

CHAPTER 3

METHODOLOGY

3.1 Introduction

This chapter outlines the research design employed which was adhered to the Design and Development Research (DDR). Discussion on sampling frame, consumer's eligibility criteria, sampling method and research procedure were made based on the three phases involved in DDR approach which are: Need analysis (Phase 1); Design and development (Phase 2) and Implementation and evaluation (Phase 3). Finally, statistical analyses utilized were elaborated in order to meet the required research objectives.

3.2 Research design

The research design for food poisoning prevention educational module is adhering to design and developmental research (DDR) that utilized quantitative and qualitative methods in order to gather the information. The implementation of both quantitative and qualitative methods helps to complement the strengths and weaknesses of research (Johnson & Christensen, 2014). In addition, this synergy helps to increase the quality of the research due to different approaches having different advantages and disadvantages.

Ideally, Saedah et al. (2013) proposed several examples of data collection methodologies that can be employed in DDR. Each phase will have a different technique of data collection and this is outlined in Table 3.1.

Table 3.1: Proposed data collection method for each DDR phase.

Phase	Method
Phase 1: Need Analysis	Interview Survey Content analysis
Phase 2: Design and development	Delphi technique Fuzzy Delphi Interpretive Structural Modelling (ISM) Structural Equation Model (SEM) Experts' opinion
Phase 3: Implementation and assessment	Interview Survey Quasi experiment Pre and post-test finding

With this respect, the following paragraphs on research instrument and data collection are outlined based on DDR phases. Each phase was conducted using different approaches in the aspect of sampling method, research procedure and data analysis.

3.2 Phase 1: Need Analysis

Need analysis is an initial phase of developing the 'See, Select, Tell' food poisoning educational module. It is an assessment of the need among the consumer to provide necessary information on the programme's aim (Gustafson & Branch, 2002). Need analysis was conducted in order to identify areas in food poisoning prevention that need to be

emphasized. With this regard, the researcher conducted a structured survey on consumer's sociodemographic, knowledge on food poisoning, attitude, food poisoning preventive behavior and risk perceptions to gather information on the consumer's need and problem on food poisoning prevention. The researcher also distributed an open – ended questionnaire to the experts that involved in food safety education in order to obtain gaps in food safety education among the consumers in Malaysia. Consumer characteristics, sample size, sampling technique and instruments used for this purpose are elaborated in the following subsection.

3.2.1 Structured survey

3.2.1a Respondent recruitment

The recruitment process started by selecting respondents based on these criteria:

- i. Malaysian citizens aged 18 and above
- ii. Those buying food/eating outside from home at least one to three times in a month
- iii. Those who understand Bahasa Malaysia or English.

There were a few criteria of which a respondent may not be included in the research study:

- i. Those with terminal illness or end organ failure
- ii. Those who certified or diagnosed of mental disorders.

3.4.1b Location of study

The research areas involved were those under administration of *Majlis Perbandaran Ampang Jaya* (MPAJ) or Ampang Jaya Municipal Council that covers *Mukim Ampang*, *Mukim Hulu Kelang* and part of *Mukim Setapak*, and is approximately 14,350 hectares. The adjoining councils include *Dewan Bandaraya Kuala Lumpur*, *Majlis Perbandaran Selayang* and *Majlis Perbandaran Kajang*. The map showing MPAJ and its neighboring municipalities is shown in Figure 3.1. The population of MPAJ is estimated at 600,000 people in 2007 (MPAJ Action Plan, 2015) or 12.7% of the total population of Selangor.

The district consists of four planning blocks as shown in Table 3.2. MPAJ together with Kuala Lumpur has one of the highest population densities in Malaysia due to accumulation of economic and institutional activities. Its location near to Kuala Lumpur and is known as the 'Golden Triangle' that comprised of Taman Ampang Utama, Taman Putra Sulaiman, Ampang Point, Taman Tun Abdul Razak and Ampang Jaya. Ampang Jaya territory is chosen in Phase 1 due to its mixture placements of urban and sub urban. As such, this allowed the researcher to obtain broad information on consumer's knowledge, attitude, risk perceptions and food poisoning preventive behavior from different locations. In addition, most residential are being colonized by the immigrants from the nearby country (eg: Indonesia, Myanmar, Bangladesh) whom came to work for their living and Asian cuisine food premise and stalls has flourished ever since then (MPAJ, 2015). This reflects a concern to the community nearby as it may expose to mishandling of food during food preparation and serving that can cause food poisoning (Zarina & Faisal, 2012).

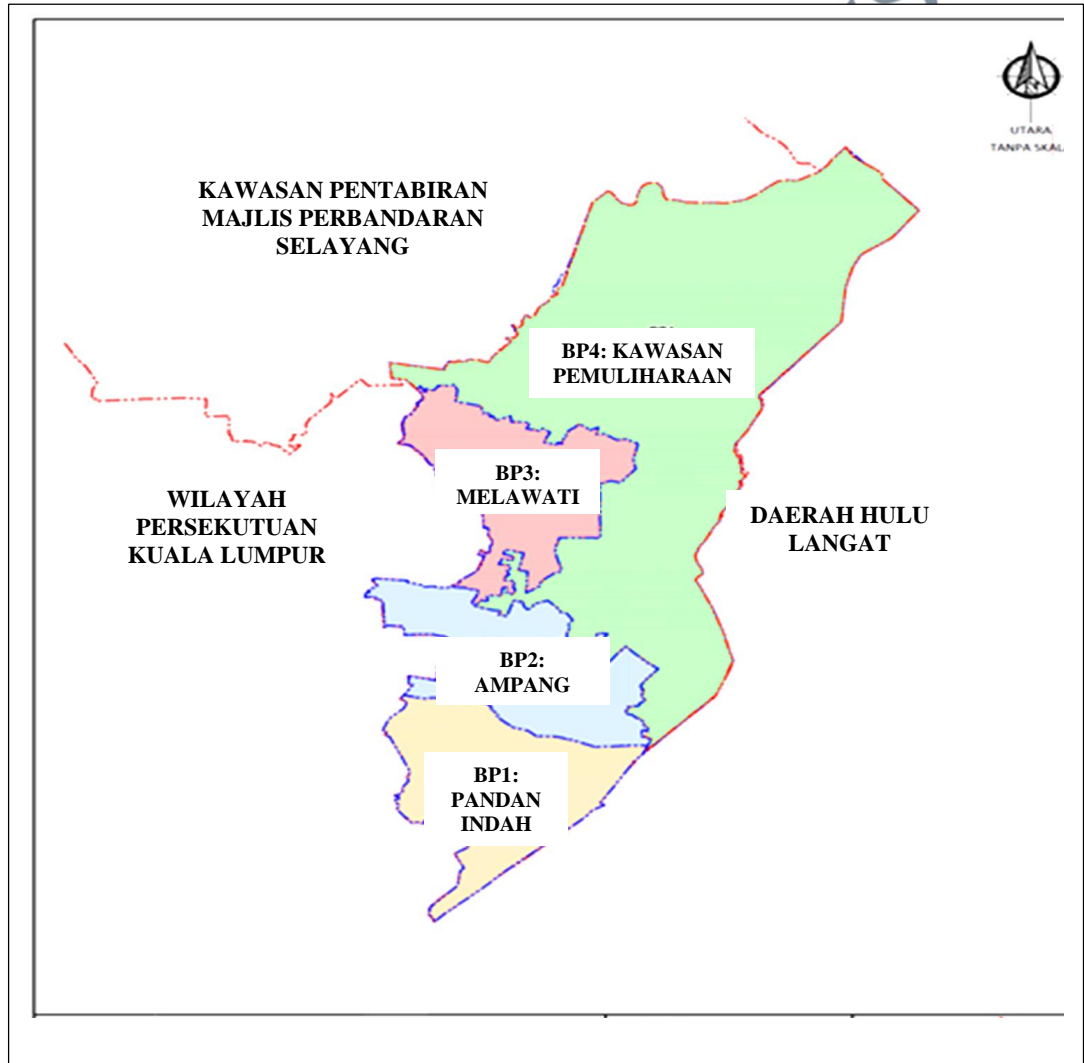


Figure 3.1: Ampang Jaya Municipal Council planning blocks (Source: MPAJ Strategic Plan 2015-2020).

Table 3.2: Ampang Jaya Municipal Council planning blocks (PB).

Planning Block (PB)	Area (Hectare)
PB 1: Pandan Indah	2,056
PB 2: Ampang	1.880
PB 3: Taman Melawati	1,823
PB 4: Conservation Area (Hulu Gombak reserve forest)	8,591

Source: MPAJ Strategic plan 2015-2020 (2015)

3.4.1c Sample size

Calculation of sample size is important to ensure that the sample included in the study is representing the general population with good precision. It is also crucial for the statistical analysis to be evidence-sound and able to accept or rejecting hypothesis with less error (Charan & Biswas, 2013). Initial sample size for Phase 1 is calculated using Open Epi software, available at: <https://www.openepi.com/SampleSize/SSCohort.htm> . The calculation is based on the formula developed by Daniel (1999):

$$\text{Sample size} = \frac{Z_{1-\alpha/2}^2 P(1-p)}{d^2}$$

Where :

$Z_{1-\alpha/2}$: Standard normal variate (at 5% type I error ($P < 0.05$) it is 1.96 and at 1% type 1 error ($P < 0.01$) it is 2.58). Majority of studies considered significance below 0.05, hence 1.96 is used

p : Expected proportion in population based on previous studies or pilot study

d : absolute error or precision. In proportion of one; if 5%, $d = 0.05$

Figure 3.2 exhibits the interface of Open Epi software. By using this software, researcher entered the anticipated frequency value, based on the previous data reported. In this case, the proportion of knowledge, attitude and practice (KAP) and perceptions of consumers on food safety from similar previous studies reported. Unfortunately, the study of KAP among consumers in Malaysia on food safety is very scarce and most studies were conducted among the food handlers. Only one research was conducted among Malaysian youth on knowledge and practice of food safety (Low, et al., 2016). To an extent of search, no studies were reported in evaluating consumer's attitude and perception. Low et al. (2016) defined youth in their study as those with age 18 years old and above. The correct knowledge and practice percentage obtained from the study are 71.48% and 70.73 % respectively. For unknown proportion of attitude and perception domains, the proportion will be set at 50%, as suggested by Dean et al. (2013). The calculated sample size using Open Epi software reveals that the minimum sample size required for 95% confidence interval using (i) knowledge domain: 314 (Figure 3.3); (ii) awareness domain: 319 (Figure 3.4); and (iii) attitude and risk perceptions domain: 384 (Figure 3.5).

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Sample Size for % Frequency in a Population (Random Sample)

Population size	1000000	If large, leave as one million
Anticipated % frequency(p)	50	Between 0 & 99.99. If unknown, use 50%
Confidence limits as +/- percent of 100	5	Absolute precision %
Design effect (for complex sample surveys--DEFF)	1.0	1.0 for random sample

Author(s)
 Statistics
 Kevin M. Sullivan, Emory University
 based on code from John C. Pezzullo
 Interface
 Andrew G. Dean, Epiinformatics.com,
 and Roger A. Mir

Sample Size for a Proportion or Descriptive Study
 This module calculates sample size for determining the frequency of a factor in a population. Sample sizes are provided for confidence levels from 90% to 99.99%.

A finite population correction will be applied if the population size is not large. For samples that are not random or systematic, a design effect other than 1.0 may be entered. The calculated sample sizes are multiplied by the design effect.

