

## Development and Validation of a Website on Early Childhood Nutrition

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### ABSTRACT

This study aimed to develop and determine the content and face validation of eHealth website that can function as a one-stop information center for parents, caregivers, teachers, and healthcare professionals on early childhood nutrition. This study was divided into two phases. Phase 1 involved website development and was executed in three steps: Step 1: Need Assessment, Step 2: Design Arrangement, and Step 3: Website Construction. Phase 2 involved website validation, which included content validation by six professionals in nutrition/dietetics and early childhood education fields and face validation by six professionals and 50 target users, including parents, caregivers, nursery or preschool teachers, and students. The content validation obtained a score of 1.00. The face validation by professionals exceeds the minimum value of 80% except for the Quality of Information. In comparison, face validation by the users exceeds 80% except for Subjective Quality. Krippendorff's Alpha for each validation was below 0.66. In conclusion, the content validation of the website indicated high agreement, while the face validation indicated sufficient by the professionals and target users. The website will be a good start for intervening in long-term nutrition-related issues such as non-communicable diseases and obesity, as eating habits and food choices from young affect future health outcomes.

**Keywords:** early life nutrition, eHealth, nutrition education, validation study, website development

### INTRODUCTION

Early childhood can be defined as a period until the age of 8, a period of rapid growth and brain development that needs to be reinforced by nutritious food to help these children grow to their full potential. (UNICEF 2019a). However, this potential can be stunted by nutrition inadequacy associated with the double burden of malnutrition, a lifetime adverse effect for these children (UNICEF 2019b).

The global report showed children under five years old were nutritionally vulnerable to malnutrition in the form of stunting (149.2 million), wasting (45.4 million), and overweight (38.9 million), while in Asia, more than half (53%) of children in the world were stunted, over two-thirds (70%) were wasted, and almost half (48%) of children under five worldwide were overweight (UNICEF, WHO, World Bank Group 2021). In Malaysia, children under five years old suffer from stunting (20.7%), wasting (11.5%), and overweight (6.0%) (Mannar *et al.* 2020). This double burden of malnutrition has been

associated with eating behaviors and food choices in the early years of life. Thus, establishing proper eating habits during early childhood is crucial as it shapes lifelong eating habits and food preferences (Brown 2017). Consequently, poor eating habits in early childhood will lead to detrimental effects of obesity and other non-communicable diseases in the future (UNSCN 2018).

The family contributes substantially to nutrition adequacy because its members are role models in determining children's eating patterns (Mutoro *et al.* 2019; Sirasa *et al.* 2019; Cepni *et al.* 2021). Other factors include peers, schooling or caretaking environment, and food availability, which may influence the mothers or caretakers and can indirectly affect the food intake of children (Soon & Tee 2014; Chaudhary *et al.* 2020; Ragelienė & Grønhøj 2021). However, mothers or caretakers usually need help seeking reliable support and suggestions. Many mothers complained about the long waiting hours during clinic visits to ask simple questions regarding their children's eating practices or nutritional intake

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(National Academy of Sciences, Engineering, and Medicine 2016). Previously, the concept of an information center was related to health centers (clinics and hospitals), books, pamphlets, and mouth-to-mouth information (Plantin & Daneback 2009). However, modern society has advanced, and the internet has become a source of information-seeking platforms for various topics, helping its users in decision-making to reach an outcome that could substantially influence themselves and healthcare institutions (Bäckström *et al.* 2022). The internet's growth has allowed internet-based platforms to convey health-related information to a large number of people at relatively low cost (Burrows *et al.* 2015; Jefrydin *et al.* 2020; Reynolds *et al.* 2019). However, the reality is that - not all information is reliable, credible, and trusted to be used as guidance to its users, including mothers and caretakers (Burrows *et al.* 2015).

Hence, a reliable, convenient, and time-saving reference will benefit mothers, caretakers, or anyone seeking information about early childhood nutrition. Therefore, this study aims to develop and determine the content and face validation of an eHealth website, a one-stop information center to educate parents, caregivers, teachers, and healthcare professionals about early childhood nutrition.

