Students' Nutrition Knowledge and Teachers' Perceptions of Integrating Nutrition Messages into Junior High School Curriculum

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ABSTRACT

This study aimed to measure nutritional knowledge and observe teachers' perceptions of delivering nutrition messages through an e-module within the junior high school curriculum. This study was conducted at SMPN 35 Medan and employed the quasi-experimental approach, and a one-group pretest-posttest design was used. This study's population was students in grades 7 and 8. The minimum sample size was 102 students after adding 10% of the total sample size. Teachers' perceptions were taken from four subject teachers. Data were collected using a questionnaire survey and an interview. A focus group discussion was conducted with the teachers to gather information about their perceptions of using an e-module to deliver nutrition messages at school. The data were analyzed using the Wilcoxon test. The results showed that the student's average total knowledge score before receiving the nutrition education intervention was 22.66. It increased to 26.48 after students received the intervention. Teachers used the e-module to deliver content learning about nutritional messages in schools and employed the e-module to deliver the relevant subject matters of nutrition messages at school. The teachers realized the importance of delivering nutrition messages to the students. The e-module could broaden the teachers' horizons as they came to realize that nutrition messages could be delivered through various subjects. They initially believed that nutrition messages could only be taught in the subject of natural sciences. However, they discovered that nutrition messages could also be delivered in other subjects, such as mathematics, crafts, and physical education.

Keywords: integration, junior high school curriculum, nutrition messages

INTRODUCTION

Adolescence is the second period of rapid growth in the human life cycle; low nutritional quality in this stage will cause stunting and potentially hamper optimal physical growth and cognitive development. Currently, Indonesian youth bear three nutritional burdens: malnutrition, excess body weight, and micronutrient deficiencies, which still show quite high levels (UNICEF 2020). The national short stature prevalence for adolescents aged 13–15 years was 35.1% (13.8% indicating very short and 21.3% indicating short). Meanwhile, underweight (body mass index for age) and wasting showed 6.7% and 1.4% of prevalence, respectively (Ministry of Health Republic of Indonesia (MoH RI) 2018). The 2018 Basic Health Research (Riskesdas) reported that the anemia prevalence in adolescents was 32%, meaning that 3–4 adolescents out of 10 suffer from anemia. However, overnutrition still becomes a problem among Indonesian adolescents because the overweight prevalence is still relatively high at 8.3%, and 2.5% of adolescents are obese (MoH RI 2018). Nearly 15% of adolescents are overweight or obese. The trend occurs more frequently in girls than boys. Many adolescents and parents are unaware that their current eating habits will impact their future health status.

The very rapid development of technology has changed adolescents' diets and physical activities (UNICEF 2021). Most adolescents spend their free time in a lack of physical activities. Instead of doing physical activities, they spend their time on the Internet while eating processed food, cakes, fried foods, and crackers. The easier access to food provided by various online food applications has contributed to the severe decline in adolescents' physical activities.

Such conditions indirectly raise nutritional problems in adolescents (Juniartha & Darmayanti 2020).

Physical activities and healthy eating behavior could significantly prevent obesity (Hastoety *et al.* 2017). The conditions of being overweight and obese during childhood and adolescence could be overcome by improving one's food environment, increasing healthy food consumption, avoiding unhealthy food consumption, and increasing physical activities (UNICEF 2020). Improving nutrition could significantly impact youth. Adolescent girls have a strategic role in improving the nutritional status of their future children to prevent malnutrition.

A school is a place for students to learn and presents a great opportunity to allow them to shape and change their behavior as desired. Moreover, some efforts are systematically made at school to shape their behavior. It is known that there is a close relationship between knowledge and behavior (Haryana *et al.* 2019; Lathifa & Mahmudiono 2020). Teachers play a big role in providing knowledge and a source of information for adolescents at school. Teachers can influence students' mindsets, increase their knowledge, improve their attitudes, and encourage changes in their behavior. Currently, nutrition materials are rarely delivered in schools. These limited materials are only delivered in a select few subjects in junior high schools (Nurjhani *et al.* 2012). If teachers have insufficient knowledge about nutrition, nutrition information cannot be delivered to students. Research on students' nutritional concept mastery revealed that, on average, students did not reach 50% of all concepts taught in the junior high school curriculum (Nurjhani *et al.* 2012). The lack of nutritional information accessible to students from their junior high school curriculum causes these students to perform poor nutritional behavior. Strategies to integrate nutrition messages into the subject taught by teachers may pave the way to implementing nutrition education for junior high school students. Thus, the need for nutrition education guidelines, especially for adolescents, now arises.

