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# An Evaluation of High School Students' Change in Knowledge and Preferences towards Seafood through Education

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**Abstract**
Aquaculture and wild-caught seafood contribute to the global seafood demand, but ocean resources have exceeded a sustainable yield. To promote a sustainable future, we must educate adolescent seafood consumers on factors that have the greatest impact in driving consumption preferences. Targeting adolescents can make a difference in their present food habits and lead to conscious consumers in the future. A pre- and post-survey was developed to assess high school students' knowledge and preference for aquaculture versus wild-caught seafood before and after the implementation of an educational program. The educational program, A.Q.U.A. (A Quest to Understand Aquaculture) was developed by the Center for Tropical and Subtropical Aquaculture (CTSA) covering five lessons. Survey responses were collected from three high schools across the island of O'ahu, Hawai'i. Using a mental model analysis, education was found to be effective at increasing the knowledge of aquaculture and the preference for aquaculture seafood based on all four factors: 'taste', 'environmental impact', 'health concerns', and 'what they eat at home'. Using analysis of variance tests, schools were found to have a significant impact on the change in knowledge of aquaculture. The study provides useful information needed to implement an effective education program into school curricula to enhance students' knowledge and promote conscious consumption for the benefit of a sustainable future.
**Keywords:** aquaculture seafood, wild-caught seafood, education, consumption preferences, dietary behaviors
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## 1. Introduction/Problem Statement

The growing trend for seafood consumption continues to add pressure to our oceans resources leading to an unsustainable supply of seafood (FAO, 2020). Much of this seafood demand is surrounding wild-caught species (e.g., oysters and tuna) whose stocks have become overfished (Brayden et al., 2018). While capture fisheries provide 54% of the total global fish production, aquaculture has demonstrated a crucial role in global seafood security and sustainability (FAO, 2020). Aquaculture is a key alternative to meet the growing demand for seafood as a sustainable option of quality and nutritional value (Claret et al., 2016). Seafood consumption is affected by several attributes including quality, health, taste, and environmental impacts (Claret et al., 2016; Fernández-Polanco & Luna, 2012; Krešić et al., 2020; Brayden et al., 2018; Feucht and Zander, 2015; Davidson et al., 2012, Murimi et al., 2018). Understanding which attributes are most influential in consumers preference is critical in promoting consumption of a targeted source.

Consumers perceive wild-caught seafood to be of better quality and healthier in terms of being naturally-produced (Brayden et al., 2018; Feucht and Zander, 2015). Whereas, aquaculture is perceived as having a negative impact on the environment and animal welfare in terms of its production process (Claret et al., 2016; Feucht and Zander, 2015). Furthermore, a study by Davidson et al. (2012) found that residents in Hawai'i prefer wild-caught seafood based on taste and environmental impacts (Davidson et al., 2012). Studies have found that environmental impacts are a major concern among consumers and are a barrier for consumption of aquaculture products (Feucht and Zander, 2015; Hoerterer et al., 2022). These perceptions are linked to lower consumption rates of aquaculture seafood due to false and misleading information (Krešić et al., 2020). A study has shown that scientific knowledge can change attitudes and perceptions towards aquaculture and lead to increased consumption to meet growing demand and sustainability (Krešić et al., 2020). Hawai'i presents an intriguing case study to evaluate education impact on knowledge and consumption preferences of aquaculture seafood as high school students across O'ahu indicated having some knowledge of aquaculture and a higher preference for wild-caught seafood (Beyer et al., 2023). In addition, Hawai'i has a high seafood consumption per capita (three times the national average) (Davidson et al., 2012).

Based on results from Claret et al. (2016), educational efforts should be focused on providing information that improves the perception and attitude of aquaculture to drive consumption preferences. Previous studies have shown that providing information about aquaculture operations reduces the negative attitude towards aquaculture

 

products (Fernández-Polanco & Luna, 2012, Bouchard et al., 2021). Providing information such as health benefits, nutritional value, and environmental impacts of aquaculture prevented misleading perceptions (Feucht and Zander, 2015). According to Bouchard et al. (2021), consumers with knowledge of aquaculture operations and origin of production tend to prefer aquaculture over wild-caught seafood. Overall, the public would benefit from more education based on scientific facts, specifically production methods and sustainability regarding aquaculture seafood (Hoerterer et al., 2022). The FAO recommends investing in education to provide more fact-based information to consumers to address the various perceptions that impact the growth of the aquaculture industry (FAO, 2020).

