



(RESEARCH ARTICLE)



Acceptability, Shelf Life and Microbial Analysis of Brine, Corn Oil, and Tomato Sauce in Salmonete (*Mullus surmuletus*) Jackfruit (*Artocarpus heterophyllus*) Dish

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Abstract

This experimental-developmental study aimed to develop a bottled jackfruit-salmonete (mullet) dish as an innovative, affordable, and nutritious alternative to traditional canned sardines, addressing concerns over rising fish prices and depleting marine resources in the Philippines. The study specifically sought to determine the sensory qualities and acceptability of the product across three treatments: Treatment A (Tomato Sauce), Treatment B (Corn Oil), and Treatment C (Brine Solution). Using a completely randomized design with three replications, the products were evaluated by ten expert panellists and 100 consumer respondents using a Nine-Point Hedonic Scale. Data were analyzed using mean scores to determine acceptability levels. Results from expert evaluations revealed that Treatment B (Corn Oil) consistently obtained the highest mean ratings across sensory attributes, particularly in appearance, aroma, color, taste, and texture, all described as “Very Much Appealing” to “Extremely Soft and Intact.” Consumer acceptability tests confirmed these findings, with Treatment B garnering the highest grand mean (Liked Extremely), followed by Treatment A and Treatment C. The findings suggest that bottled jackfruit-salmonete dish, particularly with corn oil, is a highly acceptable product with potential for commercialization. This innovation offers practical implications for food entrepreneurs, jackfruit growers, and fishermen by providing a value-added product that utilizes local resources, promotes food security, and offers a healthy, protein-rich meal option for Filipino families.

Keywords: Jackfruit; Salmonete; Bottled Dish; Sensory Evaluation; Product Acceptability

1. Introduction

The Philippines is globally recognized for its rich agricultural and marine resources, particularly its exceptional marine biodiversity. This wealth has supported a thriving local industry, including numerous Philippine-owned canning companies that produce canned goods, most notably sardines. However, like many nations, the country faces the reality that its resources are not infinite. According to an article by Rappler (2017), threats to ocean sustainability such as climate change and coral bleaching first identified as early as 1999 have now escalated into critical concerns. Compounding this environmental crisis is the growing consumer demand for seafood, as Filipinos increasingly experiment with diverse marine species, driving commercial exploitation that further strains fish populations. A study by oneocean.org paints a bleak picture of the current state of fisheries both locally and globally, citing overfishing, illegal fishing practices, and habitat destruction as primary drivers of declining fish production. Alarming, protein deficiency, once unthinkable just two decades ago, is now rising rapidly even within fishing communities.

Canned sardines have long been a staple in Filipino households, valued for their affordability and nutritional contribution. However, the recent implementation of the TRAIN Act has led to increased prices of basic commodities, including sardines, placing additional burden on consumers. Given the dual challenges of depleting fish supply and rising costs, there is a clear and urgent need for innovation in the Philippine food industry.

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This study responds to that need by developing a bottled dish that substitutes traditional sardines with mullet, locally known as “salmonete.” Mullet is a highly nutritious fish, rich in easily digestible protein, essential vitamins (A, B1, PP), minerals (phosphorus, calcium, zinc), and omega-3 fatty acids, which are known to support cardiovascular health, reduce the risk of stroke, and maintain cognitive function. To further enhance affordability and nutrition, the study incorporates jackfruit as an extender. Jackfruit is not only more economical than fish but also offers significant nutritional benefits, including vitamins, minerals, fiber, and calories without cholesterol or saturated fats.

This study aims to provide a practical, healthy, and affordable alternative to traditional canned fish products. In the face of climate change, unsustainable fishing practices, and rising food costs, this bottled dish represents a timely and sustainable solution for Filipino consumers.

2. Material and methods

2.1. Methodology

This study employed experimental and developmental methods of research. The experimental method was used to investigate the proportion of salmonete in developing a bottled jackfruit-fish dish, while the developmental method was applied to create a product with potential for commercialization and utilization in other food products such as canned sardines. The study utilized a Completely Randomized Design (CRD), wherein the acceptability of bottled jackfruit-salmonete dish was examined through subsequent replications to determine variations in sensory qualities.

