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Original Article

Development of Stunting Prevention Education Videos through Balanced Nutrition Arrangements for Adolescents

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ABSTRACT

Stunting in children contributes to adolescent nutrition problems because adolescent nutrition affects the health quality of the next generation. Adolescent malnutrition, such as iron and protein deficiencies, impacts reproductive health and increases the risk of giving birth to stunted children. Therefore, it is important to carry out adolescent nutritional interventions to prevent stunting as early as possible. This research aims to produce educational videos that are feasible and effective in increasing knowledge about stunting and balanced nutrition with the target group of adolescents. This research is a Development Research using the ADDIE (Analysis, Design, Development, Implementation, Evaluation) development model. The data analysis applied a one-to-one test and a small-group test. The one-to-one test obtained a percentage of 89% indicating that the video design is in a good category with revision. The small-group test reached 92% indicating that it is categorized as very good but some suggestions for improvement are recommended. The suggested revision is not fundamental because it is only related to the selection of vocabulary to be understood better by the target. Another recommendation is the background musical illustrations that possibly distract the targets' attention. After some improvements, it is recommended that this educational video be disseminated through social media platforms such as WhatsApp Group or Instagram so that more teenagers can access it.

Keywords: *stunting prevention; educational videos; adolescents.*

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INTRODUCTION

Indonesia has had serious nutrition problems which potentially impacts the quality decline of human resources.[1] Adolescents are a nutrient-prone group because they are in a rapid growth and development period. Data from the Ministry of Health of Indonesia shows that the prevalence of chronic energy deficiency (SEZ) in adolescents aged 10-18 years is still quite high, reaching 15.9% in 2020. In addition, the prevalence of adolescent obesity also increased from 8.1% in 2013 to 11.9% in 2020. [2] Stunting is not a nutritional problem for adolescents but the Triple Burden Malnutrition circle (double burden of malnutrition: Stunting – obesity – anemia), shows that adolescents are upstream of the problem circle. If anemia is prevented before pregnancy occurs, it will reduce the risk of giving birth to stunted babies. If the problem of stunting can be prevented before the baby is born, then the increase in obesity problems in children will be suppressed. Obesity and anemia are non-incidence. If the problem of anemia can be suppressed, it will be followed by a decrease in obesity problems.[3] In addition, eating disorders also often occur in teenagers. According to the American Academy of Child and Adolescent Psychiatry (AACAP), about 0.5%-1% of adolescent girls suffer from anorexia nervosa, while about 1%-2% of adolescent girls suffer from bulimia nervosa.[4]

This adolescent nutrition problem needs serious attention. Efforts to maintain adolescent health must aim to prepare them to become healthy and productive adults, both socially and economically.[4] Maintaining a healthy body must be learned from an early age.[5] Effective and targeted nutrition education is needed to help adolescents develop healthy diets and

active lifestyles.

Good nutrition education can help adolescents acknowledge the importance of understanding their nutrition problems. One effective way to deliver nutrition education to adolescents is through educational videos. Adolescents tend to be more interested and actively participate in learning delivered through videos than conventional methods. Additionally, the use of digital media also tends to increase among teenagers. According to a Pew Research Association report, 95% of teens have access to smartphones and spend an average of 7.5 hours per day interacting through digital media. Therefore, educational video development for adolescents is very relevant and important. Mulyadi et al. Reported that the knowledge of the sample has increased after being given health education through video media. [5] This happens because video media can display moving images, writing, and sound compared to other media. Thus, it can attract the teenagers'attention.[6]

Educational videos can be used as an appropriate tool to deliver health education materials. Video media displays moving images, writing, and sound that can attract attention so that the delivery of health messages to the public can be more effective compared to other media. [7]. Referring to the presentation of this problem, this current research is carried out to make appropriate and effective educational videos to increase adolescents' knowledge so that they pay more attention to their health problems.