A study found that properly packaged modules with interesting pictures could become one of the most effective learning media to increase knowledge for both teachers and students (Aries *et al.* 2018). Nutritional information availability is very important to improve students' nutritional behavior (Haryana *et al.* 2019; Wardhani *et al.* 2021). If students are given access to nutrition information at school, they will be more likely to apply it. Teachers can provide nutrition messages for students. Most students will heed the information they deliver because they trust the teachers; therefore, integrating nutrition messages into school subjects will increase the possibility for students to apply the nutrition messages. During the COVID-19 pandemic, students did online learning from home; this condition forced them to spend a lot of time on sedentary activities, meaning their physical activities decreased (Firmansyah *et al.* 2021). Students need information about correct nutritional behavior to avoid nutritional and health problems.

This study aimed to measure nutritional knowledge and observe teachers' perceptions of delivering nutrition messages through an e-module according to the junior high school curriculum.

METHODS

Design, location, and time

This study employed a quasi-experimental design with one pre-test and post-test group. This study provided nutrition education for research subjects by implementing nutrition messages at schools. Afterward, changes in knowledge were measured before and after the treatment. This study was conducted at SMPN 35 Medan (a public junior high school) from September to November 2020. The research site was selected purposively because this school was strategically located. The research site was located between offices, schools, shopping centers, and several campuses which probably influenced students' nutritional behavior.

The Research Ethics Committee of the Faculty of Public Health, Universitas Sumatera Utara approved the research protocols (No. 552/KEP/USU/2020).

Sampling

The population of this study was 820 students from 22 classes of grades 7 and 8 at SMPN 35 Medan. The sample was calculated using the Lemeshow formula with a proportional consideration of 0.5. The calculation obtained a

sample size of 93 people plus a 10% correction. The sample class was selected using the random sampling technique. For grade 7, classes 7.3 and 7.8 were selected; for grade 8, class 8.1 was selected. The sample is carried out by total sampling from the selected class which amounts to 102 respondents. Teachers' perceptions were observed by four subject teachers. Data were collected through a questionnaire survey and interview.

Data collection

This study employed a pre-post intervention research design by delivering nutrition messages using an e-module at school to junior high school students. Nutrition knowledge was measured to investigate any changes before and after the intervention. The nutrition messages at school were delivered via online and offline methods. The intervention was conducted twice a week for two weeks in each class. The duration of each meeting was 30–45 minutes. The intervention time was determined based on an agreement with the teachers and the school.

The e-module to apply nutrition messages at school is part of this study. The e-module was designed by the teachers for teaching the subjects by considering nutrition messages. This e-module was created by incorporating nutrition messages into the topic of several selected subjects. Previous research revealed four selected subjects taught in grades 7 and 8: natural science, physical education, mathematics, and crafts. The nutritional messages inserted into the subject topics included messages, benefits, suggested messages equipped with examples, and practice questions.

The nutritional messages that were integrated into these subject topics included message content, benefits, suggestions, some examples, and exercises. The e-module served as a guide for teachers to integrate nutritional messages into the subject topics taught in the class. The 16 nutrition messages included: 1) consuming a variety of foods; 2) consuming fibrous food, such as vegetables and fruits; 3) having breakfast every morning; 4) increasing knowledge about the relationship between nutrition and reproductive health; 5) eating iron-rich food; 6) eating calcium-rich food; 7) consuming various carbohydrate-rich foods; 8) limiting sugar, salt, and fat consumption; 9) limiting fast food consumption; 10) reading the label when buying packaged food; 11) drinking eight glasses of clean water a day; 12) consuming safe foods for health; 13) doing physical activities and monitoring body weight regularly; 14) not smoking and drinking alcohol; 15) using smartphones wisely, and 16) consuming iodized salt.

This e-module was a guide for teachers to successfully insert nutrition messages into the subjects they taught. The teaching methods they used for this study were lectures and discussions. Data on students' nutritional knowledge were obtained by distributing a questionnaire on Google Forms. The case-based e-module was made using Google Sites and Google Forms.

