JURNAL MEDIA PENELITIAN DAN PENGEMBANGAN KESEHATAN
Vol 34 No 1, Maret 2024

NUTRITION EDUCATION MEDIA FOR OVERWEIGHT EARLY ADOLESCENTS: THE HEALTHY SNACKS QUARTET

Media Edukasi Gizi Untuk Remaja Awal Overweight: Kuartet Jajanan Sehat

Ferliani Fransisca Sa'pang [1]*, Tri Rejeki Andayani [2] , Muthmainah Muthmainah[3]
[1] Program Studi Ilmu Gizi Sekolah Pascasarjana, Universitas Sebelas Maret, Surakarta, Jawa Tengah, Indonesia
[2] Fakultas Psikologi, Universitas Sebelas Maret, Surakarta, Jawa Tengah, Indonesia
[3] Fakultas Kedokteran, Universitas Sebelas Maret, Surakarta, Jawa Tengah, Indonesia
*Email: ferlifs.ff@gmail.com

ABSTRAK

Remaja merupakan kelompok usia yang rentan terhadap masalah gizi seperti kelebihan berat badan dan diperkirakan pada tahun 2030 akan ada 49,5 juta remaja dengan status gizi *overweight*. Penelitian ini bertujuan untuk mengembangkan media kuartet sebagai media edukasi tentang jajanan sehat untuk remaja usia 12-15 tahun dengan status gizi overweight. Penelitian ini menggunakan metode *Research and Development* (R&D) dengan model ADDIE (*Analyze, Design, Development, Implementation, Evaluation*) untuk mengembangkan media edukasi dan pada tahap *implementation* dilakukan dengan metode *Quasy Experimental* dengan rancangan *pre post-test with a control group*. Penelitian ini melibatkan partisipasi tiga validator ahli dan 15 remaja sebagai calon pengguna. Pengumpulan data melalui wawancara dan kuesioner penilaian media. Jumlah sampel pada tahap *implementation* terdiri dari 36 remaja awal *overweight.* Analisis data menggunakan teknik deskriptif. Hasil penilaian kelayakan media oleh ahli diperoleh skor rata-rata 80% dengan kategori layak dan uji coba media pada kelompok calon pengguna diperoleh skor rata-rata 84,7% dengan kategori sangat layak. Kuartet jajanan sehat dapat digunakan sebagai media edukasi gizi jajanan sehat pada remaja usia 12-15 tahun dengan status gizi *overweight*. Uji beda skor pengetahuan jajanan sehat menggunakan analisis statistik *Wilcoxon* pada kelompok intervensi di tahap *evaluation* diperoleh nilai p=<0,001 sedangkan nilai p=0,618 pada kelompok kontrol. Hal ini menunjukkan bahwa terdapat perbedaan skor pengetahuan yang signifikan pada kelompok intervensi setelah 21 hari diberikan edukasi kuartet jajanan sehat.

Kata Kunci: edukasi, gizi, kuartet, *overweight*, remaja

ABSTRACT

Adolescents are an age group that is vulnerable to nutritional problems such as overweight and it is estimated that by 2030 there will be 49.5 million adolescents with overweight nutritional status. This study aimed to develop quartet media as an educational media about healthy snacks for adolescents aged 12-15 years with overweight nutritional status. This research used the Research and Development (R&D) method with the ADDIE model (Analyze, Design, Development, Implementation, Evaluation) to develop educational media and at the implementation stage is carried out with the Quasy Experimental method with a pre-post test with control group design. This study involved the participation of three expert validators and 15 teenagers as potential users. Data were collected through interviews and media assessment questionnaires. The number of samples at the implementation stage consisted of 36 overweight early adolescents. Data analysis using descriptive techniques. The results of the media feasibility assessment by experts obtained an average score of 80% with a feasible category and media trials in prospective user groups obtained an average score of 84.7% with a very feasible category. Healthy snacks quartet can be used as a nutrition

education about healthy snacks for adolescents aged 12-15 years with overweight. The different test of healthy snacks knowledge score using Wilcoxon statistical analysis in the intervention group at the evaluation stage obtained p-value=0.001 while the p-value=0.618 in control group. This shows that there was a significant difference in knowledge scores in the intervention group after 21 days of healthy snacks quartet education.

