

Intelligent Flashcards: A Community-Based Education Tool For Fish Consumption Adoption Purposes

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ABSTRACT

The conception of this Intelligent Flashcards originates from an attempt to solve the seven tier-based fish consumption barriers in households through community-based education. The method of learning is done through the use of gamification with intelligent flashcards because it is deemed as the easiest method for someone to understand a problem and obtain the most proper solution to it. Educational activities using Intelligent Flashcards may contribute to government efforts in Public Education. It is particularly crucial in areas where the rate of fish consumption is low, so that barriers to fish adoption/consumption may be mitigated through giving each barrier a suitable solution specific to its context. Card games have always been exciting and generate high engagement rates among participants. Utilizing the Intelligent Flashcard, participants were able to understand difficult concepts easier. This method also brings a more pleasant atmosphere during the learning process. The result of the Intelligent Flashcards trial on housewives from lower to middle socioeconomic backgrounds showed there is an increase in the participants' understanding and knowledge to solve challenges they might face regarding fish consumption at home.

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INTRODUCTION

The Ministry of Marine Affairs and Fisheries of Indonesia have been attempting to increase the rate of fish consumption on a national scale, as supported by Law no.45/2009 in the fisheries sector that aims to increase the supply and consumption of fish as a source of protein, as well as Law no.18/2012 that states fish be included as part of the staple food in Indonesians' diet accordingly to its availability (Ministry of the State Secretariat, 2009, 2012). The efforts to increase fish consumption is backed by an even more powerful constitutional mandate in the form of Presidential Regulation no.3/2017 which explains the drafting process of the said presidential regulation on "Gemarikan" (Gerakan Memasyarakatkan Makan Ikan), as well as Presidential Instruction no.1/2017 to detail on the execution of Gemarikan (Cabinet Secretary, 2017a, 2017b).

With the ever-increasing strategic presence of fish and fisheries in Indonesia, it becomes even more crucial for the central government to enact educational activities aimed at educating consumers on fish and fisheries. One of the myriads of strategies conducted by Gemarikan is Community Education in an attempt to increase the demand for fish consumption in households. However, the increase in demand generated is not yet proportional to the material and financial effort that the government had churned out. Thus, there is still room for improvement (Rudianto, 2017). As one of the top largest fish producers in the world, the rate of fish consumption in Indonesia lags behind its neighbors (Widria, 2019).

Gemarikan and "Forikan" (Forum Peningkatan Konsumsi Ikan) were launched for the first time on April 4 2004 by Megawati Soekarno Putri, the fifth president of the Republic of Indonesia (Ministry of Marine Affairs and Fisheries, 2017). Gemarikan's existence signifies a defining moment in the nation's attempt at realizing its visions of a strong, healthy, educated, and optimum nation, as well as building the characters of a highly intelligent nation both physically and mentally through fish consumption (Ministry of Marine Affairs and Fisheries, 2018). Gemarikan is implemented in several different activities or campaigns for example a fish-based dishes recipe competition, a National Fish Day celebration, fish consumption socialization safari, cooking demos, and promotions through the use of social media. Public communication plays an important role in the context of educating people and society. The emphasis relies primarily on promoting health so that behavior changes occur (Evans & Hastings, 2008).

JP2GI (Jejaring Pasca-Panen Untuk Gizi Indonesia) is an organization that aims to increase the rate of fish consumption in Indonesia. JP2GI is an alliance of government and financial institutions, experts, private-owned businesses that are part of the supply chain, as well as the public that aims to (1) Reduce depreciation of post-harvested produce along the supply chain through education and implementation of technology innovations, (2) Increase collaborative efforts of food and nutrition stakeholders of the people, (3) Be a platform of information exchange and knowledge management on local, national, and global levels, (4) Improve the availability and continuity of high-quality food supply to ensure that the

nutrient requirements of the people are met.

JP2GI is backed by the Global Alliance for Improved Nutrition (GAIN) in its efforts to improve the nutrition requirements of the people. GAIN is an international organization launched by the United Nations in 2002 and headquartered in Geneva. It has established its branches in multiple countries including Indonesia. GAIN aims to guide the international community to fund and reform the food system. GAIN acts as the donor for JP2GI to discover and support the development of local technological innovations that are affordable, effective, and promotes 'good handling practice behavior' to reduce the depreciation of post-harvest fresh fish.

