

## Utilizing TikTok Animation for Nutrition Education: A Feasibility and Preliminary Efficacy Study among Mothers Underweight of Toddlers

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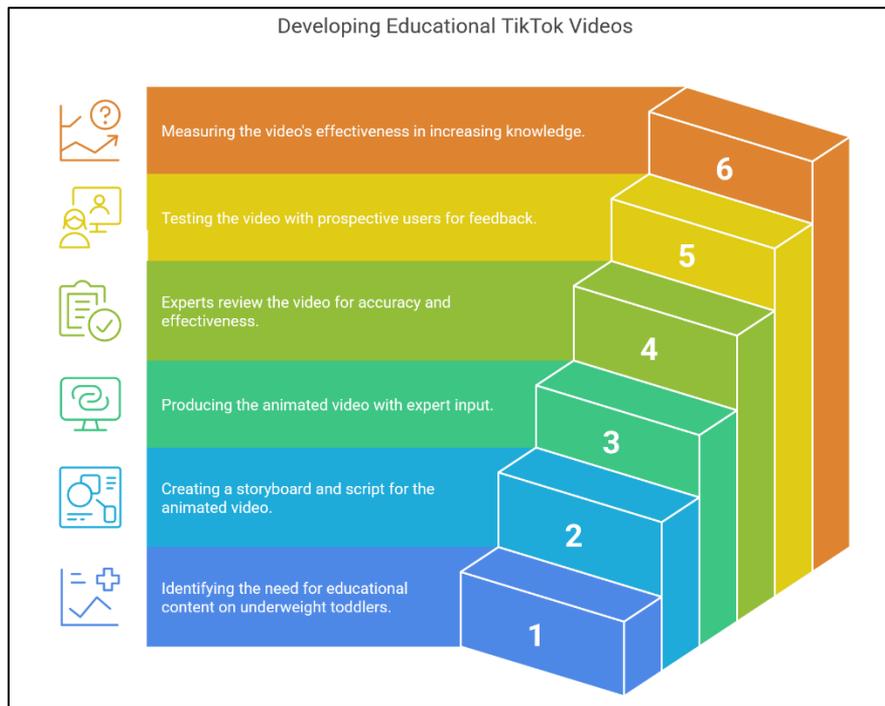
### ABSTRACT

Underweight is a condition of body weight based on the toddler's age (BW/A) with a Z-score value  $<2SD$ . This study aims to develop TikTok animated videos to help toddlers overcome being underweight. The type of research uses Research and Development (R&D) with the ADDIE model, including Analysis, Design, Development, Implementation, and Evaluation. However, this study is only up to the development stage. Video validation involved three experts, namely material, language, and media experts, with an average result of 80.3 (feasible category, minor revision). Furthermore, trials were carried out on prospective users ( $n=10$ ) selected by purposive sampling. The results of the product assessment by prospective users were 91.08 (very feasible category, no need to revise). The impact of using the video was measured by a knowledge questionnaire (reliability = 0.743). The results of the knowledge score based on the pretest and posttest on mothers of toddlers obtained an average N-Gain score of 0.84 with a high category. Developing the TikTok animated video product is feasible based on the results of the analysis. It can be applied as educational media to increase the knowledge of mothers of toddlers and overcome the problem of underweight toddlers.

#### Key Messages:

- A developed and validated TikTok animated video proved feasible and effective as an educational tool, significantly increasing maternal knowledge regarding the management of underweight toddlers.

## GRAPHICAL ABSTRACT



## INTRODUCTION

UNICEF's 2023 data indicates that approximately 45 million children globally, aged below five, suffer from underweight conditions, predominantly residing in less developed nations. (1). The 2023 Indonesian Health Survey (SKI) results showed that the national underweight rate reached 15.9% in Indonesia. In Central Java Province, the figure was 17.6%. In comparison, in Surakarta City, it was 15.5%, exceeding the national nutrition target of 12% and far above the limit set by the World Health Organization, which is less than 5% (2).