Keywords: adolescents, education, nutrition, overweight, quartet

INTRODUCTION

Adolescence is a developmental period characterized by physical, biological, emotional, and psychosocial changes. During this time, there is a heightened requirement for nutrients to ensure optimal nutritional intake, which is crucial for supporting the transition to adulthood. This also makes adolescents an age group that is vulnerable to nutritional problems [1]. Nutritional problems that adolescents are vulnerable to are malnutrition and overweight. By 2030 it is estimated that there will be 49.5 million cases of overweight in children and adolescents aged less than 15 years in the world [2]. The increase in the prevalence of overweight adolescents that has occurred in Indonesia over 5 years is 2.9% [3]. Makassar City is one of the cities with a high prevalence of overweight adolescents, which is 26.8% [4]. Meanwhile, recent study on the nutritional status of adolescents in Makassar City found that 41.7% of early adolescents (12-15 years old) were overweight [5]. Adolescents who are overweight, particularly between the ages of 12 and 15, experience not just physical consequences but also negative effects on their mental well-being [6]. Overweight adolescents tend to have emotional eating behavior, which is shown by loss of control over excessive eating behavior. This is experienced by 63% of adolescents worldwide and significantly impacts increasing Body Mass Index (BMI) [7].

The prevalence of obesity in adolescents can be attributed to various factors, including the intake of unhealthy foods such as junk food and sugary beverages, excessive eating habits, and lack of physical exercise due to increased exposure to electronic devices [8]. Adolescents' shifting eating habits are also influenced by their lack of knowledge about nutrition and their confidence in fast food advertisements. Adolescents are particularly susceptible to being exposed to unhealthy snacks due to the significant amount of time spent in the school setting, where readily available packaged snacks are ingested during breaks [9]. In addition, knowledge about nutrition and health, in general, obtained through parents also determines adolescents' level of understanding. Parents who equip their children with literacy and food processing skills can increase adolescents' self-efficacy and manifest in adolescents' nutritional status. Overweight adolescents have low self-efficacy, which is reflected in their knowledge and behavior of excessive consumption of unhealthy food [10].

In dealing with this issue, there is an attempt to increase adolescents' awareness of snack consumption and promote healthy lives. This strategy can also serve as a proactive approach to dealing with issues related to adolescent nutrition, particularly obesity. Enhancing adolescents' nutritional awareness through education can positively influence changes in their dietary behavior [11]. Education for adolescents demands innovative approaches to enhance their enthusiasm for learning and inquisitiveness. Utilizing games for educational purposes can enhance cognitive, social, and physical abilities as a result of the inherent challenge and the desire to win on the game. Quartets have the potential to be transformed into educational media for early adolescents. The quartet is an appropriate choice for adolescents aged 12 and above due to their enhanced cognitive ability, enabling them to engage in complicated decision-making processes [12]. Education conducted with game methods such as the use of game cards

has proven effective in improving knowledge, attitudes and behaviors in 75 adolescents related to healthy snacks at school [13]. This research aims to develop nutrition education media about healthy snacks for overweight early adolescents.

METHODS

The research used mixed methods, namely R&D and Quasy Experimental study at the implementation stage of healthy snacks quartet media. Development of healthy snacks quartet nutrition education media using the Research and Development (R&D) approach, utilizing the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation). The aim is to create and assess goods to tailor them to the specific requirements of the target audience [14]. This research has received ethical approval from the Ethics Commission of the Faculty of Medicine, Sebelas Maret University Surakarta with Letter Number 170/UN27.06.11/KEP/EC/2023. The research was conducted from September to October 2023 in Makassar City.

This study adopts the ADDIE framework due to its inherent accessibility and systematic implementation [15].

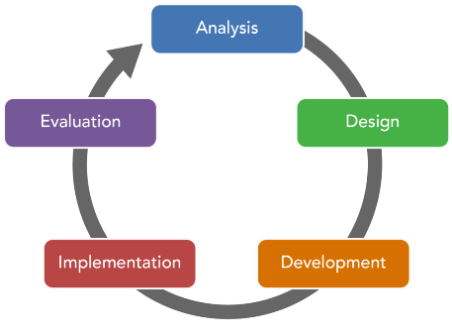

Figure 1. ADDIE Model

1. **Analyze**

   This phase is the preliminary step in media production, where an analysis is conducted to identify the demands and challenges the target audience encounters. The purpose is to generate a solution in terms of a product or media [16]. The current phase involves conducting a situation and needs analysis of educational media for early adolescents through interviews with the target group and the instructor responsible for the Student Health Effort (UKS).