Extensive education and outreach efforts are warranted, especially considering the potential for aquaculture to make immediate and significant impacts on food security and the balance of the ecosystem (FAO, 2020). To enhance future sustainable seafood consumption in the United States, priority should be given towards investing in education -- which begins with teachers and students and trickles down to the broader community, in particular, to disseminate information and resources about aquaculture, and improve community support for local farming efforts. In a recent study, Beinert et al. (2022) investigated the influence of food and health education on middle and high school students' food choices, frequency of cooking, and food hygiene where the majority of the students agreed they had more knowledge of a healthy diet after education. Another study by Ronto et al. (2016) showed that education positively influences dietary behaviors, particularly with knowledge of nutrition in adolescents. While these studies have investigated the influence of education on food consumption preferences, there is a dearth of information on the influence of education, specifically regarding aquaculture and wild-caught seafood consumption preferences.

Adolescent food habits have proven to be influential in their future food decisions (Fernández-Polanco et al., 2010). Consumption behaviors and preferences established earlier in life are likely to be maintained into adulthood and education is an effective intervention to change these food habits in adolescence (Murimi et al., 2018; Beckman & Smith, 2008; Bai et al., 2018). Another study by Bai et al. (2018) found that education impacted adolescents' attitudes, preferences, and self-efficacy leading to increased vegetable consumption. Targeting consumers at a younger age through the implementation of an educational program can bring awareness to the actual benefits and impacts of the aquaculture seafood industry. Furthermore, assessing the effectiveness of education intervention on adolescents' knowledge, perceptions, and preferences of aquaculture seafood can uncover barriers that need to be surpassed before a positive impact on the aquaculture seafood consumption can be achieved.

## 2. Objectives

The primary purpose of this study is to evaluate how education affects knowledge and consumption preferences of aquaculture versus wild-caught seafood in Hawai‘i. Through effective integration of education efforts to promote sustainable aquaculture in local high schools, this project aims to increase awareness, understanding, and appreciation of the interconnectedness of food production, consumption and the environment. The specific objectives are: 1. To evaluate the impact of education on changes in knowledge and consumption preferences of aquaculture and wild-caught seafood, 2. To identify if sociodemographic factors impact the effectiveness of education, and 3. To recommend how education interventions can be introduced.

## 3. Materials and Methods

This section summarizes the methods and procedures for carrying out the study. The following were done in sequential order: survey development, survey testing, IRB approval, data collection, data analysis evaluating the impact of education intervention in between the pre and post surveys. The survey was developed via literature review and expert consultation. Specifically, a Fuzzy-logic Cognitive Mapping (FCM) framework was used to design the survey in order to conduct a comparative analysis of the impact of education on seafood preferences. This method has been used in revealing consumer and public preferences for private and public resources (Moon et al., 2019). To begin, we developed a cognitive map with the help of experts familiar with the relationship between consumers’ consumption preferences for aquaculture versus wild-caught seafood. A well-established educational program titled A.Q.U.A. (A Quest to Understand Aquaculture) was used to provide students with information about aquaculture and wild-caught seafood prior to conducting the post-survey. In order to accomplish objective two, an ANOVA test was used to evaluate what socio-demographics influence the effectiveness of education.

### *3.1 Survey Development*

The pre- and post- surveys were developed to assess changes in knowledge and consumption preferences for seafood type before and after the implementation of an educational program. To construct the surveys, we gathered information through literature review and interviews with experts' to identify and select the most relevant factors impacting seafood consumption preferences. Based on the literature, six recurring factors:

 

sociodemographics, taste, food safety, health benefits, price, and fisheries sustainability were identified as being most influential factors affecting seafood preferences (Davidson et al., 2012; Fernández-Polanco & Luna, 2012). In addition, nine experts' with expertise in Biology and Aquaculture, Economics and Aquaculture, Economics and Agriculture, and Education and Aquaculture gathered in July and August of 2020 to evaluate the six identified factors and provided feedback and added additional information based on their knowledge and experience. Results from the literature and experts indicated the following factors as relevant factors influencing an individual's preference for seafood: 'taste', 'environment impact', 'health concerns', and 'what they eat at home'. Because our focus was on students' consumption preferences and not on the household grocery shoppers (i.e., parents, guardians), price was not included in the survey.