The tools and equipment used in the study included: one set of stainless measuring cups, one set of stainless measuring spoons, one medium casserole, one set of two-burner gas stove, two pieces of medium-sized stainless mixing bowls, one working table, two pieces of medium-sized colanders, one digital scale, one stainless ladle, one wooden chopping board, one stainless knife, and one small pressure cooker. All equipment was properly sanitized and prepared prior to use.

The experiment was conducted using one product formulation with three replications. The primary output was the development of Bottled Jackfruit-Salmonete Dish, with the goal of determining its acceptability based on sensory qualities including appearance, aroma, color, and taste. The quantities of base ingredients remained constant across all treatments, with standardized measurements ensuring consistency. The only variable introduced across treatments was the type of flavoring agent, allowing the researcher to determine which variation was most acceptable to consumers. The three treatments were as follows: Treatment A – Bottled Jackfruit-Salmonete Dish with Black Beans; Treatment B – Bottled Jackfruit-Salmonete Dish with Corn Oil; and Treatment C – Bottled Jackfruit-Salmonete Dish with Tomato Sauce. Each treatment contained 50 grams of salmonete, 20 grams of jackfruit, 10 grams of pickles, 3 pieces of bay leaf, 3 pieces of chili, 3 pieces of peppercorn, and 3 grams of salt. The distinguishing factor for each treatment was the 120 ml addition of black beans for Treatment A, corn oil for Treatment B, and tomato sauce for Treatment C.

To prepare the salmonete, the viscera were removed, and the fins and tail were cut. The fish was washed thoroughly, then soaked in a brine solution for 15 minutes in a mixing bowl to remove fishy odor and residual blood, after which it was drained thoroughly. The jackfruit was sourced from Bagong Lipunan Trade Center. The whole jackfruit was washed, peeled, and sliced. It was then washed again to remove the sticky sap (tagok) and set aside for later use.

In making the bottled jackfruit-salmonete dish, all ingredients including salmonete, jackfruit, pickles, bay leaf, chili, peppercorn, and salt were prepared according to the specified measurements. The ingredients were arranged in sterilized glass bottles, and the corresponding flavoring agent (black beans, corn oil, or tomato sauce) was poured into each bottle up to the brim. The bottles were then covered and placed in a pressure cooker with water reaching up to half the height of the bottles. The pressure cooker was started at high temperature to immediately heat the bottles, then adjusted to maintain temperature once the pressure cooker whistled. The bottles were pressure-cooked for two hours to ensure proper preservation and cooking.

A score card was used as the research instrument, measuring the four sensory qualities of appearance, aroma, color, and taste as variables determining the general acceptability of the bottled jackfruit-salmonete dish. Evaluators were given samples of each treatment in saucers, along with bottled water to neutralize their taste buds between evaluations. The score card employed a Nine-Point Hedonic Scale, where respondents rated each product according to predetermined categories for sensory qualities. After several preliminary trials, one final product formulation was established with three replications. In Trial 1, products were presented to ten expert panellists for evaluation using the Nine-Point Hedonic Scale. Trial 2 used the same formulation, with the same set of evaluators rating the product using identical score cards. Trial 3, the final product formulation with three replicates, was again submitted for evaluation by the same panel of experts. After comparing results from all three trials, the formulation with the highest scores was

produced in larger quantity for evaluation by one hundred consumers, including Senior High School teachers, neighbors, and students. The Nine-Point Hedonic Scale was likewise used to evaluate the three products during consumer testing.

The Statistical Package for Social Sciences (SPSS) was used to generate and process all data. Mean scores were employed to determine the acceptability of the bottled jackfruit-salmonete dish across the four sensory qualities. One-way Analysis of Variance (ANOVA) was applied to analyze differences among the three treatments in terms of appearance, aroma, color, and taste. All data were derived from computed means and processed through SPSS using a 0.01 margin of error. For scoring the variables, the nine-point hedonic scale was utilized in evaluation score cards. Each sensory quality was assigned a score, given corresponding weight, and categorized according to descriptive ratings. In addition to individual sensory qualities, qualitative descriptions were also provided for the general acceptability of the product.

