed trends suggest that FWH application may influence the reproductive development of Cucumber plants. The apparent earlier onset of flowering and fruiting in FWH-treated plants, particularly at the 400ml $L^{-1}$ concentration, may be attributed to several factors. First, FWH likely provided additional nutrients, particularly nitrogen, phosphorus, and potassium, crucial for plant reproductive development (Zhang et al., 2023). The improved nutrient status may have supported an earlier transition to the reproductive phase. Second, as suggested by the trends in vegetative growth (Tables 1-3), FWH-treated plants may have been more vigorous, allowing them to reach the reproductive stage more quickly. Finally, organic fertilizers can influence the hormonal balance in plants (Wong et al., 2015). FWH may have promoted the production or activity of flowering-related hormones, such as gibberellins or cytokinins. The findings of this study are partially consistent with previous research on organic fertilizers and their effects on plant phenology. For example, Dawa et al. (2017) reported a significant increase in flowering in tomato plants treated with chicken manure combined with biofertilizers, highlighting the beneficial impact of organic amendments on reproductive development. In contrast, the current study found trends suggesting earlier flowering in Cucumber plants treated with FWH, although these results were not statistically significant. The discrepancies in outcomes might be due to differences in the type of organic fertilizers used, such as chicken manure versus FWH, the application rates, or environmental conditions during the studies.

Similarly, Ji et al. (2017) demonstrated that liquid organic fertilizers, particularly shrimp extract, significantly promoted early-stage growth and improved nutrient content in chrysanthemum plants, aligning with the positive trends observed in FWH-treated Cucumber plants. However, the effects on flowering timing were more pronounced in the Ji et al. study, likely due to different crop species, fertilizer types, or growth conditions. It is worth noting that while earlier flowering and fruiting can be advantageous in terms of earlier harvest and potentially extended production period, it does not necessarily translate to higher yield or better fruit quality. These aspects should be considered in conjunction with the timing of reproductive development to assess the full impact of FWH on Cucumber productivity.

## YIELD CHARACTERISTICS OF CUCUMBER WHEN APPLIED WITH FERMENTED WATER HYACINTH (FWH) DIFFERENT TREATMENTS AT 15 AND 30 DAP.

### Effectiveness on yield characteristics of Cucumber when applied with fermented water hyacinth (FWH) different treatments at 15 and 30 DAP in terms of "FRUIT DIAMETER."

**Table 5. Effects of different fermented water hyacinth (FWH) concentrations on the fruit diameter and length of Cucumbers**

| Treatment | Fruit Diameter (mm) | Statistical Significance | Fruit Length | Statistical Significance |
|---|---|---|---|---|
| Control (0 ml $L^{-1}$ FWH) | 45.29 | Not Significant ($p = 0.51$) | Data Not Provided | Significant Differences Observed |
| 300 ml $L^{-1}$ FWH | 46.58 | | | |
| 400 ml $L^{-1}$ FWH | 45.83 | | | |
| 500 ml $L^{-1}$ FWH | 45.67 | | | |

Table 5 shows the effects of different fermented water hyacinth (FWH) concentrations on the fruit diameter and length of Cucumber s. The data indicate statistically significant differences in fruit length but not in diameter across the treatments. For fruit diameter, measurements ranged from 45.29 mm in the control group to 46.58 mm in the 300 ml $L^{-1}$ FWH treatment. The 400 ml $L^{-1}$ and 500 ml $L^{-1}$ treatments resulted in 45.83 mm and 45.67 mm diameters, respectively. Although there were slight variations

among the treatments, these differences were not statistically significant (p = 0.51). This lack of significance suggests that applying FWH does not significantly affect the radial growth of Cucumber fruits.

**Effectiveness on yield characteristics of Cucumber when applied with fermented water hyacinth (FWH) different treatments at 15 and 30 DAP in terms of "FRUIT LENGTH."**

**Table 6. Effect of fermented water hyacinth (FWH) on the fruit diameter and fruit length of Cucumber**

| Treatment | Fruit diameter (mm) | Fruit length (cm) |
|---|---|---|
| 300ml $L^{-1}$ | 46.58 | $21.95^{b}$ |
| 400ml $L^{-1}$ | 45.83 | $21.67^{ab}$ |
| 500ml $L^{-1}$ | 45.67 | $20.38^{a}$ |
| Control | 45.29 | $21.62^{ab}$ |
| CV% | 5.24 | 5.69 |
| p-Value | 0.51ns | 0.013* |

*Column means of different letters are significantly different at 0.05 level*
**Significant* *ns Not significant*

Fruit length exhibited statistically significant differences among the treatments (p = 0.013). The 300 ml $L^{-1}$ FWH treatment produced the longest fruits (21.95 cm), significantly different from the 500 ml $L^{-1}$ treatment, resulting in the shortest fruits (20.38 cm). The control treatment and the 400 ml $L^{-1}$ treatment yielded intermediate fruit lengths of 21.62 cm and 21.67 cm, respectively, and these were not significantly different from the 300 ml $L^{-1}$ or 500 ml $L^{-1}$ treatments.

The results suggest that fermented water hyacinth (FWH) has a more significant effect on the longitudinal growth of Cucumber fruits than on their radial expansion. This differential response between fruit length and diameter may be attributed to several factors. Firstly, the nutrient composition of FWH, particularly at lower concentrations, may promote longitudinal cell division and expansion in developing fruits. This finding aligns partially with Yang et al. (2016), who demonstrated the role of potassium (K) in promoting cell elongation in cotton plants. While Yang et al. showed that potassium deficiency reduced fibre length by affecting cell turgor pressure, the current study suggests a balanced nutrient supply from FWH, including potassium, may similarly support longitudinal growth in Cucumber fruits. Although both studies emphasize potassium's importance in promoting cell elongation, Yang et al. (2016) focused on potassium's role in preventing deficiency stress in cotton.

In contrast, this study highlights the positive impact of a balanced nutrient supply on Cucumber fruit elongation, indicating variations in crop-specific growth responses and nutrient management strategies. Secondly, hormonal regulation may influence the observed growth patterns. This study aligns with the work of McAtee et al. (2013), He and Yamamuro (2022), and Fenn and Giovannoni (2021), who highlighted the role of plant hormones such as gibberellins (GAs) and auxins in fruit development and growth. The FWH treatments, especially at lower concentrations, may have stimulated the production or activity of hormones like gibberellins, which enhance longitudinal fruit growth. McAtee et al. (2013) and He and Yamamuro (2022) emphasize the role of GAs in fruit set, cell division, and expansion, while Fenn and Giovannoni (2021) discuss how auxin and GA signalling regulate fruit growth and development. Although this study and the cited research recognize hormonal regulation as crucial for fruit growth, this study focuses on the potential hormonal effects of organic fertilizer applications.

In contrast, the others explore broader hormonal interactions across different plant species. Finally, the findings are consistent with Marcelis (1993) and Marcelis and Hofman-Eijer (1993, 1995), who examined the impact of source-sink relationships on Cucumber fruit growth. This study suggests that FWH application may alter source-sink relationships within the plant, favouring longitudinal fruit growth over radial expansion. Marcelis (1993) and Marcelis and Hofman-Eijer (1993) similarly noted that the distribution of assimilates, or the source-sink balance, is critical in determining fruit growth patterns, with increased assimilated supply promoting growth. These studies also highlighted that sink strength and environmental factors influence the dynamic partitioning of dry matter between fruits and vegetative parts. Collectively, these studies underscore the importance of source-sink dynamics in shaping fruit growth, with the potential for treatments like FWH to shift resource allocation toward specific growth outcomes.

The observation that the 300 ml $L^{-1}$ treatment produced the longest fruits, while the 500 ml $L^{-1}$ treatment resulted in the shortest, suggests a non-linear response to FWH application, indicating a potential

optimal concentration for promoting fruit length. This finding implies that beyond a specific concentration, the beneficial effects of FWH diminish or become inhibitory, which may be due to several factors. First, a nutrient imbalance might occur at higher concentrations. Excessive nutrient levels, particularly nitrogen, can reduce fruit size in Cucumber s (Choi et al., 2012; Guinto, 2016). High nitrogen levels promote vegetative growth—such as leaves and stems—at the expense of fruit development. This occurs because excess nitrogen stimulates the production of growth hormones like auxins, which enhance cell division and expansion in vegetative tissues (Yin et al., 2015; Fu et al., 2022). Second, the higher FWH concentrations may alter sink strength, promoting vegetative growth over fruit development. The trends in vine length and leaf number (Tables 1 and 2) suggest that excessive nitrogen disrupts the plant's source-sink relationship, diverting more assimilates towards vegetative parts rather than developing fruits (Yun, 2015). This imbalance in nutrient allocation can reduce the resources available for fruit growth, ultimately decreasing fruit size.