Various factors contribute to the high rate of underweight in toddlers, including poverty, limited food availability, recurrent illness, inadequate care and sanitation, and poor parenting practices (3). One key factor that is often overlooked is the low level of maternal nutritional knowledge, which leads to inappropriate feeding and directly impacts the child's nutritional status (4). In Central Java, for example, the quality of MPASI is still low, with only 32.9% of mothers meeting the standards for complementary feeding practices (5).

Therefore, increasing mothers' knowledge about child nutrition is an important approach to addressing this problem. Educational interventions have been shown to improve mothers' understanding and positively impact feeding practices, as shown in a study in Bengkulu Regency, where weekly education for four weeks significantly increased mothers' knowledge (6). However, conventional educational methods such as lectures or booklets have limited reach and effectiveness, especially for today's young mothers.

As technology and social media develop, platforms such as TikTok have begun to be utilized as innovative and easily accessible health education media. However, research that develops explicitly and evaluates animated video-based nutrition education content on TikTok for mothers of toddlers is still limited (7). TikTok is a popular platform among Gen Z mothers and has been proven effective in conveying information through short videos that are interesting and easy to understand (8).

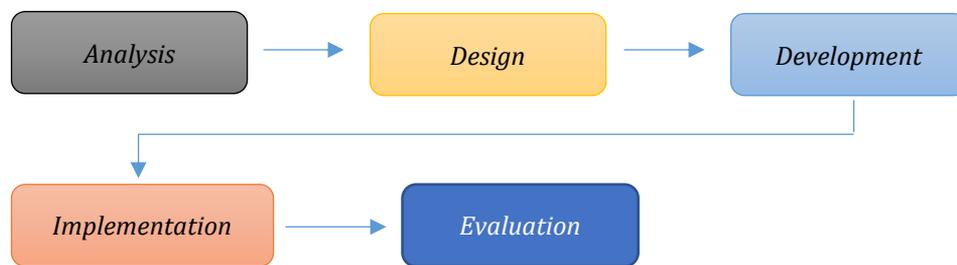
Short animated videos on TikTok have the potential to influence perceptions and encourage changes in habits, especially in toddler feeding practices (9). By utilizing applications such as Canva and Capcut, educational videos can be created more easily and visually appealing. Therefore, this study aims to analyze the effectiveness of nutrition education through TikTok videos for mothers of underweight

toddlers. Video development was carried out using the ADDIE (Analysis, Design, Development, Implementation, Evaluation) model, which allows the learning process to be designed systematically and based on real needs in the field.

Based on these problems, researchers want to develop TikTok animated videos, which are expected to be an alternative solution for TikTok-based education to improve knowledge and practices of feeding mothers, ultimately contributing to overcoming the problem of underweight toddlers.

## METHODS

The study was conducted in January 2025 in Surakarta City. The population of this study were mothers of underweight toddlers in Surakarta City. The sampling technique used was purposive sampling on mothers of underweight toddlers who met the inclusion and exclusion criteria. The inclusion criteria were young mothers entering the Gen Z age of 20-30 years ( $n=10$ ), who had underweight toddlers and were willing to be respondents. The method used in this study was Research and Development (R&D); the R&D method was used to produce products in the form of animated videos and test their effectiveness in a study. The analysis, design, development, implementation, and evaluation (ADDIE) model was used because it was systematically arranged and focused on product development (10). The time of this study was from January - February 2025.



**Figure 1 Model ADDIE**

The first analysis stage is to clarify the problem and identify the target audience, audience characteristics, and the choice of information delivery related to underweight conveyed by respondents. The second stage is design, which includes learning objectives, content assessment instruments, intervention material analysis, intervention planning, and media selection. The information collected will be used to compile and design nutritional education videos with TikTok videos. This nutritional education video uses Indonesian so that viewers can better understand the material to be watched. The video content includes problems related to underweight toddlers, such as the level of knowledge, maternal parenting patterns, and toddler weight, as well as the definition, purpose, impact, and guidelines for a balanced diet. The duration of good and effective TikTok video media presentations ranges from 15 seconds to 3 minutes, and it is estimated that video presentations that are longer than 3 minutes will cause boredom and are no longer interesting to watch. The video content is divided into four video segments. The first video discusses the prevalence of underweight, the definition of underweight, the causes of underweight, signs of underweight, the impact of underweight, and balanced nutrition interventions. The second video discusses the practice of feeding and responsive feeding by considering 5 PMBA (feeding for infants and children) concepts related to knowledge and parenting patterns of toddlers' diet and weight. The third video discusses the provision of local PMT and other interventions. The fourth video discusses the material from all videos one to three. At the video development stage, researchers will create educational video content containing material, objectives, animation, text, voiceover, and duration, which is validated by three material experts: nutritionists, media experts, and language experts. Validation by experts aims to obtain assessments and suggestions so that the media developed is of good quality in terms of material and video appearance. Validation by experts aims to obtain input and suggestions so that the media developed is of good quality in terms of educational media and video media appearance.