Sample Size for Frequency in a Population

Population size (for finite population correction factor or fpc) (N): 1000000
 Hypothesized % frequency of outcome factor in the population (p): 50% +/- 5
 Confidence limits as % of 100 (absolute +/- %)(d): 5%
 Design effect (for cluster surveys--DEFF): 1

Sample Size(n) for Various Confidence Levels

Confidence Level(%)	Sample Size
95%	384
80%	165

Figure 3.2: Interface of Open Epi software for sample size calculation.

Sample Size for Frequency in a Population

Population size (for finite population correction factor or fpc)(N): 1000000
 Hypothesized % frequency of outcome factor in the population (p): 71.48% +/- 5
 Confidence limits as % of 100 (absolute +/- %)(d): 5%
 Design effect (for cluster surveys--DEFF): 1

Sample Size(n) for Various Confidence Levels

Confidence Level(%)	Sample Size
95%	314
80%	154
90%	221
97%	384
99%	541
99.9%	883
99.99%	1234

Equation

Sample size $n = [DEFF * N * p(1-p)] / [(d^2 / Z^2_{1-\alpha/2} * (N-1) + p(1-p)]$

Results from OpenEpi, Version 3, open source calculator--SSPropor
 Print from the browser with ctrl-P
 or select text to copy and paste to other programs.

Figure 3.3: Sample size calculation at 95% confidence level using knowledge domain.

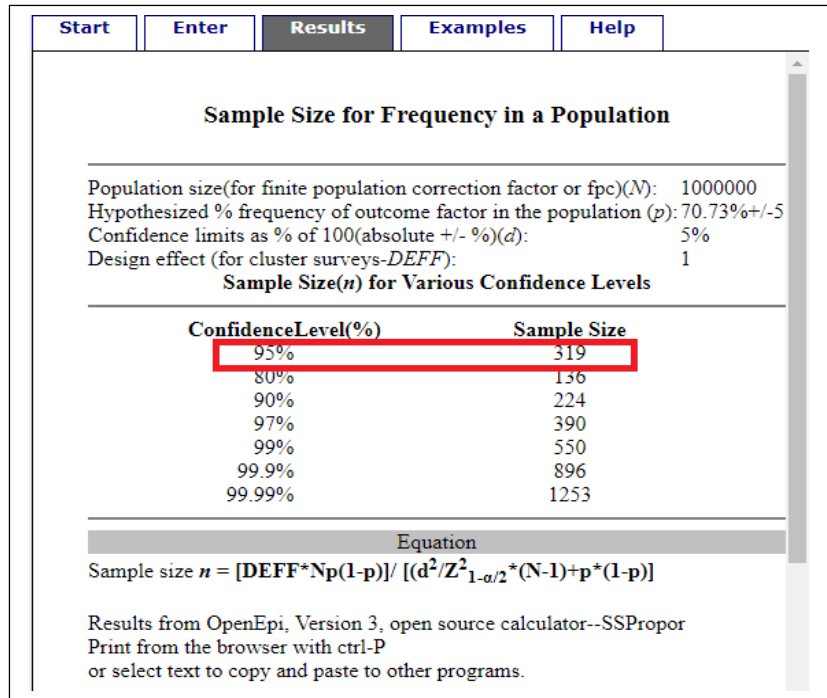


Figure 3.4: Sample size calculation at 95% confidence level using practice domain.

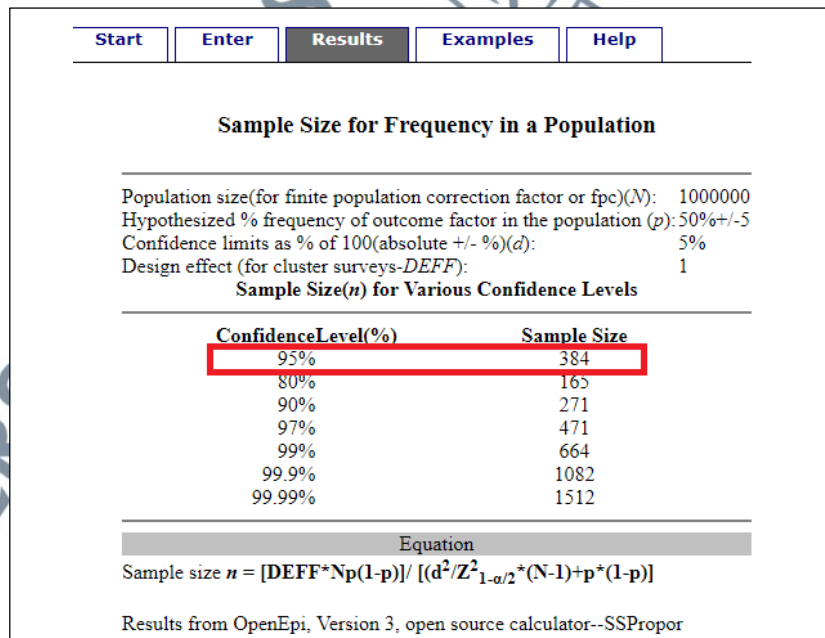


Figure 3.5: Sample size calculation at 95% confidence level using attitude and risk perception domain.

Sample size using attitude and perception domain yield the largest sample size calculated. Hence, this sample size of 384 was employed for the study. Nonetheless, it is noted that attrition rate is common in survey. Taking into consideration of 10% attrition rate (Naing et al., 2006), the final sample size required was 422.

3.4.1d Sampling technique

For Phase 1, the study employed probability sampling of proportionate stratified random sampling. Probability sampling is considered as the gold standard of sampling that ensures the generalizability of the study result to the target population. It also reduces the sampling bias whereby each of the individuals in the population have an equal chance to be selected (Acharya et al. 2013). Proportionate stratified random sampling involves the division of entire population into different group subgroups or strata, then randomly select the final consumers proportionally from the different strata. In this case, the strata were planning blocks (PB 1, PB 2 and PB 3). This sampling method allows researchers to sample even the smallest or inaccessible subgroups in the population (Sujata & Nilima, 2017). For this study, samples were recruited based on planning blocks whereby population for each block was obtained. Table 3.3 exhibits distribution of population based on planning blocks based on 2020 population census in each planning block (*Rancangan Tempatan Majlis Perbandaran Ampang Jaya 2007 – 2020*). In proportionate stratified random sampling, each sample size in each stratum has the same sampling fraction. Example of sampling fraction is shown in Table 3.3. The number of residences in each planning block was acquired from township planning department, MPAJ. These residences represent the sampling frame and samples were randomly selected using ballot method. Number of

selected residents according to block and example of random selection in residential areas were exhibited in Appendix 1 and Appendix 2. One resident from each selected residence who meets the eligibility criteria in 3.4.1a was included for the study.

Table 3.3: Population (2020 census) at each planning block and fraction calculation.

Planning block	Population (2020^a)	Fraction (n= 422)
Pandan Indah	330,400	$\frac{330,400}{688,295} = \underline{x}$
Ampang	259,030	$\frac{259,030}{688,295} = \underline{y}$
Taman Melawati	98,865	$\frac{98,865}{688,295} = \underline{z}$
TOTAL	688,295	422

^aBased on 2020 population projection.

Source: *Rancangan Tempatan Majlis Perbandaran Ampang Jaya, 2007 – 2020*

3.4.1e Research instruments

In need analysis, the researcher developed a structured questionnaire. The questionnaire consists of six domains namely: (i) sociodemographic profile; (ii) knowledge; (iii) attitude; (iv) practice; (v) behavioral perceptions; and (vi) health seeking behaviors. The questionnaire was developed and adapted from previous literatures and checklist (Gupta et al., 2018; Zahiruddin et al., 2018; Nik Rosmawati et al., 2016; Hanson et al., 2015; Ministry of Housing and Local Government, 2014; Haapala & Probart, 2010; McClenahan et al., 2007). The questionnaire was structured using mix type of questions

that are close – ended questions, open – ended and Likert scales (Appendix 3). Permission to utilize the questionnaire was sought from the authors (Appendix 4). Questionnaire were prepared in English and translated into Bahasa Malaysia using Brislin’s back-translation as being advised by WHO (2019). The translation was performed by two external translators who were experts in linguistics and subject matter. According to Brislin method, the translated document was translated back to the original source of language. This is to ensure the accuracy of the translation and the meaning conveyed (WHO, 2019). Each of the questionnaire constructs is explained in the following paragraph.

(a) Sociodemographic profile

This section consists of questions to gain information about the population background. These include gender, age, ethnicity, jobs, marital status, educational level and household income. Other ethnic in this section is referring to others than large ethnic in Malaysia (Malay, Chinese, Indian) that include indigenous, Sabah’s and Sarawak’s ethnics. Informal education is defined as an educational model that is gained spontaneously during the learning process and does not have a pre – defined curriculum (Ngulube, 2017). Respondents were required to estimate his or her household income per month that includes each related member sharing in the particular household of residence (Department of Statistic, Malaysia (DOSM), 2015). This section also includes the frequency of eating away from home and adapt from eating behavior among Malaysian young adults (Chin & Mohd Nasir, 2010).

(b) Respondents' eating away from home behavior

Respondents were also asked on types of food premises that they usually visit and reason of choosing the specific food premise, as well as their awareness on food premise grade. The researcher also assessed respondents' awareness of their right to lodge complaints on insanitary food premises and mishandling behavior. In this study, we only emphasize on food premise; defined as 'premises used for or in connection with the preparation, preservation, packaging, storage, conveyance, distribution or sale of any food, or the relabeling, reprocessing or reconditioning of any food' (Section 2, Malaysia Food Act, 1983). Hence, street food and food truck vending were also included.

(c) Knowledge of food poisoning

Cambridge dictionary defined knowledge as understanding of or information about a particular subject that acquired by experience or learning (Cambridge Dictionary, 2019). For the purpose of this study, consumers' knowledge on food poisoning was assessed based on food poisoning etiologic agents, high risk foods, signs and symptoms, complications and prevention aspects (5; Zahiruddin et al., 2018). The questions allow response in the form of 'Yes', 'No' and 'Unsure'. 1 mark will be given to correct answer and 0 mark for incorrect or 'Unsure' response (Zahiruddin et al., 2018). All scores were summed up in order to obtain the summary score.

(c) Attitude on food poisoning prevention

Attitude is defined as preferential ways of behaving in specific circumstances in order to endure a system belief and ideas. Cognitive (thinking), affective (feeling) and

behavior (action) are combined and permuted in order to deliver attitude in specific condition (Joshi et al, 2015). Hence, consumer's attitude was assessed according to these subdomains with respect to food poisoning prevention, treatment and risk-related behaviors. The construct was adapted from Zahiruddin et al. (2018). There were four affective items created in negative response (example: 'I do not mind if I see food handlers commit unhygienic practices that can contaminate food'). On the other hand, the behavior and cognitive items (eight items) were developed in positive response (example: 'I will ensure the cleanliness of the food premise and its surrounding environment before entering the premise'). Negatively worded items were included to measure attitude in order to reduce acquiescent response bias as consumers are forced to rate each item attentively (Mamun Ali & Showkeen Bilal, 2014). All responses were rated using 5 – point Likert scale (1: Strongly Disagree; 2: Disagree; 3: Unsure; 4: Agree; 5: Strongly Agree). Negative items were reverse – scored and scores for each domain were summed up to produce summary score for attitude.

