

A Comparative Assessment of Self-reported and Observed Food Safety Competencies Among Cookery Teachers

MANELYN D. SALVADOR^a, MARC LAURENCE Q. TAMAYO^a, SHAIRA VITA MAE G. ADVIENTO^b, REALYN Q. SALVADOR^c, SHAREEN KATE A. GAMIAO^a, MARIZ G. BUSTAMANTE^a, AND MARK R. LIMON^{b*}

^a Department of Education, Division of Ilocos Norte, Laoag City, Philippines 2900

^b Department of Technical-Vocational and Livelihood Education, College of Teacher Education, Mariano Marcos State University, Laoag City, Philippines 2900

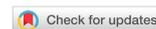
^c Department of Bachelor of Science in Industrial Technology, College of Industrial Technology, Mariano Marcos State University, Laoag City, Philippines 2900

*Corresponding author

mark.limon149@yahoo.com

TEL: +639175553696

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Abstract

Several foodborne disease outbreaks involving school-aged children and teachers have been reported in the Philippines due to the lack of effective and sustainable strategies to address this public health concern. This study aimed to assess and compare the self-reported and observed food safety competencies of Cookery teachers. Using a descriptive-comparative research design, the study was conducted across three Department of Education (DepEd) school divisions. A total of 102 Cookery teachers from junior and senior high schools were selected through universal sampling to complete an online survey, while 30 were chosen through multi-stage cluster sampling for classroom observation. Five food safety experts also assessed the teachers' competencies. Data were collected using an adapted survey questionnaire and observation checklist. Descriptive statistics and the Wilcoxon signed-rank test at a 0.05 significance level were employed for data analysis. Results showed that the teachers' self-reported food safety knowledge, attitudes, and practices (KAPs) had an overall mean of 1.27, interpreted as "Poor." Meanwhile, observed food safety practices had a mean of 2.93, interpreted as "Always Practiced." The discrepancy between self-reported and observed practices suggests possible unawareness or reluctance to disclose actual behaviors. The nonparametric test indicated a significant difference between self-reported and observed food safety competencies ($Z = -4.25, p < 0.05$). The study concludes that Cookery teachers display a notable gap between perceived and actual food safety practices, highlighting the need for a capability-building program to enhance their competencies.

Keywords: Cookery Teachers; Food Safety Competency; Knowledge; Attitudes; Practices; Self-Reported; Observed

1 Introduction

Contamination, incorrect food handling techniques, and flawed systems are all factors that contribute to foodborne diseases (FBDs) in dif-

ferent regions of the world. According to the World Health Organization (2024), it is estimated that 1 in 10 people fall ill every year because of eating contaminated food. Globally, contaminated food causes 600 million foodborne

Nomenclature

FBDs	Foodborne Diseases	TLE	Technology and Livelihood Education
WHO	World Health Organization	TVL	Technical-Vocational and Livelihood
FSED	Food Safety Education	DI	Descriptive Interpretation
KAP	Knowledge, Attitude and Practices	MMSU	Mariano Marcos State University
JHS	Junior High School	URERB	University Research Ethics Review Board
SHS	Senior High School	HBM	Health Belief Model
DepEd	Department of Education	TPB	Theory of Planned Behavior
NC II	National Certificate II	CBP	Capability-Building Program
TESDA	Technical Education and Skills Development Authority		

diseases and 420,000 deaths annually (Subedi et al., 2025; World Health Organization, 2024; Yang et al., 2025). The burden of FBD falls disproportionately on groups in vulnerable situations and especially on children under 5, with the highest burden in low-and middle-income countries (Grace, 2023; Keddy et al., 2025; World Health Organization, 2024).

A critical role of food handlers is to ensure that food handling practices and techniques adhere to the food safety requirements to help mitigate issues concerning FBDs in general (Amaia et al., 2024; Mahmoud et al., 2021; Putri & Susanna, 2021; Tuglo et al., 2023), and to decrease the transmission rate of microbial pathogens to the consumers (Awad et al., 2024; Freivogel et al., 2022; Sirichokchatchawan et al., 2021; Urban-Chmiel et al., 2025). Despite their vital role, food handlers occasionally fail to display quality and safe food handling standards, resulting in roughly 10% to 20% FBD outbreaks (Limon et al., 2021; Yemane & Tamene, 2022).

In addition to children, other vulnerable populations-including the elderly and pregnant women-are at heightened risk to FBDs (Branca, 2024; Grace, 2023; Ishra et al., 2025; Salvador et al., 2024). Since FBDs are so common in basic education, many young learners and teachers are at risk of developing these diseases, commonly caused by microorganisms (Kurt & Serdaroglu,

2024; Limon, 2022).

Furthermore, teachers in the Philippines face a scarcity of food safety education (FSED) materials, resulting in teachers who are inexperienced with food safety and who rely on unauthorized sources (Limon, 2021a, 2022). Due to the prevalence of these difficulties involving students and teachers, there is a greater danger of FBD in the home, in schools, and food situations outside of them if they are not addressed. It is therefore possible that the teachers' lack of emphasis on food safety in their classes, as well as the described inappropriate practices of handling food among middle school and undergraduate college students, are to blame for the increasing number of FBD cases in these contexts.

FBDs all over the world have been constantly increasing due to unhygienic conditions when handling food (Alkhamis et al., 2024; Gamiao et al., 2025; Makhunga & Hlongwana, 2024; Subedi et al., 2025). WHO estimates that globally over one million people on average get sick due to the consumption of unsafe food. Focusing on the Philippines, 41 students from a public school in the Philippines were hospitalized in 2019 due to contaminated beverages Gonzales (2019). In addition, 70 student-athletes and coaches from Biliran Province were brought to the hospital after eating spoiled rice and meat cooked in coconut milk (Meniano, 2019).