Data analysis

The nutrition knowledge questionnaire consisted of 36 questions. Each correct answer for a question scored 1, and each incorrect answer scored 0 (Khomsan 2021). The data on the nutrition knowledge variable were processed by adding up the scores. Nutrition knowledge data were collected using the survey method. If the collected data were normally distributed, it would be analyzed using the Wilcoxon test. Focus group discussions were conducted to explore teachers' perceptions of using e-modules to implement nutrition messages at schools. Some questions were asked about the teachers' perceptions of the nutrition messages, as well as the benefits and difficulties of delivering messages and suggestions. The data on teachers' perceptions of using the e-module were analyzed qualitatively.

RESULTS AND DISCUSSION

Characteristics of junior high school students

The research samples were dominated by female students. The students were from small-sized families (33.7%), moderate-sized families (51.5%), and large-sized families (13.8%). They were 13, 14, and 15 years old (20.7%, 28.7%, and 49.6%, respectively). Moreover, most sample students had normal nutritional status (74%). Only 18.8% of the students had poor nutritional status, and 5.9% of them were obese. In addition, this study found that 72.2% of the students came from non-poor families (Table 1).

Students' nutrition knowledge

The results show that the student's average knowledge score before receiving the nutrition

Table 1. Subjects' socio-demographic characteristics

Characteristics	n	%
Sex		
Male	58	57.4
Female	43	42.6
Household size		
Small	34	33.7
Medium	52	51.5
Large	15	14.8
Age (year)		
13	21	20.7
14	29	28.7
15	51	49.6
Body mass index		
Underweight	19	18.8
Normal	74	74.3
Obese	7	6.9
Socioeconomic status		
Poor families	28	27.8
Non-poor families	73	72.2

education intervention was 22.66. However, their average score increased to 26.48 after receiving the intervention (Table 2). To summarize, the students' average knowledge score increased by 3.82 points, from 22.66 to 26.48. The statistical results showed a significant difference between the knowledge scores before and after the intervention ($p < 0.05$).

Yurni and Sinaga (2017) investigated nutrition education's effect on elementary school students' balanced nutrition knowledge. They found that after receiving a nutrition education intervention, the student's knowledge of balanced nutrition increased from 44.2% to 65.4% and was categorized as good. Another study examined 216 students in Istanbul and involved three types of interventions for mathematics subjects, such as video-mediated, peer-directed, and visual

Table 2. Changes in the proportion of sample students by nutrition knowledge level before and after the delivery of nutrition messages

	Mean±SD	*p*
Before intervention	22.66±3.86	0.05*
After intervention	26.48±4.09	
Score difference	3.82	

SD: Standar Deviation

aids. The results of the study showed that the students' nutritional knowledge increased after the intervention in their mathematics class using all learning methods (Aydin *et al.* 2022). All the intervention methods resulted in significant increases in post-test scores ($p < 0.05$).

Table 3 presents the average nutritional knowledge percentage before and after the intervention. The nutrition knowledge questionnaire comprised 36 questions about 16 nutritional messages. Each message, examined with a different number of questions, was used. The knowledge percentage increased to 14.8 points after the nutrition education was implemented by the teachers.

Students' average nutritional knowledge percentage before education was 61.3 However, their average percentage increased to 14.8 after the e-module with nutrition messages was applied. Nutrition education for students could improve their nutritional knowledge and practices (Ekayanti *et al.* 2014; Haryana *et al.* 2019; Follong *et al.* 2022).

Table 3 shows that the message with the lowest number of correct answers was message 12, "consuming safe foods for health." Initially, the students did not know how to choose safe foods with an average percentage of 22.3 point, but after the intervention, most of them understood how to choose and consume safe food with an increased percentage of 44.5 points. Warlenda and Desnovianti (2018) also found a low level of knowledge about safe food selection (38.2%). Applying a modified monopoly game could improve elementary school student's knowledge and attitudes toward food safety (Enjelina *et al.* 2020). Inadequate knowledge is one of the factors that contribute to selecting unsafe snacks (Warlenda & Desnovianti 2018; Enjelina *et al.* 2020).