(d) Food poisoning preventive behaviors

Behavior domain in this study includes possible food safety practices of a consumer. The items are constructed based on previous research conducted on consumers (Low et al., 2016; Odeyemi et al., 2019). Example of practice item: 'I choose clean food premise'. Responses were rated based on frequency of Never, Seldom, Sometimes, and Always (Hanson et al., 2015). For each of the behavior item, value of 4 is assigned for Always; value of 3 for Sometimes; value of 2 for Seldom and value of 1 for Never. All items were summed up to produce summary score for practice.

(e) *Risk perceptions on food poisoning*

Respondents' risk perception on food poisoning threats, benefits barriers to perform prevention action was ascertained using the health belief model (HBM) constructs. Perceived threat is a combination of perceived susceptibility and perceived severity (Rosenstock et al., 1994). Hence, the overall constructs that were adapted in this study include perceived barriers (five items), perceived susceptibility (four items), perceived severity (two items) and perceived benefit (four items). The selection of these constructs is based on the previous findings that highlighted perceived barriers, susceptibility and severity as domains that affect one's behaviors toward food poisoning prevention (Hanson et al., 2015; Hanson, 2002). All constructs were assessed on a 5 – point Likert scale (1: Strongly Disagree; 2: Disagree; 3: Unsure; 4: Agree; 5: Strongly Agree).

Perceived barriers items were modified based on Ng, Kankanhalli, and Xu (2009) of which each item is developed in accordance to negative belief of a person to a certain action related to food poisoning. The negative aspects include inconvenience or unpleasant experience of a certain action to a person. A sample item is stated as 'I feel that getting treatment in hospital or clinic due to food poisoning symptoms is inconvenient'.

Perceived severity on the other hand measures consumer's perception on the seriousness of food poisoning to health (Hanson et al., 2015) . Items in this domain were adopted from Haapala and Probart (2010) . Example of item as stated 'Food poisoning can be life threatening'.

Perceived susceptibility on the other hand is notion that an individual see themselves susceptible to the illness. Items for this construct are modified from Hanson et

al. (2015); of which they are constructed in negative statement (eg: ‘My odds of developing food poisoning are very small’).

Perceived benefits construct measures individual beliefs regarding the relative effectiveness of an action to reduce the illness threat (Ng, et al., 2009). Items for this construct are developed based on Gupta et al. (2018). The author had highlighted four components that affect individuals decision to purchase good or food and these include: price, accessibility, convenience and quality. Scores for each items were summed up based on 5 – point scale. Example of item is : ‘Food that is hygienic and safe to consume usually sold at reasonable price’. Hanson et al. (2015) emphasized that higher scores for both perceived susceptibility and severity indicate greater perceived threat.

(f) Preference on food poisoning information communication delivery and reliable individual to deliver the information

A set of items were included in order to ascertain respondents’ preference on food poisoning information communication and delivery. This is crucial for the need of module development and module implementation in Phase 2 and Phase 3. For this purpose, the importance of common food poisoning information deliveries was assessed on a 5 – point Likert scale (1: Definitely Not Important; 2: Not Important; 3: May or May Not be Important; 4: Important; 5: Very Important). Similarly, consumers rated a few individuals whom they trust in delivering the food poisoning information on a 5 – point Likert scale (Definitely Not Likely to Trust – Definitely Would Trust). Findings were exhibited as percentage (%).

3.4.1f Reliability and validity of the research instrument

The validity of the instrument is the ability of the instrument to measure the outcome of the research on the intended population (face and content validity and it captures theoretical construct under the questions (construct validity). In order to achieve content validity, the questionnaire draft and module was reviewed by three panel of experts that include food hygienist, epidemiologist, and community health practitioner (Appendix 5: Copy of appointment of expert for questionnaire validation). The panels identified and judged the relevance and representativeness of the instruments (Appendix 6: Sample of filled validation form).

The questionnaire was initially pre – tested among 15 adult consumers around Kajang. Pretesting is important to pinpoint problem area, reduce consumer's burden, identifying whether consumer interpreting the question correctly and ensuring the order of the question is not influencing the way a consumer answer (Tuckman & Harper, 2012). A proper amendment was made according to the suggestion and recommendation (Refer to Table 3.4).

Table 3.4: Suggestions for improvement on items in pre-test.

No	Items	Comments /suggestions
1	<p>Part 2: Food poisoning knowledge</p> <p>1. What is/are the cause(s) of food poisoning? (d) Chemical</p> <p>2. Which of the following food is/are high risk food? (h) Canned foods</p>	<p><i>The chemical was changed to pesticide residue</i></p> <p><i>Canned food was changed to canned foods whilst unopened or indented</i></p>
2	<p>Part 4: Practices on food poisoning prevention</p> <p>Rating number order in column : 4-3-2-1</p>	<p>Rating number order to change to 1-2-3-4 to synchronize with the interpretation heading.</p>

Next, the researcher piloted the questionnaire in order to determine the questionnaire's reliability and construct validity. The reliability of the study instrument refers to the exactness of a measurement of which if it is repeated under the same condition of the same content, it will yield the same results (Marquart, 2017). Reliability also addresses internal consistency of a scale or index and this can be computed using a mathematical scores using Kappa agreement or Cronbach's alpha (Marquart, 2017; Claydon, 2015). To achieve this, the questionnaire was piloted among 79 consumers in Kajang and Bangi that meet the recruitment criteria. Item is considered reliable if the alpha coefficient of Cronbach's alpha test is $\alpha \geq 0.70$ (Marquart, 2017). An item which is <0.7 alpha coefficient may need revision or exclusion (Marquart, 2017).

Construct validation was performed on the scaled items namely: attitude, preventive practice and risk perceptions using convergent and discriminant validity. This analysis was performed using Smart PLS 3.2 software. Convergent validity is defined a measure or items that correlates positively with alternative measures of the same construct (Hair et al., 2014). To do this, outer loadings of the items and Average Variance Extracted (AVE) need to be considered. High outer loadings on a construct indicate that the associated indicators have much in common and captured by the construct (Hair et al., 2014). Generally, indicator with outer loading between 0.4 to 0.7 should be considered for removal only when deleting the item leads to increase of composite reliability (Hair et al., 2014). Nevertheless, item with outer loading below than 0.4 should always be considered for deletion (Hair et al., 2014). Deletion of item one item at a time was made with the lowest loading to be deleted first. The process continues until the unidimensionality was achieved (Wan Mohamad Asyraf, 2013). AVE value of 0.5 or higher indicates, on average, the construct explains more than half of the variance of its item. Hence, AVE value > 0.5 was used for the threshold value.

The preliminary items in preventive behavior, attitude and risk perceptions constructs were 13, 15 and 15 respectively. Unidimensionality process suggested that few items due to their less contribution to a construct (< 0.4). In this case, 7 items from preventive practice, 9 items from attitude and 8 items from health perceptions were deleted. Subsequently, convergent analysis was performed on the selected items and AVE value of > 0.5 was considered to be acceptable. Table 3.5 illustrates the factor loading, AVE values and Cronbach's alpha for attitude, preventive practice and risk perceptions.

Discriminant validity on the other hand is the extent to which a construct is truly distinct from other constructs. Hair et al. (2014) suggested two indicators for discriminant validity, namely: cross loadings of the indicator and Fornell –Larcker criterion. Wan Mohamad Asyraf (2013) explained that discriminant value is obtained from the square root of AVE value. This value defines how much variance in the items that is able to explain the variance in the construct (Wan Mohamad Asyraf, 2013). Discriminant validity is confirmed when the diagonal value in bold is higher than its row and column (Table 3.6).

Table 3.5: Factor loading, AVE values, and Cronbach’s alpha for each item

Item	Statement	Construct	Outer loading ^a	AVE value ^b	Cronbach’s alpha ^c
Att3	I will choose food premise of which the food handlers wear glove while handling food.		0.611		
Att5	I will not buy food from food handlers whose nails are not trimmed.		0.610		
Att8	I will ensure the premise hygiene grade when choosing a food premise.		0.857		
Att9	I will not purchase cooked food that is left at room temperature for a long period.	Attitude	0.739	0.527	0.820
Att10	I will ensure the food premise that I visited is clean.		0.793		
Att15	I need to see doctor if I exhibit food poisoning symptoms.		0.712		

Table 3.5: (continued)

Item	Statement	Construct	Outer loading ^a	AVE value ^b	Cronbach's alpha ^c
Prac2	I will use liquid soap over bar soap when washing my hands.		0.761		
Prac4	I reject food premise that harbor pests.		0.882		
Prac5	I reject food premises from which the food handlers are smoking during food handling.		0.700		
Prac6	I choose clean food premises.	Preventive behavior	0.680	0.517	0.809
Prac11	I will not choose food premises from which the food handlers do not wear glove while handling food.		0.615		
Prac13	I will smell the food in order to ensure the food is not spoiled.		0.644		
Percept 9	My risk of getting food poisoning is very small because my food is prepared by hygienic food handler.	Perceived susceptibility	0.4000		^d
Percept 10	Food poisoning can be life-threatening.	Perceived severity	0.833		0.840
Percept 11	I think unsafe food can make people really sick.		0.890		
Percept 12	I believe proper food handling reduces risk of food poisoning.	Perceived benefit	0.867	0.535	0.758
Percept 13	I believe that clean food premise can attract more consumers		0.889		
Percept 14	I think that safe-to- consume food is usually sold at reasonable price.		0.616		
Percept 15	I believe that safe to consume food are easy to access.		0.425		

^a Outer factor loading was accepted at ≥ 0.4

^b Average variance extraction (AVE) was accepted at > 0.5

^c Cronbach's alpha was accepted at > 0.7

^d Cronbach's alpha could not be performed due to it being a single item

Table 3.6: Discriminant validity for each latent construct

Construct	Attitude	Preventive practice	Perceptions
Attitude	0.726		
Preventive practice	0.332	0.719	
Perceptions	0.108	0.409	0.731

3.4.1g Administration of Phase 1: Need Analysis

Data collection was conducted once ethical approval was gained from Universiti Sains Islam Malaysia (USIM) ethical committee. Ethical approval was gained on 8th August 2019 (USIM/JKEP/2019-61) (Please refer to Appendix 7: Ethical approval letter). The approval is necessary to ensure respondents have their rights to obtain information on the research and to discontinue participation without any penalty. Once ethical approval was obtained, pilot testing was conducted. Apart from its aim to test instrument validity and reliability, pilot testing or known as feasibility study is also a trial conduct for the whole research process, usually from methodological standpoint. This is necessary to identify potential problem pertaining to research procedure and access, whether the research is feasible and realistic from the beginning of the study until to its finishing point (Antoni et al., 2018). For this purpose, the current study conducted pilot testing on 79 consumers around Kajang and Bangi.

Once piloting completed, Phase 1 was initiated. Consumers for Phase 1 who met the selection criteria (as stated in para 3.4.1) were randomly selected where one representative was selected from each household. Recruitment of consumers was conducted with the assistance from *Jawatankuasa Penduduk* (residents' committee members) from each zone or planning block. Selected consumers were invited via letter

together with study information sheet (Please refer to Appendix 8: Study information sheet). Agreed participants consented (Appendix 9: Consent form). The survey in this phase was administered using face – to – face interviewing conducted by trained enumerators. The enumerators were selected among the Environmental Health students and trained on proper interviewing technique in obtaining accurate information. This method allows significant information to be obtained from the consumers and assist consumers whom might have sight problems (Richards, 2009). All questionnaires were examined for completeness and recorded for data entry purposes. Figure 3.6 illustrated the flow of survey.