Among these FBDs, diarrheal diseases account for 70% of the overall burden. The recurrence of FBD has increased worldwide concern about food hygiene and safety among food handlers. Improper food handling makes millions of people sick every year, of which thousands die, Azanaw et al. (2021). The ongoing global challenge of FBDs is dynamic, influenced by factors such as international food trade, advancements in food production technologies, the emergence of new pathogens, and evolving consumer behaviors and preferences (Elbehiry et al., 2023; Hassan et al., 2023; Pires et al., 2020; Severino et al., 2025; Sinha et al., 2025). FBD outbreaks are occurrences that are consistently posing health risks among the public in both agricultural and industrialized countries, as reported by WHO, and some studies by food safety and health experts. Focusing on food safety education (FSED), the integration of Cookery in the K to 12 curriculum addresses these gaps by equipping students with practical skills and knowledge for safe food preparation.

Given the ongoing concern about FBDs in basic education in the Philippines, as well as the ineffective mitigation policies that have been issued and implemented by the Department of Education (DepEd), this study was conceived. Although there is much literature and there are many studies about food safety knowledge, attitudes and practices (KAPs), there is no study which assesses the KAPs of Cookery teachers in the Philippines. Several studies, like those by Darling-Hammond et al. (2024), Ovca et al. (2017), and Putri and Susanna (2021) and Zhang et al. (2024), posited that if teachers do not perform suitable teaching, coaching, and particularly training, we cannot anticipate having proficient food handlers with the necessary knowledge, which is the fundamental foundation on which perspectives towards sanitation and later practices are developed. Therefore, the pivotal role of the teachers in basic education to provide adequate food safety information is indispensable.

FSED among junior and senior high school students is critical to improving safe food handling knowledge and skills, and thereby helping to promote scientific literacy. The K to 12 Curriculum in the Philippines requires Junior High School

(JHS) students to prepare, cook, and serve food to clientele (Gamiao et al., 2025; Limon, 2021a, 2022), however, food safety is not integrated into the curriculum (Limon, 2022). Also, the Philippines has no FSED materials integrated within the curriculum, specifically for JHS students (Limon, 2021a). It is also reported in the studies conducted by Limon (2022) that FSED has inadequate learning space and is treated in a separate, scattered, and disconnected manner, positioning it at the margins of the K to 12 Curriculum.

While the K to 12 curriculum aims to develop 21st-century skills and prepare Filipino learners for future challenges, it lacks the integration of FSED. Studies highlight that FSED is scattered, inadequately addressed, and marginalized in the curriculum, particularly at junior and senior high school levels. Despite Cookery subjects under the Technology and Livelihood Education (TLE) and Technical-Vocational and Livelihood (TVL) tracks requiring students to engage in food preparation, handling, and storage, there are no dedicated materials or structured approaches to FSED. This gap leaves both students and teachers underprepared to address foodborne illness risks effectively. To bridge this gap, Cookery teachers play a pivotal role in fostering food safety practices, ensuring students are equipped with the knowledge and skills to maintain high standards in food handling and preparation.

Taking the related literature and studies into account, this study was conducted to gather information on the food safety competency level among Cookery teachers in terms of their KAPs. This study aimed to assess and compare the self-reported and observed food safety competencies of Cookery teachers.

2 Methods

2.1 Locale of the Study

The study was conducted in the province of Ilocos Norte, Philippines, specifically at the JHS and SHS levels across three school divisions since these secondary schools are offering Cookery subjects. Identifying the needs of the Cookery teach-

ers in relation to food safety is significant to producing competent and qualified food handlers, especially across the three school divisions since these schools are also facing FBDs. With the permission of authorities from the DepEd, this research was conducted on 63 public secondary schools in the province of Ilocos Norte. There are three school divisions involved; the Division of Ilocos Norte, Philippines, which consists of 49 secondary schools; the Division of the City of Batac, which comprises seven secondary schools; and finally, the Division of Laoag City, which has seven secondary schools. In total, 63 secondary schools participated in this study.

2.2 Research Design

This study used a descriptive-comparative research design. The researchers adapted and enhanced the survey questionnaire and observation guide before these were distributed and administered to the respondents. This study involved two stages: 1) assessing the self-reported level of food safety competency among JHS and SHS Cookery teachers; and 2) observing the level of food safety competency among Cookery teachers. Descriptive statistics and a nonparametric test were employed in this study to identify the level of food safety competency among Cookery teachers.

2.3 Population and Sampling Procedures

Participants in this study were categorized into two: Cookery teachers in the province of Ilocos Norte; and food safety expert observers. The first sample who participated in the study was selected using universal sampling, which was used in identifying the level of self-reported food safety competency among JHS and SHS Cookery teachers. Hundred and two Cookery teachers-participants taught Cookery subjects at both JHS and SHS levels in the province of Ilocos Norte. The role of the Cookery teachers in this study is to answer the survey questionnaire about their food safety KAPs.

Selected Cookery teachers were observed using multi-stage sampling where all involved DepEd

school divisions in the province were appropriately represented. This was also to make sure that their self-reported practices were compatible with the observations of their practices. The role of the selected respondents in the observation was to demonstrate their way of preparing, cooking, and storing food while they were observed by the researcher. The total number of respondents for the observation sessions was limited to 30 Cookery teachers. Although 102 Cookery teachers participated in the self-reported survey, only 30 were included in the observation phase due to the intensive and resource-demanding nature of classroom observations. Unlike survey administration, observation required face-to-face monitoring during full skills demonstration sessions, simultaneous evaluation by multiple food safety experts, and coordination across geographically dispersed schools. Observing all 102 teachers would have been impractical and could have compromised the depth, consistency, and reliability of the observations. To address this, multi-stage cluster sampling was employed to select a manageable yet representative subsample from the total population, ensuring that all school divisions were proportionately included. A subsample of 30 teachers allowed for in-depth, standardized observations while maintaining methodological rigor.

The second category of participants in the study were five food safety expert observers from academe and the food industry who were selected via purposive sampling. For inclusion, the experts had to meet the following qualifications: 1) must be an education or allied course graduate; 2) must be a TESDA NCII holder in Cookery; and 3) must have at least two years of experience as a food safety validator. The experts observed the food safety practices of the 30 cookery teachers. Observations were conducted during the teacher's class session. All observers attended together, and at the end of the observation period, they convened to agree on a single rating and discuss any issues that arose. These experts participated in the study for 12 weeks.