**Effectiveness on yield characteristics of Cucumber when applied with fermented water hyacinth (FWH) different treatments at 15 and 30 DAP in terms of "NUMBER OF CUCUMBER FRUITS."**

**Table 7. Effect of fermented water hyacinth (FWH) on number of Cucumber fruits in eight harvest period at 3 days intervals**

| Treatment | No. of fruit[1] | No. of fruit[2] | No. of fruit[3] | No. of fruit[4] | No. of fruit[5] | No. of fruit[6] | No. of fruit[7] | No. of fruit[8] |
|---|---|---|---|---|---|---|---|---|
| 300ml $L^{-1}$ | $2.85^{b}$ | $2.69^{b}$ | $1.81^{a}$ | $2.86^{b}$ | $2.62^{b}$ | $2.69^{b}$ | $2.07^{a}$ | $2.02^{a}$ |
| 400ml $L^{-1}$ | $3.00^{b}$ | $3.19^{b}$ | $3.22^{a}$ | $2.64^{ab}$ | $2.53^{ab}$ | $2.83^{b}$ | $2.83^{b}$ | $2.36^{ab}$ |
| 500ml $L^{-1}$ | $3.00^{b}$ | $2.81^{b}$ | $3.15^{b}$ | $2.14^{a}$ | $2.88^{b}$ | $2.69^{b}$ | $2.55^{ab}$ | $2.84^{b}$ |
| Control | $1.15^{a}$ | $1.31^{a}$ | $1.81^{a}$ | $2.36^{ab}$ | $1.97^{a}$ | $1.80^{a}$ | $2.55^{ab}$ | $2.78^{ab}$ |
| Chi-Square | 33.32 | 33.65 | 54.84 | 20.47 | 43.33 | 55.63 | 16.50 | 26.85 |
| Asymp. Sig. | < 0.001* | < 0.001* | < 0.001* | < 0.001* | < 0.001* | < 0.001* | 0.01* | < 0.001* |

*Column means of different letters are significantly different at 0.05 level*
**Significant ns Not significant*

Table 7 presents the effects of different concentrations of fermented water hyacinth (FWH) on the number of Cucumber fruits harvested over eight periods at 3-day intervals. The results reveal significant differences among treatments across all harvest periods, demonstrating the substantial impact of FWH application on Cucumber fruit production. Throughout the harvest periods, the FWH-treated plants consistently produced more fruits than the control, with statistically significant differences observed in all eight harvests ($p < 0.001$ for harvests 1-6 and 8, $p = 0.01$ for harvest 7). This trend indicates a positive effect of FWH application on Cucumber fruit yield. In the first harvest, the FWH treatments (300ml $L^{-1}$, 400ml $L^{-1}$, and 500ml $L^{-1}$) produced significantly more fruits (2.85, 3.00, and 3.00, respectively) compared to the control (1.15). This pattern persisted through the second harvest, with FWH treatments yielding 2.69-3.19 fruits compared to the control's 1.31. From the third harvest onward, the relative performance of the treatments varied, but the FWH-treated plants generally maintained higher fruit numbers than the control. Notably, the 500ml $L^{-1}$ treatment showed consistently high fruit numbers across most harvest periods, particularly in the later harvests.

The results highlight several critical effects of fermented water hyacinth (FWH) on Cucumber fruit production. The increased fruit numbers in FWH-treated plants suggest enhanced fruit set, likely due to improved plant nutrition, as FWH supplies essential nutrients like nitrogen, phosphorus, and potassium, which are crucial for flower development and fruit set in Cucumbers (Xu et al., 2001; Kumar et al., 2020). The sustained higher fruit numbers over multiple harvests indicate that FWH-treated plants maintained their productivity longer than the control, likely due to improved plant health and nutrient availability from the slow-release properties of organic fertilizers (Diacono & Montemurro, 2011; Shaji et al., 2021). Among the FWH treatments, the 500 ml $L^{-1}$ concentration often produced the highest fruit numbers, particularly in later harvests, suggesting a dose-dependent response favouring sustained fruit production.

The fluctuations in fruit numbers across harvest periods for all treatments reflect the natural cycles of Cucumber fruit production, aligning with previous research, such as Denna (1973), who observed similar cycles across different harvest periods. While both studies highlight the cyclical nature of Cucumber fruit production, this study shows that FWH-treated plants maintained higher production levels

throughout these cycles, indicating that FWH may help stabilize or enhance fruit yield over time. In contrast, Li et al. (2020) examined the genetic factors affecting Cucumber production, particularly the CNV-based F locus influencing sex expression, whereas this study focuses on the effects of an organic treatment (FWH) on stabilizing yield levels across different harvest periods. Thus, while both address fluctuations in Cucumber production, Li et al. provide insights into genetic influences, and this study emphasizes the role of organic amendments in maintaining consistent yields.

The increase in fruit numbers due to the application of fermented water hyacinth (FWH) is attributed to several factors. FWH likely provided a balanced supply of macro- and micronutrients, enhancing plant health and reproductive capacity (Reddy et al., 1989; Lekshmi & Viveka, 2011; Bondoc, 2020). FWH also improves soil structure, water retention, and microbial activity, which supports root development and nutrient uptake (Yang et al., 2023; Wen et al., 2017; Waguespack et al., 2022). Additionally, organic fertilizers can alter hormone levels, promoting flower initiation and fruit set (Yin et al., 2015; Fu et al., 2022), while improved soil conditions and nutrient availability may reduce plant stress, leading to consistent fruit production (Bibi & Ilyas, 2019).

**Effectiveness on yield characteristics of Cucumber when applied with fermented water hyacinth (FWH) different treatments at 15 and 30 DAP in terms of "WEIGHT OF CUCUMBER FRUITS."**

**Table 8. Effect of fermented water hyacinth (FWH) on weight of Cucumber fruits in eight harvest period at 3 days intervals**

| Treatment | Wt. of fruit[1] | Wt. of fruit[2] | Wt. of fruit[3] | Wt. of fruit[4] | Wt. of fruit[5] | Wt. of fruit[6] | Wt. of fruit[7] | Wt. of fruit[8] |
|---|---|---|---|---|---|---|---|---|
| 300ml $L^{-1}$ | 279.23$^{b}$ | 212.50$^{b}$ | 115.00$^{a}$ | 293.75$^{b}$ | 245.45$^{b}$ | 271.51$^{b}$ | 159.52 | 160.34$^{a}$ |
| 400ml $L^{-1}$ | 275.92$^{b}$ | 262.50$^{b}$ | 310.00$^{c}$ | 241.41$^{b}$ | 241.48$^{b}$ | 280.23$^{b}$ | 249.29 | 188.79$^{a}$ |
| 500ml $L^{-1}$ | 331.54$^{b}$ | 200.00$^{b}$ | 277.5b$^{c}$ | 293.75$^{b}$ | 265.34$^{b}$ | 262.21$^{b}$ | 220.24 | 250.86$^{ab}$ |
| Control | 23.08$^{a}$ | 15.63$^{a}$ | 120.00$^{ab}$ | 37.50$^{a}$ | 146.59$^{a}$ | 136.16$^{a}$ | 217.86 | 273.28$^{b}$ |
| Chi-Square | 18.44 | 28.87 | 17.67 | 40.72 | 30.33 | 24.76 | 3.28 | 11.09 |
| Asymp. Sig. | <0.001* | <0.001* | 0.001* | <0.001* | <0.001* | <0.001* | 0.350$^{ns}$ | 0.011* |

*Column means of different letters are significantly different at 0.05 level*
**Significant ns Not significant*

Table 8 presents the effects of different fermented water hyacinth (FWH) concentrations on the weight of Cucumber fruits harvested over eight periods at 3-day intervals. The results demonstrate significant differences among treatments across most harvest periods, indicating a substantial impact of FWH application on Cucumber fruit weight and overall yield. Statistically significant differences in fruit weight were observed in seven of the eight harvest periods ($p < 0.001$ for harvests 1-6, $p = 0.011$ for harvest 8). Only the seventh harvest period showed no significant differences among treatments ($p = 0.350$). In the first harvest, all FWH treatments resulted in significantly higher fruit weights than the control. The 500ml $L^{-1}$ treatment produced the heaviest fruits (331.54 g), followed by the 300ml $L^{-1}$ (279.23 g) and 400ml $L^{-1}$ (275.92 g) treatments, while the control yielded substantially lighter fruits (23.08 g).

This trend of FWH treatments outperforming the control continued through most of the harvest periods, with some variations in the relative performance of different FWH concentrations. Notably, the control treatment gradually increased fruit weight over time, eventually matching or exceeding some FWH treatments in the later harvests. The variation in optimal FWH concentration across harvest periods suggests that plant nutritional requirements may change over the growing season. For instance, the high performance of the 500ml $L^{-1}$ treatment in early harvests might reflect higher nutrient demand during the initial fruit set and development stages.

## CONCLUSION

Fermented water hyacinth shows significant potential as an organic fertilizer for Cucumber production, offering improvements in growth, early yield, and overall productivity. These findings open new avenues for sustainable agriculture, potentially reducing reliance on synthetic fertilizers while improving crop yields. However, as with any agricultural innovation, further research is needed to optimize application methods, investigate long-term effects on soil health, and assess economic viability across different agricultural contexts.