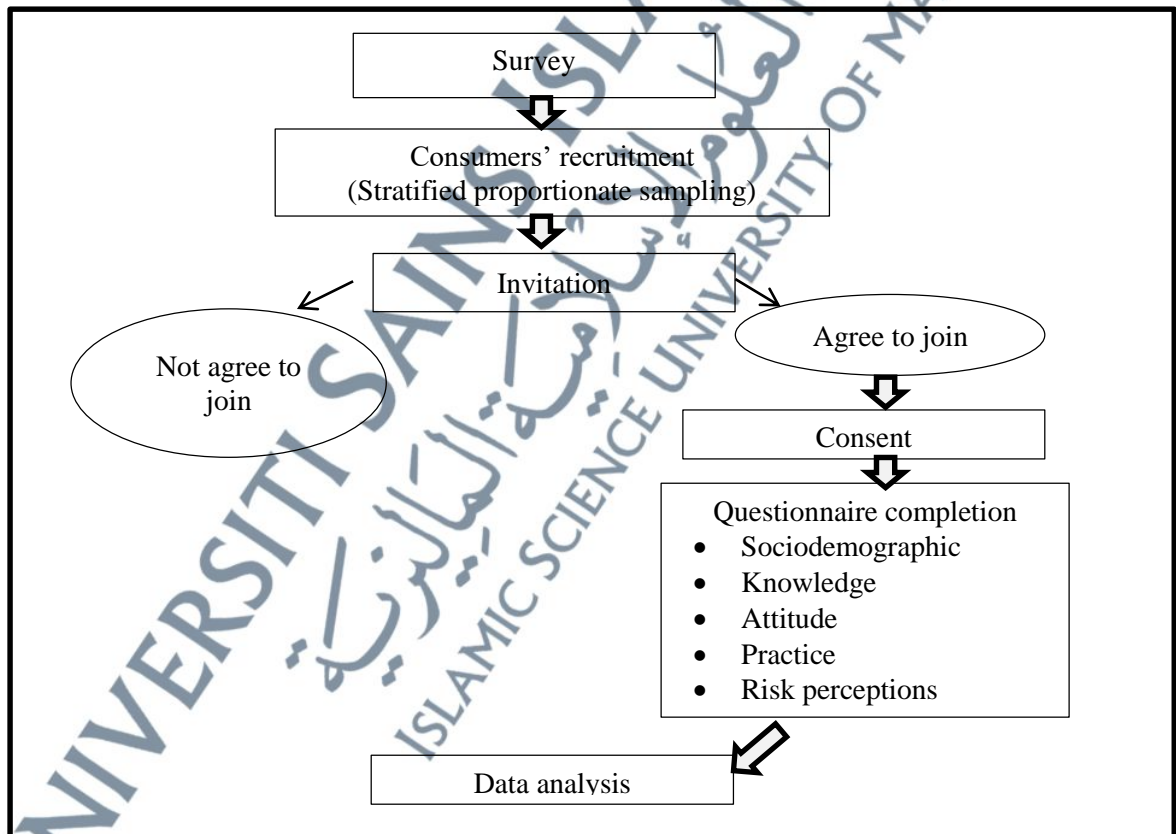


Figure 3.6: Flow chart of survey.

3.4.1h Statistical analysis for survey

All collected data was processed into IBM Statistical Programme for Social Science (SPSS) version 23.0. Descriptive analysis was used to summarize the sociodemographic profile, knowledge, attitude, preventive behavior, risk perceptions and preference information communication towards food poisoning. In order to identify knowledge, attitude, preventive behavior, and risk perceptions, the items score, or the rating scales were summed up to produce summary score and converted into percentage (Nik Rosmawati et al., 2016).

For example, total score for knowledge domain is 41. Hence, the percentage score for knowledge was calculated as:

$$\text{Knowledge score} = z \text{ score} \times \frac{100}{41}$$

For food safety knowledge, consumers were classified of having ‘good knowledge’ (60% and more) or ‘poor knowledge’ (less than 60%). The cut – off point value was set similar to Ruby et al. (2019a) whose study was conducted among adult consumers in Sibul, Malaysia. On the other hand, consumers were considered ‘good attitude’; ‘positive perception’ and ‘good preventive behavior’ if the percentage were 70% and above. Those who scored below 70% were identified as having ‘poor attitude’; ‘poor preventive behavior’ or ‘negative perception’. The cut –off point was set inline with previous research by Talaei et al. (2015) whose study was conducted among adults population in Iran.

Apart from the statistical analyses mentioned, researcher employed Partial Least Square Structural Equation Modelling (PLS-SEM) to evaluate the association between latent construct of food poisoning knowledge, attitudes, risk perceptions and preventive behavior. In order to evaluate these associations, researcher was required to illustrate the path of the model. Hair et al. (2014) explained that the path of the model which consists of several constructs is developed based on theory. They are two types of theories that are involved in developing path models, namely measurement theory and structural theory. Structural theory specifies how each construct is measured whilst structural theory exhibits how each of the latent variables is related (Hair et al., 2014). To locate and sequencing the constructs, the authors refer to the work by Al-Sakkaf (2013). Al-Sakkaf (2013) proposed three factors that shape consumer's food safety behavior that include personal factors, environmental factors and nature of risk (Al-Sakkaf et al., 2013). The researchers did not include demographic and socioeconomic factors due to the fact that these characteristics cannot be modified through health intervention (Abraham & Sheeran, 2015). Based on this premise the sequence of the constructs in the structural model was arranged as in Figure 3.7.

The structural model relationships were determined using path coefficients that represent the hypothesized relationships among the constructs. The path coefficients standardized value range between -1 and +1 of which coefficient close to +1 represent strong positive relationship and vice versa for negative values (Hair et al., 2014). In order to identify whether the coefficient is significant, bootstrapping was conducted. The bootstrap standard error allows the calculation of empirical t value.

Since current study employed a self – administered survey, common method bias is likely to be a problem (Min et al., 2016; Podsakoff et al., 2012). Common method bias is the variance that is accountable to systematic error rather than the study constructs and it can introduce potential threat in behavioral research (Podsakoff et al., 2012). Hair et al. (2014) proposed that collinearity assessment using variance inflation factors (VIFs) for all latent variables in the model can identify common method bias. VIF value of 5 and higher indicate potential collinearity problem (Hair et al., 2014). With this regard, VIF assessment had identified six items from risk perceptions (Percept 6, Percept 7, Percept 10, Percept 11, Percept 12 and Percept 13) and one from environmental factor construct (Hyg 4) had VIF value of more than 5. Hence, as proposed by Hair et al. (2014) and Kock (2015), items with high collinearity can be considered for removal or reassignment. For this case, researchers decided the items to be removed from the construction.

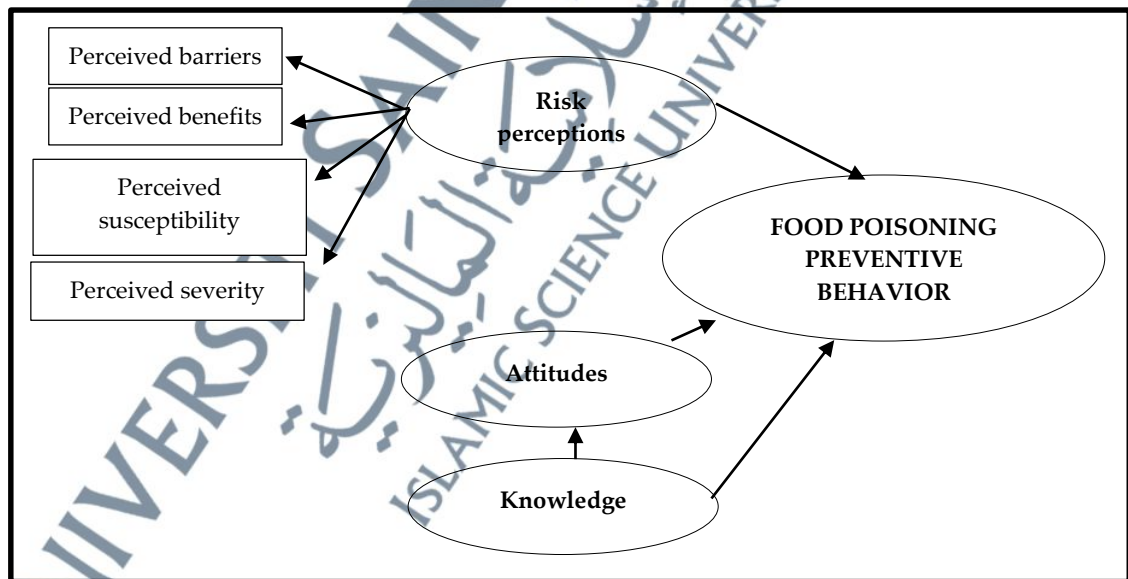


Figure 3.7: Food poisoning preventive behavior structural model.

3.4.2 Open – ended questionnaire: Experts’ opinion on the need of food poisoning preventive measurement among the consumers

An open – ended questionnaire was self – administered to four experts from Food Safety and Quality Division, Putrajaya, Kedah and Negeri Sembilan State Health Department who involved in food safety module development and education. The aim of this open – ended survey is to gain some information from the experts any possible challenges and gaps in current food safety education in Malaysia. This method allows the experts to share their thoughts and opinion freely and provide meaningful qualitative information (Bevan, 2009). Experts were selected based on the criteria:

- i. Worked in the food safety field for at least 10 years
- ii. Involved in food safety promotion or education among consumers.

The questions involved challenges faced in food poisoning prevention, identification of any consumer – oriented food safety module, suggested elements to be included in food safety module and the importance of food safety educational module for consumer on 1 – 10 rating scale (Appendix 11: Open – ended questionnaire). The utilization of both consumer and field – expert survey enables the researcher to identify the crucial component of food safety among the consumer and expert and subsequently underpin the need of the food safety module development. The summary flowchart of Phase 1 is presented in Figure 3.8.