Once the important factors were identified we developed a structured questionnaire consisting of three main sections: socio-demographics; knowledge of seafood production and consumption; and preference for aquaculture versus wild-caught seafood and whether the student's preference was conveyed to their parents. The preference questions were structured using four-point Likert scales (i.e., disagree, slightly agree, moderately agree, and strongly agree) to qualify their relative preference for seafood in terms of 'taste', 'environmental impact', 'health concerns', and 'what they eat at home'. Students were also asked to rate their perceived influence on household shopping decisions. These responses were then averaged among respondents in calculating the numeric value of the causal relationships between specific factors in the cognitive map, following a similar procedure used in previous studies (Gray et al., 2014).

The surveys were administered online via google forms after approval from the Institutional Review Board (IRB). Assent forms from parents and students were mandatory for students under 18 to participate in the study and all participation was voluntary. Following receiving the assent forms, the survey was sent directly to the students' email address provided on the assent form. All survey responses were anonymous. The pre-survey was administered in Fall 2021 and the post-survey was administered in April 2022 with the help of the students' teachers.

To assess the impact of the education intervention, the post-survey included the same questions as the pre-survey with the exclusion of two questions on the impact of Covid-19 and the addition of a filter question asking students if they had participated in the pre-survey before the educational program to ensure that we were analyzing responses from the same group of students.

### *3.2 Mental Model Framework*

A Fuzzy-Logic Cognitive Map (FCM) framework, a type of mental model, was the basis on how the survey questions were structured and developed. Mental models can provide a quasi-quantitative and qualitative explanation on the perceived relationships between variables to measure change involving complex systems and decision-making (Gray et al., 2014). This approach has been applied in various scientific disciplines (e.g., conservation, agriculture, risk analysis, medicine), being particularly useful for comparing and summarizing cumulative perceptions and knowledge of a community (Gray et al., 2014; Moon et al., 2019; Vicenzi et al., 2018).

FCM graphically represents relationships between variables by connecting concepts in a direct linkage (Gray et al., 2013). FCM was used for this study to understand how preferences of the type of seafood (i.e. aquaculture, wild-caught) are linked to 'taste', 'environmental impact', 'health concerns', and 'what they eat at home'. The preference questions were ratings based on a four-point Likert scale to specify the degree of agreement (i.e. disagree, slightly agree, moderately agree, and strongly agree). Once the data on the preference questions was collected, individual responses were aggregated and averaged to determine the intensity of the relationship between variables in the FCM map (Figure 1). Pre- and post- survey results were compared to analyze changes in intensity of relationships due to education. Mental Modeler, a software developed by Steven Gray (n.d.) was used to construct the FCM. The software was specifically designed to provide a visual interpretation to indicate relationships among variables (Gray et al., 2013). In our case, visual comparative results will be indicated on the causal relationships to indicate educational impact.

### *3.3 Educational Intervention Program*

The educational intervention program consists of a program developed by the Center for Tropical and Subtropical Aquaculture (CTSA) in Hawai`i. In an effort to improve aquaculture and marine science comprehension for Hawai'i, the Center for Tropical and Subtropical Aquaculture (CTSA) had designed and implemented an educational program titled A.Q.U.A. (A Quest to Understand Aquaculture) under the auspices of a 2010 'NOAA-PIRO Marine Education Mini Grant' project. A.Q.U.A. is a simple yet comprehensive K-12 curriculum which is available for download on the CTSA website (www.ctsa.org) (Brooks, 2012). The curriculum applies a constructivist approach to educate students on seafood with an emphasis on the difference between aquaculture and wild-caught seafood in a manner that is relevant and intriguing to children in the context of multiple disciplines, providing a well-rounded educational experience (Brooks, 2012). The

 

educational program after assessment from the project team included five lesson plans presented by Tom Iwai (retired aquatic biologist, State of Hawaii) in March 2022 following the completion of the pre-survey. The lessons were as followed: Lesson 1: Seafood & Human Health, Lesson 2: Seafood Source & Availability Lesson 3: Seafood Security in Hawai‘i, Lesson 4: Seafood Farming (Aquaculture), and Lesson 5: Careers in Seafood. Lesson 1, 3, and 5 discussed seafood in general, whereas lesson 2 and 4 highlighted the sources and process of supplying aquaculture and wild-caught seafood. The educational program was conducted at all three schools over the course of four to five weeks prior to the post-survey. The respondents were not exposed to this intervention prior to the pre-survey.