2.4 Research Instruments

To gather important and pertinent data that are deemed useful in assessing the food safety KAPs of the Cookery teachers, the following research instruments were utilized—survey questionnaire, observation guide, and interview guide.

A survey questionnaire was used to address KAP food safety competency. The survey questionnaire was adapted from Ncube et al. (2020). Modification and removal of items that are not applicable to the instrument were performed by the researchers to suit the level of KAPs of JHS and SHS Cookery teachers. This survey questionnaire aimed to identify the level of food safety competencies of Cookery teachers. The initial part of the survey questionnaire was the personal data of the respondents, which aimed to gather the following details: civil status, age, years in teaching Cookery subjects, educational attainment, and socio-economic status. The second part of the survey questionnaire identified the KAPs of Cookery teachers when it comes to food safety.

In the knowledge part, there were 10 questions to be answered with *True*, *Maybe True or False*, and *False*, which was supposed to identify the knowledge of Cookery teachers regarding food safety. In the attitudes part, which was composed of 10 statements, the respondents performed a self-examination of whether they demonstrated the attitude or behavior *Always*, *Sometimes*, and *Never*. In this part, the level of food safety attitudes of Cookery teachers was identified. In the practices part, the respondents sought to answer the 10 questions about their food safety practices. All items included in this instrument were based on published research relating to KAPs. Here, the respondents determined the statements whether they do it *Always*, *Sometimes*, and *Never*. To categorize the level of competency of the Cookery teachers in food safety in terms of their KAPs, the following scale, descriptive rating, and interpretation were used. The rating scale shown in Table 1 was used to interpret their responses to the survey questionnaire.

An observation guide was used to gather data for the food safety practices of the cookery teachers. This observation guide contained the same con-

tent from the practices part of the survey questionnaire. Since knowledge and attitudes cannot be observed, only the practice part of the survey questionnaire was used in the observation guide. The only difference from the survey questionnaire was that the observer employed a different rating scale in answering the observation guide. A three-point Likert scale was used to evaluate food safety practices among Cookery teachers, with Highly Observed, Moderately Observed, and Not Observed as the measurement criteria. Table 2 presents the rating scale applied to evaluate the cooker teachers' observed food safety practices.

The researchers ensured that all the instruments were clear and understandable. Each of the research instruments carried out or administered in this study were subjected to pilot testing by a sample of Cookery teachers not participating in the study and experts to determine their consistency and reliability. All valid comments, suggestions, and recommendations were considered and incorporated in the significant improvement of the final instrument.

2.5 Data Gathering Procedure

In collecting the data needed for this study, the researchers were directed by a set of processes. The researchers sought approval from the Mariano Marcos State University-University Research Ethics Review Board (URERB) with the reference number 2022-205 for ethical considerations to make sure that there would be no violations in the conduct of the study.

Following approval, the researchers asked permission to conduct the study involving the JHS and SHS Cookery teachers from DepEd schools in the Province of Ilocos Norte from the Superintendents of the school divisions concerned and from the Heads of the schools where Cookery teacher participants were to be sought before the conduct of the data collection process. Following approval of the requests, the teachers at the identified secondary schools were provided with copies of the permit to conduct the research.

Assessing the self-reported level of food safety competency of Cookery teachers was the first stage. In this stage, the level of food safety

Table 1: Scale and descriptive interpretation of food safety knowledge, attitudes, and practices.

Scale	Knowledge	Attitudes	Practices	Descriptive Interpretation
3	Expert	Excellent	Always	Excellent
2	Intermediate	Satisfactory	Sometimes	Satisfactory
1	Novice	Poor	Never	Poor

Table 2: Rating scale and descriptive interpretation for observed food safety practices.

Scale	Observed Practices	Descriptive Interpretation
3	Highly Observed	Always
2	Moderately Observed	Sometimes
1	Not Observed	Never

competency among Cookery teachers in terms of their KAPs was identified by administering the survey questionnaire. The survey questionnaire was converted into a Google Form, and consequently, the link was sent to the respondents through their email or Facebook Messenger account.

The second stage involved observing the level of food safety competency among Cookery teachers. Using multi-stage sampling, 30 Cookery teachers were selected for classroom observation. Each observation was conducted face-to-face during actual skills' demonstration sessions, with each session lasting approximately one complete class period (60-90 minutes). The observations focused on core cooking activities, including food preparation, handling, cooking, storage, and sanitation practices, to capture authentic food safety behaviors in a real instructional setting. This approach ensured that observed practices reflected routine teaching demonstrations rather than simulated or isolated tasks.

2.6 Statistical Analysis

Using a combination of descriptive and inferential statistics, the acquired data was evaluated and interpreted to come up with informed implications. The researcher employed Microsoft Excel 2010 to tabulate and tally the data that was obtained, and the data was also subjected to further statistical analysis using Statistical Pack-

age for Social Science (SPSS) version 30. Fleiss Kappa at .05 level of significance was conducted to test the agreement of the observers' evaluation of food safety practices among the teachers. A weighted mean was employed to quantify the degree of self-reported and observed food safety practices among Cookery teachers in relation to their KAPs. The Descriptive Interpretation rating scale of KAPs among Cookery teachers is as follows: 2.34-3.00-Excellent; 1.67-2.33-Satisfactory; 1.00-1.66-Poor. Meanwhile, The Wilcoxon Signed-Rank Test at 95% level of significance was used in this study to determine whether there is a significant difference between the self-reported and observed food safety competencies of Cookery teachers.

3 Results and Discussion

3.1 Level of self-reported knowledge, attitudes, and practices of Cookery Teachers

Knowledge

Table 3 presents the level of self-reported knowledge of Cookery teachers in food safety. The overall mean score of 1.46, interpreted as *Novice*, suggests a moderate level of knowledge but with notable areas for improvement.