2. **Design**

   During this stage, product/media design is conducted based on the specific requirements of the target audience, which consists of early adolescents (aged 12-15) with an overweight nutritional status. The current stage of product development involves the creation of learning materials focused on promoting nutritious food for adolescents. Educational media design includes creating media concepts, gathering information on nutritious snacks, and selecting the dimensions and format of media for evaluation tools. The procedure of creating nutritious snacks using educational media is now being implemented by the established design. The procedure involves creating nutritious snack graphics using the Inkscape software on a Windows platform. These graphics are then sent for printing, ensuring they truly match the predetermined design and size specifications.

3. Development

The instructional media design was subsequently evaluated by expert validators. During this stage, three specialists were involved in evaluating the viability of substance and language, and offering recommendations for enhancing media development. The three validators comprised dietitians, linguists, and media experts. Data collection using interview techniques and expert validation assessment sheets. After receiving the experts' assessment, revisions were made according to the suggestions given by the experts. Before starting the implementation stage, the instructional media passes preliminary testing on a restricted sample of potential users, specifically early adolescents who have a nutritional status characterized by being overweight. The minimum number for small group testing is 6-9 people. Therefore, in this research involved 15 samples and used a media assessment questionnaire to evaluate the effectiveness of the project [17].

The assessment questionnaire for potential consumers has 12 inquiries about the utilization, aesthetics, and functionality of the media. These questions are answered using a Likert scale, with the options being 1= strongly disagree, 2= disagree, 3= agree, and 4= highly agree. The gathered data is subsequently averaged, transformed, and evaluated to determine the category of media feasibility. The calculation of media feasibility uses the following formula [18]:

$$NP = \frac{R}{SM}\ x\ 100\%$$

Description:
NP = Percentage Value (%)
R = Score obtained
SM = Maximum score

Afterwards, the results of the validation assessment by the experts were calculated the average score with the following formula [19]:

$$x = \frac{\sum x}{n}$$

Description:
x = Mean
∑x = Number of scores
n = Number of raters

The assessment score obtained from each expert is then calculated the average value. This is done to get the results of the overall assessment of educational media from the aspects of nutrition material, language use and media design used. The average value is then interpreted based on the eligibility criteria in table 1 as follows [20]:

Table 1. Media Feasibility Criteria

Percentage	Interpretation
81-100%	Highly Feasible
61-80%	Quite Feasible
41-60%	Feasible
21-40%	Not Feasible
0-20%	Highly Unfeasible

4. Implementation

The implementation stage of the healthy snack's quartet media uses a quasy experiment research method with a control group design. The sample selection at this stage was carried out by purposive sampling according to the inclusion

criteria determined by the researcher, namely adolescents aged 12-15 years, overweight nutritional status, not on a special diet under the supervision of health workers and not taking drugs that affect hormones. Exclusion criteria in this study are adolescents with degenerative diseases, taking drugs that affect hormones, are on a certain diet with the supervision of health workers and adolescents who have dropped out of school. The population in this study were all overweight adolescents in Makassar City. The sample size was determined based on Gay and Diehl's theory in simple experimental research of 15-30 subjects [21]. The selected sample was 36 adolescents from two schools with the highest prevalence of overweight adolescents in Makassar City, namely SMPN 13 and SMPN 33. The sample was divided into two groups: the control group receiving lecture method educational intervention and the intervention group receiving healthy snacks quartet education for 21 days. Card game education carried out 3 times can increase students' knowledge up to 74.64% so with education carried out for 21 days it is hoped that it can influence the level of student's knowledge about healthy snacks [22].