## 4. Study Site

This study focuses on high school students (9-12) on O‘ahu, Hawai‘i where about two-thirds of the population of the State of Hawai‘i reside (*Census | Latest Population Estimate Data*, n.d.). We selected three high schools: Aiea High School, Waipahu High School, and Wai‘anae High School to represent urban, suburban and rural areas (area designation can be found in the Oahu General Plan developed by Department of Planning and Permit, November 2024). The selected high schools were chosen from a list by the College of Education at the University of Hawai‘i at Mānoa and through connections with the Center for Tropical and Subtropical Aquaculture (CTSA) and Future Farmers of America. The schools represented urban, suburban and rural high school demographics on Oahu.

## 5. Results and Discussion

The following is a summary of results from the pre-and post-survey comparative analysis, FCM, and selected questions on seafood consumption. In total, 107 students participated in the pre-survey and 99 in the post-survey. The results analyze only respondents that stated they completed both surveys. The final pre- and post- sample size used in our analysis is 144.

### *5.1 Respondents Demographics*

The results by school were composed of 48.65% Aiea High School students, 28.38% Waipahu High School students, and 22.97% Wai‘anae High School students.The majority of the respondents were male (56.76%) and of Asian descent (86.18%) and all areas of residency (Table 1). According to the 2020 Census, the 14-19 years old age group represented 5.5% of Oahu's population of which 55.6% were male (*Census | Latest Population Estimate Data*, n.d.). Asian ethnicity mixed with two or more races makes up 57.2% of the population in Hawai‘i (*Census | Latest Population Estimate Data*, n.d.). Similarly, respondents who identify with asian descent in our study sample are in the majority. The survey asked respondents to check all ethnicities that they identified with, thus the percentage of Asians was expected to be much higher. According to the survey responses, more than half of the respondents (58.11%) resided in suburban areas followed by urban (25.68%) and rural (16.22%) areas (Table 1). The survey respondents were predominantly students from twelfth and eleventh grade, 72.97% and 25.68% respectively.

### *5.2 Fuzzy-logic Cognitive Map (FCM)*

The following results measured changes in pre- and post- survey responses due to education by evaluating the strength of agreement of four factors that influence their preference for aquaculture and wild-caught seafood. The four factors are: ‘taste’, ‘environmental impact’, ‘health concerns’, and ‘what they eat at home’ (Figure 1). Results of the FCM on factors influencing the types of seafood preferences are positive, but in the weak ‘slightly agree’ category. After education intervention, respondents slightly increased their agreement that the four factors influenced their preference for aquaculture seafood with the largest agreement still based on ‘environmental impact’ (Figure 1). The agreement that ‘taste’ influenced their preference for wild-caught seafood decreased slightly, but the remaining factors increased slightly (Figure 1). ‘Environmental impact’ had a greater influence for the preference for aquaculture seafood and ‘taste’, ‘health concerns’, and ‘what they eat at home’ had a greater influence for the preference for wild-caught seafood.

For the preference for aquaculture seafood, the greatest increase from the pre- and post-survey is ‘taste’ and ‘health concerns’ (Figure 1). After education the respondents that asked their parents for wild-caught seafood increased while aquaculture seafood stayed the same (Figure 1). The strongest factor influencing preference for aquaculture seafood is ‘environmental impact’. The preference for wild-caught seafood decreased slightly by 0.04% based on ‘taste’ and stayed constant for ‘what they eat at home’, but were still the strongest factors. After education, the preference for aquaculture seafood based on ‘environmental impact’ did not change much as it was already the most influential factor in the pre-survey; however the preference for wild-caught seafood increased by 11% based on ‘environmental impact’.