The self-reported strengths in food safety knowledge among Cookery teachers highlight signifi-

cant proficiency in personal hygiene and hand-washing practices, which are critical for preventing food contamination. The respondents' high rating of 3.00 in *personal hygiene* indicates a strong understanding of its role in mitigating FBDs, aligning with findings that emphasize the importance of personal hygiene in food safety practices (Alkhamis et al., 2024; Almutlaq et al., 2025; Makhunga & Hlongwana, 2024; Malavi et al., 2021; Siddiky et al., 2024). The score of 2.14 for washing hands in sinks designated for cutlery reflects a solid adherence to hygiene protocols, which is crucial for avoiding cross-contamination during food preparation (Alshagrawi & Alhodaithy, 2024; Halim-Lim et al., 2023; Kanaan et al., 2023). These strengths underscore the respondents' awareness of the necessity for rigorous hygiene practices, which can serve as a foundation for enhancing their overall food safety knowledge.

However, the reported knowledge at novice level in critical areas such as cross-contamination between raw and cooked foods (1.00), the use of clean and sanitized cutlery (1.00), and risky behaviors during food preparation (1.00) reveal significant gaps in understanding. Cross-contamination is a leading cause of FBDs, and the low scores in this area underscore the urgent need for targeted educational interventions (Gargiulo et al., 2022; Hasan et al., 2025; Hassan et al., 2023; Khanal et al., 2022; Ma et al., 2024; Savant et al., 2025; Ze et al., 2024). The lack of understanding regarding the importance of using sanitized cutlery further exacerbates food safety risks, as improper utensil sanitation can lead to contamination (Anumudu et al., 2025; Koumassa et al., 2025; Nhabe & Malebo, 2025; Ogutu et al., 2022; Osaili et al., 2022). Additionally, the poor awareness of how risky behaviors, such as eating or smoking during food preparation, can introduce pathogens into food necessitates immediate attention in training programs (Alemayehu et al., 2021; Sorbo et al., 2022; Subedi et al., 2025; Zahir et al., 2025).

The respondents' knowledge at novice level of temperature control (1.27) and awareness of bacterial growth (1.46) suggest a limited understanding of safe food storage practices. However, this knowledge may not be consistently applied in practice. Given the critical role of temperature

in preventing bacterial growth, further reinforcement of this knowledge is essential (Coppola et al., 2025; Da Silva Cota et al., 2023; Gonzalez & Aranda, 2023; Jeinie & Md Nor, 2022; Lisboa et al., 2024; Qiu et al., 2022). The satisfactory understanding of bacterial growth risks within the 5-27°C (1.46) range indicates that while respondents are aware of temperature dangers, there is still a gap on the application of their knowledge to real-world practices as knowledge and attitude have a significant association that suggests these are the traits that independently influence food safety practices (Begum et al., 2025; Desye et al., 2023; Kuboka et al., 2024; Negassa et al., 2023; Okpala & Korzeniowska, 2023; Putri & Susanna, 2021).

Based on the survey conducted among Cookery teachers in the province of Ilocos Norte the age category with the highest percentage is 26-35 years old, which reveals that most of the public JHS and SHS Cookery teachers in Ilocos Norte are middle-aged. In addition, 34 (91.89%) are female respondents and only three are male (8.10%). The ratio of male to female teachers indicates that the public JHS and SHS schools in Ilocos Norte are dominated by females. The predominance of women in education professions, according to Limon (2021b), results from the assumption that teaching should be seen as an extension of adults' work with their children, which is still performed more frequently by women than men.

In connection with the knowledge deficiency in terms of food safety, it was also determined in the survey among Cookery teachers in the province of Ilocos Norte that 34 (91.89%) of the respondents have not attended training on food safety yet. There is one (2.7%) specific teacher who attended a training course, entitled "Food Safety on School Canteen Managers". In addition, there is one (2.7%) Cookery teacher who has a TESDA NCII qualification in Cookery. Furthermore, there is one (2.7%) Cookery teacher who attended a Seminar-Workshop on Canteen Management and Food Safety. Lastly, there is one (2.7%) teacher who attended a seminar on food safety.

To address these knowledge deficiencies, training programs must incorporate hands-on experiences, as theoretical knowledge alone is insuffi-

cient for effective food safety practices (Aljasir, 2023; Barnabas et al., 2024; Castro et al., 2024; Kaugi et al., 2024). Research indicates that practical training significantly enhances food safety knowledge and behaviors among food handlers, which further supports the need for targeted educational interventions in areas, such as cross-contamination, utensil sanitization, and temperature control (Aljasir, 2023; Amaich et al., 2024; Ditiarini et al., 2023; Gameda et al., 2025; Kulpiisova et al., 2025). Regular assessments of knowledge can help monitor progress and identify ongoing gaps, ensuring that training programs effectively enhance understanding and close the initially identified knowledge gaps (Miranti et al., 2022; Sherwood, 2024; Shiri et al., 2023). Such targeted capacity-building initiatives will not only elevate the competency of Cookery teachers but also positively impact on their students, equipping them to become future food handlers who can prospectively sustain high food safety standards and contribute to reducing FBDs (Malavi et al., 2021; Ruth Edet Okon et al., 2022).

Improving FSED for Cookery teachers is essential to promote public health and food safety standards. Addressing these knowledge gaps strengthens the entire food handling and preparation continuum—from classroom instruction to kitchen practices. Such a targeted action can certainly reduce the risks associated with FBDs (Afrin et al., 2024; Al Banna et al., 2021; Putri & Susanna, 2021; Rahman et al., 2025; Salvador et al., 2022).

Attitudes

The overall assessment of Cookery teachers' attitudes towards food safety, as shown in Table 4, reflects a mix of positive tendencies and areas requiring significant improvement. With an overall mean score of 1.26, categorized as *Poor*, it is evident that while there is some understanding of food safety practices, the teachers' attitudes do not fully align with optimal standards for ensuring safe food preparation and handling.