The message with the second-fewest correct answers was message 16, "consuming iodized salt." This study found that the students did not know the benefits of iodized salt (average percentage of 36.1 points). After the intervention, the iodized salt knowledge percentage increased to 78.7 points. Long-term iodine deficiency will decrease someone's intelligence. A previous study proved that health education on iodized salt affected students' knowledge at Campursalam Public Elementary School in Parakan District, Temanggung Regency (Ariyoso 2016).

Table 3. Average nutritional knowledge percentage of each message before and after intervention

Nutrition message	Pre-test	Post-test
	Mean±SD	Mean±SD
Eat a variety of foods	43.6±0.50	60.4±0.49
Consume fibrous foods such as vegetables and fruit	64.4±0.48	77.7±0.42
Have breakfast every day	74.8±0.44	86.6±0.34
Increase knowledge about the relationship between nutrition and reproductive health	72±0.46	78.8±0.42
Eat iron-rich foods	61.4±0.51	66.7±0.47
Eat calcium-rich foods	67.3±0.47	71.3±0.46
Get used to consuming a variety of carbohydrate-rich foods	59.4±0.49	71.3±0.46
Limit sugar, salt, and fat consumption	58.9±0.49	63.4±0.48
Limit fast food consumption	80.2±0.40	90.1±0.30
Read the label every time you buy packaged food	67.3±0.47	80.2±0.40
Drink eight glasses of clean water per day	77.2±0.42	81.7±0.39
Eat foods that are safe for the health	22.3±0.36	66.8±0.50
Do physical activity and monitor your body weight regularly	83.7±0.37	88.6±0.32
Do not smoke or drink alcohol	60.4±0.49	65.8±0.48
Use your smartphone wisely	52.5±0.50	89.6±0.31
Consume iodized salt	36.1±0.48	78.7±0.50
Average of all items	61.3±0.45	76.1±0.42

SD: Standar Deviation

Teachers' perceptions of delivering nutrition e-module at school

The e-module for delivering nutrition messages at school was integrated into four junior high school subjects: natural sciences, physical education, mathematics, and crafts. Teachers played an important role in integrating 16 nutritional messages into these subjects by considering the materials taught. For example, basic competence 4.2 of the craft subject stated one of the subject objectives was "to process, serve, and package vegetable foodstuffs into health foods and beverages in the local area". To achieve this competence, four nutrition messages were incorporated, namely message 2 "consuming fibrous foods, such as vegetables and fruits", message 10 "read labels anytime buying a packaged food", message 11 "drinking eight glasses of clean water every day", and message 12 "consuming safe food for health." Each message consisted of message content, examples, and exercises. The following is one instance of a nutrition message getting incorporated into the craft subject, which inserted the second nutrition message about consuming fibrous foods, such as vegetables and fruits.

Figure 1 and Figure 2 show a cover, a lesson plan containing a message, basic competencies expected to be acquired after learning, the meaning of the message, materials, and learning activities involved. The teachers were given detailed lesson guides, examples, activities, and exercises aided by video media and flyers, connected directly from the sources, and equipped with a questionnaire to measure the students' nutritional knowledge.

After receiving socialization on using the e-module to deliver nutrition messages in schools, many teachers realized the importance of these messages for students; in other words, this socialization broadened their horizons to understand that nutrition messages could be inserted into various subjects. They used to think that the topic of nutrition could only be taught in natural sciences. They realized that nutrition materials can also be inserted into other subjects, such as mathematics, crafts, and physical education. A study on junior high school mastery of nutrition concepts by Nurjhani *et al.* (2012) reported that some nutrition materials taught in natural sciences could be useful in everyday life

Figure 1. Cover and questionnaire e-module delivery of nutrition messages in school

Figure 2. A material example in the e-module

(Nurjhani *et al.* 2012). For example, balanced foods are arranged in a food pyramid, strategies to read labels on food packaging, and animals' digestive enzymes.

A Focus Group Discussion (FGD) was conducted with teachers to bring to light their perceptions of using the e-module to deliver nutrition messages at school, its benefits, and its implementation in the classroom. According to the FGD, the e-module was easily understood, had a simple presentation, and was in line with the learning materials. The essence of the delivered messages was well-illustrated in the learning activities, and the instructions for using the guidebook and the learning process were clear.