The respondents' preferences in this study did not change the respondents’ asking their families for seafood from a specific source, but what families eat at home does influence the respondents' preference for a specific

 

seafood (Figure 1). According to the respondents, families tend to eat wild-caught seafood at home much more frequently than aquaculture seafood. This could be reflective of Hawai‘i, being an island with a prominent fishing industry. Therefore, it is important to provide education on the value of aquaculture seafood to decision makers who purchase the seafood. Overall, education was effective at increasing the preference for aquaculture, but there is still a higher preference for wild-caught seafood based on ‘taste’, ‘health concerns’, and ‘what they eat at home’. However, the current impact was based on only five lessons. The outcomes may be completely different if additional lessons and hands-on learning opportunities are provided.

*5.3 ANOVA Test of Education Impact*

A two-sample t-test was used to evaluate the respondents who claimed an increase in knowledge of aquaculture after education by socio-demographics variables (gender, grades, and school). The results of the t-test revealed a significant difference between respondents from Aiea and Waipahu High School regarding their self-reported perception of change in knowledge of aquaculture ($t$ (df) = 4.327, $p < 0.000$). There were no significant differences among gender and grades. These results confirm that most knowledge of aquaculture was learnt from school and that schools play an important role in setting the baseline knowledge.

*5.4 Education Impact on Other Related Questions*

When asked “How often do you ask your parents or guardian to buy seafood to eat at your home?”, 54.29% of respondents in the pre-survey and 27.03% in the post-survey said they never ask their parents, an increase of 50% who said they asked their parents to buy seafood, again indicating the significant impact of education intervention. However, respondents who asked their parents or guardian to purchase seafood did not ask for a specific type of seafood. Although education was not effective at influencing the respondents' who ask their families to buy a specific type of seafood, it was effective at increasing the number of respondents who ask their families to purchase seafood in general.

For two of the schools (Aiea and Waipahu), our results revealed an increase of the student's self-reported knowledge of aquaculture after the education intervention (Figure 2). No change was identified for the Wai‘anae High School group due to 100% of respondents claiming they know aquaculture in the pre-survey. The total percentage of respondents who claimed to know about aquaculture was 48.57% in the pre-survey and 85.14% in the post-survey, a 75.29% increase from the baseline data (Figure 2). Aiea High School respondents had the greatest change with a 62.72% increase, followed by Waipahu High School with a 12.55% increase (Figure 2).

When asked, “Do you know the difference between wild-caught seafood (or wild seafood caught in the ocean) and farm-raised (also known as aquaculture) seafood?”, 64.28% of respondents in the pre-survey and 86.48% in the post-survey answered yes, a 35% increase (Figure 3). Waipahu High School had the greatest change with a 89.15% increase in respondents indicating having knowledge of aquaculture versus wild-caught seafood in the post-survey, followed by Aiea High School with a 20% increase and Wai‘anae High School with a 29% increase (Figure 3). After education, there was an increase of 12.99% who agreed that it would be best for the environment if we ate both aquaculture and wild-caught seafood. In the pre-survey, almost none (0.14%) of the respondents agreed that it would be best for the environment if, in Hawai‘i, we only ate farm-raised seafood; however, 24% in the post-survey said eating farm-raised seafood would be good for the environment, a notable increase. These results were expected and reflect the effectiveness of education intervention.

## 6. Conclusion

This study is a comparative analysis of the impact of education on consumers' knowledge and preferences towards aquaculture versus wild-caught seafood. The students' knowledge of aquaculture increased after education. However, there is variation in the extent of increase due to the location of the schools in relation to the coastline. Wai‘anae High School has an active aquaculture program, which could explain the respondents’ knowledge of aquaculture before education. Wai‘anae High School is located in a rural seaside community, whereas Aiea and Waipahu High School are located inland. Location may play a significant role as coastal consumers may be more familiar with the seafood industry as mentioned by Brayden et al. (2018). There was a higher percentage of students who indicated an increase in knowledge of aquaculture as compared to the knowledge of aquaculture versus wild-caught seafood after education. These results indicate that the students have knowledge of what aquaculture is, but may not have as much knowledge regarding the difference between aquaculture and wild-caught seafood in terms of environmental and health impacts. Preference for aquaculture or wild-caught seafood after educational intervention did not translate to asking their parents or guardians to buy a particular type of seafood. Although education was not effective at changing the respondents asking their families to purchase a particular type of seafood, there was a significant increase in the number of respondents asking their families to purchase seafood in general. This is consistent with our assumption that adolescents will ask their families to purchase seafood after education on the environmental and health impacts of seafood. If we increase the education on aquaculture from the current five sections, we expect to see a more significant impact

 

from the education.