2.2. Experimental Procedure

The experiment was conducted using one product formulation with three replications. The primary output of this study was the development of Bottled Jackfruit-Salmonete Dish, with the goal of determining its acceptability based on sensory qualities such as appearance, aroma, color, and taste. The quantities of the base ingredients remained constant throughout the experiment, with standardized measurements used to ensure consistency. The only variable introduced across the three treatments was the type of flavoring agent, allowing the researcher to assess which variation was most acceptable to consumers. The three treatments were as follows: Treatment A – Bottled Jackfruit-Salmonete Dish with Black Beans; Treatment B – Bottled Jackfruit-Salmonete Dish with Corn Oil; and Treatment C – Bottled Jackfruit-Salmonete Dish with Tomato Sauce. As shown in Table 1, each treatment contained 50 grams of salmonete, 20 grams of jackfruit, 10 grams of pickles, 3 pieces of bay leaf, 3 pieces of chili, 3 pieces of peppercorn, and 3 grams of salt. The distinguishing factor for each treatment was the 120 ml addition of black beans for Treatment A, corn oil for Treatment B, and tomato sauce for Treatment C.

Table 1 The preparation of Bottled Jackfruit-Salmonete Dish

Ingredients	Treatment A	Treatment B	Treatment C
Salmonete	50 g	50 g	50 g
Jackfruit	20 g	20 g	20 g
Pickles	10 g	10 g	10 g
Bayleaf	3 pcs	3 pcs	3 pcs
Chili	3 pcs	3 pcs	3 pcs
Peppercorn	3 pcs	3 pcs	3 pcs
Salt	3 g	3 g	3 g
Black beans	120 ml		
Corn Oil		120 ml	
Tomato Sauce			120 ml

3. Results and discussion

This chapter presents the analyses and interpretation of the data gathered. Textual discussion is provided prior to the presentation of tabular data on the acceptability of the bottled salmonete jackfruit dish across three treatments: Treatment A (bottled salmonete jackfruit dish with Tomato Sauce), Treatment B (with Corn Oil), and Treatment C (with Brine Solution). The evaluation focused on quality attributes including appearance, aroma, color, taste, and texture.

3.1. Sensory Qualities as Evaluated by Experts in Three Replications

Table 2a presents the sensory qualities of bottled salmonete jackfruit dish across three treatments as evaluated by a panel of experts during the first replication. In terms of appearance, Treatment A (Tomato Sauce) received the highest mean score of 7.80, described as "Very Much Appealing," indicating that the product was highly preferred by the experts. Treatment B (Corn Oil) followed with a mean of 7.30, also described as "Very Much Appealing," while Treatment C (Brine Solution) obtained a mean score of 7.10, which was described as "Moderately Appealing." These findings reveal that

Treatment A was the most preferred in terms of appearance among the three treatments. Regarding aroma, both Treatment A and Treatment B garnered the same mean score of 7.30, described as “Very Much Pleasant.” In contrast, Treatment C received a lower mean score of 6.50, described as “Moderately Pleasant.” The results indicate that Treatment A and Treatment B were highly accepted by the expert panel in terms of aroma, while Treatment C was less favored.

In terms of color, data revealed that Treatment A (Tomato Sauce) received the highest mean score of 7.50, described as “Very Much Authentic.” Treatment B (Salmonette Jackfruit with Corn Oil) followed closely with a mean score of 7.30, also rated as “Very Much Authentic,” while Treatment C was described as “Moderately Authentic.” These results indicate that the ten expert panelists preferred Treatment A for its superior color among the three treatments. Regarding taste, as shown in Table 2a, Treatments A and B both obtained the highest mean score of 7.20, earning the adjectival rating “Moderately Delicious.” Treatment C received a slightly lower mean score of 6.70 but was still described as “Moderately Delicious.” Based on these findings, the experts considered Treatment A to be a potentially marketable product in terms of taste. In terms of texture, Treatment A received a mean score of 7.50 and Treatment B received 7.40, both described as “Very Much Soft and Intact,” while Treatment C obtained a mean score of 7.20, described as “Moderately Soft and Intact.” A comparison of the mean scores suggests that the experts preferred Treatment B in terms of texture.