METHODS

This research applied research and development (R&D) method. R&D is a research and development method used to produce a specific product and test the product's effectiveness. The model used in this R&D is the ADDIE development model which is widely used to design learning systems with a wide variety of applications. The ADDIE model is also considered the most suitable for the product developed, namely educational videos. This model consists of five steps as presented in Table 1. ADDIE is effectively used as one of the learning material development models. ADDIE's stages are also very systematic to produce ready-to-use products. They also lead to fulfilling product development testing standards.[8]

Table 1. Stages of Activities in the ADDIE Method

Stages	Activities	Notes
1	Analysis	At this stage, four activities are carried out as follows: a) Analysis of the community's need for knowledge about balanced nutrition in adolescents; b) Discussions with nutritionists; c) Analysis development preparation by looking for source references; and d) Identifying media that have been used in previous nutrition education
2	Design	At this stage, an Outline of Media Content and Material Description was developed, as well as storyboarding with reference books and nutrition knowledge journals
3	Development	At this stage, learning video media with the animation concept was developed. The development of learning animation videos started with characters, coloring, animating, voice-over, composting, and then a preview and several video editing processes to produce the desired video media. At this stage, learning video media with the animation concept was developed. The development of learning animation videos starts with characters, coloring, animating, voice-over, composting, and then a preview and several video editing processes to produce the desired video media
4	Implementation	At this stage, the media that had been made according to the concept was then tested with the one-to-one test, the small group test, and the field test
5	Evaluation	At this stage, the researcher conducted an evaluation, aiming to improve or develop the product

Several advantages of the ADDIE model in learning are recognized as follows: 1) Systematic: The ADDIE model uses a systematic approach to learning development. 2) Flexibility: ADDIE models can be used for varied situations. 3) Focus on evidence: The ADDIE model emphasizes evidence in the learning process. 4) Evaluation: The ADDIE model emphasizes evaluation in the learning process. 5) Easy to learn: The ADDIE model has a simple structure and is easy to learn. 6) Student-centered: The ADDIE model is student-centered cooperatively, and 7) Suitable for problem-solving: The ADDIE model is suitable for addressing students' and teachers' problems in the teaching and learning process. Another model is Dick and Carey Model. This model is very detailed but unsuitable for this research: 1. Rigid, because every step has been determined. 2. Not suitable for large-scale e-learning.[9] A model of ASSURE has several benefits and limitations. Teachers can develop their teaching model by applying the ASSURE model. The learning component is complete, and the learner can be involved in preparation for learning. On the other hand, Prawiradilaga in Kustandi suggested that this model has limitations, namely it does not measure the impact on the learning process because the supra system component does not support it. There is an additional task from a teacher and special efforts are needed in directing students to prepare for learning.[10]

The stages of this research are carried out starting from designing educational videos to validating material and media experts by a team of experts or experts and small group trials. The sample was selected purposively. This sample was carefully chosen because it had almost the same characteristics as the target population for the stunting prevention implementation of this education video (target audience), regarding their age, gender, and educational background.[7]

In this development research, the validation of video content is carried out by three experts, namely: 1) **A material expert**. The material expert determined in this study is a Nutritionist who is an academic staff from the Medan Ministry of Health Polytechnic; 2) **A health Promotion Expert**. The Health Promotion Expert determined in this study is a Health Promotion expert who is a lecturer at the Health Promotion Study Program of the Malang Ministry of Health Polytechnic; and 3) **A media expert.** The media expert determined in this study is a media expert who is a lecturer at the Denpasar Ministry of Health Polytechnic, as the facilitator of the Communication, Education, and Nutrition Training course. Nutrition Counseling and Community Nutrition Intervention Program. The following is the video-link being assessed: http://gg.gg/video_edukasigizi_remaja

Next, the assessment from the validators is converted into a percentage to determine the feasibility of the developed media. The eligibility assessment criteria can be seen in Table 2.