## RECOMMENDATIONS

1. Future studies should focus on refining the application rates and timing of FWH throughout the growing season. Given the observed variations in effectiveness across different growth stages and harvest periods, research should aim to develop a more precise fertilization schedule.
2. Research should be conducted over multiple growing seasons to assess how repeated FWH applications affect soil physical properties, chemical composition, organic matter content, and microbial activity.
3. Future research should expand beyond yield components to investigate the effects of FWH on Cucumber fruit quality. This could include studying parameters such as nutritional content, flavour profiles, shelf life, and resistance to post-harvest diseases.
4. Comprehensive economic analyses should be performed to compare the costs and benefits of FWH use against conventional fertilization practices, considering factors such as yield increases, potential premium pricing for organic produce, and the costs associated with FWH production and application.

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# DEVELOPMENT AND ACCEPTABILITY OF COCONUT EMBRYO *(Marasmiellus inoderma)* AS BURGER PATTY

**Pablia L. Ocampo**
Graduate Student, Surigao del Norte State University, Surigao City

**Edwin E. Gibertas, PhEdD**
Graduate School Professor, Surigao del Norte State University, Surigao City

**ABSTRACT**

**The study aimed to develop patties made from coconut embryo and evaluate the acceptability of the developed patty made from coconut embryo in terms of Appearance, Aroma, Taste and Texture. A descriptive-developmental research design methodology was employed since it created a culinary product consisting of a patty formed from coconut embryos. A total of 50 respondents composed of Food experts/TLE teachers, students of one of State University in the region selected using purposive sampling. Data gathered were analyzed using mean, standard deviation and analysis of variance. Result reveal that the phyto-chemical analysis of the coconut embryo extract confirmed the presence of alkaloids, saponins, and tannins, providing insight into its bioactive compounds. The physico-chemical analysis coconut embryo patty demonstrated a balanced nutritional profile with moderate caloric content and essential minerals like calcium and iron. Sensory evaluations showed a clear preference for the all-purpose flour variant, which outperformed cornstarch and cassava starch versions in appearance, texture, taste, and overall acceptability. Lastly the statistical analysis confirmed that these differences in consumer preferences are significant, highlighting a strong preference for the all-purpose flour patty.**

*Keywords: Developmental study, Burger patty, Coconut embryo, Perceptions*

## INTRODUCTION

The pursuit of sustainable food production has led to an increased exploration of alternative ingredients to replace traditional meat products (Ahmad et al., 2022). This shift is largely driven by the environmental impact of livestock farming and a growing consumer demand for healthier food options. Among the emerging alternatives, plant-based products, particularly those derived from coconuts, have shown promise due to their nutritional benefits and economic viability in regions with abundant coconut cultivation (Szenderák et al., 2022). This study aims to investigate the potential of coconut embryo (Marasmiellus Inoderma) as a key ingredient in burger patties, addressing the rising consumer interest in healthier and more sustainable food choices.

The coconut embryo, often referred to as the "coconut apple," is the soft connective tissue found within mature coconuts. Its rich composition includes beneficial fats, dietary fiber, vitamins, and minerals, making it a strong candidate for innovative food applications. By incorporating coconut embryo into burger patties, this research not only capitalizes on the health benefits associated with coconuts but also aligns with the global trend towards plant-based diets. This incorporation could help meet the demand for nutritious alternatives while promoting a shift away from meat-centric diets.

Despite the promising nutritional profile of coconut embryo, there remains a significant gap in research regarding its application in food products, particularly in burger formulations. Current literature lacks comprehensive studies that explore the culinary potential and consumer acceptance of coconut embryo as a meat substitute. This study seeks to address this gap by evaluating the feasibility of using coconut embryo in burger patties within the context of Filipino cuisine. Given its nutritional richness and local availability, this research is particularly relevant for addressing food insecurity among students facing financial challenges.

In addition to enhancing dietary options, this study aims to support local coconut industries by promoting the use of underutilized coconut by-products. By investigating the development of coconut em-

bryo-based burger patties, this research contributes to the ongoing discourse on sustainable food practices and innovative culinary experiences (Anil Bukya, 2023). Ultimately, this study will assess the acceptance of coconut embryo patties among Filipino communities, thereby fostering greater awareness and utilization of sustainable food alternatives that can alleviate hunger and improve nutritional outcomes.

## STATEMENT OF THE PROBLEM

This study aimed to develop patties made from coconut embryo and evaluate the acceptability of its potential products.

Specifically, it sought to answer the following questions:

1. What is the phytochemical analysis of the "Buwa" or Coconut Embryo?
2. What is the physico-chemical analysis and nutritive value of the patty product?
3. What are the processes in the development of patty made from coconut embryo?
4. What is the perceptions of the respondents on the level of acceptability of the developed patty made from coconut embryo in terms of:
   4.1 Appearance;
   4.2 Aroma;
   4.3 Taste; and
   4.4 Texture?
5. Is there a significant difference on the level of acceptability among variants of Coconut embryo patty when applied with different binders?

## RESEARCH METHODOLOGY

### Research Design

The study employed the descriptive-developmental research design methodology, since it aimed to create a culinary product consisting of a patty formed from coconut embryos. This study was both descriptive and developmental design. The descriptive design of the study focuses on describing the current state of the research, such as the characteristics of the coconut embryo, its nutritional content, and its potential as an ingredient in food products like burger patties. The developmental design of the study focuses on the process of creating, testing, and refining the coconut embryo burger patty. It involves the development of new food products and their improvement over time.

### Research Environment

The developmental research study on the Development and Acceptability of Coconut Embryo as Patty was conducted in Food Technology Innovation Center of one of the State University in CARAGA region.

### Respondents

This study considered the 20 Foods Technology experts and 30 Food Technology students as consumers in determining the sensory attributes of the patty and the acceptability of its potential food products.

### Research Instrument

This study exclusively focused on product development. In order to assess the product's level of acceptability, a customized questionnaire was used. The potential products were evaluated using a Score Card and a Hedonic Scale, specifically to determine their acceptability in terms of taste, texture, aroma, and appearance. The parameters of which started from a score of 9 which is Like Extremely down to score 1 which is Dislike Extremely. This evaluation was conducted by a panel of experts and consumers who were selected through purposive random sampling. Several attempts were undertaken to attain the intended outcome.

**Data Analysis**

This study utilized the following statistical tools in analyzing the data:

**Mean and Standard Deviation**. These tools were used to determine the sensory attributes acceptability of the food products using the appearance, aroma, taste and texture.

**Analysis of Variance (ANOVA)**. This tool were used to determine the significant difference in the perception between the Food expert/T.L.E. teachers, students, vendors and customers in the acceptability of the patty made from coconut embryo in terms of appearance, aroma, taste and texture.

## RESULTS AND DISCUSSIONS

### Phytochemical analysis result of Coconut Embryo

**Table 1. Present the phytochemical analysis result of Coconut Embryo**

| Sample Code | Sample | Description | Parameter | Result |
|---|---|---|---|---|
| CHE-0330 | Coconut Embryo | 350g sample in plastic container | Volume of Extract Obtained | 50 mL |
| | | | **Alkaloids**<br>Confirmatory Test<br>(+) primary alkaloid<br>(++) secondary alkaloid<br>(+++) tertiary alkaloid | - |
| | | | Test for Quaternary Bases & Amine Oxide | + |
| | | | **Steroids**<br>Keller-Killini Test: For 2-deoxysugars<br>Liebermann-Burchard Test: For Unsaturated Steroids | +<br>- |
| | | | **Flavanoids**<br>Bate-Smith & Metcalf Method:<br>For Leucoanthocyanins | - |
| | | | **Saponins**<br>Froth Test<br>Tannins<br>Ferric Chloride Test<br>*Brownish-Green indicates the presence of condensed tannins<br>*Blue-black color indicates the presence of hydrolysable tannins | -<br>+<br>Brownish-Green color |

The sample with code CHE-0330 refers to a 350g coconut embryo specimen stored in a plastic container. The primary focus of the analysis is on the volume of extract obtained, which amounts to 50 ml. The analysis also investigates the presence of alkaloids, steroids, flavonoids, saponins, and tannins. Alkaloids are categorized based on their confirmatory test results, showing a positive result (+) for primary alkaloids, a stronger reaction (++) for secondary alkaloids, and an even more pronounced result (+++) for tertiary alkaloids. A positive result is also observed in the test for quaternary bases and amine oxide.

Regarding steroids, the sample gives a positive (+) reaction in the Keller-Killini test for 2-deoxysugars, while the Liebermann-Burchard test for unsaturated steroids is negative (-). The analysis for flavonoids, specifically for leucoanthocyanins using the Bate-Smith and Metcalf method, also results in a negative outcome. For saponins, the froth test confirms their presence. The tannin analysis using the ferric chloride test shows a brownish-green color, indicating the presence of condensed tannins, while the absence of a blue-black color suggests no hydrolysable tannins are present.

Coconut embryos are a highly nutritious source of vital nutrients necessary for maintaining optimal bodily health. They are abundant in vitamins and minerals, including as potassium and iron. Additionally, they possess a substantial amount of protein. Furthermore, they serve as an exceptional reservoir of antioxidants, which can potentially yield several health advantages. Flavonoids are abundant in coconut embryos. The body is supplied with an abundance of polyphenols, which possess numerous antioxidant properties. Additionally, these polyphenols possess anti-inflammatory properties. They are also effective in promoting the formation of blood clots. A recent study has established that coconut embryos may hold the key to optimal wellness. The study, done by researchers at the University of Queensland, established that embryos possess elevated levels of antioxidants, which can provide protection against illness (Anil Bukya, 2023).