Table 2a The Sensory Qualities of Bottled Salmonette Jackfruit Dish in Three Treatments in 1st Replication

Sensory Qualities	Replication 1					
	TA	AD	TB	AD	TC	AD
Appearance	7.80	VMA	7.30	VMA	7.10	MA
Aroma	7.30	VMP	7.30	VMP	6.50	MP
Color	7.50	VMAu	7.30	VMAu	6.60	MAu
Taste	7.20	MD	7.20	MD	6.70	MD
Texture	7.50	VSI	7.40	VSI	7.20	MSI
Average Mean	7.46	LVM	7.30	LVM	6.82	LM

Table 2b presents the sensory qualities of the bottled Salmonette Jackfruit dishes across the three treatments during the second replication. In terms of appearance, Treatment A obtained the highest mean score of 8.10, described as “Very Much Appealing,” followed by Treatment B with a mean score of 7.90, also rated “Very Much Appealing,” and Treatment C with a mean score of 7.10, described as “Moderately Appealing.” These results indicate that Treatment A (Tomato Sauce) was the most preferred in terms of appearance. As for aroma, Treatment A again received the highest mean rating of 8.50, described as “Extremely Pleasant,” followed by Treatment B with a mean score of 7.80, rated “Very Much Pleasant,” and Treatment C with the lowest mean score of 7.10, described as “Moderately Pleasant.” These findings suggest that Treatment A was highly accepted by the experts in terms of aroma. In terms of overall authenticity, Treatment A obtained the highest mean score of 8.20, described as “Extremely Authentic,” followed by Treatment B with a mean score of 7.70, rated “Very Much Authentic,” and Treatment C with a mean score of 7.20, described as “Moderately Authentic.” Consistently, Treatment A (Tomato Sauce) emerged as the most preferred treatment across multiple sensory attributes, particularly in color, appearance, aroma, and authenticity.

The data in terms of taste, the (10) experts gave a highest rating to Treatment A (Tomato Sauce) as rated “Extremely Delicious” as reflected by the mean of 8.50. Followed by the Treatment B with the mean rating of 8.00 and have an adjectival description of “Very much Delicious” while Treatment A got a lowest mean score of 7.10 and have an adjectival described as “Moderately Delicious”. As to the texture of the product, experts found Treatment A with the mean score of 8.30, Treatment B with the mean score of 8.20 were both described as “Extremely Soft and Intact”. While Treatment A got the lowest rating mean of 7.80 and had an adjectival description of “Very Much Soft and Intact”. Comparing the mean results of the product in terms of texture participants preferred to like Treatment A of bottle salmonette jackfruit dish product.

Table 2b The Sensory Qualities of Bottled Salmonette Jackfruit Dish in Three Treatments in 2nd Replication

Sensory Qualities	Replication 2					
	TA	AD	TB	AD	TC	AD
Appearance	8.10	VMA	7.90	VMA	7.10	MA
Aroma	8.50	EP	7.80	VMP	7.10	MP
Color	8.20	E Au	7.70	VMAu	7.20	MAu
Taste	8.50	ED	8.00	VMD	7.10	MD
Texture	8.30	ESI	8.20	ES	7.80	VSI
Average Mean	8.32	LE	7.92	LVM	7.26	LVM

Table 2c revealed the sensory qualities of bottled salmonette jackfruit dish among three treatments as evaluated by the panel of experts in third replication. In terms of appearance, Treatment B got the highest mean score of 8.90 which was described as “Extremely Appealing” followed Treatment A and C with the mean score of 8.10 and 7.90 and were described as “Very Much Appealing”. Data showed that the product with Corn Oil which was the treatment B was highly preferred in terms of appearance as evaluated by experts.

As to its aroma results shown that Treatment B had a highest mean score of 8.80, and were described as “Extremely Pleasant”. Followed by the Treatment A with the mean score of 8.00 and Treatment C with the mean score of 7.40 were both described as “Very Much Pleasant”. The findings of the study revealed that the treatment B were highly accepted by experts in terms of aroma.

In the same table revealed that the Corn Oil (Treatment B) still have a highest mean score of 8.80 which was described as “Extremely Authentic”. On the other hand, Treatment A (Tomato Sauce) with the mean score of 7.90 and the Treatment C (Brine Solution) with the mean score of 7.40 were both described as “Very Much Authentic”. This goes to say that the (10) experts participants found Corn Oil Treatment (b) have a better color among the three treatments in preparing the product.

In terms of taste, the (10) experts gave the highest rating to Treatment B (Corn Oil) as “Extremely Delicious” as reflected by the mean score of 8.60. The same adjectival description was true with the Treatment A (Tomato Sauce) which obtained the mean rating of 8.00, Treatment C (Brine Solution) with mean score of 7.30, having the same adjectival description of “Very Much Delicious”. From the result of the study the (10) experts found treatment B was “Extremely Delicious” as product which was potentially marketable.