5. Evaluation

The evaluation stage was carried out by analyzing the difference in knowledge scores of healthy snacks for adolescents before and after the intervention for 21 days. The knowledge score of adolescents is known based on the results of filling out a valid and reliable healthy snacks knowledge questionnaire. The difference test on adolescents' knowledge was conducted using Wilcoxon Signed Rank Test nonparametric statistical analysis with SPSS 27.0 for Windows application.

RESULT

The outcome of this research is a quartet of nutrition education media focused on healthy snacks, designed for adolescents between the ages of 12 and 15 with an overweight nutritional status. This educational tool aims to enhance their understanding of healthy snacks. The subsequent outcomes of media development, according to the ADDIE model, are outlined below:

1. Analyze

The needs analysis of educational media was conducted on 12 adolescents and six teachers responsible for UKS, who oversee health education activities at school. The results of interviews with students showed that the health education they had received used PowerPoint media with the lecture approach. Students feel bored with the education provided through the lecture style, and the material presented is also ineffective due to decreasing student engagement in the material being explained. Teacher interviews revealed a desire for nutrition education among students, particularly regarding making healthier snack choices. This is due to an observed increase in obesity rates among students, who have a preference for consuming fast food. Furthermore, it is important to provide adolescents with information through attractive media related to the tendency of adolescents to become easily bored.

"Health lectures are often given at school but I get bored listening to them because they are not interesting." (Interview with student)

"If you want to lecture on health, if possible, you can also play while playing so that you don't get sleepy." (Interview with student)

"Adolescents are frequently given health education, but it usually takes the form of lectures or PowerPoint presentations, which can quickly bore them. It is

preferable to teach adolescents through interactive media so they won't become bored and can learn valuable lessons as well." (Interview with UKS Teacher of SMPN 33 Makassar)

"The kids nowadays like to snack carelessly, don't pay attention to cleanliness, and prefer instant snacks because they are quick to make and get full quickly too." (Interview with UKS Teacher of SMPN 13 Makassar)

2. Design

According to the excerpts from the needs analysis interview, the researcher's approach involves creating instructional media for healthy snacks that are engaging and captivating. The aim is to stimulate curiosity and prevent students from feeling pressured to learn the offered material. The media created is a quartet that is implemented using a collaborative gaming approach.

The researchers developed an educational media called the "Healthy Snacks Quartet" which includes a set of 32 cards, one instruction card and a box of the cards. The development of this medium is conducted according to the objectives determined by the analysis of adolescent requirements, which is as a stimulating instrument for nutrition education and indirectly as a means for spreading information about healthy snacks. During this phase, three primary tasks were completed: examining and developing educational resources, creating instructional media using the Inkscape software, and constructing an evaluation tool for a quartet of nutritious snacks. The paper utilized was Art paper. The title card has a font size of 12 pt, while the sub-title card has a font size of 9 pt, both using the Paper notes font. At this step, the researcher designed the procedures for the healthy food quartet game and the assessment instruments for validation, which will be implemented in the next stage. Figures 2 and 3 below are the overall design of the Healthy Snacks Quartet educational media.

Figure 2. Card Back Design, Game Instruction Card and Healthy Snack Quartet Box

Figure 3. The Healthy Snack Quartet's Design

3. Development

At this stage of development, media validation is carried out by experts with the following results:

a. Media Validation by Nutrition Material Expert, Linguist, and Media Expert

The assessment score from the experts shown in Table 2 obtained a value of 80% so the healthy snacks quartet nutrition education media is suitable for use as educational media in early adolescent.

Table 2. Results of Validation Media by Experts

Experts	Percentage	Interpretation
Nutrition Expert	87,5%	Highly Feasible
Linguist	70%	Quite Feasible
Media Expert	82,7%	Highly Feasible
Total	**80%**	Quite Feasible

The results of the media feasibility assessment from the aspect of language use obtained an assessment score of 70% with a feasible category but with revisions. The adjustments provided by language experts for the healthy snack's quartet media are as follows:

1) Each number in the game instructions ends with a full stop (.) instead of a semicolon (;).
2) The use of verbs with prefixes and the use of prepositions that are still not appropriate.
3) Improving the narration on the game instructions card
4) The use of the word "kedaluarsa" is not standardized, which is correct and standardized "kedaluwarsa".
5) The card group of healthy snacks type point 2 should be "penganan" and point 3 should be clarified.

b. Media Trial Result

Media trials of healthy snacks quartets were conducted on 15 early adolescents. Table 5 shows the evaluation of the media trial by the target user group obtained a score of 84.8% with a very feasible category and without suggestions, indicating that the healthy snack quartet media can be effectively utilized among adolescents aged 12-15 years.