The validator assesses video support by providing a test ( $\sqrt{\quad}$ ) in the available form column; the results will be analyzed. The assessment uses a Likert scale, namely 1 = very poor, 2 = poor, 3 = fair, 4 = good and 5 = very good. After assessing the assessment sheet, the expert team filled in comments or suggestions for researchers according to the nutritional education video that had been made. In addition to validation by experts, validation of the development of nutritional education videos was carried out by conducting a trial of product use to a small group of 10 people who were given a pre-and post-test knowledge form to see the impact of the feeding practice animation video. The fourth stage, implementation, and the fifth evaluation will be carried out after the small-scale trial is completed, followed by field research with a larger sample. Therefore, this study only covers the development stage.

The results of the assessment by the expert team and a small group of 10 respondents are then calculated using the following formula (11) :

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

Description:

NP : Percentage value

R : Score obtained

SM : Maximum score

The expert team's validation calculation results were converted into the media eligibility criteria (12).

Media eligibility criteria based on achievement levels. A score between 90% and 100% is categorized as "Very Good," indicating that the media is highly feasible and does not require any revisions. Scores ranging from 75% to 89% fall under the "Good" category, meaning the media is eligible but may need some revisions. A "Fair" rating, given scores between 65% and 74%, suggests the media is feasible but requires significant revisions. The "Poor" category, with scores from 55% to 64%, indicates that the media is less feasible and needs extensive revisions. Lastly, scores below 55% are considered "Very Poor," signifying that the media is not feasible in its current state and must be revised entirely.

The next stage is to analyze the responses of mothers of toddlers by comparing the results of the pretest and posttest, then the data is processed using the N-gain formula as follows (13) :

$$N \text{ Gain} = \frac{\text{skor posttest} - \text{pretest}}{\text{skor ideal} - \text{skor pretest}}$$

The calculation results are then converted with the following criteria. The criteria for interpreting the results of the N-gain formula are categorized into three levels based on the percentage obtained. If the N-gain value falls between 0 and less than 0.3, it is classified as **low**, indicating minimal improvement. An N-gain ranging from 0.3 to less than 0.7 is considered **medium**, showing moderate progress. Meanwhile, a value between 0.7 and less than one is considered **high**, reflecting significant improvement. These classifications help in evaluating the effectiveness of a learning intervention or instructional method (14).

## CODE OF HEALTH ETHICS

This study uses primary data, has requested approval from the Surakarta City Health Office, and has submitted a research ethics application to the Health Research Ethics Committee (KEPK) of the Faculty of Medicine, Sebelas Maret University with the number 02/UN27.06.11/KEP/EC/2025.

## RESULTS

The result of this study produced a TikTok video to address nutritional issues. The video can be accessed on the TikTok account @edukasigizi2. It aims to improve mothers' understanding of underweight toddlers' nutrition, so it is expected to be a medium that can help address toddler nutrition in mothers of Gen Z toddlers. The results of the media development are presented below using the ADDIE model:

### Analysis

The analysis stage is carried out by clarifying the problem, identifying the target audience, audience characteristics, and information delivery choices regarding the underweight conveyed by

respondents. Based on a preliminary study conducted by researchers, the incidence of underweight toddlers in Surakarta City is still a nutritional problem in the community, especially the target group of young toddler mothers, Gen Z. The purpose of this study is to evaluate the effect of nutritional education on toddler mothers through video intervention via TikTok on toddler mothers. The analysis results will be used as a source of data and information when designing a product.