Table 2. Eligibility Assessment Criteria

Categories Assessment	Percentage %
Highly appropriate (HA)	81 – 100
Appropriate (A)	61 – 80
Quite appropriate (QA)	41 – 60
Less appropriate (LA)	21 – 40
Very Inappropriate (VI)	0 – 20

Adapted from: Sugiono, 2016

Samples for small group trials were taken Purposively at SMP Negeri 2 Tabanan The minimum number of samples taken was 40 students.

RESULTS

1. Expert validation results

Three competent people in their fields, namely nutrition, media, and health promotion, were asked for their opinions on the design of educational videos. The results of the assessment are presented in Table 3.

Table 3 Validator Assessment of Video Media Design

Aspects	Assessed	Validator Assessment			Average	Percent Value	Conclusion
		1	2	3			
Display	Accuracy of design appearance	5	5	2	4.00	80.00	A
	Accuracy of color selection (*background*)	4	5	4	4.33	86.67	HA
	Color and background matching	4	5	4	4.33	86.67	HA
	Suitability of image selection	4	5	2	3.67	73.33	A
	Clarity of text size	4	5	4	4.33	86.67	HA
	Image size clarity	4	5	2	3.67	73.33	A
Material Quality	Clarity of material content	5	5	3	4.33	86.67	HA
	Accuracy of material selection	5	5	2	4.00	80.00	A
	Interesting material	4	5	2	3.67	73.33	A
	Clarity of material order	4	5	3	4.00	80.00	A
	Ease of understanding the material	4	5	2	3.67	73.33	L
Language	Suitability of good and easy-to-understand use of Indonesian	4	5	5	4.67	93.33	SL
	The language used is simple, straightforward and easy to understand	5	5	5	5.00	100.00	SL

Note : HA= Highly appropriate; A= Appropriate

As presented in Table 3 from the average results of the assessment by the three validators, it can be concluded: 1) Indicators of the characteristics that are assessed as Highly appropriate (HA) which include: (a) Accuracy of color selection (background), (b) Suitability of color and background, and (c) Clarity of writing size. 2) The indicators that are considered Appropriate (A) are (a) Accuracy of the design display, (b) Suitability of image selection, and (c) Clarity of image size; and 3) The indicator of the quality of the material that is considered Highly appropriate (HA) is only the clarity of the content of the material. Meanwhile, what is considered appropriate (A) includes indicators: (a) Accuracy of material selection, (b) Attractiveness of material, (c) Clarity of material order, (d) Ease of understanding of material. Furthermore, for the indicators of the language aspect, all are considered Highly appropriate (HA), namely: (a) Suitability of the use of good and easy-to-understand Indonesian and (b) The language used is simple, straightforward, and easy to understand.

Table 4. Validator criticism and suggestions

Validator	Criticism	Suggestions
1	There is no connecting narrative between videos 1,2 and 3 yet	Create a narrative that connects between videos 1,2 and 3
	There are no eating recommendations for teenagers to meet their energy needs, protein, etc., according to video 1 outlined on my plate.	Make a recommendation that teenagers need to eat a few grams of rice, side dishes, and vegetables according to the contents of their plate to meet the needs of Energy, protein, etc according to video 1
	A little for the breakfast editorial	Best Written Breakfast
2	In the Balanced Nutrition Guidelines Video on writing Sub Titles, the choice of letters is not clear (for example, the writing of Pilar)	Choose a Font/Letter for a more readable subtitle. Overall it is good and can be used in field trials.
3	Images & slides don't match the sound	The information conveyed by voice must also be visualized in slides with pictures, not just writing

As presented in Table 4 related to the assessment of the educational videos developed, validators 1 and 3 recommended the field trial on the video could be conducted after revising/editing the video as suggested. S/he rated it as Appropriate (A). Validator 2 recommended the field trial on the video could be conducted without preliminary revision. S/he rated it as Appropriate (A).