The assessment of food safety knowledge among Cookery teachers reveals significant barriers, particularly in willingness to learn about food hygiene and safety (1.0) which indicates a poor at-

titude toward ongoing education. Several studies by Abalkhail and Alslamah (2022), Hibbert et al. (2023), and Mosimann et al. (2023) and Ystaas et al. (2023) argued that this reluctance to engage in further learning is concerning, especially given the dynamic nature of hygiene standards and safety regulations that require continual updates. Without ongoing education, there is a heightened risk that outdated practices may persist, thereby undermining food safety protocols (Berglund et al., 2024; Bi et al., 2020; Çakmakçı et al., 2023; Ze et al., 2024). Institutions must address this gap by emphasizing the critical need for continuous professional development, potentially through mandatory refresher courses or incentivized training programs that align with practical applications (Gouge et al., 2023; Halim et al., 2024; Shiri et al., 2023). Encouraging self-directed learning and fostering a culture of curiosity towards advancements in food safety can also play a crucial role in improving attitudes in this area (Finger et al., 2019; Nichifor et al., 2025; Pai et al., 2024; Putri & Susanna, 2021).

Despite the low willingness to learn, teachers' attitudes towards participating in structured food safety training (1.03) are slightly better but still categorized as *Poor*. This indicates that while teachers may not actively seek out learning opportunities, they are more inclined to participate when training is readily available (Darling-Hammond et al., 2024; Kinyua et al., 2024; Yu & Chao, 2023). Leveraging this attitude, institutions could implement mandatory workshops, seminars, and practical demonstrations that provide consistent training across the board (Çelik & Razi, 2023; Gizaw, 2019; Hamadi et al., 2023). Structuring these sessions around real-life kitchen environments or hands-on activities can help ensure that theoretical knowledge is effectively translated into daily practices (Koh et al., 2023; Kübra Dindar Demiray & Sayar, 2024; Wang et al., 2025; Yoon & Jun, 2025).

The score of 1.03 for responsible in preventing food contamination and spoilage suggests that teachers recognize the importance of reducing risks related to food contamination, spoilage, and hygiene lapses. However, the satisfactory score indicates a need for deeper accountability and more stringent practices (Lamm et al., 2021). Since contamination is one of the primary risks

Table 3: Level of self-reported food safety knowledge of cookery teachers.

Knowledge	Mean	DI
1. The 1-5 °C is the safe operating temperature for the refrigerator.	1.27	Novice
2. The bacteria will not destroy when refrigerating and freezing.	1.62	Novice
3. Use separate cutlery to prepare and handle raw and cooked foods.	1.05	Novice
4. The contact of raw and cooked foods can contribute to food contamination.	1.00	Novice
5. Not wearing jewelry like rings, watches, and necklace.	1.05	Novice
6. Most food-spoiling bacteria grow best between 5-27 °C.	1.46	Novice
7. Using clean, sanitized cutlery reduces food contamination	1.00	Novice
8. Eating, drinking, talking, or smoking during food prep spreads contamination.	1.00	Novice
9. Washing hands in cutlery sinks spreads contamination.	2.14	Intermediate
10. Poor hygiene increases contamination risk.	3.00	Expert
Overall Mean	1.46	Novice

Note: DI-Descriptive Interpretation; 1.00-1.66 - Novice; 1.67-2.33 - Intermediate; 2.34-3.00-Expert

Table 4: Level of self-reported food safety attitudes of cookery teachers.

Attitudes		
1. I am willing to learn about the food hygiene and safety.	1.00	Poor
2. I am interested to participate in food safety training.	1.03	Poor
3. I always try to do my best to observe clean and safe preparation food.	1.00	Poor
4. I put labels on cutleries and use them properly.	1.27	Poor
5. I am responsible in preventing food contamination and spoilage.	1.03	Poor
6. I always use gloves to handle non-packed food.	1.41	Poor
7. I do need incentives to do my best to prevent food contamination.	2.46	Excellent
8. I do need to follow the correct way of preparing food.	1.03	Poor
9. I should cook food for the recommended time, not by taste or smell.	1.32	Poor
10. Assessing my food safety attitude helps prevent contamination	1.05	Poor
Overall Mean	1.26	Poor

Note: DI-Descriptive Interpretation; 1.00-1.66 - Poor; 1.67-2.33 - Satisfactory; 2.34-3.00-Excellent

in food preparation, enhancing education on preventive measures and the serious health consequences of safety violations, such as FBDs, is crucial (Gargiulo et al., 2022; Guo et al., 2020; Putri & Susanna, 2021; Ze et al., 2024). According to Boonyong et al. (2019), this concern can be addressed through simulation exercises and case studies that illustrate the real-world impacts of poor safety practices.

The attitude towards regular physical assessments (1.05), reflects some level of understanding among teachers regarding the value of systematically checking food safety practices. How-

ever, this awareness may not always translate into consistent, rigorous application (Semenza & Paz, 2021). As opined by The Bucharest University of Economic Studies et al. (2018), regular self-assessments, peer reviews, and supervisory evaluations can reinforce the importance of maintaining high standards in the kitchen environment. Studies by Anumudu et al. (2025) and Lu and Ko (2023) and Papatzimos et al. (2022) added that creating clear and accessible checklists or utilizing digital assessment tools could aid teachers in conducting regular checks and making necessary improvements.

The use of gloves, (1.41), indicates a poor attitude towards preventive hygiene measures. While the use of gloves is crucial in minimizing contamination risks, it is important to emphasize that gloves are just one part of a comprehensive approach to food safety (Bosch et al., 2018; Pakdel et al., 2023). Practices, such as regular handwashing, cleaning surfaces, and proper glove disposal and replacement are equally important. Training programs should reinforce that glove use alone is insufficient to ensure safety and should be part of a holistic food safety strategy (Malavi et al., 2021; Michaels et al., 2024; Shukla et al., 2018).