**Design**

The design stage includes learning objectives, content assessment instruments, intervention material analysis, planning, and media selection. The information collected will be used as preparation material for designing a nutrition education video with TikTok videos. This nutrition education video uses Indonesian to help viewers better understand the material to be watched. The video content includes problems related to underweight toddlers regarding their level of knowledge, maternal parenting patterns, and toddler weight, as well as definitions, goals, impacts, and balanced diet guidelines. The duration of a good and effective TikTok video media presentation is around 15 seconds to 3 minutes, and it is estimated that a video presentation longer than 3 minutes will cause boredom and is no longer interesting to watch [12]. The video content is divided into four video clips, namely the first video discussing the prevalence of being underweight, the definition of underweight, causes of being underweight, signs of being underweight, impacts of being underweight, and balanced nutrition interventions. The second video discusses feeding practices and responsive feeding by considering 5 PMBA (infant and child feeding) concepts related to knowledge, parenting patterns, and toddler weight. The third video discusses the provision of local PMT and other interventions. The fourth video discusses material from all videos from the first to the third.

**Development**

This development stage resulted in an assessment from 3 experts, namely a material expert, a language expert, and a media expert, and an assessment from a small group (potential users). The material expert is a nutritionist who focuses on toddler nutrition. The language expert is a Bangka Belitung Provincial Language UPT lecturer in S1 Indonesian Language Literature. The media expert is a multimedia diploma graduate and a graphic design and marketing specialist at a start-up in Indonesia. Below is a table with three experts' results of the validation assessment.

**Table 1. Result Of Validation Expert**

Expert	Percentage Level Achievement	Criteria
Material Expert	81,8%	Eligible, revised as necessary
Language Expert	86,6%	Eligible, revised as necessary
Media Expert	72,7%	Eligible, revised as necessary
Average	80,3%	Eligible, revised as necessary

Based on Table 1, the results of the media validation assessment from 3 experts obtained an average P value of 80.3%. Hence, the nutritional education video is feasible and revised as necessary or feasible with minor revisions as an educational media for mothers of toddlers. In addition to the quantitative assessment, the researcher allowed three experts to provide comments and suggestions for each video. The following is a summary of the qualitative assessment: comments and suggestions.

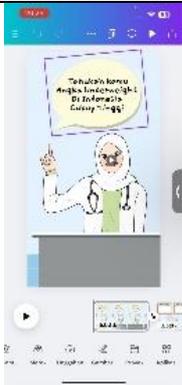
**Table 2. Result Of Comments and Suggestions 3 Experts about Video Animation**

Expert	Comments	Suggestions
<b>Material Expert</b>	<ol style="list-style-type: none"> <li>The first part of the video contains some incomplete material related to underweight</li> <li>The video explanation section consists of 4 videos, there is text that is too long while the video scene is too short so it cannot be read</li> </ol>	<ol style="list-style-type: none"> <li>Can be supplemented again for the material</li> <li>Pay attention again to the use of text that is too long.</li> </ol>
<b>Language Expert</b>	<ol style="list-style-type: none"> <li>Sentences, foreign grammar "underweight" are explained</li> </ol>	<ol style="list-style-type: none"> <li>Pay attention to the spelling of foreign words</li> </ol>

Expert	Comments	Suggestions
<b>Media Expert</b>	<ol style="list-style-type: none"> <li>1. The content is delivered clearly and in detail, the video flow is relatively relaxed, and the ambience is cheerful, the background sound slightly covers the voice over sound</li> <li>2. Good color selection, good presentation of images and animations</li> </ol>	<ol style="list-style-type: none"> <li>2. Pay attention to the use of commas</li> <li>1. There are some texts in the video that can be reduced in number, and the volume of the background sound can be reduced a little</li> <li>2. There are some explanations in the video that can be shortened so that the duration is not too long</li> </ol>