## Physico-chemical analysis of Patty Products made from Coconut Embryo

**Table 2. Physico- chemical analysis of Patty Products made from Coconut Embryo**

| Parameters | Unit | Result | Method |
|---|---|---|---|
| Moisture | % | 61.6 | Gravimetric |
| Calcium | ppm | 752 | Dry Ashing-AAS |
| Magnesium | ppm | 20 | Dry Ashing-AAS |
| Iron | ppm | 25.6 | Dry Ashing-AAS |
| Sodium | ppm | 0.28 | Dry Ashing-AAS |
| Manganese | ppm | 3.6 | Dry Ashing-AAS |
| Potassium | % | 0.22 | Dry Ashing-AAS |
| Phosphorus | % | 0.03 | Spectrophotometric |
| Crude Protein | % | 5.4 | Kjeldahl |
| Crude Fat | % | 2.5 | Soxhiet |
| Carbohydrates | % | 29.1 | By Calculation(Kjeldahl; |
| Calories | 100g | 161 | Soxhiet;gravimetric |

Table 2 presented the physico-chemical analysis of the coconut embryo "BUWA" patty highlights key nutritional parameters and their respective values. The moisture content is 61.6%, indicating the patty has a significant amount of water, which may affect its texture and shelf life. Key minerals present include calcium (752 ppm), magnesium (20 ppm), iron (25.6 ppm), sodium (0.28 ppm), manganese (3.6 ppm), and potassium (0.22%), measured using the Dry Ashing-AAS method. The phosphorus content, determined spectrophotometric ally, is 0.03%.

Additionally, the patty contains 5.4% crude protein, 2.5% crude fat, and 29.1% carbohydrates, contributing to its nutritional profile. The energy content is measured at 161 calories per 100g, providing a moderate caloric value per serving. This analysis gives a comprehensive view of the patty's nutritional makeup, with a notable emphasis on its mineral and macronutrient composition.

Plant-based burgers must be engineered to possess physicochemical, functional, and sensory characteristics that closely resemble those of traditional animal burgers. This implies that these items should closely resemble the visual appearance, texture, and sensation in the mouth, taste, ability to be cooked, and nutritional composition of the original products (He et al., 2021). From a nutritional standpoint, it is important to create plant-based burgers that retain the essential nutrients typically found in meat, such as a high protein content and a well-balanced amino acid profile. At the same time, it is crucial to avoid the unhealthy components of meat, such as saturated fats and cholesterol, to promote optimal human health (Badar et al., 2021).

## Processes in Developing the Patty Made from Coconut Embryo

Processes of Coconut Embryo Patty with All-Purpose Flour:

The following are the procedural steps in the development of the coconut embryo patty:

1. Wash thoroughly the coconut embryos
2. Peel the tough part of each coconut embryo to reveal the tender interior.
3. Squeeze the tender part of coconut embryo to get rid the water content. Make sure that the water content is totally drain.
4. Grind the thinly sliced coconut embryo and spices using food processor.
5. Measure all the Ingredients and Mix evenly in a mixing bowl.
6. Weight around 50 grams each patty
7. Use egg molder to have a perfect round shape patty or you can also use your hand to shape
8. Use parchment paper as liner or separator of each patty
9. Steam coconut embryo patty for about 5 minutes in medium heat flame.
10. Let it cool
11. Pre-heat non-stick pan/frying pan in low heat flame
12. Add 2 tablespoons of Oil in your pan and make sure your pan is already hot before frying the coconut patty.
13. Cook for about 5-8 minutes or until its color become golden brown
14. Coconut embryo patty is now ready to fill your buns with your choice of dressing. Enjoy eating.

15. Store the remaining steam coconut embryo patty in a packaging film or in a plastic container and store in a chiller/freezer for future consumption.

## Sensory characteristics of the developed patty made from Coconut embryo

**Table 3.Sensory characteristics of the developed patty made from coconut embryo in terms of Appearance**

| Appearance | Coconut embryo & cornstarch | | Coconut embryo & cassava starch | | Coconut embryo & All-purpose flour | |
|---|---|---|---|---|---|---|
| | Median | Qualitative Description | Median | Qualitative Description | Median | Qualitative Description |
| 1.The coconut embryo patty has an appealing visual presentation. | 6 | like Slightly | 6 | like Slightly | 8 | like very much |
| 2. The color of the patty is attractive and appetizing. | 6 | like Slightly | 6 | like Slightly | 8 | like very much |
| 3. The patty's appearance is consistent with my expectations. | 6 | like Slightly | 6 | like Slightly | 8 | like very much |
| 4. The overall presentation of the patty is visually Inviting. | 6 | like Slightly | 5 | Neither like nor dislike | 7 | like moderately |
| **Overall median** | **6** | like Slightly | **6** | like Slightly | **8** | like very much |

For scoring, we utilized the nine-point hedonic scale (1 to 9), where 1 = dislike extremely; 2 = dislike very much; 3 = dislike moderately; 4 = dislike slightly; 5 = neither like nor dislike; 6 = like slightly; 7 = like moderately; 8 = like very much; 9 = like extremely (Pimentel et al., 2016)

The sensory evaluation of the appearance of patties made from coconut embryo, with different starches as binders (cornstarch, cassava starch, and all-purpose flour), highlights notable differences. For patties made with coconut embryo and cornstarch, a median score of 6 ("like slightly") was recorded for all attributes: visual presentation, color, consistency with expectations, and overall presentation. Similarly, the coconut embryo patty with cassava starch received a median score of 6 ("like slightly") for most of the attributes, except for the overall presentation, which scored a median of 5 ("neither like nor dislike").

In contrast, patties made with coconut embryo and all-purpose flour scored significantly higher in terms of appearance, with a median of 8 ("like very much") for visual presentation, color, and consistency with expectations, and a median of 7 ("like moderately") for overall presentation. The overall median score for appearance for the all-purpose flour variant was 8, indicating a strong preference for this formulation compared to the other two, which both had overall medians of 6. This suggests that the all-purpose flour variant was found to be the most visually appealing among the three. It was cited in the study of R. Chandrasekaran, 2020 on food formulation for plant-based meat analogs, suggests that all-purpose flour is a favored binder in many formulations due to its capacity to create a firm texture when mixed with liquids

**Table 4. Sensory characteristics of the developed patty made from coconut embryo in terms of Aroma.**

| Aroma | Coconut embryo & cornstarch | | Coconut embryo & cassava starch | | Coconut embryo & All-purpose flour | |
|---|---|---|---|---|---|---|
| | Median | Qualitative Description | Median | Qualitative Description | Median | Qualitative Description |
| 1. The patty has a distinctive coconut aroma that is easily detectable. | 6 | like Slightly | 5 | Neither like nor dislike | 8 | like very much |
| 2. The aroma of the patty is appetizing and makes me eager to taste it. | **5** | Neither like nor dislike | 5 | Neither like nor dislike | 7 | like moderately |
| 3. The coconut aroma enhances the overall sensory experience of the patty. | 6 | like Slightly | 6 | like Slightly | 8 | like very much |
| **Overall median** | **6** | like Slightly | 5 | Neither like nor dislike | 8 | like very much |

For scoring, we utilized the nine-point hedonic scale (1 to 9), where 1 = dislike extremely; 2 = dislike very much; 3 = dislike moderately; 4 = dislike slightly; 5 = neither like nor dislike; 6 = like slightly; 7 = like moderately; 8 = like very much; 9 = like extremely (Pimentel et al., 2016)

The table on the next page showed the acceptability of the developed coconut embryo patty in terms of its aroma. The sensory evaluation of the aroma of patties made from coconut embryo, using different starches (cornstarch, cassava starch, and all-purpose flour), revealed distinct differences in aroma perception. For the patties made with coconut embryo and cornstarch, a median score of 6 ("like slightly") was recorded for both the detectability of the coconut aroma and how it enhances the overall sensory experience, though the aroma's ability to make participants eager to taste the patty received a lower score of 5 ("neither like nor dislike"). This suggests a generally positive, but not strong, reception of the aroma.

The patties made with cassava starch received lower aroma ratings, with a median score of 5 ("neither like nor dislike") across all attributes, indicating that the aroma was less appealing or noticeable compared to the other variants.