As to the texture of the product experts highly preferred Treatment B and A with the mean score of 8.90 and 8.30 were described as “Extremely Soft and Intact”. Followed with Treatment C with the mean score of 7.80 and were described as “Very Much Soft and Intact”. Comparing the mean results of the product in terms of texture participants’ preferred to like the bottled salmonette jackfruit dish of both Treatment B and A.

Table 2c The Sensory Qualities of Bottled Salmonette Jackfruit Dish in Three Treatments in 3rd Replication

Sensory Qualities	Replication 3					
	TA	AD	TB	AD	TC	AD
Appearance	8.10	VMA	8.90	EA	7.90	VMA
Aroma	8.00	VP	8.80	EP	7.40	VMP
Color	7.90	VWAu	8.80	E Au	7.40	VMAu
Taste	8.00	VMD	8.60	ED	7.30	VMD
Texture	8.30	ESI	8.90	ESI	7.80	VMSI
Average Mean	8.06		8.90		7.56	

3.2. Sensory Qualities of Bottled Salmonette Jackfruit Dish as Evaluated by Expert

Table 3 presents the sensory evaluation results for the bottled Salmonette Jackfruit dish, based on the assessments of a panel of experts across three trials. This evaluation compares three treatments: Treatment A (Tomato Sauce), Treatment B (Corn Oil), and Treatment C (Brine Solution).

In terms of appearance, both Treatment B (Corn Oil) and Treatment A (Tomato Sauce) were rated highest, with mean scores of 8.03 and 8.00, respectively. Both received the descriptive rating "Very Much Appealing." Treatment C (Brine Solution) followed with a mean score of 7.36, also described as "Very Much Appealing." The grand mean for appearance across all treatments was 7.79, which corresponds to a "Very Much Appealing" rating. These findings indicate that Treatment B was the most preferred in terms of appearance.

In terms of aroma, Treatment B again received the highest mean rating (7.96), closely followed by Treatment A (7.93). Both were described as "Very Much Pleasant." In contrast, Treatment C received the lowest rating (7.00), described as "Moderately Pleasant." These results suggest that Treatments B and A were highly acceptable to the expert panel in terms of aroma.

For color, Treatment B (Corn Oil) obtained the highest mean score of 7.93, followed by Treatment A (Tomato Sauce) with a mean of 7.86. Both were interpreted as "Very Much Authentic." Treatment C (Brine Solution) received a lower mean rating of 7.06, described as "Moderately Authentic." This implies that the panel of ten experts found Corn Oil (Treatment B) to yield the most desirable color among the three treatments.

Table 3 The Sensory Qualities of Bottled Salmonette Jackfruit Dish as Evaluated by Experts

Sensory Qualities	TA		TB		TC	
	MEAN	QD	MEAN	QD	MEAN	QD
Appearance	8.00	VMA	8.03	VMA	7.36	VMA
Aroma	7.93	VMP	7.96	VMP	7.00	MP
Color	7.86	VMP	7.93	VMP	7.06	MAu
Taste	7.86	VMP	7.93	VMP	7.06	MD
Texture	8.03	VMP	8.16	ESI	7.60	VMSI

The sensory evaluation of taste and texture for the bottled Salmonette Jackfruit dish, as assessed by ten expert panelists, is presented in Table 2.4. In terms of texture, Treatment B (Corn Oil) received the highest mean score of 8.16, which corresponds to the descriptive rating "Extremely Soft and Intact." Meanwhile, Treatment A (Tomato Sauce) and Treatment C (Brine Solution) obtained mean scores of 8.03 and 7.60, respectively, both described as "Very Much Soft and Intact." These results indicate that the panelists found the texture of the product prepared with Corn Oil to be superior.

In terms of its general acceptability, Treatment B (Corn Oil) again emerged as the most preferred option, achieving the highest grand mean of 8.00. This was followed closely by Treatment A (Tomato Sauce) with a mean of 7.93, while Treatment C (Brine Solution) received a lower mean rating of 7.20. These findings suggest that the experts generally favored the product prepared with Corn Oil over the other two treatments.