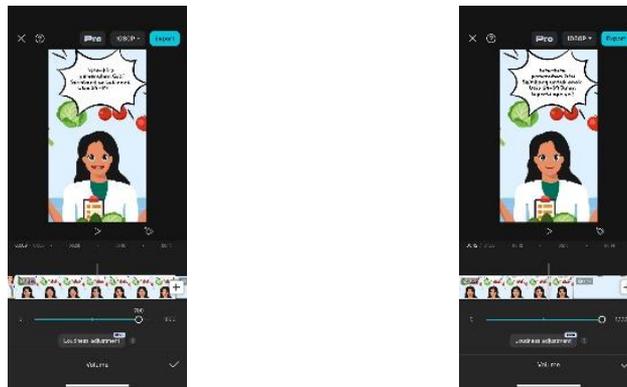
Table 2 includes comments and suggestions from material, language, and media experts, including adding material, shortening text scenes, improving the writing, and adjusting the back sound and voiceover volume.

Table 3. Differences between videos before and after revision video animation

Suggestions from 3 experts	Before revision	After revision
	<b>Material Expert</b>	
Video 1-2 introduction text is too long, scene is too short		
Video 3 Additional material		
	<b>Language Expert</b>	
Video sentence writing 3		

Media Expert

Adjusting the percentage of back sound volume



Based on Table 3, changes in video images can be seen based on comments and suggestions from three experts. The next stage in development is product trials on potential users. Researchers distributed questionnaires to mothers of toddlers in Surakarta, and then purposive sampling techniques were used to select samples. Furthermore, researchers screened potential respondents based on inclusion and exclusion criteria to obtain five samples as potential user samples for trials. Researchers distributed animated video effectiveness questionnaires to assess video effectiveness using a Likert scale, namely 1 = poor, 2 = very poor, 3 = fair, 4 = good, and 5 = very good. The aspects assessed were material, video, audio, and language. The following is a table of the results of the small-group trial validation. The results of the assessment by the small group were then converted according to the media eligibility criteria in Table 4, so that the following results were obtained:

**Table 4. Small Group Trial Results**

Respondent	Total score	Maximum score	Percentage (%)
R1	121	130	93,08
R2	118	130	90,77
R3	117	130	90,00
R4	110	130	84,62
R5	117	130	90,00
R6	116	130	89,23
R7	118	130	90,77
R8	121	130	93,08
R9	116	130	89,23
R10	130	130	100,00
Average	118,4	130	91,08

Primary data result, 2025

Based on the results of the small group trial in Table 4, the average assessment was 91,08% and was included in the very feasible category, and did not need to be revised. Furthermore, to determine the impact of nutritional education through animated videos on mothers of toddlers, a measurement of increased knowledge was carried out. The Knowledge Questionnaire created by the researcher with a reliability result of 0.743. The knowledge questionnaire consists of 15 multiple choice questions, the correct answer is 10 points and the wrong answer is 0 points. The highest value is 70 points, the lowest is 0 points. Results of the knowledge level questionnaire reliability test with cronbach's alpha .743.

The technique used is that mothers of toddlers are given a pretest questionnaire on knowledge and mother's eating patterns, then given time to watch a video for 20 minutes, then given a posttest questionnaire on knowledge. The following are the results of the trial of prospective media users on the knowledge of mothers of toddlers.

**Table 5. Results of the Trial of Prospective Media Users on Knowledge of Feeding Practice**

No	Initials	Score <i>pre-test</i>	Score <i>post-test</i>	N-gain value	Criteria
1	R1	40	60	0.67	Medium
2	R2	40	70	1	High
3	R3	30	50	0.5	Medium
4	R4	30	70	1	High
5	R5	50	60	0.5	Medium
6	R6	50	60	0.5	Medium
7	R7	60	70	1	High
8	R8	50	60	0.5	Medium
9	R9	40	70	1	High
10	R10	60	70	1	High

Table 5 is the result of the media user trial on knowledge. The calculation technique uses the N-gain formula, namely the pretest score-posttest score divided by the maximum score-pretest score of each individual. N-gain (Normalized Gain) is a statistical measure commonly used in educational research to determine the effectiveness of an instructional intervention. It quantifies how much a student's understanding has improved from pre-test to post-test relative to the maximum possible improvement. Then, the calculation results are converted using the criteria. Furthermore, to obtain conclusions on the impact of knowledge, researchers use the average N-gain value of all respondents. Below is a table of the results of calculating mothers' knowledge using the N-gain formula.