Table 5. Media Trial Results on Potential Users

Question Number	Total Maximum Score	Total Actual Score	Percentage (%)
1	60	49	81,7
2	60	51	85
3	60	52	86,7
4	60	50	83,3
5	60	51	85
6	60	51	85
7	60	49	81,7
8	60	52	86,7
9	60	49	81,7
10	60	53	88,3
11	60	52	86,7
12	60	52	86,7
Total	**720**	**611**	**84,8**

4. Implementation

Table 6 shows the nutrition education program using healthy snack quartet media was implemented on 36 early adolescents (12-15 years old) who were overweight for 21 days. The control group are adolescents who often receive health education, while the intervention group are adolescents who rarely receive health education.

The group consisted mostly of 26 male adolescents (72.2%). Subjects in the study ranged from 12 years old to 14 years old. Most of the participant aged 12 years old (47,2%) with 41.7% of adolescents lacking a family history of obesity.

Table 6. Subject Characteristics

Characteristics	Control (n=18)		Intervention (n=18)		Total (n=36)	
	n	%	n	%	n	%
Sex						
Boys	15	83,3	11	61,1	26	72,2
Girls	3	16,7	7	38,9	10	27,8
Age						
12 years	15	83,3	2	11,1	17	47,2
13 years	3	16,7	11	61,1	14	38,9
14 years	0	0	5	27,8	5	13,9
History of Obesity						
Father	5	27,8	8	44,4	13	36,1
Mother	5	27,8	2	11,1	7	19,4
Father and mother	0	0	1	5,6	1	2,8
None	8	44,4	7	38,9	15	41,7

Table 7. Subject's Healthy Snacks Knowledge

Knowledge Criteria	Control (n=18)				Intervention (n=18)			
	Before		After		Before		After	
	n	%	n	%	n	%	n	%
Healthy Snacks Knowledge								
Low (score < 60)	0	0	0	0	2	11,1	0	0
Moderate (score 60-75)	7	38,9	6	33,3	10	55,6	2	11,1
Good (score >75)	11	61,1	12	66,7	6	33,3	16	88,9

The information on healthy snacks related to the execution of the Healthy Snacks Quartet educational media is categorized into three levels: low, medium, and high. Table 7 shows that before receiving instruction, adolescents in the intervention group had a knowledge level of 55.6%, defined as moderate knowledge. After receiving education on healthy snacks for 21 days, their knowledge level increased to 88.9% classified as good knowledge of healthy snacks.

5. Evaluation

The evaluation phase of this study was to analyze the impact of nutrition education through healthy snack quartets on overweight early adolescents by measuring their knowledge scores regarding healthy snacks.

Table 8. Results of Analysis of Differences in Knowledge of Healthy Snacks Before and After Intervention

Groups	Mean ± SD	*p*
Control		
Pre-test	81,05 ± 9,18	0,618
Post-test	82,1 ± 9,23	
Intervention		
Pre-test	71,16 ± 12,72	<0,001
Post-test	84,78 ± 6,76	

Wilcoxon analysis result in Table 8 showed a significant difference in the healthy snacks knowledge score of the intervention group ($p<0.001$) compared to the control group ($p=0.618$) after 21 days of implementing the healthy snacks quartet. Adolescents who received education on healthy snacks through healthy snacks quartets for 21 days showed a notable increase in knowledge compared to the control group, which did not experience a significant gain in knowledge.