Educational activities with the Intelligent Flashcards can be adopted as part of Gemarikan by the government. The module for the educational activities is made in the form of playing cards that mitigate the seven tier-based fish consumption barriers in households. Aside from that, the module is complemented by the educational cards containing the seven tier-based fish consumption barriers as well as the solution to those barriers.

The conception of Intelligent Flashcards originates from an attempt to solve the seven tier-based fish consumption barriers in households (Maulana et al., 2019) through community-based education and increased understanding of consumption barriers. The previous study shows that barriers to adopting a fish-based diet closely correlates with the level of knowledge possessed by the consumer. Efforts to increase the level of knowledge that consumers possess about fish may increase their likelihood to adopt fish consumption (Grieger et al., 2012; Olsen, 2004; Pieniak et al., 2010).

Educational activities using Intelligent Flash Cards may contribute to government efforts in Public Education. It is particularly crucial in areas where the rate of fish consumption is low, so that barriers to fish adoption/consumption may be mitigated through giving each barrier a suitable solution specific to its context. These educational activities fall into the category of post-harvest treatments to generate awareness and understanding of the importance of fish consumption.

LITERATURE REVIEW

Maulana et al. (2019) found via ethnography research, that there are seven tiers of barriers to adopting fish consumption among Indonesian households. The seven tiers range from coming up with dishes to consume to serving the dishes. These tier-based barriers in fish consumption correlate closely with the level of knowledge possessed by each individual. Research suggests that campaigns on fish consumption are more effective when they are aimed at each of the specific tier-based barriers as opposed to campaigning general knowledge on fish.

Figure 1 gives a more complete picture of the collection of barriers that must be overcome before fish

consumption can be adopted in the long term, not just in a momentary trial run. The settlement of consumer problems must be seen as a series of barriers within each touchpoint both at that point and after that point. For example, consumers who have reached the fifth touchpoint are preparing fish in the kitchen and may need more help to be able to overcome the pain points at points 6 and 7, including knowing how to use fish as an ingredient in the kitchen without reducing its quality, learning techniques for cooking fish properly and having a choice of fish-based recipes that are simple and acceptable for the family. Another example is that consumers who are at a touchpoint in Tier 7 should be considered as having overcome problems from Tiers 1 to 6. For this consumer group, the task of the educator is to focus on Tier 7 barriers, such as teaching the consumers how to serve the fish dishes in such a way to be well-received and enjoyed by the family.

