

Development of Smart E-Books "caring strategies to prevent stunting during pregnancy"

Yuni Purwati^{1*}, Diah Nur Anisa¹, Febriana Renitasari²

¹Department of Maternity Nursing, Universitas Aisyiyah Yogyakarta
Jalan Siliwangi (Ring Road Barat) No. 63 Nogotirto, Gamping, Sleman, Yogyakarta. 55292

²Department of Nurse-Midwifery and Women Health,
National Taipei University of Nursing and Health Sciences,
No. 365, Mingde Rd, Beitou District, Taipei City, Taiwan 112

*Corresponding author : yunipurwati@unisayogya.ac.id

ABSTRACT

Background: Stunting is a health problem in Indonesia due to malnutrition during the first 1000 Days of Life, namely 270 days in the womb and 730 days after birth (until the age of two years). In 2023, the incidence of stunting remained relatively high, with 30.8% of children under five affected. Children with stunting are at risk of recurrent infectious diseases and may experience impairments in cognitive, motor, and verbal development. Stunting also impacts a child's intelligence level, reduces work productivity, and increases the risk of developing non-communicable diseases in adulthood. Therefore, caring strategies for stunting prevention need to be implemented as early as during pregnancy. Educational media are required to support prenatal class activities in order to improve pregnant women's practices in preventing the birth of stunted children.

Objectives: This study aims to develop a smart electronic book as an educational tool for stunting prevention starting from pregnancy.

Methods: This research used a modified Research and Development design based on Borg & Gall, conducted through the following steps: 1) Needs assessment for development; 2) Design of the smart e-book; 3) Development of the smart e-book; 4) Validation by content and media experts; as well as 5) Revision and finalization of the smart e-book.

Results: the compilation of the smart e-book "Giring Nanting Hamil" (caring strategy to prevent stunting during pregnancy) which has been validated by two material experts with a result of 81% (very valid) and two media experts with a result of 80.33% (valid).

Conclusions: The smart e-book titled "Giring Nanting Hamil" has been developed and validated as appropriate for use. Furthermore, follow-up is required through direct trials involving a sample of pregnant women to scientifically assess the effectiveness of the smart e-book in enhancing stunting prevention practices during pregnancy.

KEYWORD: caring; smart e-book; stunting; preventing; pregnancy

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INTRODUCTION

Stunting is a health problem caused by a lack of good nutritional intake during the first 1000 days of life as the most critical period. The period of the first 1000 days of life “1000 HPK” is recognized as a critical window for growth and development process. This period consists of 270 days in the womb and 730 days after birth (until the age of two). It is during this time that the most rapid physical and cognitive development occurs. Accordingly, the first 1000 days of life period is also called “the window of opportunities” or the golden period (1, 2). The damage that occurs during this period is irreversible, meaning that it cannot be repaired in the next phase of life. Children who are stunted are at risk of experiencing recurrent infectious diseases and disorders in cognitive, motor, and verbal development. Stunting in children also has an impact on intelligence levels, reduces work productivity, and increases the risk of suffering from non-communicable diseases when they are adults, such as diabetes mellitus, hypertension, and heart disease (3).

Until now, stunting still becomes the health problem in Indonesia. Based on the results of the Basic Health Research of the Republic of Indonesia in 2021, around 30.8% of toddlers in Indonesia experience stunting (4). The health profile of the Special Region of Yogyakarta in 2021 shows that 8.50% of toddlers experience protein energy deficiency and 9.83% of toddlers experience stunting. Meanwhile, in Bantul Regency, the prevalence of toddlers with protein energy

deficiency is 8.5%, and stunting is 8.36% (5). Bantul Regency has a fairly high incidence of stunting from the total number, with 921 (7.26%) toddlers experienced stunting and are evenly distributed in the Bantul area Health Centers (6). The Indonesian government has a policy of preventing stunting since pregnancy, starting with educating pregnant women to increase nutritional intake for pregnant women, implementing regular antenatal care and providing iron tablets (7). However, findings from an assessment conducted in four Community Health Centers in Bantul, Yogyakarta, Indonesia, revealed that pregnant women do not regularly participate in pregnancy classes. Although these classes are routinely scheduled at the Community Health Centers, inviting 20–25 pregnant women, actual attendance is usually only around 10–15 participants. The reasons expressed include limited time due to household responsibilities, employment, or caring for other children; learning materials that are perceived as less engaging or difficult to understand; the absence of easily accessible learning media; as well as transportation challenges or the lack of someone to accompany them. These conditions highlight the relevance of developing electronic educational media with a design that integrates text and visually appealing images, effectively supporting consistent *caring* strategies delivered by health workers to pregnant women. Previous studies have emphasized that Education media is very important in health education because it