DISCUSSION

According to the outcomes of product trials conducted on adolescent user groups aged 12-15 years during the previous development stage, it is evident that the healthy snacks quartet educational media is highly suitable for use as a nutritional education tool. It applies a fun gaming approach, uses easily understood language, and features images matching each card's information. The dimensions of the card, the color palette used, the typography, and the legibility of the attractive lettering are all conducive to an enjoyable and engaging gameplay experience.The basis for choosing quartet media in this study is that quartet media is a visual media that is easily accessible used and does not depend on gadgets. The excessive use of electronic devices among school-aged children has a detrimental effect on their ability to concentrate during learning activities and affects the development of their social ability skills [23]. Quartets have several advantages as educational media because quartets consist of elements of images and writings that are presented attractively. Additionally, quartets are designed as interactive games, fostering a competitive atmosphere among participants. Moreover, quartets can

be utilized in various settings, allowing for an effortless integration of learning and play. At the bottom of the picture are four members of the card's theme group and the writing with special marks is a description of the picture on the card [24].

The quartet in this study consisted of 32 cards with eight sub-themes on healthy snacks. The game was conducted in groups of three to four participants. The player who can collect the complete pair of cards is considered the winner. Education conducted with quartet media on adolescents in schools has a positive impact because it forms healthy competition, establishes communication between fun peer players and also trains adolescents' imagination because there is stimulation of the sense of sight in the education process through quartets. Furthermore, adolescents aged 12-15 years have better cognitive abilities so that they can understand information concretely in quartets through attractively presented images [25]. At the media development stage, product trials were conducted on 15 early adolescents with overweight nutritional status and obtained a media feasibility score of 84.8% so that the quartet media is a valid educational media to be used at the implementation stage.

In the intervention group, the percentage of adolescents with a good understanding of healthy snacks increased from 33.3% before education to 88.9% after receiving education through quartet gaming media. It is crucial to educate adolescents about nutritious snacks at an early age before they transition into adulthood. Adolescents are a diverse population with varying needs due to the transition from childhood to adulthood, experiencing physical, sexual, psychological, and social changes simultaneously, necessitating adequate nutritional knowledge [26].

Healthy snacks education also has a significant impact on changes in adolescent healthy snacks knowledge scores in the intervention group with a significant value of <0.001 ($p<0.05$) while in the control group there is no significant difference in knowledge scores with a significance value of 0.618 ($p>0.05$). Rahmah (2019) conducted research indicating that use of quartet educational media can enhance nutritional awareness in research participants through two interventions [27]. The Healthy Snacks Quartet is an educational media card that provides information on the introduction and selection of healthy snacks. It includes visuals that correspond to the theme on each card, focusing on color, shape, and texture. Quartet media helps learn as it encourages students to actively engage with knowledge through visual, tactile, textual, and auditory methods presented on the cards [28].

CONCLUSION

The development of nutrition education media for overweight early adolescents involves a needs analysis to determine the specific requirements. It has been recognized that adolescents require engaging educational media that enhances their motivation to learn, and is enjoyable, to stimulate their curiosity regarding healthy snacks. Following the researchers' design of the media, a media feasibility assessment was conducted by experts specializing in nutrition, language, and media. The assessment determined that the healthy snacks quartet media is suitable for use among adolescents aged 12-15 years, with an effectiveness rate of 80%. The media feasibility assessment was then also carried out on a group of prospective users, namely 15 adolescents aged 12-15 years, and it obtained a value of 84.8% in the very feasible category. Therefore, it can be assumed that the quartet of healthy snacks media can serve as an educational tool for healthy snacks for adolescents between the ages of 12 and 15 who have an overweight nutritional status. This is supported by the results of the Wilcoxon analysis at the evaluation stage where there is a significant difference in the knowledge score of healthy snacks in the intervention group with a p-value of <0.001 so it can be concluded that education with The Healthy Snacks Quartets in overweight adolescents has a significant impact on knowledge about healthy snacks. Healthy snacks quartet is effective for

educating early adolescents with overweight nutritional status. However, it is essential to use a combination of treatments to handle overweight nutrition in adolescents and prevent it from continuing to obesity.

REFERENCES

[1] A. Nuraini and E. A. Murbawani, “Hubungan Antara Ketebalan Lemak Abdominal Dan Kadar Serum High Sensitivity C-Reactive Protein (Hs-Crp) Pada Remaja,” J. Nutr. Coll., vol. 8, no. 2, p. 81, 2019, doi: 10.14710/jnc.v8i2.23817.

[2] WHO, "Obesity and overweight," Medicine (Spain), 2020. https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight#cms.