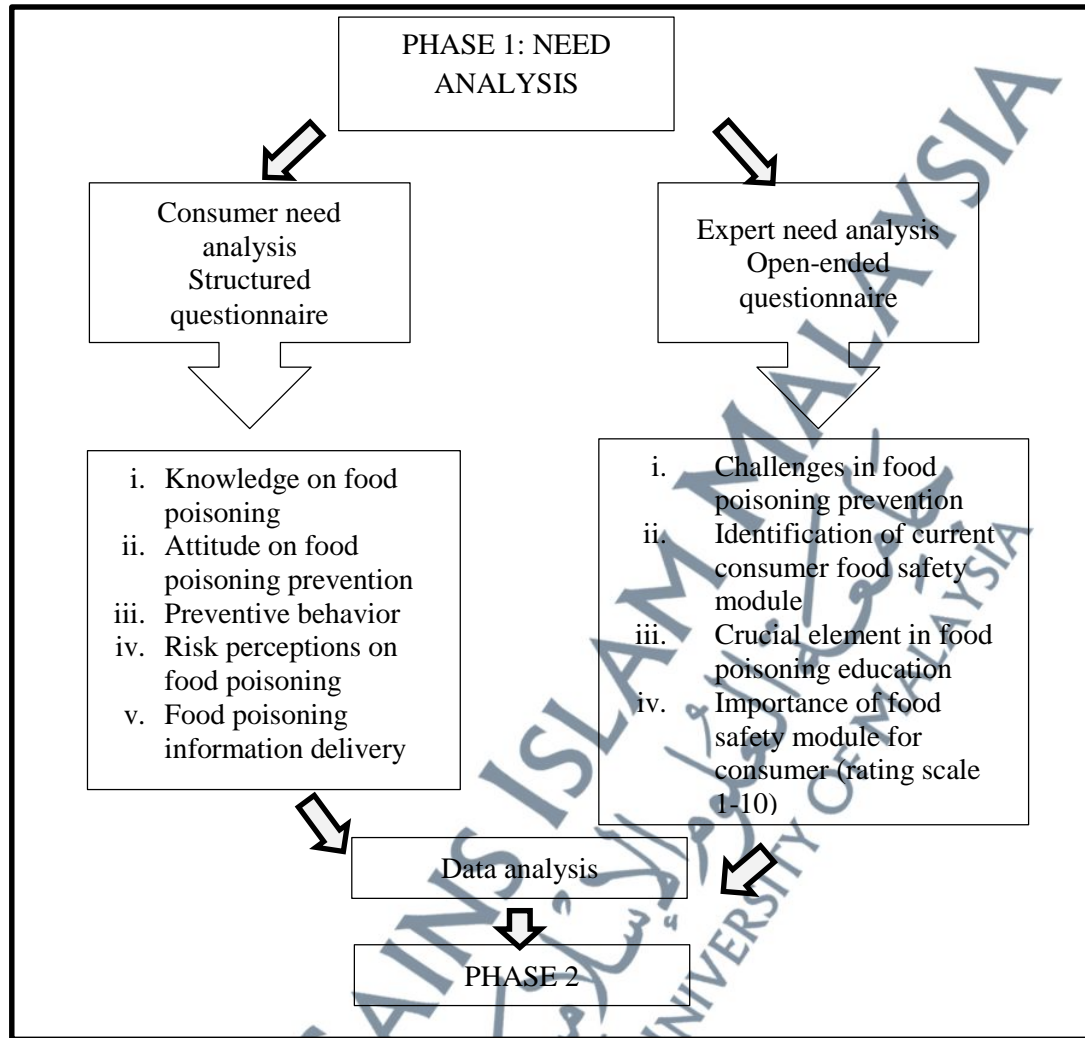


Figure 3.8: Flowchart Phase 1 – Need Analysis

3.3 Phase 2: Design and Development

Findings from Phase 1 were used to identify areas of concern among the consumers in food poisoning prevention. These would be useful in the second phase of designing and developing an appropriate food poisoning prevention module. Design and development phase is a crucial phase as being argued by Saedah et al. (2013) that in this phase a product or model developed is relevant in health education of which it consists of the value of knowledge and supported by related theories. To achieve this, a few methods were applied

in order to design and develop a food poisoning preventive module. Figure 3.9 illustrates the design and development of the module that involved several methods.

Researcher separated this Phase into two sub phases namely the (i) design phase and (ii) development phase. The design phase referred to production of module components that include objectives, content, delivery method, materials and evaluation. The module component was adapted from Sequential Iterative Model (SIM) of training, whilst the finding from Phase 1 was used to outline the crucial elements to be included in the food poisoning prevention module.

The second sub – phase is a development stage whereby researcher identified appropriate training or learning scope and element to include in the module. In this stage, analysis was conducted on related document such as Centers for Disease Control and Prevention (CDC) and Ministry of Health, Malaysia (MOH) guidelines on eating out guideline and food safety. In addition, review on previous literatures on food poisoning education activity and related materials were conducted in order to gain few insights on suitable food poisoning prevention activities, materials and assessments. The module draft later was validated by several experts from related fields. Experts' views are crucial since items in this phase were required to be arranged according to ranking. In addition, module content should be constructed based on the priority elements or scopes to be delivered (Saedah et al., 2013). With this respect, researcher began to identify module scope or element through document and literature analysis. Findings from the document analysis were used to construct a validation questionnaire for the experts. All these will be further elaborated in the subsequent section.

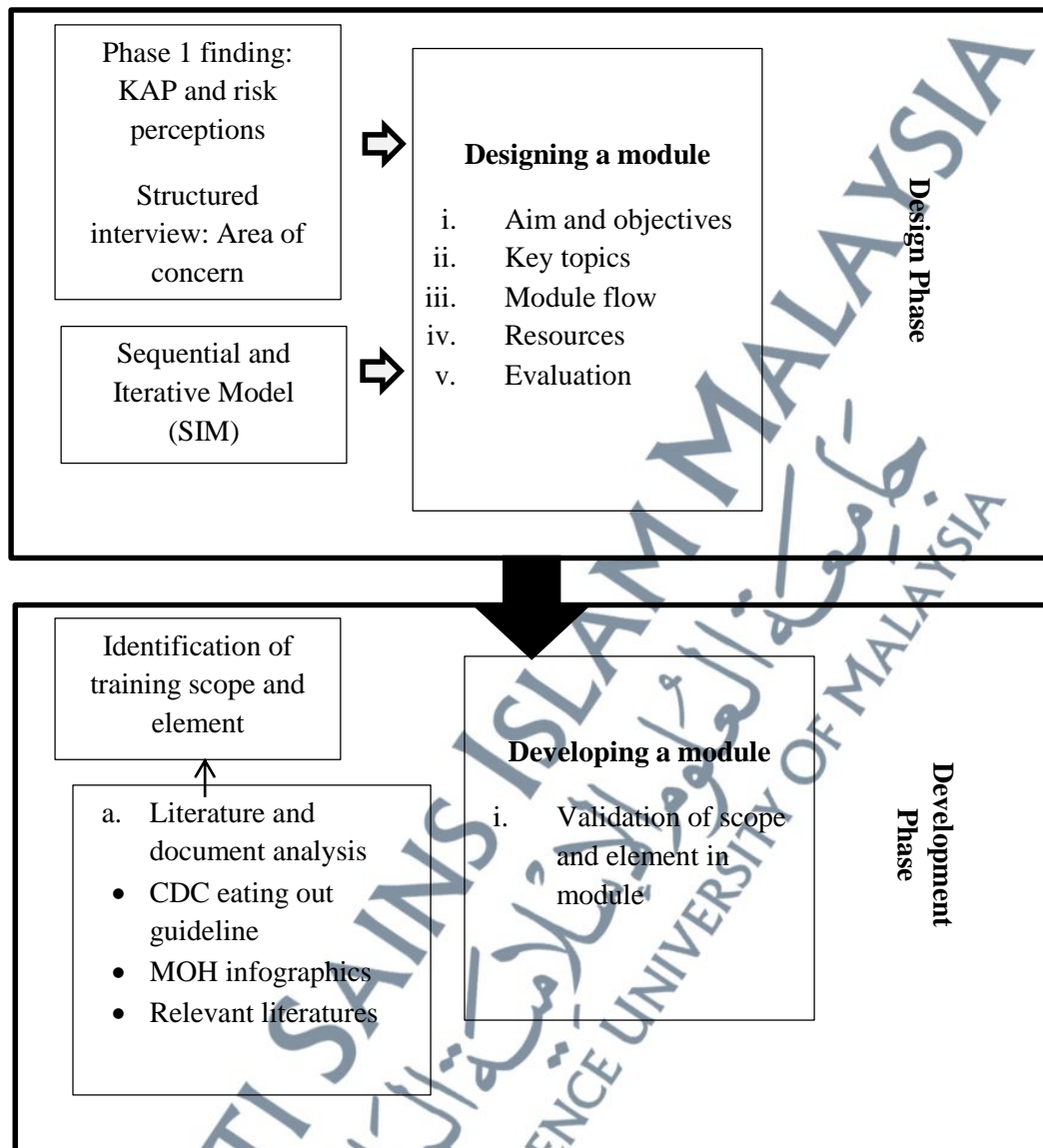


Figure 3.9: Methods involved in module design and development.

3.5.1 'See, Select, Tell' module design

A module should comprise a few components that should be able to measure its efficacy (Sidek & Jamaludin, 2005). For this purpose, a SIM training model was adhered.

The primary strength that can be seen from the SIM model is that effective training begins

with the determination of the aim and objectives that focus on the outcome of the training. Next, it involves the key topics that require selection of the content in the training development. The training flow on the other hand arranges the training content based on the priority that involve expert in the training field. The emphasis of the training material in training is to ensure the training to be conducted efficiently. Finally, the training evaluation component helps to determine the usability of the module on the consumers.

3.5.2 Document and literature analysis

In order to identify the food poisoning prevention component to be embedded in the module, document analysis was conducted. Document analysis is a research technique that involves written texts such as books, book chapters, essay, interview finding, discussion, news article history documents, advertisements, theater materials or any message that is used for communication (Zaharah, 2008). The purpose of document analysis is to identify elements of food poisoning prevention that need to be incorporated in the module and proposed intervention activities. The document involved in this analysis includes CDC and MOH guidelines and previous literature on eating out and selecting clean and safe food. A few elements pertaining to buying or eating outside food were analyzed. There are a few elements that were given great emphasis by CDC on ensuring food safety while eating or eating away from home food:

- i. Checking for food premise cleanliness grade or scores
- ii. Safe food handling practices (example: not smoking while handling food; food handlers wear clean apron, cap/hairnet and gloves; good personal hygiene)

- iii. Foods were properly cooked
- iv. Food poisoning or food mishandling complaint lodge.

(CDC, 2018)

Similarly, MOH (2020b) has outlined a few elements pertaining to safe – to - consume food:

- i. Clean food premises
- ii. Food handlers with good personal hygiene
- iii. Food that is not exposed to room temperature for a longer period
- iv. Foods were not handled with bare hands
- v. Practice ‘smell, see and taste’ in order to ensure the food is safe to eat
- vi. Foods were properly cooked
- vii. Cooked food was served not more than 4 hours
- viii. Avoid reheating food more than two times
- ix. Food poisoning or mishandling practice complaint channels

(MOH, 2020b)

With this respect, researcher has grouped the elements into four to be included as the module unit or scope. These are:

- a. Introduction to food poisoning
- b. Choosing a safe –to –consume food
- c. Food poisoning and mishandling complaint channel
- d. Getting prompt food poisoning treatment

These module scopes were aligned to the module objectives or domain as mentioned earlier in Chapter 2 that are: (1) food poisoning prevention knowledge; (2) attitude and (3) risk perception. This is to ensure the module content can measure the desired outcomes of the food poisoning preventive behavior (Young et al., 2015). Next, the researcher embedded key topics for each of the module scope. To achieve this, the researcher identified appropriate key topics from previous literature research for each of the module scope determined. This is summarized as in Table 3.7.

Table 3.7: ‘See, Select, Tell’ module domain, scope and related key topics

No	Module outcome/domain	Module scope /unit	Key topics
1	Knowledge, risk perceptions (perceived severity, perceived benefits)	Introduction to food poisoning	<ul style="list-style-type: none"> i. Food poisoning signs and symptoms ii. Food poisoning complications and effect to individual and country iii. Food contamination source iv. Cross- contamination
2	Attitude, risk perceptions (perceived barriers)	Choosing safe-to eat food	<ul style="list-style-type: none"> i. High-risk and low-risk food to contamination ii. Spoilt food identification iii. Food premise cleanliness assessment
3	Knowledge, attitude	Lodging food mishandling and insanitary food premise complaint	<ul style="list-style-type: none"> i. Type of food mishandling ii. Food premise insanitary example iii. Available lodging complaint medium and how to use them

Table 3.7: (continued)

No	Module outcome/domain	Module scope /unit	Key topics
4	Attitude, Risk perceptions (perceived severity, perceived barriers, perceived benefits, self-efficacy)	Getting prompt treatment for food poisoning	i. Treatment involved in food poisoning ii. Food poisoning complication iii. The role of family members and community in getting prompt treatment for food poisoning.