helps to increase understanding and knowledge, change behavior, and increase awareness of health. With the right media, health messages can be delivered effectively and attractively, so that people can more easily understand and apply the information provided (8). The utilization of appropriate and optimal media can increase the knowledge of pregnant women more effectively in preventing stunting. Good educational media must be able to stimulate all five senses so that the target of education can understand the contents of the message conveyed better (9). A preliminary study on maternal and child health workers in basic health facilities stated that there is no special media that can be used for caring strategies to prevent stunting since pregnancy. The development of educational media in the form of electronic smart books is required as an interesting and interactive educational media, easy-to-understand content, providing a fun and effective learning experience. Besides, the use of electronic technology becomes easily accessible and economical. The purpose of this study is to produce electronic smart books as educational media for pregnant women in implementing caring strategies to prevent stunting. This is considered suitable as a media for caring strategies to prevent stunting since pregnancy.

MATERIALS AND METHODS

Smart e-book development with R&D (Research and Development) research,

namely research and development methods to produce products and test product effectiveness. Development stages with Borg & Gall modifications (10): 1) Identification of needs, with a literature review of the need for the development of a smart e-book “giring nanting hamil” (caring strategy for preventing anemia and stunting in pregnant women); 2) Design of a smart e-book “giring nanting hamil”; 3) development; 4) expert validation with validation focuses covering: 1) material aspects (relevance, consistency and completeness of the scope of the material); 2) presentation aspects (systematics and presentation methods); 3) language aspects (easy to understand); 4) graphic aspects (supporting illustrations and attractive presentation); and 5) revision.

Expert validity is carried out on material/content experts and media experts. Material experts in the field of maternity nursing expertise and graphic design experts. The implementation of expert evaluation uses a Likert scale, namely: very good = 4, good = 3, quite good = 2, less good = 1. The validity of the material expert includes: quality and suitability of content 8 items, language presentation 3 items, format aspects 4 items and graphic aspects 3 items. The total checklist of material expert validity is 18 items. The checklist of media expert validity consists of 7 items. The overall outcome criteria are presented as the mean I-CVI (Item Content Validity Index), including the score range: 25-44% = media is less feasible; 44-63% = media is quite feasible;

64-82% = media is feasible and 82-100% = media is very feasible (11). Result criteria 25-44% = media is less feasible; 44-63% = media is quite feasible; 64-82% = media is feasible and 82-100% = media is very feasible (12). This research has met the ethical research standards and has received approval from the Health Research Ethics Commission (KEPK) of Aisyiyah University of Yogyakarta number: 4233/KEP-UNISA/II/2025, dated February 15, 2025.

RESULTS AND DISCUSSION

RESULTS

The results of the development of the smart e-book "Giring Nanting Hamil" can be seen as follows:

Literature Study

Collecting relevant materials in terms of the material "Giring Nanting Hamil" (caring strategy for preventing anemia and stunting in pregnant women). Content literature includes stunting (definition, measurement, signs and symptoms, causative factors, and impacts). Material on caring strategies for preventing stunting since pregnancy includes routine pregnancy check-ups, nutrition education for pregnant women, increasing clean and healthy living behaviors, and family support for pregnant women. Materials used in this research were adopted from references (12,4,13,14,15,16).

Design planning

Design planning through flowchart,

which describes the whole between parts in the media that facilitate the compilation of smart e-book media flowchart. Functions as a map in the media creation guide. In the flowchart is equipped with a selection of interesting images and short sentences that are easy to understand.

Development of the Smart E-book

Regarding the process of development, all components at the design stage are assembled into a single media unit unit with a design that has been designed using canva according to the flowchart, equipped with attractive images and colors. The content of the smart e-book covers two subtopics: an introduction to stunting and caring strategies for preventing stunting during pregnancy "Giring Nanting Hamil". The "Giring Nanting Hamil" section focuses on topics including routine antenatal check-ups, maternal nutrition, clean and healthy lifestyle practices during pregnancy, and family support during pregnancy.