[3] Kementrian Kesehatan Republik Indonesia/Kemenkes RI, “Laporan_Nasional_RKD2018_FINAL.pdf,” Badan Penelitian dan Pengembangan Kesehatan. p. 674, 2018, [Online]. Available: http://labdata.litbang.kemkes.go.id/images/download/laporan/RKD/2018/Laporan_Nasional_RKD2018_FINAL.pdf.

[4] Lembaga Penelitian Badan Penelitian dan Pengembangan Kesehatan, Laporan Provinsi Sulawesi Selatan Riskesdas 2018, vol. 110, no. 9. 2018.

[5] N. Mufliha, “Hubungan Gaya Pengasuhan Orang Tua Dengan Kejadian Berat Badan Lebih Pada Remaja di SMPN 3 Makassar,” Universitas Hasanuddin, 2022.

[6] L. J. Förster et al., "Mental health in children and adolescents with overweight or obesity," BMC Public Health, vol. 23, no. 1, pp. 1–11, 2023, doi: 10.1186/s12889-023-15032-z.

[7] L. H. Shriver et al., "Longitudinal associations between emotion regulation and adiposity in late adolescence: indirect effects through eating behaviors," Nutrients, vol. 11, no. 3, 2019, doi: 10.3390/nu11030517.

[8] P. A. Pratama, E. Zulkarnain, and M. Ririanty, “Efektivitas media promosi ‘ Piring Makanku ’ pedoman gizi seimbang sebagai panduan sekali makan,” e-Jurnal Pustaka Kesehat., vol. 6, no. 1, pp. 53–59, 2018, [Online]. Available: http://jurnal.unej.ac.id/index.php/JPK/article/view/6767vvv.

[9] A. P. W. Anggraeni, N. Widyastuti, R. Purwanti, and D. Y. Fitranti, “Perbedaan konsumsi makanan jajanan kemasan mengandung monosodium glutamat dan status gizi pada remaja urban dan sub urban di Kabupaten Semarang,” Darussalam Nutr. J., vol. 4, no. 2, p. 64, 2020, doi: 10.21111/dnj.v4i2.3980.

[10] J. H. Rachel, Brown; Jamie A., Seabrook, Saverio, Stranges; Andrew F. Clark and and J. A. G. Colleen O'Connor, Sean Doherty, "Examining the Correlates of Adolescent Food and Nutrition Knowledge," Nutrients, vol. 13, no. 6, pp. 15–16, 2021, doi: 10.3390/nu13062044.

[11] H. Hannanti, Ibnu Malkan Bakhrul Ilmi, and Muh. Nur Hasan Syah, “Pengaruh Edukasi Gizi Melalui Komik Dan Leaflet Terhadap Peningkatan Pengetahuan Terkait Anemia Pada Remaja Putri Di Sma Negeri 14 Jakarta,” J. Gizi Dan Kesehat., vol. 13, no. 1, pp. 40–53, 2021, doi: 10.35473/jgk.v13i1.85.

[12] M. Santoso, “Rancang Bangun Game Edukatif Duta Indonesia (Dadu Dan Peta) Indonesia,” Konstr. J. Pendidik. dan Pembelajaran, vol. 11, no. 1, pp. 20–31, 2019, doi: 10.35457/konstruk.v11i1.663.

[13] T. Utami and A. Nirwana, “Perancangan Kartu Kuartet sebagai Media Pengenalan Dasar Tanaman Obat dengan Teknik Ilustrasi Botani untuk Remaja Usia 12-15 Tahun,” Pros. Semin. Nas. Desain Komun. Vis., vol. 1, pp. 37–49, 2021, doi: 10.33479/sndkv.v1i.207.

[14] Sugiyono, Metode Penelitian Kuantitatif, Kualitatif dan R&D. Bandung: Alfabeta, 2021.

[15] N. D. Usta and E. T. Güntepe, "Pre-Service Teachers' Material Development Process Based on the ADDIE Model: E-book Design," J. Educ. Train. Stud., vol. 5, no. 12, p. 199, 2017, doi: 10.11114/jets.v5i12.2820.

[16] S. Gustiani, "Research and Development (R&D) Method as a Model Design in Educational Research and its Alternatives," Holistics J., vol. 11, no. 2, pp. 12–22, 2019.