In addition to the module scope and key topic identification, the researcher also performed analysis on previous literature to identify suitable form of activities and delivery medium for the module content. To achieve this, literature search was conducted on scoping review and systematic review. Scoping review allows researcher to identify key concepts and sources of evidence in specific research areas, whilst systematic review was more empirical and focused on research questions (Pham et al., 2014). Two related papers were identified and the finding was presented in the form of matrix to determine the most conducted activities, materials and content as in Table 3.8. Based on the matrix table above, module activities were preferred to be conducted in group and appropriate media to be used is printed material.

Taking into account information obtained from previous documents and literature, the researcher developed and arranged the module content as in Table 3.9.

Table 3.8: Finding matrix on food poisoning education and intervention.

Author	Title	Intervention Finding
Sivaramalingam B., Young I., Mai T. Pham, Waddell, L., Greig, J., Mariola Mascarenhas, M., Papadopoulos, A. (2015)	Scoping Review of Research on the Effectiveness of Food-Safety Education Interventions Directed at Consumers	<ul style="list-style-type: none"> - 93.1% targeted on consumers - Intervention type: community-based training/ workshop (52%) - Method of delivery: <ul style="list-style-type: none"> i. In person training by group (49.1%) ii. Printed media (29.5%) - Intervention content <ul style="list-style-type: none"> a. Personal hygiene (55.5%) b. Time-temperature control (53.8%) c. Avoiding cross contamination (48%) d. Adequate cooking of foods (43.9%) e. High risk food (25.4%) f. Food spoilage (24.3%)
Young I., Sivaramalingam B., Mai T. Pham, Waddell, L., Greig, J., Mariola Mascarenhas, M., Papadopoulos, A. (2015)	A systematic review and meta-analysis of the effectiveness of food safety education interventions for consumers in developed countries	<ul style="list-style-type: none"> - To evaluate effect size of food safety education <ul style="list-style-type: none"> a. Educational training using RCT on adult behavior : (94% - Low) b. Educational training using non – randomized controlled trials (NRTs) on adult behavior : (58% - Low)

Table 3.9: Summary of ‘See, Select, Tell’ module content

Module scope	Activities	Content	Objectives	Delivery strategy	Time allocation (hour)
1) Introduction to food poisoning	Mix and match	Food poisoning signs and symptoms	i. To list correctly the signs and symptoms of food poisoning	Group activity	1
	<i>Euwww.. apa tu?</i>	Food contamination source	i. To classify type of food contamination correctly	Group activity	1
	<i>Rangkaian beracun</i>	Cross-contamination	i. To define food cross-contamination ii. To explain the occurrence of food cross-contamination	Demonstration and discussion	1
	<i>Sesi interaksi santai bersama anggota kesihatan- Keracunan makanan: perlukah saya kisah?</i>	Understanding food poisoning	i. To define food poisoning correctly ii. To identify four high risk groups for food poisoning iii. To list impact of food poisoning individually and to the country	Panelist talk	1
2) Choosing a safe-to eat food	<i>Mak pergi pasar</i>	High and low risk food	i. To identify high risk food contamination correctly ii. To describe the food safety using time and temperature concept	Group activity	1
	<i>Elok lagi ke tak?</i>	Spoilt food detection	i. To demonstrate spoilt food detection using sensory	Sensory experiment and discussion	1
	<i>Detektif Along</i>	Food premise hygiene evaluation	i. To identify at least four (4) criteria of a clean food premise ii. To list at least three (3) characteristics of food handler’s personal hygiene iii. To identify at least three (3) food mishandling	Food premise visit	2

Table 3.9: (continued)

Module scope	Activities	Content	Objectives	Delivery strategy	Time allocation (hour)
3) Lodging food mishandling and insanitary food premise complaint	Interactive session with <i>Bahagian /Unit Pengurusan Aduan Jabatan Kesihatan Negeri dan Majlis Perbandaran/Majlis Daerah</i>	Introduction to food mishandling complaint and premise insanitary complaint management	i. To list three (3) complaint management processes involved in the unit ii. To list four (4) food mishandling during food preparation	Talk with officer from 'Bahagian Keselamatan dan Kualiti Makanan, District Health Office and Municipal Council	1
	Available complaint medium for food mishandling and insanitary food premise	Utilization of complaint medium for food mishandling and insanitary food premise	i. To identify available medium of complaint ii. To demonstrate at least four (4) correct steps of lodging a complaint using e-form in SISPAA website and Municipal council	Demonstration	1
4) Getting prompt treatment for food poisoning	<i>Bicara pakar- Rawatan keracunan makanan</i>	Food poisoning treatment	i. To list three (3) types of medical treatments given for food poisoning cases ii. To identify two (2) serious food poisoning signs and symptoms that need to be aware	Medical expert talk	1
	Role play - <i>Adik muntah-muntah</i>	Understand the role of individuals, family members and health professionals in getting early treatment for food poisoning	i. To role play as family members and health professionals in assisting the patient in getting early treatment for food poisoning.	Role play	1

Total time allocation

12

3.5.3 Module validation – Experts’ recruitment

The number of experts’ recruitment varies according to the study objectives and need. Wiersma and Jurs (2009) discussed that there was no optimum panel sample size. Adler and Ziglio (1996) suggested that 7 to 15 experts were sufficient provided there was high consistency among the experts. The number of three to four experts was deemed to be little whilst bigger sample size may implicate expenses and time (Shahriza, 2017).

The current study recruited 7 experts from community health, local authorities, food hygienist and health practitioners who were involved in food safety educational module from Ministry of Health. Experts were defined as individual who possessed information on specific issue and show interest on the study (Linstone & Turoff, 1975). Weirisma and Jurs (2009) on the other hand, define expert panels as those who possessed specific knowledge and skill, able to identify issues in their expert field and provide opinion in order to solve the issue. One local researcher, Mohd Faizal (2008) outlined a few characteristics of expert recruitment as follows:

- i. A person who has served in the agencies or government for more than 10 years
- ii. Individual with at least 10 years’ experience in the research field

Expert recruitment in current study was conducted based on combination of three criteria that include individual who have served either in government agencies or non – government agencies (NGO) that involved in food safety education activities for more than 10 years; community health professionals who had experience more than 10 years; and health professionals who had experience in health module development. In summary, researcher recruited four (4) experts from higher education; two (2) from Food Safety and Quality Division, Ministry of Health and one (1) from Institute of Health Behavior Research, National Institute of Health. Information on experts involved in design and development phase is illustrated in Table 3.10.

Table 3.10: Attributes of expert panels involved in module validation

	Variable	Frequency (n)	Percentage (%)
Gender	Male	3	42.86
	Female	4	57.14
Religion	Muslim	7	100.00
	Buddha	0	0
	Hindu	0	0
	Christian	0	0
	Others	0	0
Highest education	Degree	3	42.86
	Master	1	14.28
	PhD	3	42.86
Field of expertise	Food Hygiene	2	28.57
	Community/Public Health	3	42.86
	Human behavior	2	28.57
Job position	Academician	4	57.14
	Chief assistant director	2	28.57
	Assistant director	1	14.29
Years of experience in food safety education	0-10 years	4	57.14
	More than 10 years	3	42.86
Years of experience in module development	0- 5 years	4	57.14
	More than 5 years	3	42.86

3.5.4 Module validation: Instruments used for expert evaluation

A set of questionnaires was constructed for the expert to evaluate and validate the main component of the ‘See, Select, Tell’ module. In order to construct the items, a few methods can be employed, and these include: (i) interviewing; (ii) focus group discussion; (iii) document and literature analysis and (iv) open – ended questions. Alternatively, Chang et al. (2011) suggested that questionnaire form from previous literatures that relate to the research issue can be applied in this phase. Hence, this study developed a questionnaire based on components outlined by Sidek and Jamaludin (2005) and Milano and Ullius (1998). These components were: (i) module objective; (ii) module scope; (iii) delivery strategy; (iv) resources; and (v) module scope evaluation. In addition to the components mentioned, researcher also included two components that were: (i) module scope arrangement and (ii) time allocation. This is to gather information on module’s topic or scope arrangement, wording used and time allocation for every activity. All items were constructed in 5 – point Likert scale. The instrument was validated by two experts. A sample of validated questionnaire by expert was appended in Appendix 10.

3.5.5 Module validation and calculation score

In order to determine the module content validation performed by the experts, 70 percent of achievement is considered acceptable (Sidek & Jamaludin, 2005). The percentage was calculated based on the formula:

$$\text{Validity achievement} = \frac{[\text{Total experts' score (x)}]}{[\text{Maximum score}]} \times 100\%$$

Scores given by the experts from the Likert scale were summed up component, divided by maximum scores for each module component then multiply by 100. If the percentage obtained more than 70% for every module component, it can be considered acceptable, whilst percentage less than 70% is considered as low module validity (Sidek & Jamaludin, 2005). The percentage subsequently was transformed into correlation coefficient. Hence, value of 75% content validity can be considered having correlation coefficient of 0.75 (Sidek & Jamaludin, 2005).

Besides the elements rated, the researcher included an open-ended feedback column for the expert to freely add any additional information with regards to the elements assessed. Appendix 12 summarized some additional comments from the experts and improvements made from the comments.

3.5.6 Piloting the module

The developed module was piloted among consumers with similar selection characteristics in Phase 1. The aim of piloting the module is to determine any language clarity during module implementation (Antoni et al., 2018). For this purpose, a pilot study was conducted among twenty five (25) administrative staffs in Institute of Medical Science Technology, Universiti Kuala Lumpur in Kajang on 22nd – 23rd July 2020. Feedback on the module implementation was gathered using survey feedback on 5 – point Likert scale (Strongly Agree – Strongly Disagree). The feedback was recorded in Table 3.11 below and appropriate amendment was made accordingly.

Table 3.11: ‘See, Select, Tell’ module pilot feedback and improvement

No	Feedback	Improvement
1	100% of respondents agreed that the wording used in module delivering was easy to understand.	-
2	12% of respondents either agreed or disagreed that there were jargons/scientific terms that were used during module activity.	i. <i>Bakteria Salmonella</i> was changed to <i>Kuman Salmonella</i> ii. Simpler explanation on cross-contamination
3	100% of respondents agreed that instructions given during activity conduct were clear	i. The cockroach model was replaced with pebbles/stone for physical contamination. This is to avoid confusion since cockroaches can be a source of biological contamination.

3.6 Phase 3: Implementation and evaluation

The purpose of Phase 3 is to evaluate the usability of the developed module. Usability as defined by ISO 9241-11 (ISO, 1998) is how far the product or tool can be utilized by the user in order to achieve the module aim effectively, efficiently and provide satisfaction in the context of usefulness. Usability evaluation is necessary to assess the quality of the product and it serves as the indicator of the product's effectiveness. Hence, product usability can be interpreted as effectiveness, efficiency and user's satisfaction (Jeng & Tzeng, 2012). In order to evaluate the effectiveness of the ‘See, Select, Tell’ module, this research was conducted using pre and post experimental study. Module effectiveness was assessed using a structured questionnaire. A feedback survey was conducted in order to assess the module's efficiency and usability. This survey was distributed to both respondents and facilitators. Figure 3.10 exhibits the flow involved in Phase 3. It then follows the

elaboration on the sample size, sampling procedure, research procedure and data analysis.