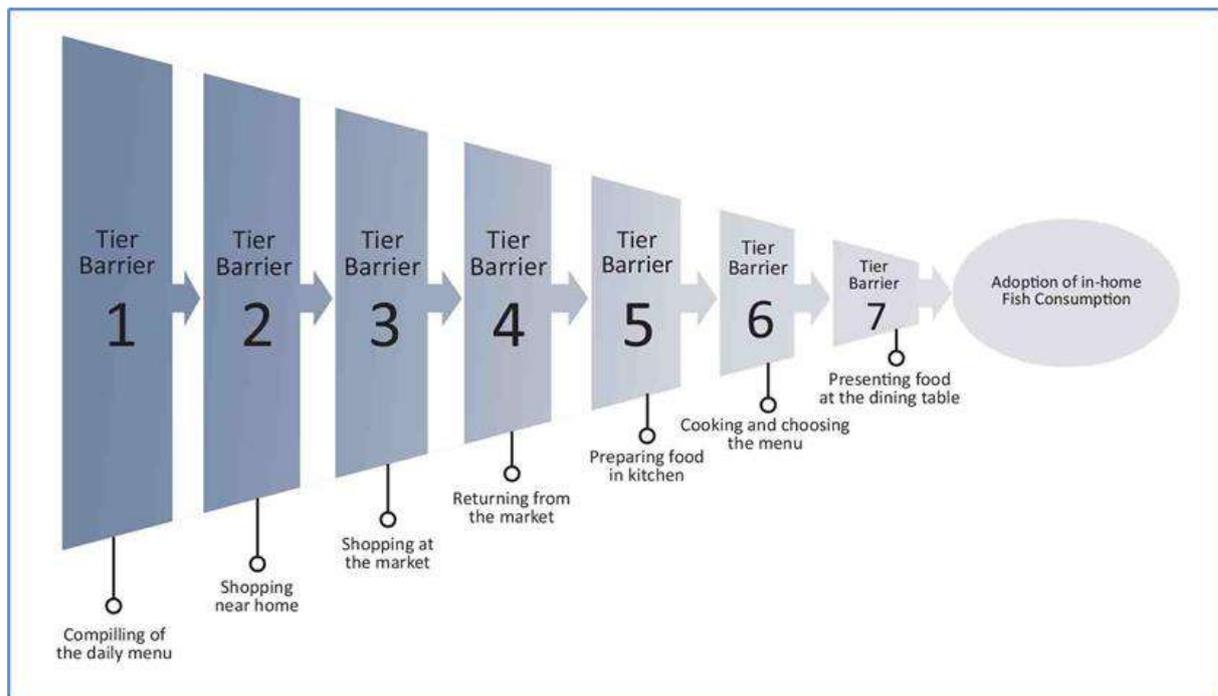


Figure 1.
Seven tier-based adoption barrier of fish consumption in households
Source: Maulana et al. (2019)

The game module is devised to tackle the seven tier-based fish consumption barriers for housewives of lower to middle socioeconomic backgrounds through the use of card games. Modules and card games may be able to help housewives in recognizing the barriers they face in fish consumption and discovering possible solutions.

MATERIAL AND METHOD

The method of consumer learning is done through the use of gamification because it is deemed as the easiest method for someone to understand a problem and obtain the most proper solution to it. Other than that, gamification is easily accepted by not only children but also adults of all ages. Thus, it is expected that the playing cards can be implemented to all parties, particularly middle to lower class housewives to increase awareness of fish consumption within their respective households. Conveying information through the use of playing cards is deemed to foster a more conducive teaching environment (Turcotte & Betrus, 2016). In addition to that, playing card games by matching symbols and elements within the cards is proven to improve the players' retention rate of the information by a large margin (Gutierrez, 2014; Mariscal et al., 2012).

The following are the stages of the process in the development of the Intelligent Flash Card game.

1. Preparation stage

This is the stage where organizers determine the location, plan the budget, and prepare for other necessities. The emphasis of fish consumption problem that would like to be clarified in that specific community is based on the findings of which problem the audience have.

2. Development of the activity and product design

The planning and development of the material are conducted by using pictures that illustrate and fulfill the obstacles and fish consumption criteria. The creation of the content and design of the Intelligent Flashcards has already gone through consultations with JP2GI and two experts in the fishery sector in the development process.

3. Trial of activity and product

The product trials are conducted on several related parties, including: (1) trials by the internal team, (2) trial in the targeted community. The trial of card gaming by the internal team was conducted with four researchers as participants with three people acting as the players and one person acting as the facilitator. That trial was conducted to determine whether the game meets the expectations. The trial was also conducted to test whether or not the cards are fun enough to play.

4. Evaluation and improvement

After the cards have been tested, the results from the pre-trial and post-trial examination are evaluated, including the design and the form of the game. The evaluation is important to improve the

quality of the card game. The prototype of the Intelligent Flashcards may be printed out and copied whenever the counseling programs begin.



Figure 2.
Intelligent Flashcards Game Play Simulation by Research Team

5. Location and Participant of Trial

The targeted demographics for the Intelligent Flashcard are housewives, aged 25 years old or above, from the middle to low socio-economic background, who have school-age children. The rationale for selecting this group is to focus on a group of consumers that need knowledge about the benefits of fish for the children.

Five participants are selected to attend the card game trial. The objective is to check the effectiveness and obstacles of the game to play and obtain the fish consumption knowledge. Their feedback especially on the game-related likes and dislikes during the activity improves the card game quality. This activity was held in Pondok Aren, South Tangerang.

RESULT AND DISCUSSION

In the first round of the trial, there are several evaluation points. The illustration on the card must be revised. There should be two different games players can play using the card, and the duration per game should be around 15 minutes.

Trial towards the targeted community was conducted after internal testing. They were five housewives that fall into a low to the middle class category of socioeconomic background residing in South Tangerang. The trial was supervised by two researchers acting as facilitators.

The trial began with facilitators explaining the rule of the game. After that, participants must fill in a fifteen minutes pre-test to measure their initial knowledge regarding fish consumption's seven critical points. The first game was conducted for twenty minutes, followed by the second one with similar duration. When the games are done, participants must answer the pre-test question again to measure out the game's impact.

Discussion during the game showed how enthusiastic the participants were. They discussed their experiences relevant to the seven tier-based obstacles. This game allowed the participants not only to acquire information from the card but also from sharing each other's personal stories.