2. Results of small group assessments

The video trial was carried out with a small group at SMP N2 Tabanan. The 40 students who participated in this trial were eighth graders, consisting of 20 people (50%) males and 20 people (50%) females with an average age of 13.95 + 0.815 years. The small group responses to the full adolescent nutrition education video media are presented in Table 5.

Table 5. Distribution of Sample Responses to Adolescent Nutrition Education Video Media

Questions	Respons							
	Strongly Agree		Agree		Disagree		Strongly disagree	
	n	%	n	%	n	%	n	%
1. Video media is more appropriate for education about adolescent nutrition	10	25.0	30	75.0				
2. Video media has made me better able to understand the material about adolescent nutrition	12	30.0	28	70.0				
3. The terms/vocabulary used in educational videos are easy to understand.	9	22.5	29	72.5	2	5.0		
4. Compared to print media or audio recordings, learning using video is more fun	12	30.0	27	67.5	1	2.5		
5. The content of the adolescent nutrition education message is easier for me to receive after learning to use videos	7	17.5	31	77.5	2	5.0		
6. There are no difficult terms I found in the teen nutrition education video.	5	12.5	30	75.0	4	10.0	1	2.5
7. The appearance of adolescent nutrition education videos is generally interesting to watch.	10	25.0	29	72.5	1	2.5		

Sample responses to adolescent educational video media as presented in Table 5 show that most respondents (>70%) agreed that this video media is used as an adolescent educational media. There are few respondents to be considered. Some <15% of respondents suggested the choice of vocabulary used, especially the difficult terms for them to understand. The smallest number of respondents or 5% of respondents suggested videos be made in "slang" which is not standard but is very popular among teenagers. The assessment of the youth nutrition education video media is presented in Table 6.

Table 6. Distribution of Sample Assessment on Adolescent Nutrition Education Video Media

Questions	Answers			
	No		Yes	
	n	%	n	%
1. Adolescent nutrition education videos aroused my curiosity about adolescent nutrition materials	2	5.0	38	95.0
2. I felt the benefits of learning adolescent nutrition materials in daily life after watching adolescent nutrition education videos	4	10.0	36	90.0
3. This educational video can give me the motivation to implement a balanced nutritional diet	3	7.5	37	92.5
4. The use of music does not interfere with the explanation of the material	8	20.0	32	80.0
5. The color design used in this educational video is interesting to see	2	5.0	38	95.0
6. The illustrations of the images displayed are following the content of the material explained in the educational video	3	7.5	37	92.5
7. The font size used in the educational video is clear to read	1	2.5	39	97.5
8. The placement of images and text is appropriate and easy to observe	2	5.0	38	95.0

As presented in Table 6, almost all samples (>90%) assessed a positive response to this adolescent educational video. There are only a few notes, namely the use of music as a video background that does not correspond to the explanation of the material.

DISCUSSION

The development of educational videos is inseparable from the role of multimedia in producing information in the form of a combination of images, sounds, and animations so that it greatly facilitates the delivery of messages. Generally, multimedia is defined as a combination of text, image, graphic arts, animation, sound, and video.[11]

Multimedia-based educational videos are effective in conveying nutritional information to adolescents because videos combine visual and auditory elements. Teens with visual learning styles can more easily grasp concepts through engaging infographics, animations, and illustrations, while those who are more auditory will find it helpful with clear narratives and relevant background music. Combining these two elements has been recognized as improving understanding and information retention in adolescents with a limited attention span.[12] In addition, delivering messages in the form of videos makes the material more engaging and easy to understand.

Social media platforms such as WhatsApp and Instagram can be used effectively to exploit the spread of this educational content. Instagram, specifically with its Reels and Stories features, allows for the distribution of short, interactive, and accessible videos, and can reach a wider audience through content promotion algorithms.[2] Thus, this approach is effective both in terms of delivery methods and in expanding the reach of education through media familiar to adolescents.