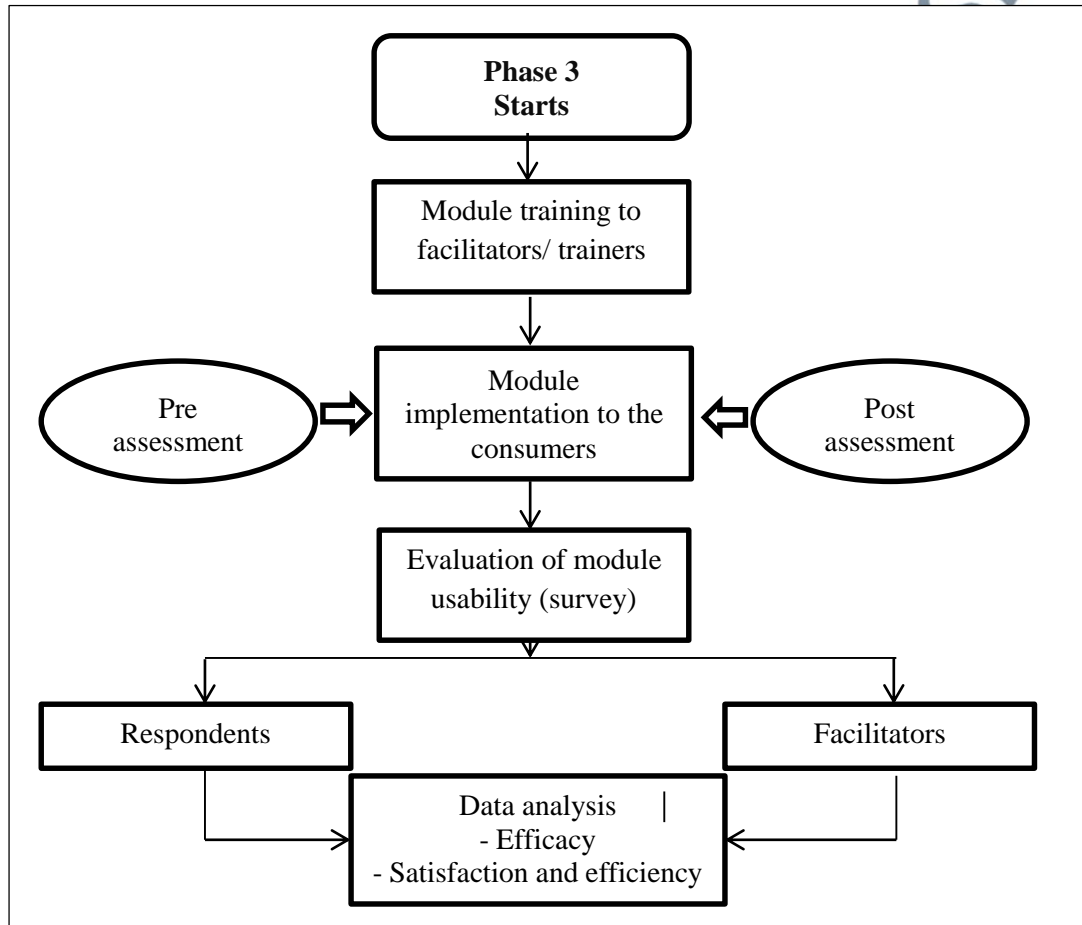


Figure 3.10: Flowchart of Phase 3 - Implementation and Evaluation.

3.6.1 Research design

Phase 3 aims to determine the usability of the ‘See, Select, Tell’ module in the context of effectiveness, efficiency and user’s satisfaction. Thus, quasi experimental study of pre and post design would be appropriate to achieve the objective of Phase 3.

In addition, addressing an appropriate sample size and the sample recruitment will be the key factors of successful generalization of the result. This will be discussed in the subsequent paragraph.

3.6.2 Sample size and recruitment

Recruitment of the respondents was conducted in two different localities. This was conducted based on the premise that allocating random respondents from a similar sampling frame into treatment and control groups may induce ‘Hawthorne effect’ (Westreich et al., 2016). ‘Hawthorne effect’ is a validity threat of which the respondent’s participation itself induces behavior change and this threat can be hard to be controlled by the researchers (Rosenberg et al., 2018; Westreich et al., 2016). For example, in a study of food consumption behavior, respondents might reduce their food consumption after being aware they were allocated in a treatment group in an effort to make a good impression (Robinson et al., 2015). For the purpose of minimizing the selection bias, the researcher recruited residents from two different localities in KTMB Gemas (treatment group) and Dangi, Kuala Pilah (control group) in Negeri Sembilan using purposive sampling. Both residents’ areas were selected due to their well-known cooperation and active involvement among the residents in a community programme known as *Komuniti Sihat Pembina Negara* (KOSPEN).

The selection of sample in Phase 3 is different from those in Phase 1 based on the premise that communities who were health-conscious and actively involved in health screening will produce a higher participation and engagement, hence contribute to the feasibility and reduce the attrition rate of an intervention programme (Mindell et al., 2015). Since the aim of this phase is to identify the usability of the module, the incorporation controlled- matched allocation of participants in control and intervention groups helps to reduce the maturity threat in the intervention. In addition, the usage of similar questionnaire items from Phase I too may avoid the instrumentation threat in Phase 3. These will be further discussed in section 3.6.3 and 3.6.4.

The selection of respondents was based on the eligibility criteria below:

- i. Malaysian citizens aged 18 and above
- ii. Those buying food or eating away from home at least one to three times a month
- iii. Those agreed to participate and consented
- iv. Those who were information technology (IT) literate.

There were a few criteria of which respondents were not included in the research study:

- i. Those with terminal illness or end organ failure
- ii. Those certified or diagnosed with mental disorders.

The sample size required for Phase 3 was much smaller than Phase 1. For this purpose, a specific sample size formula for interventional study with continuous outcome and two-sided test of 5% were used (Chan, 2003):

$$\text{Sample size} = \frac{2c}{\delta^2} + 1$$

where,

δ : standardized effect size

c : 7.9 for 80% power

For this purpose, standardized effect size was obtained from Young et al., (2020) for knowledge ($\delta = 0.88$) and behavior ($\delta = 0.94$) outcome domains among consumer. For attitude domain, an effect size of 0.79 from study by Kosa et al. (2011) was used in the sample size calculation. With this respect, the sample size required for

each control and intervention was calculated, according to outcomes measured (Refer Table 3.12):

Table 3.12: Calculation of sample size using knowledge, attitude and practice outcome domains

a) Knowledge	b) Attitude
$\text{Sample size} = \frac{2 \times 7.9}{(0.88)^2} + 1$ $= 20.4 + 1$ $= 21.4$ ≈ 21	$\text{Sample size} = \frac{2 \times 7.9}{(0.79)^2} + 1$ $= 25.3 + 1$ $= 26.3$ ≈ 26
c) Behavior	
$\text{Sample size} = \frac{2 \times 7.9}{(0.94)^2} + 1$ $= 17.9 + 1$ $= 18.9$ ≈ 19	

Hence, the sample size for this phase study was 26 for each control and intervention group; using attitude domain values that yield the highest sample size number. Taking into account the attrition rate of 20%, the sample size for each group was 30.

3.6.3 Allocation of consumers in intervention and control group

As discussed in previous subsection, this study employed quasi experimental method due to the lack of randomization element during group allocation (Piaw, 2014). Nonetheless, both true experiment and quasi experimental studies require respondents' equivalency in treatment and control groups (Piaw, 2014). To achieve this, a controlled

– matched technique can be used by identifying characteristics of pairs that are quite similar (although might not be 100% similar) (Piaw, 2014). Piaw (2014) suggested that respondents in both control and treatment group should be matched according to measurable characteristics such as mean scores or age. With this regard, the researcher matched the respondents according to their baseline food poisoning knowledge score. To minimize the risk of respondent maturity as a result of existing food poisoning knowledge and experience, respondents from both intervention and control groups were only selected from those with baseline knowledge score below 60, as proposed by Talaei et al. (2015) and Ruby et al. (2019a).

3.6.4 Internal validity of quasi experimental design

Quasi experimental of pre – post design is known to be a reliable research method provided that the threat from the instrument, respondent's background, testing, and confidentiality is controlled (Johnson & Christensen, 2014). These threats are able to influence the research internal and external validity of which can impact the research justification between the independent and dependent variables. Internal validity refers to how far the interpretation reported by the researcher fits with the data collected. The internal validity takes into consideration the accuracy of interpreting the research result. On the other hand, external validity denotes the generalization of the research sample conducted to other studies or different context.

Creswell and Creswell (2018) highlight the impact of the threats (also known as external variables) are often not analyzed but able to impact the experiment dependent variables and finding. Hence, a few control measures can be implied to minimize the threats as elaborated in Table 3.13.

Table 3.13: Possible internal threats and control

Internal threat	Explanation	Control
Maturation	The difference of respondent's experience and existing knowledge in both control and intervention group may affect the research finding.	Researcher matched the respondents in both control and intervention group according to their baseline food poisoning knowledge score.
Confidentiality	Activity of the research may induce unnatural behavior change due to the awareness of respondents on the research objective.	Respondents were recruited from two different localities to avoid 'Hawthorne effect.' Respondents in both control and intervention group were not informed on the research objective to obtain true behavior change.
Pre – test sensitization	The possibility that pretesting can increase or decrease scores for similar and different measurement instruments used post-intervention, altering the nature of the intervention, and complicating its evaluation.	The 4 weeks interval time between pre and post-test conducted may reduce the recall bias from the pre-test. Respondent tends to forget the content of the questionnaire.
Instrumentation	Different measures are used in pre-test and post-test phases.	Both control and intervention group received the same set of questionnaires for pre and post-test. Questionnaire was validated by the field experts and pre-tested.

3.6.5 Method of controlling the external validity

External threats occur when the study finding is unique and does not generalize to other situations, people, settings, and measures of a particular study (Creswell & Creswell, 2018). In the current study, the involvement of the health inspectors who act as the executor of the module to deliver its content to the consumers helps to reduce the external threat. The finding obtained was at least can be generalized to other population,

environment and others that have very much similar situation (Creswell & Creswell, 2018). Hence, the summary of the current finding on the causal – effect (internal validity) and generalization to other group (external validity) are able to be controlled in this study.

3.6.6 Module training to the facilitators

A facilitator is the one who delivers the content of the module. Hence, to ensure the success of the module delivery, facilitators were appointed among those who were well – versed on the topic of the module content (Russell, 1974). For this purpose, the researcher had appointed three Health Inspectors from Tampin Health District Office, Negeri Sembilan. Appointment was made with the permission of the Health District Officer (see Appendix 13: Permission letter to conduct food poisoning prevention education and Appendix 14: Example of appointment letter). Module training was conducted at the training room in Tampin Health District Office and all appointed facilitators went for 12 hours of module activities (Figure 3.11 and Figure 3.12). Module used for the training is appended in Appendix 15.