## METHODS

### Design, location, and time

This study involved instrumentation design consisting of two phases. Phase One involved website development, and phase Two involved website validation. Phase One was executed in three steps, which include: 1) Step 1: Need Assessment; 2) Step 2: Design Arrangement, and 3) Step 3: Website Construction. Phase 2 consists of content validation and face validation. The study was conducted online and participants from Klang Valley were recruited through various online platform including professional emails, Facebook and Whatsapp.

The study's ethical approval was obtained from the Universiti Teknologi MARA (UiTM) ethics committee (Ref No: 600-TNCP(5/1/6)).

### Sampling

Purposive sampling was used to identify suitable professionals to participate in the content

and face validation of the eHealth website. Convenience sampling was used to recruit parents, caregivers, teachers, and students to participate in the face validation of the eHealth website.

### Data collection

Phase 1 involved three steps. Step 1, Need Assessment: Information regarding current data availability, information-seeking issues, and information on childhood nutrition during the first five years of life was gathered. The information was gathered from literature reviews, journal articles, and relevant publications to identify the participants' perspectives on eHealth websites. It was discovered that previous eHealth websites focused more on the population of obesity (Davies *et al.* 2014; Uesugi *et al.* 2016). However, Burrows *et al.* (2015) found that parents were more proactive in participating in informative programs rather than intervention or lifestyle change programs. Furthermore, websites from the Malaysian government, such as MyHealth, Bahagian Pemakanan, and NutritionistKKM, and non-government websites, such as Positive Parenting, comprise nutrition education. However, these websites focus on many different perspectives, including the general health of people from different age groups. These websites are beneficial for information dissemination but can be overwhelming for people searching for specific information within a particular age group. Therefore, this study focuses solely on nutrition for early childhood to give more insight and understanding nutrition in young children. Nevertheless, the mentioned websites above were one of the sources in guidance of building this eHealth website, and concurrently, were used to tailor to the cultural and local needs. Next, Step 2, Design Arrangement. In this step, the web hosting service, theme, design, theme, layout, and language of the website were discussed. Lastly, Step 3, Website Construction, was the execution of previous steps.

Next, phase 2, content and face validation, was executed. Content validation measures the relevance of the instrument, in this context, the - website through the viewpoint of professionals with experience or work in the related field (Zamanzadeh *et al.* 2015). Face validation is the degree to which raters evaluate the instrument's items as appropriate or inappropriate to the

targeted construct and assessment objective (Nevo 1985; Hardesty & Bearden 2004). Face validation in this study used professionals and laypeople such as parents, caregivers, teachers, and students because they are the expected end users of the website. This helped the researchers to observe the website's acceptance from both perspectives (Zamanzadeh *et al.* 2015). Six professionals were recruited to conduct the content and face validation. The professionals were from the nutrition/dietetics and early childhood education fields in Klang Valley. The number of professionals was determined by Polit and Beck (2006) and Yusoff (2019a), who recommended the number between six and not exceeding ten professionals. The professionals were approached through their email, available on their university website. The face validation involved 50 users in Klang Valley, including parents, caregivers, teachers, and students aged 18 and above. According to Beaton *et al.* (2007), 30 to 40 participants from a target setting are ideal. Yusoff (2019b) also stated that 30 is the common sample size. No sample size or calculation was indicated in this study or other validation studies. These users were enrolled online by publishing in online groups available on social media such as Facebook – parents and caregivers, directly emailing or contacting the number of the kindergartens listed in Klang Valley – kindergarten teachers, and WhatsApp group – students.

There were two instruments used in this website. First, the Evaluation of the Printed Education Material (EVALPEM) questionnaire by Silveira *et al.* (2007) used by professionals, and second, the User Validation of the Mobile Application Rating Scale (uMARS) by Stoyanov *et al.* (2016) used by the users. EVALPEM was used because the instruments contain both content and face validation evaluations. There are seven sections in the EVALPEM, with two sections, namely scientific accuracy and content for content validation, and five sections, namely literary presentation, illustrations, material sufficiently specific and understandable, legibility characteristics, and quality of information. Although EVALPEM was a printed version, this instrument had been used by previous studies to assess the content and face validation of the module and website (Lau *et al.* 2019; Rahmad & Teng 2020). The users used uMARS because

the instrument is more applicable to end-users as it can assess the quality of the website through three sections – quality ratings, subjective quality, and perceived impact. Each section contains one scale, except for quality ratings with four scales – engagement, functionality, aesthetics, and information quality. At the end of both questionnaires, spaces were provided for additional comments. Both instruments had minor adaptations to suit the current local research context.