Facilitators have important roles in this game. They act as a guide to ensure the game was done correctly and to keep the discussion happening relevant to fish consumption aspects. Facilitators also provide factual knowledge and debunk any misconception that participants had related to seven obstacles. Gameplay simulation with stay at home mothers could be seen in Figure 3.



Figure 3.

Gameplay Simulation with Stay at Home Mothers

Pre and Post Test Results

Pre-test and post-test consist of ten open-ended questions to identify participant’s knowledge regarding fish consumption obstacles based on critical points in household fish consumption study. Each correct answer will generate ten points, and the wrong answer will give them zero. Results from the pre-test and post-test were accumulated and compared. The results are as follows.

Table 1.
Pre-test and Post-test Results

Participants	Pre-test	Post-test	Improvement
Housewife A	50	100	2 times
Housewife B	30	80	2 ½ times
Housewife C	20	80	4 times
Housewife D	10	80	8 times
Housewife E	30	90	3 times
Total	140	430	3 times
Average	28	86	

Based on the comparison, Intelligent Flashcards successfully tripled the participant's average score. This shows that the card game successfully increases participant's knowledge and understanding to face fish consumption barriers at home.

Intelligent Flashcards

The creation of the Intelligent Flashcards is based on the seven tier-based obstacles of household fish consumption (Maulana et al., 2019). The seven obstacles are (a) putting together a daily menu; (b) shopping for fish nearby; (c) shopping at the market and choosing fresh fish; (d) coming home from the market; (e) preparing to cook in the kitchen; (f) choosing and cooking the menu; and (g) serving the fish dish on the dining table. Those obstacles are then molded into solutions that solve them. Card box design could be seen in Figure 4.

The recommended number of players is four, but this game is also suitable to be played by three to five players. There will be one facilitator to guide the players during the game. If the players already understand how to play the game and its rules, the role of the facilitator in the game is optional. The duration of the game is around 15-20 minutes. In one set of the game card, there are 21 obstacle cards, 21 solution cards, and the game instruction. Intelligence flashcards packed could be seen in Figure 5.

The main purpose of this game is to match the obstacle cards with their solution cards. The main objective of the players is to match the obstacle cards with their corresponding solution cards based on the game module. The fastest player to finish matching all the obstacle cards with their solution cards in their hand is the winner. Sample of obstacle (up) and solution (down) could be seen in Figure 6.

The existence of a facilitator is important in the process of module training, which is conducted by playing the game. The facilitator functions as (a) a guide for the players while playing the game; (b) the one who gives an understanding of the barriers to fish consumption and solutions that are listed on the card game; and (c) a judge to assess the players on the ongoing game.

How to Play the Game

After taking into account several game techniques that exist and several trials that have been conducted, there are two ways to play the Intelligent Flashcards which are Game 1 –Beginner and Game 2 – Advanced.

Here are the steps to play Game 1 – Beginner:

- a. The facilitator shuffles and distributes all the cards to the players so that all 4 players receive 10 cards each.
- b. The game starts from the player to the left of the facilitator.
- c. The first player matches their obstacle cards with its corresponding solution cards that they have in

their hand. Those pairs of obstacle-solution cards are taken out of the player's hand and placed openly in front of the player.

- d. The facilitator then explains the correct pair of cards that have been taken out and tries to incite a discussion among the players on the content of the pair of obstacle-solution cards.



Figure 4.
Card box design



Figure 5.
Intelligence flashcards packed; Obstacle cards (up)
and Solution cards (down)



Figure 6.
Sample of Obstacle (up) and Solution (down)

- e. Every pair of obstacle-solution cards that are correctly matched worth 10 points for the players. The players that do not get a matched pair of cards get 0 points.
- f. After matching the cards, regardless of whether or not the first player gains points, the first player continues the game by taking one card from the player to their left. If there is a matched pair of the obstacle-solution card after that, the first player takes out that card and gains another point.
- g. The game continues with the next players taking turns clockwise until there are no cards left between players.
- h. The winning player is the one that finishes their cards first or gets the highest points from the pairs of obstacle-solution cards that they successfully matched.

Here are the steps to play Game 2 – advanced.