The highest score in this assessment was needs incentives to do my best to prevent food contamination (2.46) which highlights teachers' responsiveness to external motivation when it comes to preventing food contamination. This suggests that recognition and rewards play a key role in fostering adherence to safety protocols (Jo & Shin, 2025; Pan et al., 2020; Savanevičienė et al., 2025). In the studies conducted by Chaudhary et al. (2022) and Meng and Briscioli (2024) and Wanjiku and Mungai (2024) it was suggested that institutions could explore the development of reward systems, such as certificates of excellence, public recognition, or monetary incentives, to motivate teachers. However, relying solely on external incentives may lead to temporary improvements rather than long-term behavioral change. Thus, administrators should also focus on fostering intrinsic motivation, helping teachers see the personal and ethical importance of food safety in their profession (Bahramnezhad & Keshmiri, 2025; Daker et al., 2024; Yenew & Tadele, 2020).

The overall Poor rating indicates that while Cookery teachers exhibit a basic understanding and attitude toward food safety, substantial gaps remain in critical areas that ensure a safe kitchen environment. The low willingness to learn and reliance on external incentives suggests that institutions need to adopt a more structured, mandatory approach to FSED, accompanied by continuous assessments to ensure consistent application of safety standards (Natsuhara et al., 2022; Okpala & Korzeniowska, 2023; Pai et al., 2024).

Moreover, a shift in attitude from merely adher-

ing to safety rules to embracing food safety as an integral part of their teaching responsibilities is necessary. Teachers must recognize that their role extends beyond the classroom and impacts the broader food safety culture (Dixon et al., 2023; Mogopodi et al., 2022; St. Pierre et al., 2024). This can be achieved through targeted training, creating a culture of safety awareness, and fostering ongoing professional development. As Alghafari and Arfaoui (2022) and Badaracco et al. (2023) and Zandonadi et al. (2020) put it, with the right combination of education, support, and motivation, Cookery teachers can develop more proactive and consistent attitudes toward food safety, leading to safer kitchen environments that benefit both teachers and students.

Practices

The data presented in Table 5 reveal the self-reported practices of Cookery teachers with respect to food safety, as evaluated through a series of 10 statements. The practices were rated using a scale, with a mean score interpretation, where higher scores indicate better practice in food safety. The overall mean score for all the practices is 1.08, which falls under the *Never Practiced*.

The assessment of food safety practices among teacher-respondents reveals critical areas where adherence is alarmingly low, particularly in practices such as the separate storage of raw and cooked foods (1.00), interpreted as *Never Practiced*. This indicates a significant lack of awareness or negligence regarding this foundational principle of food safety, which is essential for preventing cross-contamination and FBDs (Afrin et al., 2024; Aljasir, 2023; Begum et al., 2025; Malavi et al., 2021). The absence of adherence to basic hygiene practices, such as not wearing jewelry during food preparation and maintaining clean, short nails, further exacerbates the risk of contamination (Fracarolli et al., 2024; Koumassa et al., 2025; Nanayakkara et al., 2018; Pakdel et al., 2023). These practices are fundamental to ensuring food safety, and their poor implementation raises serious concerns about the overall hygiene standards maintained by Cookery teachers.

Also, the food safety practices such as the use

Table 5: Level of self-reported food safety knowledge practices of cookery teachers.

Practices		
1. Separate storage of raw and cooked foods.	1.00	Never
2. Separate cold storage of raw vegetables and meat.	1.03	Never
3. Separate cutlery used for raw and cooked foods.	1.16	Never
4. Expired food should not be consumed.	1.14	Never
5. Cutlery should not be handled in surfaces that come into contact with food.	1.14	Never
6. No jewelry should be used during preparation of food.	1.00	Never
7. Hand nails should be kept clean and short when preparing food.	1.00	Never
8. Use hairnet when preparing food.	1.14	Never
9. Use washed and clean apron.	1.05	Never
10. Protective gear should not be taken to potentially contaminated.	1.16	Never
Overall Mean	1.08	Never

Note: DI-Descriptive Interpretation; 1.00-1.66 - Never; 1.67-2.33 - Sometimes; 2.34-3.00-Always

of separate cold storage for raw vegetables and meat (1.03) and the use of separate cutlery for raw and cooked foods (1.16) were not practiced by the Cookery teachers. While these scores indicate a basic understanding of food safety, they remain at the lower end of the satisfactory scale, suggesting that there is significant room for improvement. The practice of *not consuming expired food* (1.14) is reassuring, indicating that most teachers recognize the risks associated with foodborne diseases. Additionally, the *use of hairnets* (1.14) and *clean aprons* (1.05) reflects a general awareness of personal hygiene, although the scores suggest a need for more consistent application.

The overall mean score of 1.08, interpreted as Never, indicates that while Cookery teachers display a basic understanding of food safety practices, several areas of concern require immediate attention, particularly those rated as Poor. The gap between satisfactory and poor practices highlights the necessity for additional training and reinforcement of food safety protocols (Abdelhakim et al., 2019; Al Zoubi et al., 2025; Alqurashi & Al-Humud, 2025; Okpala & Korzeniowska, 2023; Siddiky et al., 2024; Teym et al., 2025). Regular training sessions focusing on high-risk areas, such as the storage of raw and cooked foods, personal hygiene regarding jewelry, and nail care, should be prioritized to en-

hance the food safety practices of Cookery teachers (Ovca et al., 2017; Palupi et al., 2024).

While Cookery teachers demonstrate a basic awareness of food safety practices, there is a clear need for improvement in several key areas. Strengthening these practices will help minimize the risk of food contamination, ultimately leading to safer food preparation environments in educational settings. Institutions must implement structured training programs that emphasize the importance of these practices and ensure that teachers are equipped with the necessary knowledge and skills to uphold food safety standards (Gouge et al., 2023; Mphasha et al., 2024).

The overall assessment of food safety KAPs among Cookery teachers indicates a novice-level understanding of food safety principles, with a mean knowledge score of 1.46. This suggests that while teachers possess a fundamental grasp of food safety, their understanding lacks depth and comprehensive insight into critical food safety practices, which was also corroborated in the studies carried out by Afrin et al. (2024), Alghafari and Arfaoui (2022), and De Jong et al. (2022) and Ercan Oruc et al. (2020). The satisfactory attitude score of 1.26 implies that teachers hold a generally positive perspective towards food safety, however, this attitude may not be strongly proactive or deeply integrated into their teaching methodologies. The low score in prac-

tices, rated at 1.27, reflects that teachers' seldom or never incorporate food safety practices into their daily routines, which indicate a significant gap among the application of KAPs (Da Vitória et al., 2021; Tuglo et al., 2021).