[17] T. A. Ulfah, E. A. Wahyuni, and M. E. Nurtamam, “Pengembangan Media Pembelajaran

Permainan Satuan Panjang," Pros. Semin. Nas. Mat. dan Pembelajarannya. Jur. Mat., vol. 3, no. 3, pp. 955–961, 2016.

[18] H. Handayani, F. G. Putra, and Y. Yetri, "Pengembangan Media Pembelajaran Berbasis Macromedia Flash," J. Tatsqif, vol. 16, no. 2, pp. 186–203, 2018, doi: 10.20414/jtq.v16i2.160.

[19] T. A. J. Wulandari, A. M. Sibuea, and S. Siagian, "Pengembangan Media Pembelajaran Berbasis Multimedia Interaktif Pada Mata Pelajaran Biologi," J. Teknol. Inf. Komun. Dalam Pendidik., vol. 5, no. 1, pp. 75–86, 2019, doi: 10.24114/jtikp.v5i1.12524.

[20] R. Purba, M. Taufik, and U. Jamaludin, "Pengembangan Media Pembelajaran Liveworksheets Interaktif Dalam Meningkatkan Hasil Belajar Ips," Pendas J. Ilm. Pendidik. Dasar, vol. 7, no. 2, pp. 336–348, 2022, doi: 10.23969/jp.v7i2.6800.

[21] Amirullah, Metode Penelitian Manajemen. Malang: Bayumedia Publishing, 2015.

[22] K. Sutriyanto, A. S. Raksanagara, and M. Wijaya, "Pengaruh Permainan Kartu Kasugi Terhadap Peningkatan Pengetahuan Perilaku Hidup Bersih Dan Sehat Pada Siswa," J. Sist. Kesehat., vol. 1, no. 4, pp. 193–200, 2017, doi: 10.24198/jsk.v1i4.12828.

[23] N. I. M. Agustina, E. A. Ismaya, and I. A. Pratiwi, "Dampak Penggunaan Gadget Terhadap Karakter Peduli Sosial Anak," J. Basicedu, vol. 6, no. 2, pp. 2547–2555, 2022, doi: 10.31004/basicedu.v6i2.2465.

[24] Karsono, Y. Sujana, J. Daryanto, and N. Yustinus, "Pada Siswa Sekolah Dasar," Mimb. Sekol. Dasar, vol. 1, no. April, pp. 43–49, 2014.

[25] W. Priawantiputri, M. Rahmat, and A. I. Purnawan, "Efektivitas Pendidikan Gizi dengan Media Kartu Edukasi Gizi terhadap Peningkatan Pengetahuan, Sikap dan Perilaku Makanan Jajanan Anak Sekolah Dasar," J. Kesehat., vol. 10, no. 3, p. 374, 2019, doi: 10.26630/jk.v10i3.1469.

[26] Makhrajani Majid, Suherna, and Haniarti, "Perbedaan Tingkat Pengetahuan Gizi, Body Image, Asupan Energi Dan Status Gizi Pada Mahasiswa Gizi Dan Non Gizi Fakultas Ilmu Kesehatan Universitas Muhammadiyah Parepare," J. Ilm. Mns. Dan Kesehat., vol. 1, no. 1, pp. 24–33, 2018, doi: 10.31850/makes.v1i1.99.

[27] F. Rahmah, A. Noviardhi, S. Prihatin, C. Hunandar, and A. Y. Rahmawati, "Pengaruh Pendidikan Gizi Dengan Media Kartu Kuartet Terhadap Kebiasaan Sarapan, Asupan Energi Dan Protein Sarapan, Dan Pengetahuan Gizi Tentang Sarapan Di Sdn Pedurungan Kidul 01 Dan 02 Kota Semarang," J. Ris. Gizi, vol. 7, no. 1, p. 48, 2019, doi: 10.31983/jrg.v7i1.4368.

[28] Khairunnisah, "Penggunaan Media Kartu Sebagai Strategi Dalam Pembelajaran Membaca Permulaan: Studi Kasus di Madrasah Ibtidaiyah Negeri Rukoh, Banda Aceh," J. Pencerahan, vol. 9, no. 2, pp. 66–82, 2015.