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Submission date: 19-May-2023 07:27PM (UTC+0700)

Submission ID: 2097052657

File name: veness_of_online_training_-_Mahmudiono_et_al_-_Februari_2022.pdf (189.08K)

Word count: 3299

Character count: 19196

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Received: December 7, 2021 • Reviewed: January 4, 2022

Accepted: February 8, 2022 • Published: February 28, 2022

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Abstract

Nutrition education can contribute to maintaining health and optimal learning capacities during childhood. One important aspect to achieve goals and have successful nutrition education in schoolchildren is the quality of nutrition educators. This study aims to assess the effectiveness of online nutrition educator training to improve knowledge, attitudes, and self-efficacy in giving nutrition education and overcoming barriers in nutrition education due to the Covid-19 pandemic. This was a quasi-experimental study with one group pretest-posttest design, including seventy-three nutrition educators. Nutrition educators derived from nutrition students/alumni and was recruited online by interviews. Intervention was done in terms of one-time online education by the experienced lecturers. Knowledge regarding reducing salt, sugar and fat consumption was retrieved from 20 multiple choice questions. Self-efficacy was assessed using a self-developed questionnaire. From this study, intervention for nutrition educators significantly increased educators' knowledge by 3 points from 82 to 85 ($p < 0.01$) and improved self-efficacy was significant for 1-time and 3-times per week. Nutrition educators perceived that the best duration to do nutrition education related to reduction of sugar, salt and fat among schoolchildren was 3 times/week, for 30 minutes per meeting. Higher self-efficacy was found in giving offline than online nutrition education. Crowded places, bad weather, a conducive environment, and educators' bad health become barriers to nutrition educators in providing nutrition education. Nutrition educators are having more self-efficacy in giving nutrition education using power-points ($p < 0.001$) rather than through video or games in online based-nutrition education for schoolchildren. This study succeeded in providing significant results on the effectiveness of one-day training in improving the nutrition educators' knowledge, attitude, and self-efficacy.

Keywords: nutrition education, health, educators, self-efficacy, knowledge, attitude

I. INTRODUCTION

One of the most important goals of nutrition education is to help people use their nutrition knowledge and alter their diets to achieve optimal nutritional status [1]. In general, eating habits spread in children up to the age of juvenile and often continue to adulthood [2]. Therefore, among schoolchildren, educating nutrition and health from an early age by encouraging healthy eating habits and regular physical activity has the potential to have a significant influence on health and well-being throughout childhood and later life [3]. Especially during school, children's social environments become more diverse, and extra-familial influences become increasingly essential references. During this time, children become more self-reliant, begin to make their own food choices, and make personal selections about what they consume. The elementary school would be the best strategic location to develop a healthy lifestyle and a second front in the war against disease and malnutrition, yet in the other hand, the scientific field of nutrition education in schools is not vastly studied [4], [5]. In addition, nutrition during childhood contributes to maintaining health and optimal learning

capacities [6], thus, it is crucial to develop a nutrition education for schoolchildren. One important aspect to have successful nutrition education is the quality of nutrition educators.

Nutrition educators were defined as persons with baccalaureate-level training who are frequently responsible for, or expected to participate in nutrition education [7]. A nutrition educator also teaches the benefits of healthy food consumption and how to improve eating habits [8]. Nutrition educators promote health by teaching nutrition techniques and designing nutrition education programs [9]. In recent years, there has been an increased demand and need for nutrition education, globally, nationally and locally, but this is not balanced with the amount and capacity of nutrition educators [10]. According to multiple research, many nutrition educators have a weak awareness of the factors that impact dietary behavior change and nutrition knowledge implementation [11]. Further research into these characteristics is critical to achieving the aims of nutrition education. Examining the nutrition knowledge, attitude, and self-efficacy in doing nutrition education as well as in overcoming barriers during nutrition education of

people who have taken on or been assigned to teach nutrition is essential. In our opinion, limited study in Indonesia is related to intervention study especially using online training for nutrition educators, and we thought that increasing educators' knowledge, attitude and self-efficacy is crucial in order to have successful nutrition education. This study aims to assess the effectiveness of online training to improve knowledge, attitudes, and self-efficacy of nutrition educators especially for elementary school children due to the Covid-19 pandemic.