- a. The facilitator shuffles and distributes all solution cards so that every player gets seven cards each.
- b. Every player can adjust the solution cards in their hand as desired.
- c. The facilitator, as a judge, prepares and shuffles all the obstacle cards and stack them up closed.
- d. The facilitator takes out one card from the stack of obstacle cards.
- e. All the players check the obstacle card that was taken out by the facilitator and pay attention to the number, the color, and the type of the obstacle card.
- f. The players check the solution cards on their hands and take one out if they own a solution card that solves the obstacle in the obstacle card that has been taken out. Tips: the player could match the cards based on the number, the color, and the type of solution cards.
- g. The players and the facilitator can discuss the obstacle and its solution on the card.
- h. When the obstacle card and its corresponding solution card are matched by a player, the game continues with the facilitator taking out another obstacle card from the stack.
- i. The player that finishes off their solution cards first is the winner.
- j. The game ends after all the solution cards are matched with its corresponding obstacle cards.

CONCLUSION AND RECOMMENDATION

Card games have always been exciting and generate high engagement rates among participants. Utilizing the Intelligent Flashcards, participants were able to understand difficult concepts easier. This method also brings a more pleasant atmosphere during the learning process. The result of the Intelligent Flashcards trial on housewives from lower to middle socioeconomic backgrounds showed there is an increase in the participants' understanding and knowledge to solve challenges they might face regarding fish consumption at home. This game successfully increased their understanding of the tier-based adoption barriers.

The utilization of card games as an educational tool helps facilitators create a relaxed and engaging

learning environment compared to the conventional method. Card games establish an atmosphere that allows the participant to comfortably discuss relevant issues. Intelligent Flashcards can be an alternative to increasing public knowledge about fish, especially for Gemarikan organizers. Intelligent Flashcards is ready to be distributed and utilized across Indonesia to achieve "Gerakan Memasyarakatkan Makan Ikan".

Community Education designed according to ethnographic research is proven to significantly raise public knowledge and eventually, change the fish consumption behavior of the public. Intelligent Flashcards is a successful example that many researchers and community educators can replicate.

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Appendix 1. Obstacle Card and Solution Card Explanation

The following are pairings of obstacle and solution card for each module:

No	Obstacle	Solution
MODULE 1 Coming Up with Daily Menu		
Problem: Presumptions due to the housewives' past unpleasant experiences when coming up with a menu, purchasing, and preparing fish to be consumed by family members		
1	Dilemma selecting source of protein Mothers often have trouble choosing a source of protein to cook for their family	Choosing fish because of its high nutritional value which is important for children As one of the most nutritious protein sources, mothers must be informed of the importance of its consumption, especially for children.
2	Assumption of family dislike for fish There is a perception that all family members must dislike fish, especially children. This perception results in mothers tending to not pick fish-based dishes.	Persuade the family to eat fish because it is good for intelligence Persuade the family and tell the benefits of fish-based dishes may help family members to like fish-based dishes.
3	The perception that omega-3 fish are expensive Mothers think that all fishes containing omega-3 are expensive based on the price of salmon.	Fish that contain omega-3 are not always expensive There are various types of fish available in the market which are inexpensive yet still highly nutritious.
MODULE 2 Shopping for fish near home		
Problem: Fish markets and supermarkets that sell fish are located very far away, hence taking more time and energy to access. This distance barrier leads housewives to consider finding markets or supermarkets closer to their homes.		
1	Low quality of fish from vegetable sellers traveling on foot Housewives often receive fish in poor condition from vegetable sellers, such as leftover fish.	Vegetable sellers should carry a cooling box to store fish Vegetable sellers should carry a cooling box to store and maintain the quality of fish.
2	Low quality of fish from vegetable sellers Even though vegetable sellers commonly sell fish, the fish are spoiled or have otherwise poor quality.	More careful in choosing fish early in the morning To obtain the best quality of fish, buyers must carefully select the fish and buy it early in the morning if necessary.
3	Lack of fish variety from vegetable sellers Housewives often run out of fish if they buy from vegetable sellers. Furthermore, they only provide a few types of fish with hardly any variation.	Go to the market because of the large selection of fish Housewives should go to the nearest market from home because they provide more fresh fish

MODULE 3 Shopping at markets

Problem: Shop centers for buying fish doesn't have the desired type of fish in stock, and the housewives lack knowledge in selecting good quality fish

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|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>1 The desired type of fish is out of stock
Housewives often have difficulties in obtaining their families' desired type of fish.</p> | <p>Order the fish to bring the next day
Housewives can order fish through regular traders so they can get the fish wanted.</p> |
| <p>2 Sellers keep their fish in inadequate storage places
The fish sold in markets often decrease in quality due to poor treatment from its sellers.</p> | <p>Finding sellers who store their fish with ice
Ice can keep fish fresh so buyers need to search for sellers who store fish properly, tidily, and carefully to maintain its quality.</p> |
| <p>3 Not knowing how to choose fish with good quality
Sometimes, housewives are confused or do not know how to select fish with good quality in markets.</p> | <p>Learning to choose fish with good quality from various sources
Learn tips to differentiate fresh and non-fresh fish from the internet, the news, or any other trusted media.</p> |