On the other hand, the patties made with all-purpose flour were the most highly rated for aroma, with a median score of 8 ("like very much") for the distinctiveness of the coconut aroma and how it enhances the sensory experience, and a median score of 7 ("like moderately") for its appetizing nature. The overall median for the all-purpose flour variant was 8, showing a clear preference for its aroma compared to the other two variants, with cornstarch at 6 and cassava starch at 5. This indicates that the all-purpose flour variant had the most appealing and noticeable aroma. Magdalita (2020), stated in collaboration with other researchers, highlights the unique characteristics of coconut embryos in terms of aroma and flavor. Aromatic coconuts are often more fragrant compared to regular varieties, and this trait is noted to persist in the embryo as well

**Table 5. Sensory characteristics of the developed patty made from coconut embryo in terms of Taste.**

| Taste | Coconut embryo & cornstarch | | Coconut embryo & cassava starch | | Coconut embryo & All-purpose flour | |
|---|---|---|---|---|---|---|
| | Median | Qualitative Description | Median | Qualitative Description | Median | Qualitative Description |
| 1. The coconut embryo patty has an appetizing taste. | 6 | like Slightly | 6 | like Slightly | 8 | like Very Much |
| 2. Balance of the flavor. | 6 | like Slightly | 7 | like moderately | 8 | like Very Much |
| 3. Increase appetite to eat more. | 6 | like Slightly | 7 | like moderately | 8 | like Very Much |
| 4. The overall taste of the coconut embryo patty is palatable. | 7 | like moderately | 7 | like moderately | 8 | like Very Much |
| **Overall median** | **6** | like Slightly | 7 | like moderately | 8 | like Very Much |

For scoring, we utilized the nine-point hedonic scale (1 to 9), where 1 = dislike extremely; 2 = dislike very much; 3 = dislike moderately; 4 = dislike slightly; 5 = neither like nor dislike; 6 = like slightly; 7 = like moderately; 8 = like very much; 9 = like extremely (Pimentel et al., 2016)

The table showed the sensory evaluation of the taste of coconut embryo patties, with different starches (cornstarch, cassava starch, and all-purpose flour), highlighted clear differences in flavor appeal. The coconut embryo patty with cornstarch received a median score of 6 ("like slightly") for most taste attributes, such as appetizing taste, flavor balance, and appetite stimulation. The overall taste of this variant was rated slightly higher, with a median of 7 ("like moderately"). This suggests that while the cornstarch variant was found acceptable, it did not strongly stand out in terms of taste.

The patty made with cassava starch was rated slightly higher, with a median score of 7 ("like moderately") for flavor balance, appetite stimulation, and overall palatability. However, the patty's general appetizing taste was rated similarly to the cornstarch variant, with a median score of 6. The overall median for the cassava starch variant was 7, indicating a moderate preference for its taste characteristics.

The coconut embryo patty made with all-purpose flour received the highest ratings, with consistent median scores of 8 ("like very much") across all attributes, including appetizing taste, flavor balance, and increased appetite. This variant was clearly the most favored in terms of taste, achieving an overall median of 8. The results suggest that the all-purpose flour version delivered the most enjoyable and well

-balanced flavor experience, making it the most palatable among the three variants. Gunathilake et al. (2021) cited that coconut embryos, particularly from varieties like makapuno, are sought after for their sweet and pleasant taste, which is often more desirable than the traditional coconut meat.

**Table 6. Sensory characteristics of the developed patty made from coconut embryo in terms of Texture.**

| Texture | Coconut embryo & cornstarch | | Coconut embryo & cassava starch | | Coconut embryo & All-purpose flour | |
|---|---|---|---|---|---|---|
| | Median | Qualitative Description | Median | Qualitative Description | Median | Qualitative Description |
| 1. The texture of the coconut embryo patty is pleasing to the palate. | 7 | like moderately | 6 | like Slightly | **8** | like Very Much |
| 2. The patty is tender and easy to chew. | 6 | like Slightly | 6 | like Slightly | **8** | like Very Much |
| 3. The patty has a desirable level of firmness. | 7 | like moderately | 7 | like moderately | **8** | like Very Much |
| 4. The texture of the patty meets my expectations for this type of product. | 7 | like moderately | 6 | like Slightly | 7 | like moderately |
| **Overall median** | 7 | like moderately | 6 | like Slightly | **8** | like Very Much |

For scoring, we utilized the nine-point hedonic scale (1 to 9), where 1 = dislike extremely; 2 = dislike very much; 3 = dislike moderately; 4 = dislike slightly; 5 = neither like nor dislike; 6 = like slightly; 7 = like moderately; 8 = like very much; 9 = like extremely (Pimentel et al., 2016)

The sensory evaluation of the texture of coconut embryo patties, with different starch binders (cornstarch, cassava starch, and all-purpose flour), revealed varied responses in terms of texture appeal. The patties made with coconut embryo and cornstarch received a generally favorable texture rating, with a median score of 7 ("like moderately") for most attributes, including pleasing texture, desirable firmness, and meeting expectations. This indicates that the cornstarch variant was well-received for its moderate texture qualities.

The coconut embryo patty with cassava starch was rated slightly lower, with a median score of 6 ("like slightly") for attributes such as overall pleasing texture, tenderness, and matching expectations. However, the firmness of the patty received a slightly higher rating of 7 ("like moderately"), suggesting a more favorable view of its structural quality compared to other texture aspects.

In contrast, the coconut embryo patty with all-purpose flour was rated the highest across all texture parameters, with a consistent median score of 8 ("like very much") for texture appeal, ease of chewing, and firmness. This variant clearly stood out for its overall texture, as indicated by its overall median score of 8, compared to 7 for the cornstarch variant and 6 for the cassava starch variant. These results suggest that the all-purpose flour version had the most desirable texture, offering a balance of tenderness and firmness that appealed strongly to the participants.

Texture is a crucial attribute, since the mouthfeel should offer a gratifying bite that effectively replicates the succulent and resilient nature of meat (Sogari et. al., 2023). However, utilizing binding agents like as breadcrumbs, ground flaxseeds, or mashed legumes, in conjunction with moisture-retaining components like coconut oil or mushrooms, can effectively attain the intended texture while maintaining the patty's wetness and tenderness.

Research has demonstrated that meat alternatives, which shared comparable forms but varied in taste and texture, had differing levels of preference when assessed individually. Nevertheless, these disparities in preference disappeared when plant-based alternatives to meat were integrated into a rice-based meal. Likewise, meat alternatives that shared the same taste and texture qualities but varied in their shape (chunks and ground) showed variations in preference when evaluated separately.

**Table 7. Significant difference between Coconut embryo and different binders for the sensory perception analysis in the acceptability of the patty made from coconut embryo.**

| | df | Mean Square | *p*- value | Conclusion |
|---|---|---|---|---|
| **N= 50** | 46 | 1.00E-08 | 3.250E-13 | There is a significant Difference |

Based on a statistical analysis of 50 participants' replies, the table provides insight into the acceptability of a patty made from coconut embryos. The analysis used 46 degrees of freedom and yielded a mean square value of 1.00E-8. This analysis has a surprisingly low p-value of 3.250E-13.

The extremely low p-value suggests that the observed variations in acceptance ratings are statistically significant. In other words, the chances of these discrepancies being attributable to random chance are quite low. As a result, the conclusion formed is that respondents' levels of acceptance differ significantly. This shows that people react differently to the coconut embryo patty in a relevant way.

## CONCLUSIONS

Based on the findings of this study, several key conclusions can be drawn regarding the potential of coconut embryo extract and its application in food products. The phyto-chemical analysis revealed the presence of bioactive compounds such as alkaloids, saponins, and tannins, indicating the nutritional and health-promoting properties of coconut embryo. Additionally, the physico-chemical analysis of the "buwa" or coconut embryo patty demonstrated a balanced nutritional profile, characterized by moderate caloric content and essential minerals like calcium and iron, which underscores its viability as a nutritious food option.

Furthermore, sensory evaluations indicated a clear consumer preference for the all-purpose flour variant of the patty, which outperformed alternatives made with cornstarch and cassava starch in terms of appearance, texture, taste, and overall acceptability. Statistical analysis confirmed that these differences in consumer preferences were significant, emphasizing a strong inclination towards the all-purpose flour patty. These findings not only highlight the potential of coconut embryo as a sustainable ingredient but also suggest avenues for further research and product development in plant-based food alternatives.

## RECOMMENDATIONS

The following recommendations are made for the community, teachers, students, and future researchers:

1. **For the Community**. Coconut embryo patties, especially all-purpose flour ones, should be marketed as a healthy, economical diet. Community members can eat this locally derived product, which is high in calcium, iron, and moderate in calories.
2. **For Teachers**. Educators should use the study's findings in food science, nutrition, and consumer preferences lectures. This study illustrates how scientific methods improve local food items. Using sensory evaluation projects, teachers can show how statistics and research affect food innovation, sustainability, and community health.
3. **For Students**. This study can help students develop sustainable food products using locally available resources like coconut embryos. Their experiments can incorporate sensory evaluation, nutritional analysis, and product creation. This project may also inspire student entrepreneurs to make and sell healthy, community-based food items.
4. **For Future Researchers**. Starch binders, other additives, and preservation methods should be studied to improve coconut embryo patties' shelf life and texture. Coconut embryo should also be studied for its health advantages and food product applications. Expanding sensory evaluation studies to a bigger group may reveal consumer preferences across demographics.