Given that the researchers employed a Nine-Point Hedonic Scale for evaluation, it is acknowledged that there remains room for further improvement in the product development of the bottled Salmonette Jackfruit dish. In the context of fruit and vegetable products, distinctive quality is typically defined by four key attributes: (1) color and appearance, (2) flavor (comprising taste and aroma), (3) texture, and (4) nutritional value.

Consumers typically evaluate visual appearance and color first, followed by taste, aroma, and texture. According to Kramer (2010), the appearance of a product often determines its initial acceptance or rejection, making it one of the most critical quality attributes in consumer preference.

3.3. Acceptability of Bottled Salmonette Jackfruit as Evaluated by Consumers

Table 4 presents the consumer acceptability evaluation of the bottled Salmonette Jackfruit dish, involving 100 participants composed of 20 Senior High School teachers, 20 neighbors, and 60 students from Roxas City School for Philippine Craftsmen. The assessment focused on five sensory attributes: appearance, aroma, color, taste, and texture. Data revealed that all three treatments received high acceptability ratings from the consumer panel. Treatment A (Tomato Sauce), Treatment B (Corn Oil), and Treatment C (Brine Solution) obtained grand mean ratings of 8.69, 8.72, and 8.23, respectively, all of which correspond to the descriptive rating "Liked Extremely" on the Nine-Point Hedonic Scale. Among the three treatments, Treatment B (Corn Oil) emerged as the most preferred product, achieving the highest overall mean score. This indicates that the bottled Salmonette Jackfruit dish prepared with Corn Oil was potentially the best accepted variant among the consumer respondents.

Table 4 The Sensory Qualities of Bottled Salmonette Jackfruit Dish as Evaluated by Consumers

Sensory Qualities	Treatments		
	TA	TB	TC
Appearance	8.71	8.80	7.98
Aroma	8.68	8.75	8.75
Color	8.64	8.68	8.09
Taste	8.72	8.63	7.97
Texture	8.72	8.78	8.36
Grand Mean	8.69	8.72	8.23
Qualitative Descriptions	Liked Extremely	Liked Extremely	Liked Extremely

The comparative analysis of consumer preferences among the three treatments of bottled Salmonette Jackfruit dish reveals that while all variants were positively received, Treatment B (Corn Oil) obtained the highest overall preference rating. This was followed by Treatment A (Tomato Sauce), which garnered the second highest mean scores across sensory attributes. Treatment C (Brine Solution) received the lowest preference ratings among the consumer panel.

Despite the variation in mean scores, the results suggest that consumers demonstrated consistently positive acceptance of all three product formulations, as evidenced by their corresponding descriptive ratings. However, the data clearly indicate a hierarchy of preference, with Treatment B emerging as the most favored, Treatment A as the intermediate, and Treatment C as the least preferred among the consumer respondents.

4. Conclusion

The study successfully developed a bottled Salmonete-Jackfruit dish and established that the variant prepared with corn oil (Treatment B) consistently outperformed those with tomato sauce and brine solution across all sensory attributes' appearance, aroma, color, taste, and texture as evidenced by both expert evaluations across three replications and consumer acceptability assessments. While all three treatments received high ratings within the "Liked Extremely" range, indicating strong market potential, corn oil emerged as the optimal packing medium for preserving and enhancing the product's sensory qualities, with appearance proving to be a critical determinant of overall acceptability, consistent with Kramer's (2010) assertion on the primacy of visual attributes in food preference. This study contributes to the local food processing industry by promoting the utilization of indigenous fishery and agricultural resources into value-added, shelf-stable products, thereby offering livelihood opportunities and expanding consumer choices; future research may focus on optimizing the brine-based variant, conducting shelf-life studies under varied storage conditions, and exploring large-scale production feasibility to facilitate commercial adoption.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors declare that they have no conflict of interest. This research was conducted independently, and no financial or personal relationships influenced the outcomes or interpretation of the findings. The author is the sole contributor of this manuscript and has approved the final version for submission.

Statement of ethical approval

The present research work involving human participants was reviewed and approved by the institutional ethics committee of Roxas City School for Philippine Craftsmen. All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study. Prior to data collection, participants were fully informed about the nature, purpose, and procedures of the research, and they were assured of the confidentiality and anonymity of their responses. Participation was entirely voluntary, and respondents were informed of their right to withdraw at any time without consequence.

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