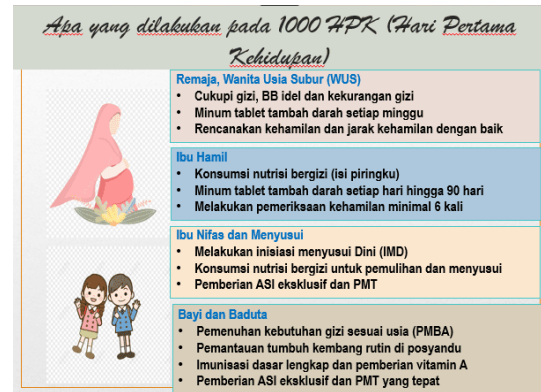
The developed smart e-book consists of 52 double-sided pages. The following is an excerpt of four pages from the development of the smart e-book "Giring Nanting Hamil" is as follows (**Figure 1**).

The audiovisual media produced was tested by experts to determine its validity. The validity test was conducted by two material experts who were experienced in the field of maternal and child health and two media experts from communication and graphic design sciences (**Table 1**).

a. Cover



b. Urgency of 1000 HPK



c. Stunting prevention



c. Stunting prevention



Figure 1. Excerpt of the design smart e-book "Giring Nanting Hamil"

Table 1. Results of Material Expert Validity

Aspect	Average score	Interpretation
Title suitability	84%	High valid
Relevance of material to outline	80%	Valid
Suitability of materials	80%	Valid
Language compatibility	80%	Valid
Average	81%	High valid

The results of the expert content validity test showed an average score of 81%, interpreted as very valid. In addition, several suggestions for revision were provided, particularly regarding language use and the sequence of material presen-

tation (Table 2).

The validity assessment by two media experts resulted in an average score of 80.33%, interpreted as valid. The aspect of color display received a score of 82%, categorized as very valid. Written sugges-

Table 2. Results of media expert validity

Aspect	Average score	Interpretation
The color display is attractive and does not interfere with understanding the material.	82%	High valid
The color display in the writing makes it easier to remember the material.	80%	Valid
The book is written using good and correct Indonesian.	80%	Valid
The use of fonts (type and size of letters) is appropriate and easy for users to read	80%	Valid
The e-book content is easy to understand	80%	Valid
The use of color effects is visually appealing	80%	Valid
Emphasis through color, typeface, and font style encourages curiosity and prompts action.	80%	Valid
Average	80.33%	Valid