One of the results of the FGD with the teachers showed that some students had difficulties in implementing the message of having breakfast every morning. The teachers recognized that many students did not have breakfast at home for various reasons. Even many teachers did not have time for breakfast. Students who miss breakfast do not have enough energy intake, causing them to be non-productive, have difficulty concentrating, and become lethargic (Larega 2015).

The teachers suggested planting fruit trees within the school area. It is known that schools and other public areas are usually decorated with ornamental plants. Additionally, planting fruit trees in the school area is expected to produce delicious fruits for students and teachers; thus, their vitamin, mineral, and dietary fiber needs would be fulfilled.

The teachers realized the importance of instilling good nutritional behavior from an early age because it greatly impacts the students' growth and determines their achievement of optimal health in adulthood. Besides that, the teachers realized the need for delivering nutrition messages during lessons at school. The nutrition interventions at school should involve parents and teachers because they can affect children's eating behavior (Haryana *et al.* 2019).

The e-module could motivate teachers to innovate in learning while delivering nutrition messages, broaden their horizons, and provide greater examples than guidebooks. Teachers' creativity in teaching nutrition materials in the classroom gives the teachers and students an idea of the importance of correct nutritional behavior. Teachers play a very important role in providing nutrition information for students. From an early age, teachers occupy the best position to influence them (Aries *et al.* 2018)

This e-module received a lot of positive responses from the teachers. The teachers proposed that nutrition messages should be inserted into other subjects besides the four selected ones, such as English and Indonesian Language subjects. In addition, some teachers even suggested reestablishing the home economics education subject that previously was a part of the education curriculum applied in Indonesia. Slater *et al.* (2014) conducted a study to explore the perception of applying home economics subjects. The subjects taught the students about knowledge and skills in nutritious food choice and preparation. They discovered that nutrition had significant potential to reduce the risk of obesity and chronic diseases. The results also showed that education can be an important means of transferring basic knowledge and skills to adolescents (Slater *et al.* 2014). They also deemed this subject very useful in instilling students' morals and raising their awareness of the importance of good and correct nutritional behavior from an early age.

The current study has several weaknesses. Since it was carried out at the beginning of the COVID-19 pandemic, learning was carried out online and offline. Teachers and students, as research respondents, were not all present at the research schedule, making it difficult to obtain optimal data.

CONCLUSION

The teachers applied a nutrition e-module at schools when teaching subjects relevant to the nutrition messages. The results of different Wilcoxon tests on knowledge data before and after the intervention showed a significant difference, and there were increased knowledge scores from 22.66 to 26.48.

The teachers realized the importance of delivering nutrition messages to the students. The e-module could broaden the teachers' insight, and they believed that nutrition messages could be inserted into several learning materials. Initially, the teachers believed that nutrition messages could only be delivered in the subject of natural sciences.

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DECLARATION OF INTERESTS

The authors declare that there is no conflict of interest with other person or institution.

REFERENCES

Aries M, Navratilova HF, Anwar K, Hardinsyah. 2018. The development of teaching guidelines and interactive nutrition education module for primary school teachers. International Conference on Community Development 1(1):177–183. https://doi.org/10.33068/iccd.Vol1.Iss1.28

Ariyoso R. 2016. Pengaruh pendidikan kesehatan tentang garam beryodium terhadap pengetahuan siswa SDN. J Health Educ 1(2):2–7.

Aydin S, Ozkaya H, Ozbekkangay E, Bakir BO, Cebiogli IK, Gunalan E. 2022 The comparison of the effects of different nutrition education methods on nutrition knowledge level in high school students. Acıbadem Univ Sağlık Bilim Derg 13(1):133–139. https://doi.org/10.31067/acusaglik.963347

Ekayanti I, Briawan D, Destiara I. 2014. Perbedaan penggunaan media pendidikan terhadap perubahan pengetahuan dan sikap ibu dalam sarapan anak sekolah dasar di Kabupaten Bogor. J Gizi Pangan 8(2):109. https://doi.org/10.25182/jgp.2013.8.2.109-114

Enjelina W, Ningrum AF, Erda Z. 2020. Pengaruh modifikasi permainan monopoli terhadap pengetahuan dan sikap siswa mengenai keamanan makanan jajanan. Jurnal Kesehatan Masyarakat Indonesia 15(1):29–34. https://doi.org/10.26714/jkmi.15.1.2020.29-34

Firmansyah AR, Nurhayati F. 2021. Hubungan aktivitas sedentari dengan status gizi pada Siswa SMP di Masa Pandemi covid-19. Jurnal Pendidikan Olahraga dan Kesehatan 9(1):95–100.