II. METHODS

This was a quasi-experimental study with one group pre-test post-test design included seventy-three nutrition educators that will be given nutrition education to schoolchildren. Nutrition educators came from a similar educational background that is bachelor in nutrition science. Intervention was done in terms of one-time online education by the experienced lecturers to increase subjects' knowledge, attitudes, and self-efficacy in giving and overcoming barriers in nutrition education. Knowledge regarding reducing salt, sugar and fat consumption was retrieved from 20 multiple choice questions, this is also in relation with the intended nutrition education that will be held in the future. While self-efficacy was divided into two terms: self-efficacy in giving nutrition education and self-efficacy to overcome barriers in doing nutrition education. Both assessed using a self-developed questionnaire, the Likert scale ranging from 0 to 10, 0 represents lowest self-efficacy and 10 is the highest.

Self-efficacy questionnaire in doing task (nutrition education) included eight questions concerning the nutrition education schedule: 1 time/week, 2 times/week, 3 times/week, and session duration: 60 minutes/meeting, 40 minutes/meeting, 30 minutes/meeting, giving online based-nutrition education and offline based-nutrition education. Self-efficacy questionnaire in overcoming barriers included the following questions: giving nutrition education without media, while fasting, while in menstruation (women) or experiencing pain (men), while on the way to somewhere, giving online-nutrition education if students do not open their video camera, giving online-nutrition education when your place is crowded, giving online-nutrition education if students are not conducive when participating in education and when the weather is raining. Similarly, attitude was also measured using a self-developed Likert scale questionnaire consisting of three questions,

i.e., the effectiveness of videos (YouTube, TikTok, etc.), games, and PowerPoint at online based-nutrition education.

The sample of this research included adults with a nutrition science background, selected by accidental sampling method. The information on nutrition education was promoted through social media, and participants who are willing to participate will be informed about the intervention and obtain informed consent. The sample size was determined using a sample size calculation to compare the mean of a continuous measurement in two samples, using a z-statistic to approximate the t-statistic with the effect size calculated from the research results [12], regarding nutrition knowledge, attitudes, and practice among nutrition educators with 95% CI and 80% power found a minimum sample of 60 subjects. Considering 80% of drop-out rate, the minimum sample size was 72 subjects [12].

A paired t-test was used to analyze the difference in outcomes measured. This statistical analysis has been adjusted for possible confounders such as children characteristics, SES and household characteristics. All data analyses were performed at IBM SPSS Statistics 23.

III. RESULTS AND DISCUSSION

Our study aims to assess the effectiveness of nutrition educator training to improve knowledge, attitudes, and self-efficacy in giving nutrition education and overcoming barriers in nutrition education. This study involved 73 nutrition educators who had a nutrition science background. This study showed that most nutrition educators were females (93.2%) and the rest participants were males (6.8%). Looking at the age, most educators were aged < 20 years and 25 years (49.3% VS 47.9%, respectively). Table 1 shows the characteristics of subjects.

Table 1.
Characteristics of subjects

Characteristic	n (%)
Sex	
Female	68 (93.2)
Male	5 (6.8)
Age group	
< 20 years	36 (49.3)
20 – 25 years	35 (47.9)
> 25 years	2 (2.7)

Table 2 showed the comparison of nutrition knowledge, attitude and self-efficacy of nutrition educators before and after training. Rather than other studies, this research is focusing on the increasing of nutrition knowledge in total, detailing self-efficacy related to task and barriers,

and providing some variables that show attitudes of nutrition educator of the education media. The new details of this study were expected to be the new results and can be a starting point to develop online nutrition education for school children. Knowledge of nutrition educators significantly increased by 3 points from 82 to 85 ($p < 0.01$). This study was similar with online nutrition education program conducted in Australia for elementary school teachers, which stated that the

results found significant ($p < 0.0001$) increases in teacher knowledge [13]. Our study also revealed that self-efficacy in giving nutrition education was significant for 1-time and 3-times per week. Nutrition educators perceived that the best duration to do nutrition education related schoolchildren was 3 times/week. In terms of duration of nutrition education, 30-minute online education demonstrated the highest self-efficacy by the participants.