The FCM results conveyed interesting results with an increase in preference for both aquaculture and wild-caught seafood based on environmental impacts, which could be due to a lack of knowledge regarding the difference between aquaculture and wild-caught seafood as mentioned previously. The FCM results indicate that 'environmental impact' is the greatest driver for the preference for aquaculture seafood regardless of education, which is similar to other studies findings (Davidson et al., 2012; Feucht and Zander, 2015; Hoerterer et al., 2022). The educational intervention positively increased the preference for both aquaculture and wild-caught seafood based on 'environmental impact' and 'health concerns'. These results could also be due to the education having a focus on environmental impacts of seafood in general rather than the difference between aquaculture and wild-caught seafood. The educational intervention did not emphasize 'taste' and 'what they eat at home', but did increase the preference for aquaculture seafood based on those two factors. Moreover, the respondents are more likely to eat what is at home than to ask their families to purchase a specific seafood, which is why more needs to be done to promote a self-aware and educated community regarding the seafood industry.

The increased impact is greater for aquaculture seafood based on all four factors as compared to wild caught seafood. Education had a small impact on 'environmental impact' for aquaculture seafood as it was the highest preference registered in the pre-survey. In terms of asking their parents to buy, wild-caught increased and no change was registered for aquaculture. The preference for either is less than 50%, which could indicate that most respondents do not have a preference for either or do not eat seafood frequently to care. These results are not consistent with previous literature that suggests consumers have a biased preference for wild-caught seafood (Feucht and Zander, 2015; Hoerterer et al., 2022, Krešić et al., 2020). Results showed that adolescents rarely ask their parents to buy a particular type of seafood and are more likely to consume what their families choose to purchase. However, there was a slight increase for respondents to ask their parents to purchase wild-caught seafood, indicating there may be other factors influencing adolescents' seafood preferences.

Based on a previous study, all four factors have the potential to impact preferences for aquaculture seafood (Beyer et al., 2023). According to our study, 'environmental impact' and 'taste' had the greatest impact; therefore education and outreach activities should be focused on environmental impacts and nutritional aspects. Education in general increases knowledge of aquaculture and helps consumers acknowledge the difference between aquaculture and wild-caught seafood, but does not have a significant impact on increasing the preference for aquaculture versus wild-caught seafood. Since preference for seafood is driven by taste and what they eat at home, education alone is not sufficient.

Overall, we recommend a diverse and interactive educational program that incorporates active and experiential learning for both students and their families. Active learning through student-led opportunities can enhance students' learning outcomes and ultimately lead to actions that reflect the education (Beinert et al., 2022). Experiential learning through hands-on activities combined with passive learning techniques can be successful in improving eating behaviors and knowledge (Powers et al., 2005). Additionally, future research should consider integrating families into the educational program to target the preferences and perceptions of the family as a whole, which will, in turn, influence their purchasing decisions. Engaging parents through face-to-face interaction is more likely to achieve success in support of the education objectives (Murimi et al., 2018). Furthermore, incorporating other factors into the educational program (i.e., price and taste) may have a greater impact on driving consumption preferences.

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**Conflict of Interest**

No potential competing interest was reported by the authors.