3.2 Level of observed food safety practices among Cookery Teachers

Table 6 presents the level of observed food safety practices among Cookery teachers, with an overall mean score of 2.93, interpreted as *Always*, reflecting generally acceptable performance in food safety practices. This score suggests that while there is a commendable level of adherence to food safety protocols, there remains room for improvement in certain areas.

Several practices achieved a perfect rating of 3.00, showcasing the teachers' high compliance with critical food safety measures. For instance, the separate storage of raw and cooked foods (3.00), indicates successful avoidance of cross-contamination, which is essential for preventing the spread of harmful bacteria (Ercan Oruc et al., 2020). Additionally, the consistent practice of not consuming expired food (3.00) demonstrates a strong understanding of the risks associated with FBDs, as also explained by Malavi et al. (2021) in their study.

The commitment to maintaining clean and short nails (3.00), which also received an *Always* rating, reflects the importance of personal hygiene in minimizing contamination risks during food preparation (Hossen et al., 2021). The use of washed and clean aprons (3.00) further demonstrates an understanding of the importance of wearing clean protective gear, contributing to hygiene during food preparation (Souza et al., 2018). Moreover, the practice of not taking protective gear into potentially contaminated areas (3.00) indicates excellent adherence to food safety protocols. According to Hassan et al. (2018), this practice prevents the introduction of contaminants from areas like toilets into food preparation environments.

Despite generally good compliance, several practices received scores between 2.75 and 2.91, indicating potential for improvement. For example,

the separate cold storage for raw vegetables and meat (2.75), suggesting a need for stricter separation to mitigate cross-contamination risks *in refrigeration* (Gruenfeldova et al., 2019). *Similarly, the use of separate cutlery for raw and cooked foods* obtained a mean rating of 2.83. In a study conducted by Abdelhakim et al. (2019), it was also found that although such distinction of use is followed, it is not consistently enforced. The handling of cutlery not in contact with food surfaces received a mean score of 2.91, indicating a need for more consistent handling practices to prevent contamination (Tuglo et al., 2021). Yıldırım and Ozturk Haney (2023) revealed in their findings that such non-compliance could harbor bacteria, and thus, affect the overall integrity and safety of the food for consumption. The *use of hairnets*, which garnered an excellent rating of 2.91, indicates that while most teachers wear them, consistent use is necessary to reduce the risk of hair contamination in food preparation. The overall mean score of 2.93 denotes that Cookery teachers are adhering to food safety practices, with some areas achieving excellent compliance. However, practices related to cutlery usage, cold storage, and personal hygiene measures like wearing jewelry and using hairnets could benefit from further attention.

The Fleiss' Kappa coefficient of 0.98, interpreted as *Almost Perfect Agreement*, indicates an exceptionally high level of consistency among the expert observers in evaluating the food safety practices of Cookery teachers. This result confirms that the observation tool was clearly defined and uniformly applied, minimizing subjective bias and chance agreement. The strong inter-rater reliability enhances the credibility of the observed practice scores and supports the validity of using expert observation as a robust complement to self-reported measures, particularly in explaining the discrepancy between perceived and actual food safety competencies.

3.3 Difference between the self-reported and observed food safety competencies

Table 7 presents the results of the comparison between self-reported and observed food

Table 6: Level of observed food safety practices of cookery teachers as perceived by the experts.

Observed Food Safety Practices	Mean	DI
1. Separate storage of raw and cooked foods.	3.00	Always
2. Separate cold storage of raw vegetables and meat.	2.75	Always
3. Separate cutlery used for raw and cooked foods	2.83	Always
4. Expired food should not be consumed.	3.00	Always
5. Cutlery should not be handled in surfaces that come into contact with food.	2.91	Always
6. No jewelry should be used during preparation of food.	2.91	Always
7. Hand nails should be kept clean and short when preparing food.	3.00	Always
8. Use hairnet when preparing food.	2.91	Always
9. Use washed and clean apron.	3.00	Always
10. Protective gear should not be taken to potentially contaminated areas.	3.00	Always
Overall Mean	2.93	Always
Fleiss Kappa	0.98	APA

Note: DI-Descriptive Interpretation; 1.00-1.66 - Never; 1.67-2.33 - Sometimes; 2.34-3.00-Always; 0.21-0.40-Fair Agreement (FA); 0.41-0.60-Moderate Agreement (MA); 0.61-0.80-Substantial Agreement (SA); 0.81-1.00-Almost Perfect Agreement (APA)

Table 7: Results of the food safety self-reported and observed food safety competencies.

Variable	N	Mean Rank	Sum of Ranks	Z-value	p-value
Self-reported	102	12.5	150.0	-4.25 ^a	0.000
Observed	30				

Note: ^ap < 0.05

safety competencies of Cookery teachers using the Wilcoxon Signed-Rank Test. The mean rank for self-reported competencies was 12.5, with a sum of ranks of 150.0, while the observed competencies were measured for the same participants. The analysis produced a Z-value of -4.25 with a p-value of 0.000, indicating a statistically significant difference between the self-reported and observed measures. This finding demonstrates that teachers' self-perceived competencies were generally lower than their observed practices, suggesting a possible underestimation of their actual food safety behaviors or a lack of self-awareness in assessing their own skills. The findings are corroborated with the findings of the studies conducted by Alghafari and Arfaoui (2022), Bauer et al. (2024), and Bodfield et al. (2025) and Wawire et al. (2025). The discrepancy between self-reported and observed competencies highlights

a knowledge-practice gap, which may stem from limited familiarity with standardized food safety procedures, inconsistencies in classroom application, or hesitation to accurately report personal practices in self-assessment instruments. The result is similar to the findings of the studies by Da Cunha et al. (2019) and Lee et al. (2017) and Limon (2022). These results underscore the importance of continuous professional development and structured interventions to bridge this gap. The significant discrepancy observed between self-reported and observed food safety competencies of Cookery teachers can be explained through several theoretical perspectives. The Health Belief Model (HBM) suggests that individuals' perceptions of their own knowledge, risks, and benefits influence their behavior. In this study, teachers may have underestimated their competencies in self-reports due to low per-

ceived self-efficacy or uncertainty about proper food safety practices, despite performing adequately in observed tasks. Similarly, the Theory of Planned Behavior (TPB) posits that behavior is influenced by attitudes, subjective norms, and perceived behavioral control. The findings indicate that while teachers may understand the importance of food safety (attitude) and recognize expected practices (subjective norm), their self-assessment does not always align with actual behavior, highlighting the role of perceived control and self-awareness in shaping accurate self-perception (Afrin et al., 2024; Bhardwaj et al., 2025; Lee et al., 2017; Machado Nardi et al., 2020; Priya & Alur, 2023).