Table 2. Comparison of the nutrition knowledge and self-efficacy of nutrition educators at pre- and post- training attitudes (N = 73)

Variables	Pre-training Mean \pm SD	Post-training Mean \pm SD	p-value
Nutrition knowledge			
Total nutrition knowledge	82.05 \pm 13.63	85.21 \pm 13.55	0.015
Self-efficacy (Task)			
Giving nutrition education 1 time/week	8.36 \pm 1.50	8.77 \pm 1.25	0.001
Giving nutrition education 2 times/week	7.22 \pm 1.98	7.22 \pm 0.98	*)
Giving nutrition education 3 times/week	6.11 \pm 2.27	7.84 \pm 1.62	< 0.001
Giving nutrition education in 60 minutes/meeting	7.10 \pm 2.02	7.40 \pm 1.92	0.053
Giving nutrition education in 40 minutes/meeting	7.74 \pm 1.82	7.74 \pm 1.82	*)
Giving nutrition education in 30 minutes/meeting	8.18 \pm 1.62	7.78 \pm 1.74	0.018
Giving online based-nutrition education	8.07 \pm 1.54	8.18 \pm 1.60	0.550
Giving offline based-nutrition education	8.34 \pm 1.64	8.52 \pm 1.21	0.258
Self-efficacy (Barrier)			
Giving nutrition education without media	5.55 \pm 2.12	6.32 \pm 1.99	< 0.001
Giving nutrition education while fasting	6.32 \pm 1.99	7.59 \pm 1.92	< 0.001
Giving nutrition education while in menstruation (women) or experiencing pain (men)?	7.59 \pm 1.92	7.75 \pm 1.60	0.340
Giving nutrition education while on the way to somewhere	7.75 \pm 1.60	7.44 \pm 1.97	0.141
Giving online-nutrition education if students do not open their video camera	6.42 \pm 1.73	7.51 \pm 1.93	< 0.001
Giving online-nutrition education when your place is crowded	6.96 \pm 1.82	6.05 \pm 2.21	< 0.001
Giving online-nutrition education If students are not conducive when participating in education	5.82 \pm 2.27	5.88 \pm 2.10	0.767
Giving online-nutrition education when the weather is raining	6.03 \pm 2.18	6.16 \pm 2.14	0.421
Attitudes			
The effectiveness of video (YouTube, TikTok, etc.) at online based-nutrition education	8.34 \pm 1.64	8.52 \pm 1.21	0.251

Continuation of Table 2

The effectiveness of games at online based-nutrition education	8.58 ± 1.27	8.30 ± 1.28	0.054
The effectiveness of PowerPoint at online based-nutrition education	7.33 ± 1.70	8.58 ± 1.27	< 0.001

*) No significant difference

Meanwhile, the way of delivering nutrition education did not show significant difference both online and offline; however, higher self-efficacy was found in giving offline than online nutrition education. The time setting of this study is depended on the teaching duration of the daily study of children, which retrieved by interviewing their teacher especially for nutrition education program. In other study, the duration of time are difficult to address but lack of awareness of resources indicates that promotion of existing resources may encourage nutrition educator to provide nutrition education [14].

We also measured educators' self-efficacy in overcoming barriers in doing nutrition education. Among eight barriers presented, four indicators were significantly increased after training including giving nutrition education without media, giving nutrition education while fasting, giving online-nutrition education even if students do not open their video camera, interestingly, giving online-nutrition education when educators' place is crowded is also negatively significant. It means that crowded places become the reason that can reduce educators' self-efficacy in giving nutrition education. Other barriers such as bad weather, an uncondusive environment, and educators' bad health.

The last dependent variable was a nutrition educator's attitude toward several ways of delivering nutrition education. Based on the results, we found that nutrition educators are having more self-efficacy in giving nutrition education using power-points ($p < 0.001$) rather than through video (YouTube, TikTok, etc.) or games in online based-nutrition

Nutrition educators' knowledge related to intended nutrition education is essential to make sure that knowledge can be well transferred. In general, our study presents a good knowledge of educators' even in the beginning before the training (mean = 82.05), then significantly increases 3-points to 85.21. Nutrition knowledge that we assessed was related to the impact of high salt, sugar and fat consumption on school children, limits on salt, sugar and fat consumption in school children, how to reduce salt, sugar and fat consumption, and how to read packaged food labels. Delivering correct barriers might also happen and reduce the effectiveness of its sessions. We also measured educators' self-efficacy in overcoming barriers. If their self-efficacy is

knowledge is one thing that assures the success of nutrition education for school children who still have limited nutritional knowledge [14], [15]. As mentioned by previous research in Korea, nutrition education programs aimed at lowering sugar intake and based on social cognition theory were beneficial in increasing nutrition knowledge, dietary attitude, and sugar intake behavior in primary school kids [16]. Furthermore, childhood nutrition education has such a large impact on long-term health and disease prevention, it is critical to design theory-based nutrition education programs and to implement systematic and consistent nutrition instruction in primary schools.