If designed properly, videos can not only be seen as film productions but also serve as educational means in the form of simulations and animations that have high graphic art value in their presentation so that they can arouse interest in learning.[4]

From the search results of five databases using 27 keywords to measure the effectiveness of video learning among students, it can be concluded that adding videos to classical learning results in stronger learning benefits. Although some experimental biases influenced the results, the findings of this literature review show that educational videos will not harm and even improve student learning outcomes.[13] It must be admitted that the impact of video use on learning outcomes varies between target groups. The video design will be more effective because of considering the factors of the target's social status[14]; previous knowledge of the targets[15]; social contacts of each target.[16] and communication skills.[17] If carefully observed, these factors are identified to increase the effectiveness of video as a means of education. In addition, differences in individual learning outcomes are fundamentally influenced by how information is processed. Those who have a visual learning style will benefit more than audio learners. The study results show that kinesthetic learners also benefit from educational videos as long as the video shows procedures or experiments that are the learning topic. Since most individuals have more than one learning style preference, video use as an educational medium can still be an alternative solution to improve learning outcomes.[18]

The educational video developed in this study took the theme "Stunting prevention through the management of a balanced nutritional menu" with the target adolescent groups. The theme of stunting was chosen considering that this problem has a wide impact on the quality of human resources development. Children who experience stunting tend to increase mortality and illness, besides that, they will also experience less than optimal cognitive and motor development. The meta-analysis results of 5 prospective cohort studies showed that a decrease in z-score based on the Body Length by Age Index (PB/U) in children under 2 years was associated with a decline of cognitive function by 0.22 SD among children aged 5-11 years. If not addressed immediately, stunting also has the potential to trigger chronic malnutrition for life. This has serious implications for population health and the fulfillment of the intellectual and economic potential of the group of low-income and middle-income countries (LMICs).[19] In Indonesia, although there has been a decrease in the prevalence of stunting from 30.8% based on the results of the 2018 Riskesdas to 21.4% based on the 2023 SSGI. If WHO criteria are referred, Indonesia has not been free from the stunting problem. Moreover, the disparity in stunting problems between regions has also been high. From the results of the latest survey,

it is known that out of 37 provinces in Indonesia, there have been five provinces with a high stunting prevalence category and only 12 provinces have been declared stunting-free.[2]

The choice of adolescents as the main target of this educational video does not mean that adolescents are included in the stunting-prone group. The main nutritional problem of adolescents, especially adolescent girls, is anemia. This anemia, if it occurs in women of productive age (mothers-to-be), will trigger many bad consequences including infant death, birth weight below the reference standard, inadequate childbirth, neurobehavioral deficits, and irreversible decline in academic ability as well as the potential for growth and development disorders so that children become stunted.[13] To examine the effect of anemia on perinatal outcomes such as premature birth (PTD) and low birth weight (BBLR), medical records from 39,587 pregnant women in Turkey hospitals were analyzed. The results showed that the incidence of BBLR and premature birth was higher in the group of pregnant women with Hb <10 gr/dl. This fact shows how important the efforts are to prevent anemia in women of reproductive age, because maternal hemoglobin plays an important role in the growth of neonatal intrauterine tissue, thus affecting the anthropometric index of the baby she is born.[14]

How important is the impact of anemia on stunting prevention efforts? The World Health Organization (WHO) has made a statement recommending that anemia prevention efforts should be conveyed through various community channels, including schools, *posyandu* and auxiliary health centers, and community-based and network-based social marketing (social media platforms)[20]. Based on these facts, as well as by adhering to the principle that prevention is better than cure, it can be said that the problem of anemia in adolescent girls is the upstream of the stunting problem. Efforts to reduce stunting rates will not bring optimal results if adolescent girls' anemia problem is not addressed. This is the reasoning behind this educational video subtheme especially the management of a balanced nutritional menu for young women. Most cases of anemia occur in Indonesia due to inadequate iron intake from food and apply to all groups prone to thermal anemia.[15]