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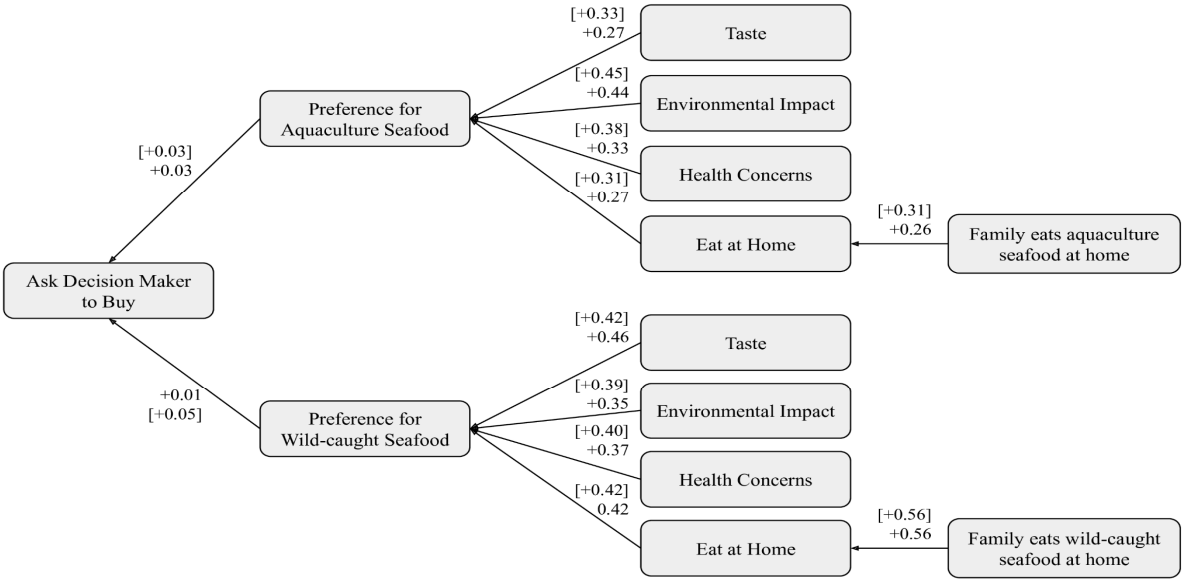
Table 1. The respondents' socio-demographics

| | | |
|---|---|---|
| Place of Residence | Urban area | 25.68% |
| | Suburban area | 58.11% |
| | Rural area | 16.22% |
| Gender | Female | 39.19% |
| | Male | 56.76% |
| | Other[1] | 4.05% |
| Ethnicity[2] | Asian | 83.78% |
| | Pacific Islander | 40.54% |
| | Caucasian | 20.27% |
| | Latino or Hispanic | 13.51% |
| | Other | 16.22% |
| Grade | 9th | 0.00% |
| | 10th | 1.35% |
| | 11th | 25.68% |
| | 12th | 72.97% |
| School | Aiea High School | 48.65% |
| | Waipahu High School | 28.38% |
| | Wai‘anae High School | 22.97% |

1. Other: prefer not to answer or left blank.
2. Ethnicity: respondents were able to choose more than one ethnicity.

*Source*: Pre- and Post-surveys conducted in 2021–2022.