Follong BM, Prieto-Rodriguez E, Miller A, Collins CE, Bucher T. 2022. Evaluating an integrated nutrition and mathematics curriculum: Primary school teachers and students experiences. Public Health Nutr 1–12. https://doi.org/10.1017/S1368980022000386

Haryana NR, Kustiyah L, Madanijah S. 2019. Pengaruh intervensi gizi multikomponen pada guru, orang tua, dan siswa sekolah dasar terhadap pengetahuan, sikap dan ketersediaan buah sayur di rumah. Media Gizi Indonesia 14(1):44–55. https://doi.org/10.20473/mgi.v14i1.44-55

Hastoety SP, Sihadi S, Sari K, Kusumawardani N. 2017. Metaanalisis: Pencegahan obesitas pada anak sekolah. Media Penelitian dan Pengembangan Kesehatan 27(1):39–48. https://doi.org/10.22435/mpk.v27i1.4838.39-48

Juniartha IGN, Darmayanti NPE. 2020. Gambaran status gizi siswa sekolah menengah pertama (SMP) di Kuta, Bali. Coping:Community of Publishing in Nursing 8(2):133. https://doi.org/10.24843/coping.2020.v08.i02.p04

Khomsan A. 2021. Teknik Pengukuran Pengetahuan Gizi. Eds. 1. Bogor (ID): PT. Penerbit IPB Press.

Larega TSP. 2015. Effect of breakfast on the level of concentration in adolescents. J Majority 4(2):115–121.

Lathifa S, Mahmudiono T. 2020. Pengaruh media edukasi gizi berbasis web terhadap perilaku makan gizi seimbang remaja SMA Surabaya. Jurnal Media Gizi Kesmas 48–56. https://doi.org/10.20473/mgk.v9i2.2020.48-56

[MoH RI] Ministry of Health Republic of Indonesia. 2018. Hasil Riset Kesehatan Dasar Tahun 2018. Jakarta (ID): MoH RI.

Nurjhani M, Rustaman NY, Redjeki S. 2012. Kajian tentang penguasaan konsep gizi siswa SMP. Jurnal Pendidikan IPA Indonesia 1(2):149–156. https://doi.org/10.15294/jpii.v1i2.2132

Slater J, Hinds A. 2014. University student perceptions of home economics: Food and nutrition education. International Journal of Home Economics 7(2):68–80.

[UNICEF] United Nations International Children's Fund. 2020. Situasi Anak di Indonesia - Tren, Peluang, dan Tantangan dalam Memenuhi Hak-Hak Anak. Jakarta (ID): UNICEF Indonesia.

[UNICEF] United Nations International Children's Fund. 2021. Social and behaviour change communication strategy: Improving adolescent nutrition in Indonesia. UNICEF. https://www.unicef.org/indonesia/media/9221/file/Executive summary of social behavioral change communication strategy.pdf [Accessed 27th July 2022].

Wardhani DA, Nissa C, Setyaningrum YI. 2021. Peningkatan pengetahuan remaja putri melalui edukasi gizi menggunakan media whatsapp group. Jurnal Gizi 10(1):31–37. https://doi.org/10.26714/jg.10.1.2021.31-37

Warlenda SV, Desnovianti. 2018. Faktor-faktor yang berhubungan dengan praktek pemilihan makanan jajanan di sekolah dasar negeri 29 Pekanbaru Tangkerang Selatan Bukit Raya tahun 2017. Photon: Jurnal Sain dan Kesehatan 8(2):95–100. https://doi.org/10.37859/jp.v8i2.722

Yurni AF, Sinaga T. 2017. Pengaruh pendidikan gizi terhadap pengetahuan praktik membawa bekal menu seimbang anak sekolah dasar. Media Gizi Indonesia 12(2):183–190. https://doi.org/10.20473/mgi.v12i2.183-190