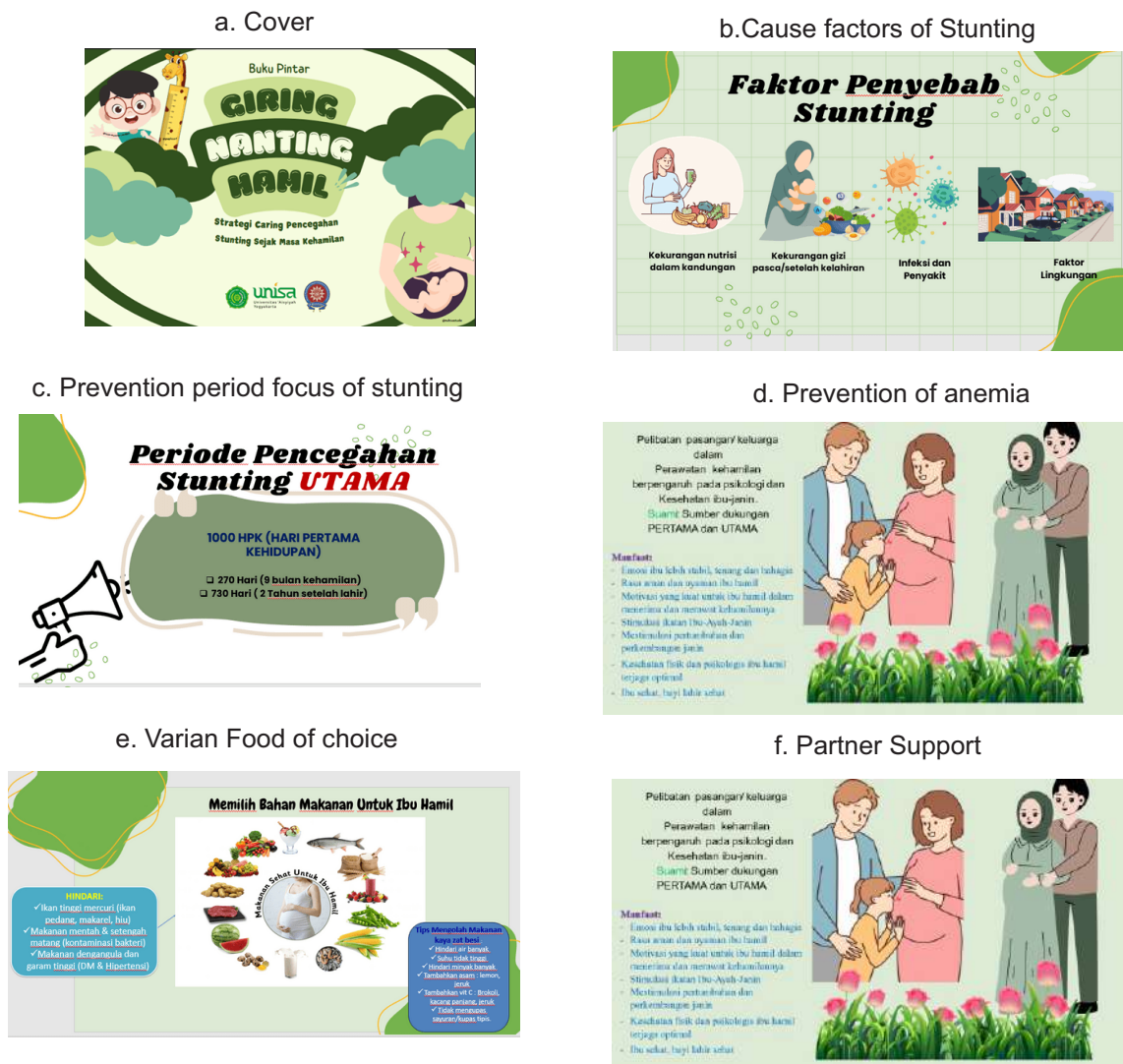


Figure 2. Excerpt of the final results smart e-book "Giring Nanting Hamil"

tions for revision included the use of varied fonts and typefaces, with a recommendation to limit the variations to no more than three.

Revised results

Based on the expert validity test, comments and suggestions were provided on the findings of the material and media design that were less appropriate, then revisions were carried out according to the comments and suggestions from expert input. Following a series of revisions based on expert feedback, the final version of the smart e-book educational media was completed, comprising 22 pages. Presented below is an excerpt featuring 6 pages from the full version (**Figure 2**).

DISCUSSION

The preparation of the smart e-book “Giring Nanting Hamil” (Caring strategy for preventing stunting since pregnancy) was carried out based on the modification of development research by Barg & Gall, including identifying needs, preparing a development design, expert consultation, and revision. The smart e-book is a medium for pregnant women and couples to learn independently that can be repeated. The learning media in the form of a smart e-book “Giring Nanting Hamil” is designed as an interesting educational media, easy to access, understandable, and can be applied in daily care during pregnancy. This smart e-book is a complement to the educational media during pregnancy in the child Identity

care book. The research results state that smart e-books are a structured and effective guide for pregnant women and their husbands, resulting in better understanding, attitudes, and practices (17). The provision of the smart e-book “Giring Nanting Hamil” (caring strategy for preventing stunting since pregnancy), becomes an effective approach to increase readiness for preventing stunting. The structured material in the smart e-book is Stunting (definition, measurement, signs and symptoms, causative factors and impacts). The caring strategy material for stunting prevention includes the objectives of stunting prevention during pregnancy, efforts to prevent stunting during pregnancy, and family support for pregnant women. **Figure 1** presents selected content from the smart e-book “Giring Nanting Hamil” that has been developed.