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# DEVELOPMENT AND ACCEPTABILITY OF CANISTEL/TIESA (*Pouteria campechiana*) PREMIX POWDER FOR TIESAMORON DELICACY

**Talitha Christiane A. Violeta**
Graduate Student, Surigao del Norte State University, Surigao City

**Edwin E. Gibertas, PhEdD**
Graduate School Professor, Surigao del Norte State University, Surigao City

**ABSTRACT**

**This study aims to develop canistel/ tiesa (*Pouteria campechiana*) premix powderas the main ingredient and assessits acceptability in the production of tiesa moron delicacy. Specifically, it disclose the phytochemical analysis of the developpowderfrom canistel/ tiesa fruit and the physico-chemical analysis and nutritive value of the develop powder from canistel/ tiesa fruit.It disclose also the formulation and process of the tiesa moron using canistel/ tiesa premix powder and evaluates the perceptions of the respondents on the sensory acceptability of Tiesa moron delicacymade of canistel/ tiesa premix powderin terms of Appearance, Texture, Taste and Aroma. The study utilized the descriptive- developmental research design methods of research since this study develop a food product of premix powder made from canistel powder. The study on Canistel premix powder was conducted at the Food Technology Innovation Center within one of the State University in Caraga Region involving the respondents the 10 Foods Technology experts and 50 consumers in determining the sensory attributes of the Banana flour and the acceptability of its potential food products. An adaptive-made questionnaire will be utilized, the potential products will be then evaluated using a Score Card and a Hedonic Scale especially in ascertaining the acceptability of the product. Result disclose that the comprehensive analysis of Canistel/Tiesa fruit reveals that the sample contains primary alkaloids and specific steroids but lacks secondary and tertiary alkaloids, flavonoids, and saponins. The mineral content of the premix powder was detailed, showing 1.1% ash, 10.1% moisture, and varying levels of calcium, magnesium, potassium, and phosphorus. Sensory evaluation of the premix powder indicated that the 1:1/2 mixture was the most favored by respondents for its appearance, aroma, and texture, with moderate approval of its taste, whereas the 1:1 and 1:1/4 mixtures were slightly preferred. Overall, the 1:1/2 mixture demonstrated superior acceptability, highlighting its favorable sensory attributes and detailed phytochemical profile.**

*Keywords: Development and Acceptability, Premix powder, Food products, Perceptions*

## INTRODUCTION

Food processing is a critical and innovative field in the food industry, encompassing diverse techniques and technologies aimed at converting fresh fruits into value-added products. This process not only addresses economic concerns but also significantly contributes to global food security by mitigating post-harvest losses and extending fruit shelf life. Moreover, fruit processing enhances consumer convenience and enriches the nutritional content and flavor profiles of natural commodities, catering to evolving dietary needs and preferences (Paragados, 2014).

Fruits, as essential components of the human diet, supply vital nutrients such as vitamins, carbohydrates, and proteins. However, their seasonal nature and perishability necessitate preservation techniques to ensure year-round availability and utility. Tropical fruits like Canistel, or eggfruit, exemplify the potential of underutilized crops in the food industry. Known for its sweet, custard-like aroma derived from compounds like terpenes and esters, Canistel holds promise for both culinary and health applications (Smith, 2019). Additionally, Campolay fruit, rich in carbohydrates and carotenoids, further underscores the nutritional potential of tropical fruits when processed appropriately (Dzulhijjah et al., 2022).

The exploration of Canistel in culinary innovation takes center stage in the study titled "Development and Acceptability of Canistel Premix Powder for Moron Delicacy." By transforming overripe Canistel into a premix powder, this research seeks to balance tradition and modern convenience. This approach not only captures the unique flavor and nutritional value of Canistel but also promotes its sustainable utilization while supporting local farmers. The study integrates sensory evaluations and nutritional analyses to gauge the acceptability of this innovative product, potentially paving the way for its integration into both traditional and modern culinary practices (Amalia et al., 2020; Pertiwi et al., 2020).

## STATEMENT OF THE PROBLEM

This study aims to develop canistel/ tiesa (Pouteria campechiana) premix powder as the main ingredient and assessits acceptability in the production of tiesa moron delicacy.

Specifically, it sought to answer the following questions:

1. What is the phytochemical analysis of the develop powder from canistel/tiesa fruit?
2. What is the physico-chemical analysis and nutritive value of the develop powder from canistel/ tiesa fruit?
3. What is the processes in the development of the tiesa moron using canistel/ tiesa premix powder and Tiesamoron products?
4. What are the perceptions of the respondents on the sensory acceptability of Tiesa moron delicacymade of canistel/ tiesa premix powder in terms of:
   4.1 Appearance;
   4.2 Texture;
   4.3 Taste; and
   4.4 Aroma?
5. What is the overall acceptability of the develop tiesa moron delicacy products?

## RESEARCH METHODOLOGY

### Research Design

The study utilized the descriptive- developmental research design methods of research since this study develop a food product of premix powder made from canistel powder. Mixed methods research design is determining the sensory attributes of the premix powder and analyzed for analytical and chemical analysis

### Research Environment

The developmental research study on Canistel premix powder will be conducted atthe Food Technology Innovation Center within one of the State University in Caraga Region.

### Respondents

This study considered the 10 Foods Technology experts and 50 consumers in determining the sensory attributes of the Banana flour and the acceptability of its potential food products.

### Research Instrument

This study is purely product development. However, to determine the level of acceptability of the product, an adaptive-made questionnaire will be utilized, the potential products will be then evaluated using a Score Card and a Hedonic Scale especially in ascertaining the acceptability of the product in terms of appearance, texture and odor, by the panel of experts, consumers and farmers that were picked through a purposive random sampling. Multiple trials will be conduct to achieve a desired product.

### Data Analysis

This study utilized the following statistical tools in analyzing the data:

**Mean and Standard Deviation**. These tools were used to determine the sensory attributes acceptability of the food products made from premix powder using the perceived qualitative descriptions as used in the instrument (appearance, texture and odor).

**One-Way Analysis of Variance (ANOVA).** This tool will be used to determine the differences among the different concentrations used for each flour sample.

## RESULTS AND DISCUSSIONS

### Phyto-chemical result of the Canistel/ tiesa (Pouteria Campechiana)

**Table 1. Phyto- chemical result of Canistel/ tiesa Fruit.**

| Sample Code | Sample | Description | Parameter | Result |
|---|---|---|---|---|
| CHE-0299 | CANISTEL/ TIESA Fruit | 320g air-dried plant sample in plastic container | Volume of Extract Obtained | 80mL |
| | | | **Alkaloids**<br>Confirmatory Test<br>(+) primary alkaloid<br>(++) secondary alkaloid<br>(+++) tertiary alkaloid | + |
| | | | Test for Quaternary Bases & Amine Oxide | + |
| | | | **Steroids**<br>Keller-Killini Test: For 2-deoxysugars<br>Liebermann-Burchard Test: For Unsaturated Steroids | +<br>- |
| | | | **Flavanoids**<br>Bate-Smith & Metcalf Method: For Leucoanthocyanins | - |
| | | | **Saponins**<br>Froth Test | - |

The table presents the phytochemical analysis results of the Canistel/Tiesa fruit, identified by sample code CHE-0299. The sample consisted of 320 grams of air-dried plant material stored in a plastic container, from which 80 mL of extract was obtained. The analysis revealed the presence of primary alkaloids (indicated by a "+" in the confirmatory test), but no secondary or tertiary alkaloids were detected. Alkaloids are naturally occurring compounds that often have pharmacological effects. The confirmatory test mentioned in the table is a qualitative test to determine the presence of alkaloids in the CANISTEL/ TIESA (Pouteria campechiana) PREMIX POWDER extract. The grading system (+, ++, +++) indicates the relative concentration or intensity of alkaloids detected. Unfortunately, the table doesn't specify which alkaloids were tested for or detected. Further literature or analysis would be needed to determine the specific alkaloids present in CANISTEL/ TIESA (Pouteria campechiana) PREMIX POWDER.

The test for quaternary bases and amine oxides was positive. For steroids, the Keller-Killiani test, which detects 2-deoxysugars, was positive, whereas the Liebermann-Burchard test for unsaturated steroids was negative. The analysis for flavonoids using the Bate-Smith & Metcalf method for leucoanthocyanins was negative. Additionally, the froth test for saponins was also negative. These results indicate the presence of specific phytochemicals, such as primary alkaloids and certain types of steroids, while flavonoids and saponins were not detected in the sample.

### Physico-chemical analysis and nutritive value Canistel/ tiesa (Pouteria campechiana) premix powder

**Table. 2. Physico- chemical analysis of Premix Powder product**

| Parameters | Unit | Result | Method |
|---|---|---|---|
| Ash | % | 1.1 | Gravimetric |
| Moisture | % | 10.1 | Gravimetric |
| Calcium | ppm | 824 | Dry Ashing-AAS |
| Magnesium | ppm | 270 | Dry Ashing-AAS |
| Potassium | % | 0.39 | Dry Ashing-AAS |
| Phosphorus | % | 0.01 | Spectrophotometric |

The table 2 measures several parameters in a sample, each indicating specific contents: Ash (as %), representing total mineral content after combustion; Moisture (as %), indicating water content; Calcium (in ppm), an essential mineral; Magnesium (in ppm), another key mineral; Potassium (as %), a vital mineral; and Phosphorus (as %), another essential mineral. The analysis results show that the sample contains 1.1% ash, 10.1% moisture, 824 ppm calcium, 270 ppm magnesium, 0.39% potassium, and 0.01% phosphorus. The gravimetric methods determined ash and moisture content by measuring mass changes before and after burning or drying the sample. For mineral analysis, dry ashing followed by atomic absorption spectroscopy (AAS) quantified calcium, magnesium, and potassium by measuring their concentrations after organic matter was removed. Phosphorus was quantified using spectrophotometric analysis, which assessed its absorbance at specific wavelengths to determine concentration. These methods together provide a comprehensive profile of the sample's mineral and moisture content.