### **Data analysis**

In this study, the Item-Content Validity Index (I-CVI) was used to analyze the content validation by professionals. The I-CVI is the professionals' rate on the relevance of every item (scientific accuracy and content). The items were rated based on the professionals' agreement with the statement in the given questionnaire using a four-point Likert scale. The four-point scale was used to avoid an ambivalent midpoint, as suggested by Yusoff (2019a). The classification of the four-point Likert scale by numbering is: 1=totally disagree, 2=partially agree, 3=agree, and 4=totally agree. To obtain the result, the I-CVI was calculated by dividing the number of professionals who rated the items from 3–4 by the total number of professionals. A score was given based on the rating; the score is 0 if the professionals rated the item as 1 or 2, while 1 score was given if the professionals rated the item as 3 or 4. Then, all the added scores were divided by the total number of professionals. The obtained result was classified according to Zamanzadeh *et al.* (2015), where the I-CVI of 0.79 and above can be considered appropriate, while the I-CVI less than 0.79 will need revision.

Next, the Content Validity Index by Scale (S-CVI) was used to analyze the face validation by professionals. The S-CVI is the professionals' content validity rate (I-CVI) in terms of overall scale. The universal agreement among professionals (S-CVI/UA) and the Average S-CVI (S-CVI/Ave) were used to calculate the validity index. S-CVI/UA method measures the total agreement among professionals. Therefore, the sum of I-CVI with a score of 1 was divided by the total items. While the S-CVI/Ave method measured the average score of I-CVI, the sum of the I-CVI was divided by the total number of items. The values of S-CVI/UA 0.8 and above

and S-CVI/Ave 0.9 and above can be considered excellent content validity (Nor'ain i *et al.* 2017).

The EVALPEM used the binary scales 'agree' and 'disagree' in face validation. The item's score was 0 if the professionals disagreed and 1 if the professionals agreed with the given statement. While uMARS used a 5-point Likert scale of 1=Totally Disagree, 2=Disagree, 3=Natural, 4=Agree, 5=Totally Agree. The score for uMARS was 0 if the users rated the item from 1 to 3, and 1 if they rated 4 to 5. Both the EVALPEM and uMARS were calculated using the percentage agreement. In each section, the sum of the rated item was divided by the total item and multiplied by 100 percent. A percentage agreement of 80% and above for each section is appropriate, while less than 80% needs revision (Yusoff 2019b).

After the CVI calculation and percentage agreement, inter-rater reliability was calculated using Krippendorff's Alpha (Kalpha). Inter-rater reliability refers to the degree of similarity between examiners without influencing one another when rating the same questionnaires by considering chance agreement (Gwet 2014). In this study, Kalpha was chosen due to its flexibility to handle two or more raters and can be used to calculate dichotomous nominal data (Zapf *et al.* 2016). According to Hayes & Krippendorff (2007), a Kalpha value between 0.80 to 1.00 can be indicated as a reliable value, between 0.67 to 0.79 is acceptable, and 0.00 to 0.66 is not acceptable.

## RESULTS AND DISCUSSION

### Website development

The title of the eHealth website developed is 'e-CN: Early Childhood Nutrition'. The website was created in English using the hosting web service Wix. This service was chosen because no coding was needed, and attractive designs were provided without charges. The website URL is <https://ecnearlyphchildhoodn.wixsite.com/my-site>. The website contains five main pages: About e-CN, the Homepage, and three main topics: (1) Infant; (2) Toddler and Preschooler, and; (3) Research and Development. About e-CN explains the eHealth website's objectives, novelty, practicality, and usefulness. The homepage is the main page, highlighting the significance of early childhood nutrition and displays the three main

topics of the website. The topics on (1) Infant and (2) Toddler and Preschooler contain subtopics, which include: (a) learning activities; (b) global issues; (c) recipes and tips, and; (d) quizzes, games, and activities. The topic of (3) R&D contains recent research on early childhood nutrition.