The preparation of the smart e-book has gone through limited trials and expert validity. Based on the results of expert consultations, there are inputs related to aspects of format, appearance, language, clarity of images, graphics, and display colors. Revisions are made based on comments and suggestions and evaluations given. Furthermore, the validity of the material expert includes aspects of quality and suitability of content, presentation of language, format and graphics with the mean I-CVI results on the module and booklet being equivalent. The results of the media expert validity were also carried out on aspects of appearance, language, effects and sound on

the video. The results show an equivalent mean I-CVI from all media. Overall, the results show a mean higher than 82, so that all media are declared suitable for use.

In the early stages of developing the smart e-book "Giring Nanting Hamil", a literature review was conducted related to the material that would be developed in compiling the smart e-book. Literature review plays an important role in developing smart books because it helps understand the context and current developments of the topics discussed. By conducting a literature review, authors can identify relevant theories, find research gaps that need to be answered, and avoid repeating existing information. In addition, literature review also provides a strong basis for the arguments that will be presented in the smart book, ensuring that the information presented is accurate, up-to-date, and based on valid evidence. This not only increases the credibility of the smart book, but also provides added value for readers seeking a deeper understanding of the topic. Research states that literature review is a very important tool for identifying development needs because it helps researchers understand key issues, trends, and knowledge gaps in the research field. By utilizing literature review, researchers can make more informed decisions and develop more innovative solutions(17).

Based on the results of the literature review, a product development design was prepared in the form of a smart e-book "Giring Nanting Hamil". An effective product development draft is crucial to ensure that the product

developed is in accordance with needs and has the potential for optimal utilization. In this study, the design of the development of a smart e-book was carried out by first compiling a development flowchart. Product development design, as a strategic and multifaceted effort, significantly influences the trajectory and results of research initiatives, providing a structured framework for translating innovative ideas into real products and services. The integration of design principles into the research methodology ensures that the resulting product is not only technologically advanced, but also aligned with market demand and user needs, increasing its commercial viability and social impact (18, 19).

The development of the smart e-book underwent validation by both content experts and media experts. Based on expert consultations, feedback was provided regarding the format, layout, language, image clarity, graphics, and color scheme. Revisions were made according to the comments, suggestions, and evaluations received. **Figure 2** shows a 6-page display of the final smart e-book after final revisions and approval for use in education. Content expert validation covered several aspects, such as the quality and relevance of the material, language presentation, formatting, and graphics, resulting in a mean I-CVI score indicating a high level of validity (**Table 1**). Media expert validation focused on visual appearance, language, visual effects, and the emphasis created through color, font, and

typeface. The results showed a mean I-CVI score of 80.33%, which was interpreted as valid (**Table 2**). Overall, the combined results from content and media expert validation indicated a mean score above 80%, confirming that the e-book is appropriate for use.

Expert validation, which integrates specialized knowledge and rigorous judgment, is essential to improve the quality and reliability of product development results (20). The importance of strategic product development design is underscored by its multifaceted impact on research outcomes, affecting areas such as educational resources and media. The creation of learning modules, for example, requires careful attention to validity, practicality, and effectiveness to ensure positive student engagement and learning outcomes. The importance of strategic product development design is underscored by its multifaceted impact on research outcomes, affecting areas such as educational resources and media (21,22). The creation of educational media requires careful attention to validity, practicality, and effectiveness to ensure positive student engagement and learning outcomes (23).

The results of the study prove that smart e-books are illustrated and systematically structured written media. These resources offer distinct advantages in conveying messages in detail, interestingly combining writing and images in engaging manner, while also allowing readers the opportunity to review the message conveyed.

The results of relevant research state that smart book media has a significant influence on increasing health care actions during pregnancy (24). This finding reinforces that the smart e-book “Giring Nanting Hamil” is a valid, relevant, and reliable educational medium for use in prenatal classes, supporting pregnant women together with their families in initiating stunting prevention efforts from the early stages of pregnancy.

CONCLUSION AND RECOMMENDATION

An e-smart book was developed as an educational medium for pregnant women in implementing stunting prevention strategies. The book was declared valid and suitable for use based on expert evaluations in both content and media aspects. Further development of this educational media should include field testing with sample groups, specifically pregnant women and their husbands, to assess its effectiveness in enhancing readiness and promoting stunting prevention practices during pregnancy. The authors would like to thank for RisetMu Program Batch VIII 2025 for funding this research.

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