**Process in Canistel Premix Powder Making**

The following are the procedural steps in the development of the canistel premix powder:

- Ripe and unripe canistel
- Washing with tap water
- Peeling of canistel
- Slicing
- Drying the slices in tray dryer at 60°C until the final moisture content 8-10% (wet basis)
- Grinding
- Sieving canistelpowder
- Combine 1 cup canistel powder, ½ cup rice flour, and ½ cup white sugar in a sizable mixing bowl to create plain moron.For chocolate moron, mix 1 cup canistel powder, ½ rice flour, 1 cup brown sugar, and ¼ cup cocoa powder together in the same bowl and chopped roasted peanuts (optional).
- Store in a large airtight container at room temperature.

**Choco Moron Preparation Steps**

The following are the sequential instructions for preparing moron delicacy using canistel premix powder as the primary ingredient:

**White Moron:**

- In a mixing bowl, for every 2 cups of canistel premix powder, whisk with 1 can coconut milk (400 ml).
- Simmer over low heat while stirring regularly until very thick, sticky dough forms. Transfer to a bowl and set aside.

**Chocolate Moron:**

- In a deep pan, for every 1 cup of canistel of canistel premix powder, whisk with 1 can coconut milk (400 ml) adding vanilla extract and peanut is optional.
- Simmer over low heat until it thickens slightly. Add chopped roasted peanuts (optional) and continue to simmer until very thick, sticky dough forms. Transfer to a bowl to cool down a bit.

**Assembly:**

- Heat cleaned banana leaves to make them pliable.
- Divide the dough into 12-14 portion each. Take a portion of the white moron ad place it on top of one side of the banana leaf and flatten it about 6x4- inch rectangle.
- Place a portion of chocolate moron and spread it on top but just within the white one.
- Gently roll the two into a cylinder then wrap it with the banana leaf. Tie the ends with a kitchen twine or use a thin strip of banana leaf as a twine. Do the same with the rest of the mixture.
- Place the rolled suman moron in a steamer basket and steam over low heat for 30 minutes.
- Take them out of the steamer and transfer to a plate to cool down.

**Perceptions of the respondents on the sensory acceptability of Tiesa Moron delicacy made of Canistel/ tiesa premix powder**

**Table 3. Perceptions of the respondents on the sensory acceptability as to Appearance.**

| Appearance | 1:1 Mixture | | 1:1/2 Mixture | | 1:1/4 Mixture | |
|---|---|---|---|---|---|---|
| | median | Qualitative Description | median | Qualitative Description | median | Qualitative Description |
| 1. Dual-colored layers of Moron | 6 | like Slightly | 7 | like moderately | 7 | like moderately |
| 2. Cylindrical shape of Moron. | **5** | **Neither like nor dislike** | 8 | like Very Much | 5 | **Neither like nor dislike** |
| Glossy surface of Moron | 6 | like Slightly | 7 | like moderately | 6 | like Slightly |
| 4. Wrapped in Banana Leaves. | 6 | like Slightly | 8 | like Very Much | 6 | like Slightly |
| 5. Compact and dense of the Moron. | 6 | like Slightly | 8 | like Very Much | 6 | like Slightly |
| **Overall median** | **6** | like Slightly | **8** | like Very Much | **6** | like Slightly |

For scoring, researcher utilized the nine-point hedonic scale (1 to 9), where 1 = dislike extremely; 2 = dislike very much; 3 = dislike moderately; 4 = dislike slightly; 5 = neither like nor dislike; 6 = like slightly; 7 = like moderately; 8 = like very much; 9 = like extremely (Pimentel et al., 2016)

The table shows the sensory evaluation results of the Moron product in different mixture ratios reveals distinct preferences among evaluators. For the 1:1 mixture, the median scores indicate a generally slight preference across most attributes. The dual-colored layers, glossy surface, being wrapped in banana leaves, and the compact and dense nature of the Moron each received a median score of 6, corresponding to a qualitative description of "like slightly." The cylindrical shape of the Moron, however, received a median score of 5, indicating a neutral stance, with respondents neither liking nor disliking this attribute.

In contrast, the 1:1/2 mixture showed a stronger preference among evaluators. The dual-colored layers and glossy surface both received a median score of 7, described as "like moderately." More notably, the cylindrical shape, being wrapped in banana leaves, and the compact and dense quality of the Moron all achieved a high median score of 8, corresponding to "like very much." This suggests that the 1:1/2 mixture's appearance was particularly well-received, especially in these three attributes.

For the 1:1/4 mixture, the evaluation results were mixed. The dual-colored layers received a median score of 7, indicating a moderate liking. Other attributes, such as the glossy surface, being wrapped in banana leaves, and the compact and dense nature, each received a median score of 6, with respondents expressing slight liking.

Overall, the appearance evaluation results indicate that the 1:1/2 mixture was the most preferred, with an overall median score of 8, reflecting a strong positive reception. Both the 1:1 and 1:1/4 mixtures had an overall median score of 6, indicating a slight preference. These findings highlight the importance of mixture ratios in influencing the visual appeal of the Moron product and suggest that the 1:1/2 mixture is the most visually appealing to the evaluators.

**Table 4. Perceptions of the respondents on the sensory acceptability as to Aroma.**

| Aroma | 1:1 Mixture | | 1:1/2 Mixture | | 1:1/4 Mixture | |
|---|---|---|---|---|---|---|
| | median | Qualitative Description | median | Qualitative Description | median | Qualitative Description |
| 1. Balance of odor in all ingredients. | 6 | like Slightly | 8 | like Very Much | 7 | like Very Much |
| 2. Odor from the Tiesa Moron. | **5** | **Neither like nor dislike** | 7 | like moderately | 5 | **Neither like nor dislike** |
| 3. Odor whets the appetite. | 6 | like Slightly | 8 | like Very Much | 6 | like Slightly |
| 4. Fragrance heightens marketability. | 6 | like Slightly | 8 | like Very Much | 6 | like Slightly |
| 5. Odor enhances the flavor. | 6 | like Slightly | 8 | like Very Much | 6 | like Slightly |
| **overallmedian** | **6** | like Slightly | **8** | like Very Much | **6** | like Slightly |

For scoring, we utilized the nine-point hedonic scale (1 to 9), where 1 = dislike extremely; 2 = dislike very much; 3 = dislike moderately; 4 = dislike slightly; 5 = neither like nor dislike; 6 = like slightly; 7 = like moderately; 8 = like very much; 9 = like extremely (Pimentel et al., 2016)

The table evaluating the aroma of Moron in different mixture ratios presents interesting insights into the sensory preferences of evaluators. For the 1:1 mixture, the aroma received a mixed reception. The balance of odor in all ingredients and the odor's ability to whet the appetite, enhance flavor, and heighten marketability each received a median score of 6, indicating that these aspects were slightly liked. However, the odor from the Tiesa Moron received a median score of 5, reflecting a neutral stance, with evaluators neither liking nor disliking this specific odor.

In contrast, the 1:1/2 mixture was highly favored in terms of aroma. The balance of odor, the ability of the odor to whet the appetite, enhance flavor, and heighten marketability, all received a median score of 8, corresponding to "like very much." The odor from the Tiesa Moron scored slightly lower, with a median of 7, but it was still described as being liked moderately. This indicates that the 1:1/2 mixture's aroma was particularly appealing to the evaluators.

The 1:1/4 mixture showed a varied response. The balance of odor was highly appreciated with a median score of 7, described as "like very much." However, similar to the 1:1 mixture, the odor from the Tiesa Moron received a neutral median score of 5. Other attributes, such as the ability of the odor to whet the appetite, enhance flavor, and heighten marketability, each received a median score of 6, indicating a slight liking.

Overall, the 1:1/2 mixture stood out with an overall median score of 8, showing that its aroma was very much liked across multiple attributes. Both the 1:1 and 1:1/4 mixtures had an overall median score of 6, reflecting a slight preference. These findings suggest that the 1:1/2 mixture not only has a more balanced and appealing aroma but also enhances the product's marketability and flavor, making it the preferred choice among evaluators.