**Table 6. Results of Calculation of Knowledge of Mothers of Toddlers**

Data	Pre test	Post test	N-Gain
Minimum	30	50	0,5
Maximum	60	70	1
Average	44,3	65,4	0,84

Based on Table 6, it is known that the results of the measurement of maternal knowledge experienced an increase in the average pretest and posttest scores from 44.3 to 65.4. With a minimum score of 30 on the pretest and 50 on the posttest and a maximum score of 60 on the pretest and 70 on the posttest. Furthermore, for the results of maternal knowledge calculated using the N-gain formula, a minimum score of 0.5 and a maximum score of 1 were obtained, thus obtaining an average score of 0.84, which is included in the high category.

## DISCUSSION

In this digital era, mothers of Gen Z tend to access social media more, especially TikTok. Therefore, health education is needed, one of which is by using animated videos with TikTok (15). Several studies have shown that TikTok social media is more effective in health education than lectures, applications, and booklets (16),(17). The popularity of TikTok in Indonesia based on data from Business of Apps (2023), TikTok social media ranks first with the most video downloads of 67.4%, around 106.51 million TikTok users in Indonesia in 2023, making Indonesia the second country in the world with the most TikTok users. Thanks to social media strategies such as watching TikTok videos, mothers of toddlers become more informed about toddler nutrition and get more information about nutrition because of social media strategies such as watching TikTok (18), based on the scoping review results, animated video media has proven significant in increasing knowledge in various age groups (19).

Based on the validation results from material, language, and media experts, as well as trials involving prospective users, it shows that this study's animated nutrition education video is very appropriate and can effectively function as an educational tool to overcome the problem of underweight in toddlers (20). This criterion is based on the theory of Tegeh et al (21). This theory also developed a balanced nutrition animation video as an educational medium for pregnant women(22). This very feasible result can be obtained because the researcher paid attention to aspects ranging from collecting materials, compiling scripts, and designing media to implementing the creation of animated videos (23). This step

was also carried out in developing student learning videos about mindful eating (24).

After the product was declared feasible, a product trial was conducted on 10 samples to see the impact of nutritional education using animated videos. This impact test was obtained from the results of the pretest and posttest of knowledge (25). The score results were then converted into an N-gain value. The N-gain value was adopted from Riyadi et al.(26) N-gain is used in various studies to evaluate the effectiveness of learning models. The N-gain assessment aims to determine the increase in respondents' abilities before and after using the product developed as a learning medium (27).

Based on the results of the animated video trial, there was an increase in mothers' knowledge before and after being given the animated video from 44.3 to 65.4. Sylvia et al.(28) developed animated videos to improve the conceptual material of the solar system in junior high school students with a gain value of 0.32 to 0.53 in the moderate category. Similar research with a multimedia learning model in college students obtained an N-gain value of 0.62 in the moderate category(29). The increase in knowledge scores was because the animated video displayed moving visuals and audio, which in implementing nutrition for underweight toddlers requires sensitivity to the five senses (30). Research by Hiyaturrahmi et al (31) revealed that animated videos can help respondents see an overview of the information received. Research by Novitasari et al. (32) stated that animated videos can present audio signals combined with dynamic moving images as if seeing the movement of objects directly.

Increased knowledge scores because animated videos display moving visuals and audio. Widyawati's research stated that animated videos can help respondents see an overview of the information received. This study has limitations. Namely, it only applies the ADDIE model at the development stage and in small group trials. Further research is expected to continue to the implementation stage in mothers with underweight toddlers and conduct evaluations with a larger sample size.

## **CONCLUSION**

The nutritional education video product with TikTok videos developed in this study obtained validation results from 3 experts of 80.3% with a feasible category, small group validation results (10 samples) of 91.08% with a very feasible category, and impact test results based on respondent knowledge scores using N-gain of 0.84 with a high category. Based on these results, the video demonstrates feasibility and potential as a medium for nutritional education for mothers of underweight toddlers. The limitation of this study is that it is only up to the development stage. Further research is expected to continue to the evaluation stage with more samples.

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## **CONFLICTS OF INTEREST**

The authors declare there is no conflict of interest associated with this study.

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