Subtopic 1, "learning activities" consists of professional lectures on infant, toddler, and preschooler nutrition topics. The subtopic also includes study materials – lecture notes, other handouts, and references from trusted materials such as government websites and journal articles. Subtopic 2, "global issues", includes current issues concerning childhood nutrition and growth. This site consists of links to reports by global organizations such as WHO and UNICEF. Subtopic 3, which is "recipes and tips", includes a few examples of recipes that can be done according to the age of the children. Subtopic 4, "quizzes, games, and activities", consists of games and self-directed assessments to allow users to assess their knowledge and ability to learn and review the topics they read in a fun way.

The website was built for parents, caregivers, teachers, and students, as they are the potential end-users of the website. Topic (1) infant and (2) toddler and preschooler were specially built for non-nutrition background users such as parents, caregivers, and teachers because these topics include nutrition information that includes breastfeeding, complementary feeding, and food safety. The information is delivered simply using layperson's terms for easy understanding. The topic (3) R&D focuses more on students and professionals from a nutrition background because it contains the latest research about early childhood nutrition. However, parents and caregivers are the main focus of this website. Therefore, the website was built as an interactive information educational tool through videos and games to increase engagement between users and the website. A study by Hammersley *et al.* (2019) suggested that focusing on building educational websites could act as a preventive strategy for inculcating healthy eating behaviors from an early age. Parents were found to be more proactive when websites focus on informing rather than intervening (Burrows *et al.* 2015).

### Content validation

A total of six professionals within the field of nutrition/dietetics (n=5) and early childhood

Table 1. Content validation for the eHealth website

Measured parameter	Item description	Professionals						Number of agreement	I-CVI*	Kalpha value**
		Nutrition			Early childhood					
		A1	A2	A3	A4	A5	A6			
Scientific accuracy	Contents are in agreement with the current knowledge	3	3	4	3	4	4	6	1	-0.1000
	Recommendations are necessary and are correctly approached	3	3	4	3	4	4	6	1	
Content	Objectives are evident	4	4	4	3	4	4	6	1	-0.1074
	Recommendation about the desired behavior is satisfactory	3	4	4	3	4	4	6	1	
	There is no unnecessary information	4	4	4	3	4	4	6	1	
	Important points are reviewed	4	3	4	3	4	4	6	1	
								S-CVI/Ave***	1	-0.0694
								S-CVI/UA****	1	

\*I-CVI, item content validity index

\*\*Kalpha, Krippendorff's alpha

\*\*\*S-CVI/Ave, content validity index by scale, average

\*\*\*\*S-CVI/UA, content validity index by scale, universal agreement

Rating: 1=Totally disagree; 2=Partially agree; 3=Agree; 4=totally agree

(n=1) participated in this study to review the eHealth website. The result obtained from the EVALPEM is shown in Table 1. The measured parameters of 'scientific accuracy' and 'content' obtain an I-CVI score of 1.00, indicating appropriate content validity (Zamanzadeh *et al.* 2015). The S-CVI/AU and S-CVI/Ave obtained scores of 1.00, indicating excellent content validity (Nor'ain *et al.* 2017). The CVI scores indicated that the professionals agreed with all items in the measured parameters. The overall Kalpha for content validation is -0.069, with Scientific Accuracy obtained at -0.1000 and Content obtained at -0.1074. As the results of the

Kalpha were less than 0.66, the content validation can be considered unacceptable (Hayes & Krippendorff 2007).

### Face validation

Table 2 shows the face validation results of the eHealth website by professionals. The percentage of agreement obtained was 91.2%. Concurrently, individual results of quality of information, legibility characteristics, illustration, literary presentation, and material sufficiently specific and understandable obtained were 77.8%, 86.7%, 94.4%, 97.0%, and 100.0%, respectively. Based on these results, all measured

Table 2. Face validation by professionals for the eHealth website

Sections	Percent of agreement (%)	Kalpha value
Literary presentation	97.0	-0.0156
Illustration	94.4	-0.0294
Materials are sufficiently specific and understandable	100.0	None*
Legibility	86.7	-0.0212
Quality of information	77.8	-0.0769
Overall	91.2	0.0178

\*Value unable to be obtained as the raw data is constant

parameters gained more than 80.0% agreement between professionals, except for the ‘quality of information’. Therefore, all measured parameters are acceptable except for the ‘quality of information’, which needed revision (Yusoff 2019b). The overall Kalpha value was 0.0178, while individually, literary presentation, illustration, legibility, and quality of information obtained were -0.0156, -0.0294, -0.0212, and -0.0178, respectively. Only the ‘materials are sufficiently specific and understandable’ was unable to obtain Kalpha value due to constant raw data. As the results of the Kalpha were less than 0.66, the face validation can be considered unacceptable (Hayes & Krippendorff 2007).