Furthermore, the Johari Window Model provides an additional framework for understanding this discrepancy. The model explains self-awareness through four areas: the open area (known to self and others), blind area (known to others but not to self), hidden area (known to self but not to others), and unknown area (unknown to both). The difference between self-reported and observed competencies in this study reflects a considerable blind area, suggesting that many teachers are unaware of how their actual food safety behaviors are perceived or assessed by others. Some may also possess a hidden area, where they consciously underreport their competencies due to modesty or uncertainty. Expanding the open area through feedback, self-reflection, and peer collaboration is therefore essential to improving self-awareness and bridging the gap between perceived and actual practices (Abraham & Singaram, 2024; Khuder, 2025; Klefbeck, 2023; Lerchenfeldt et al., 2023; Schürmann et al., 2025).

Moreover, the Experiential Learning Theory reinforces this interpretation by emphasizing that learning occurs through reflection on concrete experiences. Teachers who have limited opportunities for hands-on practice and feedback may fail to accurately assess their own performance, leading to underestimation in self-reports (Ernst et al., 2025; Knof et al., 2024; Wisniewski et al., 2022). Structured training programs that integrate both theoretical understanding and experiential engagement can therefore enhance self-awareness, accurate self-assessment, and consistent food safety behavior.

The findings also align with Adult Learning Theory (Andragogy), which posits that adults are motivated to learn when they recognize gaps in their knowledge or skills and when learning is relevant to their professional practice. The presence of a clear discrepancy between perceived and observed competencies indicates a significant professional learning need, justifying the development of the Capability-Building Program (CBP). The CBP embodies these theoretical foundations by providing targeted, reflective, and practice-based training to strengthen teachers' knowledge, attitudes, and practices in food safety.

Therefore, these theoretical perspectives collectively explain why Cookery teachers may underreport their competencies despite performing adequately, emphasize the importance of reflection and feedback in developing self-awareness (as illustrated by the Johari Window), and support the implementation of a capability-building intervention grounded in experiential and adult learning principles to enhance both knowledge and behavior in food safety education.

4 Limitations of the Study

This study has several limitations that should be considered when interpreting the findings. First, the geographic scope was confined to Ilocos Norte, Philippines, which may limit the generalizability of the results to other regions with different institutional contexts, resources, and food safety cultures. Second, while all Cookery teachers participated in the self-reported survey, only 30 teachers were included in the observation phase, which restricts the representativeness of observed practices. Third, observer effects may have influenced teachers' behavior, as awareness of being observed could have led to heightened compliance with food safety protocols, potentially inflating observed scores. Fourth, self-reported measures are susceptible to response bias, including underestimation or misjudgment of one's own competencies, which may partly explain the discrepancy between perceived and observed practices. Finally, the cross-sectional design limits causal interpretation and does not capture changes in competencies over time. Despite these constraints, the study provides valu-

able context-specific insights that inform targeted capability-building interventions.

5 Implication of the Study

The findings highlight implications for teacher development, curriculum, and policy, emphasizing Cookery teachers' role in promoting food safety as a professional and public health priority.

Reframing Teacher Training. Teacher development programs should move beyond skill transmission toward reflective practice. Embedding self-assessment, peer dialogue, and mentorship in training can foster deeper self-awareness and a sense of professional identity grounded in public responsibility.

Integrating Food Safety as Civic Literacy. Food safety education should be recognized not merely as a technical competency but as a component of civic literacy-vital to public health, sustainability, and community trust. Embedding this perspective in curricula can empower teachers to view their role as protectors of collective wellbeing.

Institutional Culture of Reflection. Educational institutions should cultivate environments where self-evaluation and feedback are normalized rather than feared. Encouraging open reflection through tools like the Johari Window or experiential learning cycles can close the perception-performance gap.

Policy Innovation. The findings call for reimagining the DepEd's food safety initiatives not as isolated training efforts but as systemic reforms-linking teacher accreditation, curriculum design, and school health programs under a unified framework of food safety leadership.

Community Ripple Effect. Teachers, as gatekeepers of daily habits, hold transformative potential. When empowered with confidence and consciousness, their influence extends far beyond the classroom-shaping households, local enterprises, and even national standards for food safety and public health.

6 Conclusion

This study transcends the assessment of food safety competencies among Cookery teachers to illuminate a deeper issue in the educational ecosystem-the gap between knowing, doing, and believing one is doing enough. The discrepancy between self-perception and observed performance signals more than a skills deficit; it reflects the hidden dynamics of teacher confidence, institutional culture, and the undervaluation of reflective professional growth in technical-vocational education.

Food safety, often treated as a procedural or compliance matter, is revealed here as a lens through which to understand how educators internalize responsibility for public health and community wellbeing. Strengthening FSED, therefore, is not simply a technical intervention but an act of cultivating ethical stewardship, critical awareness, and lifelong learning among teachers who shape the habits of future food handlers and consumers. True competency in FSED extends beyond rote adherence to standards-it requires consciousness, integrity, and agency. Thus, the ultimate challenge is to transform Cookery teachers from rule enforcers into reflective practitioners and community advocates who model a culture of safety, accountability, and care in every layer of food handling and education.

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