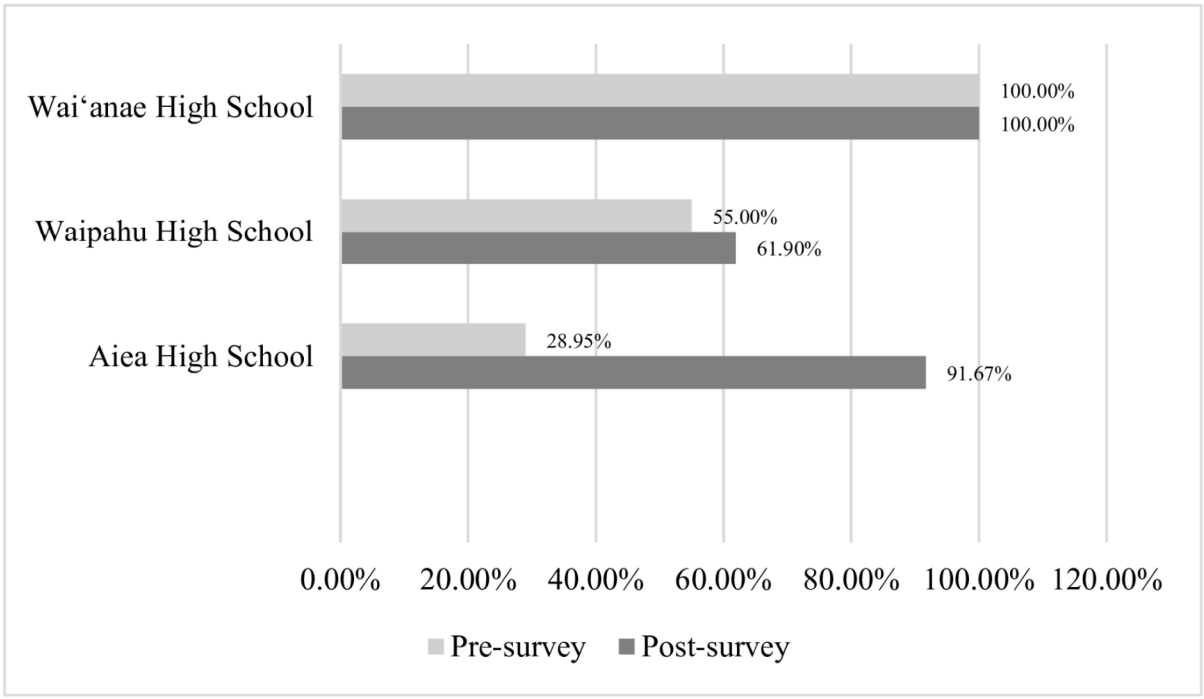



*Source*: Pre- and Post-surveys conducted in 2021–2022.

Figure 1

Fuzzy-logic Cognitive Map (FCM) from the pre- and post-survey representing the relationships between the students' preferences based on ‘taste’, ‘environmental impact’, ‘health concerns’, and ‘what they eat at home’; and how their preferences influence their family members' purchase decisions. The post-survey responses are represented in brackets [].

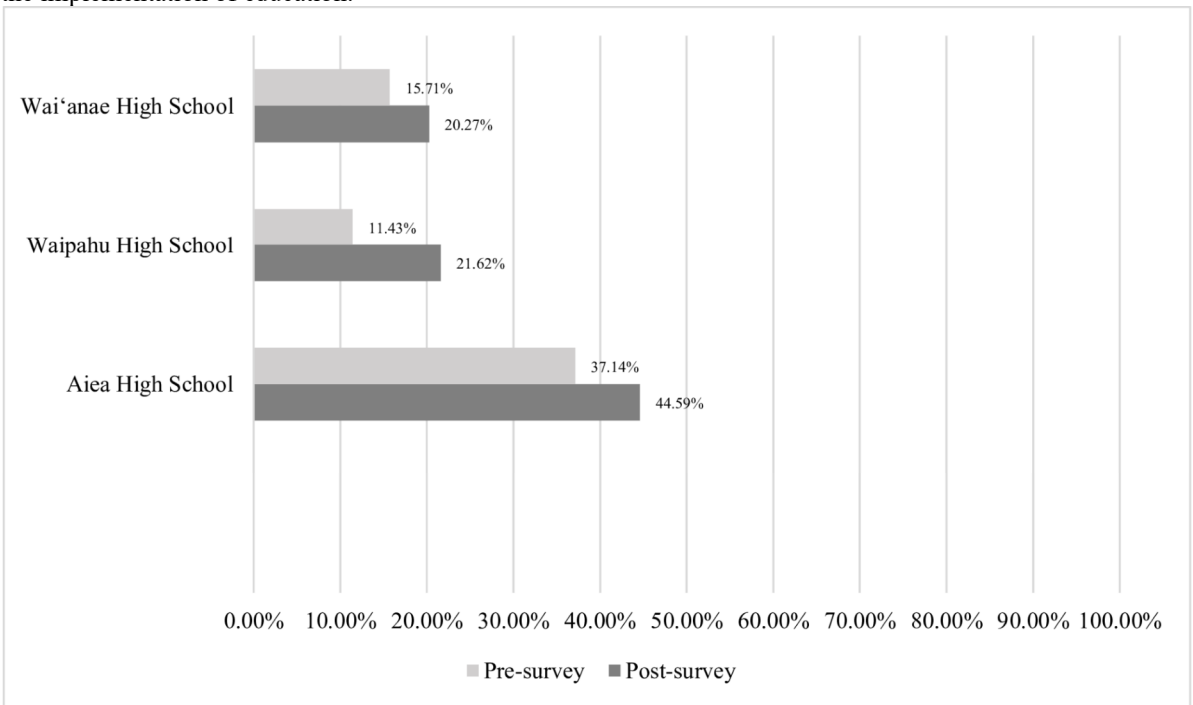
 




*Source*: Pre- and Post-surveys conducted in 2021–2022.

Figure 2

The respondent’s knowledge of aquaculture as indicated in the pre- and post-survey responses before and after the implementation of education.




*Source*: Pre- and Post-surveys conducted in 2021–2022.

Figure 3

The respondent’s knowledge of aquaculture versus wild-caught seafood as indicated in the pre- and post-survey responses before and after the implementation of education.