MODULE 4 The Trip Home from The Market

Problem: Housewives' lack of knowledge of keeping fish fresh on their way home

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|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>1 Sellers wrap fish carelessly
Sellers pay little attention to wrapping fish properly, and just put fish into regular plastic bags.</p> | <p>Asking the sellers to add ice
To preserve the fish's quality, buyers should ask sellers to provide ice to maintain the quality of the fish on the way home.</p> |
| <p>2 Decreasing quality of fish on the way home
Often, housewives aren't provided with a container or any ice to preserve the condition of fish, hence worsening the fish's quality on the trip back from the market.</p> | <p>Returning home immediately after purchasing fish
To preserve its quality, buyers should return home and refrigerate the fish right after purchasing it.</p> |
| <p>3 The fish is only placed in the kitchen and not directly cooked
Many consumers don't cook their fish right away after getting home from the market, further decreasing the quality of fish.</p> | <p>Properly store the fish in the refrigerator to cook later
The recently bought fish needs to be cleaned and stored in the refrigerator immediately, if not directly cooked.</p> |

MODULE 5 Preparing to cook fish in the kitchen

Problem: Housewives often lack the knowledge and skill it takes to prepare fish, such as cleaning fish, therefore sometimes depending on household assistants to help with the process.

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|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>1 Uncomfortable fishy smell
Consumers often complain about the signature fishy or muddy <u>smell</u> which is hard to get rid of, hence avoiding cooking fish altogether.</p> | <p>Squeezing lime onto the surface of the fish
Applying lime onto the fish's surface is proven to decrease the fishy smell.</p> |
| <p>2 Inability to clean fish
Consumers <u>don't</u> want to cook fish because of the difficulty in cleaning it.</p> | <p>Asking the seller to clean the fish
Some market sellers provide the extra service of cleaning fish beforehand.</p> |
| <p>3 Hard to prepare seasonings and ingredients
Housewives experience confusion due to the abundance of seasonings and ingredients available to cook fish.</p> | <p>Buying premade or blended spices
Some sellers provide premade or blended spices and seasonings that are appropriate for various dishes. These spices can serve as an alternative for fish seasoning.</p> |

MODULE 6 Selecting and cooking the menu

Problem: Housewives' knowledge and skills regarding recipes and methods to cook fish

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|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>1 Limited knowledge on how to cook fish
Housewives have a limited list of ideas and inspirations on cooking fish every day</p> | <p>Finding information from other sources
Sources of inspiration for fish-based dishes can be found through common recipe books and also via YouTube.</p> |
| <p>2 Unaware of other methods of cooking fish other than frying it
The fish menu is very monotonous because frying fish is the only mainstay menu that mothers can prepare.</p> | <p>Learning to cook simple and quick fish dishes
Practicing to prepare and cook fish would be easier if housewives learn simple and quick fish-based dishes</p> |
| <p>3 The fish cooked often becomes sticky or crumbled
Due to a lack of skill, housewives often fail in cooking fish. The cooked fish fall apart, and its pieces stick to the cooking utensils.</p> | <p>Cooking fish on a banana leaf
It is necessary to use some cooking techniques to minimize failing when cooking fish. One of the simplest yet best methods is to cook fish on a banana leaf.</p> |

MODULE 7 Serving fish on the dining table

Problem: Low family appetite because of the fish serving method

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|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | The fish served contains many bones
Bony fish deters children and family members from eating it. | Cooking boneless, filleted fish
Boneless, filleted fish can become an alternative because it is easier to eat. |
| 2 | Children refuse to eat fish because they don't like the flavor
Some children assume that fish don't taste good. They only prefer to eat chicken or eggs. | Serving fish in child-friendly shapes
It is essential to educate children regarding various types of food, namely fish—which are delicious and healthy. Parents need to be more creative in shaping fish dishes into an exciting dish, so children enjoy eating it, for instance, funny animal shapes. |
| 3 | Unattractive presentation of fish
Unattractive presentations reduce family members' appetite for fish. | Serving fish with an attractive display or appearance
Good plating will increase family members' appetite. |
-