Table 3 shows the sociodemographic characteristics of the users that were recruited for face validation. More than 50% were parents and caretakers. Table 4 shows the users’ face validation results. The overall agreement percentage was 77.1%. Individually, quality scale, subjective quality, and perceived impact received were 82.3%, 62.0%, and 87%, respectively. The quality scale score was obtained by calculating the percentage agreement between engagement (81.6%), functionality (85.5%), aesthetic (82.0%), and information (80.0%). According to Yusoff (2019b), each section of face validation by the users was appropriate except for subjective quality, which needed revision. Meanwhile, the overall Kalpha value was -0.0047, with each section of quality ratings, subjective quality, and perceived impact being -0.0047, 0.2335, and

-0.0114, respectively. As the results of the Kalpha were less than 0.66, the face validation can be considered unacceptable (Hayes & Krippendorff 2007).

In this study, there was a contrast between the high CVI value in content validation and the high agreement percentage in face validation to the low Kalpha value. These results were discussed in Paun *et al.* (2022). According to Paun, reliability indicates the ability to distinguish between categories. However, when a disproportionate amount of data falls under one category, which leads to highly skewed data, the agreement between the raters is high; in this context, the – high CVI and agreement percentage values would produce a low-reliability coefficient, the – low Kalpha value. Hence, when this case occurs, Paun *et al.* (2022) suggested using the raw observed agreement, which in this study was CVI for content validation and percentage agreement in face validation.

## CONCLUSION

In conclusion, this eHealth website focused on nutrition in early childhood for individuals from non-nutrition and nutrition backgrounds. As the website focuses on a small niche and acts as an interactive educational tool, the website could educate and engage with the end users of the website. The website had been content validated by professionals and face validated by both professionals and target users. In content

Table 3. Sociodemographic characteristics of target audiences (n=50)

Demographic characteristics	Frequency	Percentage
	n=50	(%)
<b>Role</b>		
Caregivers	16	32.0
Parents	21	42.0
Non-nutrition student	6	12.0
Nutrition student	7	14.0
<b>Area of living</b>		
Gombak	3	6.0
Hulu Langat	3	6.0
Klang	32	64.0
Kuala Lumpur	4	8.0
Petaling	4	8.0
Putrajaya	4	8.0
<b>Participant age</b>		
18–20	4	8.0
21–30	35	70.0
31–40	9	18.0
41–50	2	4.0
<b>Race</b>		
Chinese	1	2.0
Indian	1	2.0
Malay	47	94.0
Melanau	1	2.0
<b>Child age group</b>		
0–1	5	10.0
1–2	12	24.0
3–5	10	20.0
Not related to me	13	26.0
Two age groups of children	9	18.0
Three age groups of children	1	2.0
<b>Education level</b>		
SPM	6	12.0
Diploma	12	24.0
Degree	28	56.0
Master	4	8.0

Table 4. Face validation by target audiences for the eHealth website

Sections	Scale	Percent of agreement (%)	Kalpha value
Quality ratings		82.3	-0.0047
	Engagement	81.6	-0.0041
	Functionality	85.5	-0.102
	Aesthetic	82.0	-0.0034
	Information	80.0	-0.0118
Subjective quality		62.0	0.2335
Perceived impact		87.0	-0.0114
Overall		77.1	-0.0047

validation, the professionals agreed with all the measured parameters. While in face validation, the result from professionals was accepted; however, there is a need to improve the quality of information. The result of face validation by the target users was also acceptable, with the need to improve the subjective quality. Overall, the website may guide parents and caregivers to obtain fast and reliable information regarding child feeding practices. In addition, the website also highlights the latest research and findings in the area of nutrition and growth which may serve as a center for knowledge sharing and future research involving this area. The website will serve as a good start for intervening in long-term nutrition-related, as eating habits and food choices from young affect future health outcomes.

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#### DECLARATION OF CONFLICT OF INTERESTS

The authors have no conflict of interest.

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