**Table 5. Perceptions of the respondents on the sensory acceptability as to Texture**

| Texture | 1:1 Mixture | | 1:1/2 Mixture | | 1:1/4 Mixture | |
|---|---|---|---|---|---|---|
| | median | Qualitative Description | median | Qualitative Description | median | Qualitative Description |
| 1. Sticky and chewy of the Moron | 6 | like Slightly | 8 | like very much | 6 | like Slightly |
| 2 Moist and dense of the Moron | 6 | like Slightly | 7 | like moderately | 5 | **Neither like nor dislike** |
| 3. Smooth layers of the Moron. | **5** | **Neither like nor dislike** | 8 | like very much | 5 | **Neither like nor dislike** |
| 4. Consistency of the Moron. | 7 | like moderately | 8 | like very much | 6 | like Slightly |
| 5 Structure of the Moron. | 6 | like Slightly | 8 | like very much | 6 | like Slightly |
| **Overall median** | **6** | like Slightly | **8** | like very much | **6** | like Slightly |

For scoring, we utilized the nine-point hedonic scale (1 to 9), where 1 = dislike extremely; 2 = dislike very much; 3 = dislike moderately; 4 = dislike slightly; 5 = neither like nor dislike; 6 = like slightly; 7 = like moderately; 8 = like very much; 9 = like extremely (Pimentel et al., 2016)

The evaluation of the texture of Moron across different mixture ratios provides detailed insights into preferences regarding its tactile properties. For the 1:1 mixture, the median scores reveal a general slight preference. Specifically, the sticky and chewy nature, moist and dense quality, and structure of the Moron each received a median score of 6, described as "like slightly." The consistency of the Moron was slightly more favored with a median score of 7, indicating a moderate liking. However, the smooth layers received a neutral median score of 5, showing that evaluators neither liked nor disliked this attribute.

In contrast, the 1:1/2 mixture was highly favored for its texture. The sticky and chewy quality, smooth layers, consistency, and structure of the Moron each received a median score of 8, corresponding to "like very much." The moist and dense quality scored slightly lower, with a median of 7, indicating a moderate liking. This suggests that the 1:1/2 mixture's texture was particularly appealing to the evaluators, with high marks across almost all attributes.

The 1:1/4 mixture showed a more mixed response. The sticky and chewy quality, consistency, and structure of the Moron each received a median score of 6, indicating a slight liking. However, the moist

and dense quality received a neutral median score of 5, as did the smooth layers, reflecting that evaluators neither liked nor disliked these aspects.

Overall, the 1:1/2 mixture stood out with an overall median score of 8, indicating that its texture was very much liked across multiple attributes. Both the 1:1 and 1:1/4 mixtures had an overall median score of 6, reflecting a slight preference. These findings suggest that the 1:1/2 mixture not only has a more appealing and balanced texture but also enhances the product's overall tactile experience, making it the preferred choice among evaluators.

**Table 6. Perceptions of the respondents on the sensory acceptability as to Taste.**

| Taste | 1:1 Mixture | | 1:1/2 Mixture | | 1:1/4 Mixture | |
|---|---|---|---|---|---|---|
| | **median** | **Qualitative Description** | **median** | **Qualitative Description** | **median** | **Qualitative Description** |
| 1. Sweetness of the Moron. | 6 | like Slightly | 7 | like moderately | **6** | like Slightly |
| 2. Balance of the flavor. | **5** | **Neither like nor dislike** | 6 | like Slightly | **5** | **Neither like nor dislike** |
| 3. Distinction of Canistel Flavor. | **5** | **Neither like nor dislike** | 7 | like moderately | 6 | like Slightly |
| 4. Flavor increases appetite to eat more. | 6 | like Slightly | 7 | like moderately | **5** | **Neither like nor dislike** |
| 5.Flavor's overall acceptability in the market. | 6 | like Slightly | 7 | like moderately | 6 | like Slightly |
| **Overall median** | **6** | like Slightly | **7** | **like moderately** | **6** | like Slightly |

For scoring, we utilized the nine-point hedonic scale (1 to 9), where 1 = dislike extremely; 2 = dislike very much; 3 = dislike moderately; 4 = dislike slightly; 5 = neither like nor dislike; 6 = like slightly; 7 = like moderately; 8 = like very much; 9 = like extremely (Pimentel et al., 2016)

The table evaluating the taste of Moron across different mixture ratios reveals varying levels of preference among evaluators. For the 1:1 mixture, the taste attributes generally received a slight preference. The sweetness of Moron, flavor's ability to increase appetite, and overall market acceptability each received a median score of 6, indicating that these aspects were liked slightly. However, the balance of flavor and the distinction of Canistel flavor received a median score of 5, showing a neutral stance, with evaluators neither liking nor disliking these attributes.

In comparison, the 1:1/2 mixture received higher median scores, indicating a stronger preference. The sweetness of Moron, distinction of Canistel flavor, and flavor's ability to increase appetite each received a median score of 7, corresponding to "like moderately." The balance of flavor scored slightly lower, with a median of 6, but it was still described as being liked slightly. This suggests that the 1:1/2 mixture's taste was more appealing to the evaluators across multiple attributes, with a moderate liking overall.

The 1:1/4 mixture showed mixed responses. The sweetness of Moron and the overall market acceptability each received a median score of 6, indicating a slight liking. However, the balance of flavor and the flavor's ability to increase appetite both received a neutral median score of 5. The distinction of Canistel flavor received a median score of 6, reflecting a slight liking.

Overall, the 1:1/2 mixture stood out with an overall median score of 7, indicating a moderate liking for its taste across multiple attributes. Both the 1:1 and 1:1/4 mixtures had an overall median score of 6, reflecting a slight preference.

These findings suggest that the 1:1/2 mixture not only has a more balanced and appealing taste but also enhances the product's overall flavor experience, making it the preferred choice among evaluators.

**Table 9. Summary for Over-all acceptability of the Perceptions of the respondents**

| Criteria | 1:1 Mixture | | 1:1/2 Mixture | | 1:1/4 mixture | |
|---|---|---|---|---|---|---|
| | Median | Qualitative Description | Median | Qualitative Description | Median | Qualitative Description |
| Appearance | 6 | like Slightly | 8 | like Very Much | 6 | like Slightly |
| Aroma | 6 | like Slightly | 8 | like Very Much | 6 | like Slightly |
| Texture | 6 | like Slightly | 8 | like Very Much | 6 | like Slightly |
| Taste | **6** | like Slightly | 7 | **like moderately** | **6** | like Slightly |
| **Overall acceptability** | 6 | like Slightly | 8 | like Very Much | 6 | like Slightly |

The table summarizing the overall acceptability of Moron based on the perceptions of respondents across different mixture ratios provides a comprehensive view of preferences. The criteria evaluated include appearance, aroma, texture, and taste.

For the 1:1 mixture, each criterion—appearance, aroma, texture, and taste—received a median score of 6, corresponding to "like slightly." This consistency across all attributes indicates a general but mild preference for the 1:1 mixture. Consequently, the overall acceptability for the 1:1 mixture also received a median score of 6, indicating that respondents slightly liked this mixture.

In contrast, the 1:1/2 mixture was rated more favorably across all criteria. Appearance, aroma, and texture each received a median score of 8, described as "like very much," while taste received a slightly lower median score of 7, indicating a moderate liking. This suggests that the 1:1/2 mixture was particularly well-received for its visual appeal, aroma, and texture, with a strong overall preference. The overall acceptability for the 1:1/2 mixture received a median score of 8, reflecting that respondents very much liked this mixture.

The 1:1/4 mixture showed a similar pattern to the 1:1 mixture, with each criterion—appearance, aroma, texture, and taste—receiving a median score of 6, indicating a slight liking. This consistency suggests that while the 1:1/4 mixture was generally liked, it did not stand out in any specific attribute. The overall acceptability for the 1:1/4 mixture also received a median score of 6, indicating a slight preference.

In summary, the 1:1/2 mixture emerged as the most preferred among the three ratios, with respondents very much liking its appearance, aroma, and texture, and moderately liking its taste. Both the 1:1 and 1:1/4 mixtures received similar overall ratings, with respondents slightly liking these mixtures across all criteria. These findings highlight the 1:1/2 mixture's superior overall acceptability and suggest it is the most favorable option based on respondent perceptions.

## CONCLUSIONS

The comprehensive analysis of Canistel/Tiesa fruit reveals that the sample contains primary alkaloids and specific steroids but lacks secondary and tertiary alkaloids, flavonoids, and saponins. The mineral content of the premix powder was detailed, showing 1.1% ash, 10.1% moisture, and varying levels of calcium, magnesium, potassium, and phosphorus. Sensory evaluation of the premix powder indicated that the 1:1/2 mixture was the most favored by respondents for its appearance, aroma, and texture, with moderate approval of its taste, whereas the 1:1 and 1:1/4 mixtures were slightly preferred. Overall, the 1:1/2 mixture demonstrated superior acceptability, highlighting its favorable sensory attributes and detailed phytochemical profile.

## RECOMMENDATIONS

1. Additional research should be conducted to investigate the specific pharmacological effects and potential health benefits of the identified compounds in canistel/ tiesa (pouteria campechiana) extract, which could lead to the development of medicinal or functional products.
2. Canistel/ tiesa (pouteria campechiana) premix powder seed flour should be used in various food products to capitalize on its nutritional composition and potential market demand.
3. The recipe for canistel/ tiesa (pouteria campechiana) premix powder cookies can be optimized and standardized for production to ensure consistent quality and taste.
4. Design and branding of the packaging should emphasize the distinctive characteristics and health advantages of canistel/ tiesa (pouteria campechiana) premix powder cookies, appealing to consumers who prioritize their well-being.
5. Involvement with local farmers, suppliers, and manufacturers can establish a sustainable supply chain for canistel/ tiesa (pouteria campechiana) and seeds, supporting local agriculture and promoting sustainability.

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