Still based on Social Cognitive Theory (SCT) construct, attitude and self-efficacy were also one of the factors that shape one's behavior. In this study, we measured nutrition educators' self-efficacy in engaging specific tasks regarding nutrition education and self-efficacy in overcoming barriers during nutrition education sessions. Most educators' feel that their self-efficacy was highest in giving nutrition education 1 time and 3-times/week, with a duration of 30 minutes for each session. On the other hand, longer duration of nutrition education sessions reduces educators' self-efficacy, which might result from the respondents' concentration decreasing with longer duration. More effort should be made by educators if respondents' concentration is decreased so that nutrition messages can still be delivered. A strong feeling of self-efficacy, or conviction in one's potential to succeed, is essential to achieve intended behavior [17]. Personal self-efficacy is a Social Cognitive Theory (SCT) component, and treatments based on SCT have a significant impact on modifying food habits [18]. According to SCT, modelling other people's behavior develops knowledge while also developing the skills and tactics required to handle the environment [17]. The self-efficacy construct has the ability to predict which suggested behavior people feel capable of implementing, how much effort they will put into changing their behavior and preparation habits, and how long they will persevere in the face of challenges.

During online-nutrition education, some good, any barriers during nutrition education can be overcome. Out of eight barriers, nutrition educators have higher self-efficacy in overcoming giving nutrition education without

media, giving education while fasting and while students/ respondents did not open their web-video camera during the education session. In contrast, self-efficacy in giving online-nutrition education when educators' places are crowded reduces after the training. This might happen because crowded places make it difficult for educators to concentrate on providing education, causing noise so that there is a risk that respondents cannot hear clearly the education given and is generally uncomfortable for educators and education participants. Thus, during the nutrition education session, preparing quiet environment/places becomes one of the aspects that must be considered by the educators.

We also measured the attitude of nutrition educators to understand their perspective in giving nutrition education using several media/methods. Among three variables of attitudes that we measured, only attitude in giving nutrition education using power-point as the media to deliver the messages that significantly increase after training sessions. Another two methods that are using games and video (YouTube, TikTok, etc.) did not increase even after the training. Based on educators' testimonials, PowerPoint is easier to make compared to games and video, it takes shorter time to make as well as does not require specific skills. Developing nutrition education media is highly important in achieving a successful nutrition education. One important thing that should be considered is the population that is intended for nutrition education. For example, media for school-children might differ with that for the adult population or another age-group.

The development of fascinating and enjoyable tools or modules for nutrition education is required based on the characteristics of the target population [19]. Students in urban primary schools are certainly familiar with advanced information and technology, it is not viable to have that technology, such as a DVD player and computer, in every class. As a result, a hybrid of old and modern media and technology might emerge. Comic books or books with many eye-catching characters are a popular medium among elementary school children. Another study reported an increase in children's knowledge and attitude towards consuming fish by using

experiential learning (raised based pool) and 3-months in class nutrition education using comics and other media ($p < 0.05$) [20]. It can be concluded that a nutrition educator should have specific skills in developing media, not just how to deliver the nutrition message to the target audiences, such as skills in designs, making videos, making comics, etc. because it can help the overall nutrition education results.

IV. CONCLUSION

This study succeeded in providing significant results on the effectiveness of one-day training in improving the nutrition educators' knowledge, self-efficacy in several specific tasks of nutrition education, self-efficacy in overcoming barriers related to online nutrition education and attitude in giving nutrition education using power-point as the media to deliver the messages.

The limitation of this study was at the duration of the training that need longer duration or added more section for the training. Instead of the previous limitation, this study provides specific details related to the attitude and self-efficacy task and barriers, and the media for giving nutrition education. Further studies to assess nutrition educators' knowledge, attitude and self-efficacy should be conducted in different settings or age groups to enrich the knowledge.

ACKNOWLEDGMENTS

We would like to thank Universitas Airlangga Surabaya, Universitas Diponegoro Semarang and Universitas Hasanuddin Makassar for funding this study.

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