Figure 3.11: Train of facilitators at Tampin Health District Office.



Figure 3.12: Meeting with community representatives and appointed facilitators.

3.6.7 Instrument

In order to evaluate the effectiveness, efficiency and module's satisfaction, a set of questionnaires and feedback survey were prepared. This will be discussed in the following subsection.

3.6.7 a Effectiveness of the module

The effectiveness of the module was evaluated on the knowledge attainment food poisoning prevention attitude and risk perceptions. At this phase, actual or

reported preventive behavior was not assessed but it was evaluated based on the food poisoning preventive behavior enablers namely: food poisoning knowledge; attitude; and food poisoning prevention risk perceptions. Since Hawthorne effect is common in quasi experimental that induce unnatural behavioral change as a result from being observed or the desire to fulfill the research objectives, the utilization of the mentioned behavioral enablers help to reduce the bias (Creswell & Creswell, 2018). The outcomes were evaluated a week before the module intervention and a week after the intervention (pre and post). Food poisoning knowledge, attitude and risk perceptions were evaluated on self –reported questionnaire modified from Zahiruddin et al. (2018), Nik Rosmawati et al. (2016), Hanson et al. (2015) and Hanson (2002). All items were similar to those in Phase 1 of which the responses were rated based on rating scale mentioned previously. Items were summed up to produce summary score.

3.6.7 b Efficiency and user satisfaction

Efficiency and user satisfaction were evaluated using survey feedback. To serve this purpose, a structured feedback survey form was distributed. The survey feedback form was modified from Sidek and Jamaluddin (2005) in which the responses were evaluated on a 5 – point Likert scale and users’ opinion were recorded on open – ended format (Refer Appendix 16 for Google form interface for consumer’s satisfaction and efficiency of module). The elements of evaluation include:

- i. Module learning outcome
- ii. Appropriateness of learning and delivery strategies
- iii. Variability of learning aids and materials
- iv. Suitability of evaluation strategy for each module scope

3.6.8 Module implementation

The module intervention was implemented from 20th February until 13th March 2021 among agreed and consented residents in KTMB Gemas, Negeri Sembilan. Researcher initially conducted a meeting with respective community representatives on 29th September 2020 to brief on the research and seek community cooperation. Letter of invitation together with research information sheet were disseminated through the community representative (Appendix 17: Invitation letter to KTMB Gemas residents to participate in 'Programme Pencegahan Keracunan Makanan 'Lihat, Pilih, Maklum'). Due to COVID-19 pandemic Movement Control Order (MCO) imposed, the module intervention was postponed and later conducted online on the said date. The online module intervention was conducted using Google classroom platform with a few modifications made on delivery strategies as summarized in Table 3.14.

Table 3.14: Delivery strategies modification for online module activities

No	Activity	Delivery strategy	Modified delivery strategy
1	Mix and match	Identification of food signs and symptoms using cards – Group activity	Online interactive game, Quizzizz
2	<i>Euww... apa tu?</i>	Separation of food contamination sources using food model – Group activity	Separation of food contamination source using Google drawing
3	<i>Rangkaian beracun</i>	Experimental demonstration and discussion on food cross-contamination	Video demonstration on food cross-contamination
4	<i>Mak pergi pasar</i>	Identification of high-risk food using picture projector	Identification of high-risk food using Google slide
5	<i>Detektif Along</i>	Food premise visit	Video on food premise cleanliness; Google form
6	<i>Elok lagi ke tak?</i>	Sensory experiment for spoilt food detection	Video demonstration; Google slide
7	Complaint medium for food mishandling and insanitary premises	Group activity and demonstration	Online demonstration; Google drawing
8	Understand the roles: <i>Adik muntah - muntah</i>	Role play	Short film projection <i>Kerana rasa, badan binasa</i> ; Google doc

To perform the activities, ten (10) respondents were allocated to each appointed facilitators in three different Google classroom classes (or break rooms). All module activities were conducted in four sessions with 3 hours of activities for each session. The sessions were performed during the weekend. Allocation of activities is illustrated in Figure 3.13.

Session/Time	9.00 - 9.30	9.30-10.00	10.00-10.15	10.15 - 10.45	10.45 - 11.15	11.15 - 11.45	11.45 -12.15	12.30
Session 1	UNIT 1, Aktiviti 4- Sesi interaktif bersama anggota kesihatan: Keracunan makanan-perlukah saya kisah?		Break	UNIT 3, Aktiviti 1: Bicara pakar: Rawatan keracunan makanan		UNIT 1, Aktiviti 1: 'Mix and match'	UNIT 1, Aktiviti 2: Eeuw... Apa tu?	Adjourn
Session 2	UNIT 1, Aktiviti 3: Rantaian beracun			UNIT 4, Aktiviti 1: Sesi interaktif bersama BKKM		UNIT 2, Aktiviti 1: Mak pergi pasar		
Session 3	UNIT 2, Aktiviti 3: Elok lagi ke tak?			UNIT 2, Aktiviti 2: Detektif Along		UNIT 3, Aktiviti 2 : 'Kerana mulut badan binasa'		
Session 4	UNIT 4, Aktiviti 2: Penghantaran aduan		Questionnaire and feedback online completion					

Figure 3.13: Allocation of module training sessions.

On the other hand, the control group who was recruited among the residents in Kuala Pilah was given a set of infographics on food safety from Malaysia Ministry of Health. The infographics were distributed among the respondents via WhatsApp media. Similar to intervention group (module), all recruited respondents were consented and were briefed about the study using WhatsApp media. There were four infographics given on the information of time and temperature control, cross-contamination, selecting clean food premise and hand hygiene. Example of infographics is illustrated in Figure 3.14.



Figure 3.14: Example of infographics from Malaysia Ministry of Health distributed to the control group (MOH, 2021).

A week before intervention started, respondents in both control and intervention groups were given a set of questionnaires to assess their knowledge, attitude, preventive behavior and risk perceptions on food poisoning and its prevention. The questionnaire was completed using a Google form. A post – data collection was conducted a week after the intervention using the same questionnaire. In addition, respondents in intervention group were asked to complete a feedback survey in order to evaluate respondents’ satisfaction on the module training.

3.6.9 Data analysis

Information gathered on respondents’ food poisoning prevention knowledge, attitude and risk perceptions were keyed in using Statistical Package for Social Sciences (SPSS) version 21 (Chicago, USA). In order to calculate respondents’ food poisoning knowledge, 1 mark will be given to correct answer and 0 mark for incorrect or ‘Unsure’ response. All scores were summed up to obtain the summary score.

On the other hand, for rating items used in food poisoning prevention attitude and risk perception, negative items were reverse scored first and scores for each construct was summed up to produce summary score for. Descriptive analysis of frequency and percentage was conducted for survey feedback in order to reflect consumer satisfaction and efficiency of the module.

Depending on the data distribution (using Kolmogorov – Smirnov test for normality), mean tests were conducted to compare means between groups (intervention vs control group). Independent t-test/ Mann Whitney U test was used to compare mean scores between those groups. Paired t-test / Wilcoxon signed rank test were conducted to compare mean scores between two set of finding within the same group (pre and post intervention). *P* value < 0.05 was considered significant for all analytical statistic tests conducted.

The statistical analysis involved in each phase according to the research questions was summarized in Table 3.15.

Table 3.15: Statistical analysis involved in each phase according to research questions

Research phase	Research questions	Statistical analysis involved
Phase 1: Need Analysis	(i) What is the food poisoning knowledge level of the consumers who ate away from home? (ii) What is the food poisoning prevention attitude level of the consumers who bought outside food? (iii) What is the food poisoning preventive behavior of the consumers who bought outside food?	i. Descriptive analysis (frequency and percentage)

Table 3.17 : (continued)

Research phase	Research questions	Statistical analysis involved
Phase 1: Need Analysis	<p>(iv) What is the food poisoning prevention risk perceptions level of consumers who bought outside food?</p> <p>(v) Is there any significant association between food poisoning prevention knowledge and attitude?</p> <p>(vi) Is there any significant relationship between food poisoning prevention knowledge and preventive behavior?</p> <p>(vii) Is there any significant relationship between food poisoning prevention attitude and preventive behavior?</p> <p>(viii) Is there any significant relationship between food poisoning prevention risk perceptions and preventive behavior?</p>	<p>i. Descriptive analysis (frequency and percentage)</p> <p>ii. Path analysis and bootstrap</p>
Phase 2: Design and Development	<p>(i) What are the appropriate design, module objectives, delivery methods, learning resources and content evaluation methods of the 'See, Select, Tell' module according to experts' view?</p>	<p>i. Descriptive analysis (validity coefficient)</p>
Phase 3: Implementation and Evaluation	<p>(i) Is there any significant difference in terms of food poisoning prevention knowledge scores before and after the module implementation?</p> <p>(ii) Is there any significant difference in terms of attitudes scores towards food poisoning prevention before and after the module implementation?</p> <p>(iii) Is there any significant difference in terms of risk perceptions towards food poisoning prevention scores before and after the module implementation?</p>	<p>i. Paired sample t-test (pre and post intervention)</p> <p>ii. Independent t-test (intervention and control group)</p>

Researcher also calculated the Cohen's d coefficient. Cohen's d is employed to measure the significance of effect size between two means. The effect measurement is calculated from the mean score produced after module implementation in order to observe the effect magnitude between groups according to the effect size interpretation (Cohen, 1988). The calculation is as follows:

$$\text{Cohen's } d \text{ (effect size)} = \frac{M2 - M1}{\sqrt{\frac{sd1^2 + sd2^2}{2}}}$$

Where:

M2 = Mean score of intervention group

M1 = Mean score of control group

sd1 = Standard deviation of intervention group

sd2 = Standard deviation of control group

The interpretation of effect size is defined as 'negligible' for <0.2; 'small' for 0.2-0.4; 'medium' for 0.5-0.7 and; >0.8 as 'large' (Refer to Table 3.16).

Table 3.16: Interpretation of Cohen's d magnitude effect (Cohen, 1988)

<i>d</i>	Interpretation
<0.2	negligible
0.2 – 0.4	small
0.5 – 0.7	medium
> 0.8	large

3.7 Conclusion

This chapter discussed the Design and Development Research (DDR) approach that was employed in this research. The DDR approach involved three phases namely Phase 1: Need Analysis, followed by Phase 2: Design and Development and Phase 3: Implementation and evaluation. The research conduct was underpinned by Sequential and Iterative Model (SIM).

The research began with need assessment (Phase 1) that was conducted using a survey. Information gathered in this Phase 1 included food poisoning knowledge, attitude and preventive behavior, risk perception and food poisoning information communication delivery. A PLS-SEM analysis was employed to determine the association of the knowledge, attitude, risk perceptions and preventive behavior constructs. A structural model was proposed to illustrate the association of the constructs based on the previous study and applicable theories.

Finding from Phase 1 underpinned the areas of concern on food poisoning prevention that was subsequently utilized in Phase 2 to design and develop module content. Document analysis on CDC and MOH guideline of buying or eating outside food were analyzed in order to determine the element of food poisoning prevention.

The developed module was validated by the experts and improvement was made based on the feedback. The module was used to train Health Inspectors and feedback on the module efficiency was utilized for module improvement. The improved module later was implemented on respondents. Subsequently, the efficacy of the module was evaluated using pre-post method whilst module usability was ascertained using respondents' feedback survey. For this purpose, data were gathered using a structured questionnaire and feedback form.