There are five ways to increase the effectiveness of video as a means of learning. Learning outcomes will be better if the material presented contains graphics (dynamic drawing principle), the instructor on the screen does not take his eyes off the audience and the message displayed as is often done in classical learning (gaze guiding principle), the lesson contains instructions for engaging in summarizing or explaining the material (generative activity principle), the demonstration is filmed from a first-person perspective (perspective principle), and subtitles are added to the narration video in a language that the audience understands (the subtitle principle). It is also recommended not to add irrelevant material to the video design (the principle of distracting detail).[16]

Based on the opinions as the results of the evaluation from both expert and small groups, it is recognized that the development of educational videos with the theme "Stunting prevention through the implementation of a balanced nutritional menu" is considered to have met all the required criteria so that it is considered feasible to be applied as a learning tool with the target of adolescents. However, for the improvement process, there are several important notes, namely the need to be carried out, among others: revision of vocabulary selection so that the target group is better understood and the need to replace musical illustrations as a background which is considered to interfere with the audience's focus in absorbing the message.

Choosing the right vocabulary is one of the keys to improving learning outcomes through videos. When watching a video, acquiring information will involve two types of memory; short memory (related to the phonological treasury that has been mastered) and long memory (the complex performance that has been witnessed or experienced). Therefore, educational videos will be more effective if the information in the video is conveyed in a language that the target understands. It will be even more effective if the series of events in the video content are events experienced by the target[16]. The relationship between vocabulary and student learning outcomes is also evidenced by meta-analysis results conducted on students in China from elementary school to higher education. The results of the study show that vocabulary is a factor that contributes to the reading skills of students at all levels of education. This study confirms that vocabulary not only determines the progress of text comprehension through the identification of

semantic meanings but also suggests that the coordination of vocabulary development and grammatical knowledge, will be more effective when applied to more complex learning.[18] Regarding these findings, aligning the validator assessment's final results with the small group's assessment is necessary, especially from the linguistic aspect. The urban vocabulary and language constraints can be minimized when applied to a large group.

The placement of music illustrations as a background for educational videos is additive because it is not required to assess the effectiveness of the video. There has been no strong evidence that music illustrations as a background for conveying messages will lead to better learning outcomes in the future[19]. It means that musical illustrations can be added to deliver information. This music can be added as it does not inhibit information acquisition. Referring to the prerequisites for making a video, the use of music illustrations as a background for delivering information is related to the issue of relevance. Too prominent music may distract the audience from focusing on the main message. Unfortunately, research on the music genre's relevance to message conveying is not available yet. that examines which music genre is the most relevant to be used as a background for conveying messages, especially through video media.

CONCLUSIONS

Based on the results of the research and also the results of the discussions that have been carried out, it can be concluded that Indonesia's nutritional problems have entered the era of TBM (triple burden malnutrition) with stunting of toddlers as the main problem with the upstream problem being adolescent girl anemia. The educational video production with the theme "Stunting prevention through the management of a balanced nutrition menu" with the target group is a research-based product conducted by the researchers. The development of this educational video is seen as useful in supporting the program to accelerate stunting reduction by overcoming problems from the upstream. The one-to-one and a small group test was conducted to ensure that the media created can be used as much as possible by the target and have a positive impact after the target experiences it.

The evaluation findings acknowledge that the development of educational videos with the theme "Stunting prevention through the maintenance of a balanced nutrition menu" is considered to have met all the criteria required in making videos and is considered feasible to be applied as an educational media targeting adolescent groups. However, to obtain more effective results, it is recommended to improve the selection of vocabulary that is better understood by the target group so that the message conveyed can be accepted by a wider audience and the need to replace music illustrations as a background which is considered to interfere with the audience's focus in absorbing information.

Stunting prevention should be arranged from the beginning since teenagers so that understanding stunting prevention is carried out from an early age. Therefore, as a policy recommendation, this educational video media can be implemented as a means of health education in schools.

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