

Digital booklet on sustainable practices for promoting adolescent health

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Abstract *This methodological study aimed to describe the elaboration and validation of a digital booklet focused on sustainable practices toward adolescent health-promoting actions. It was conducted according to the following stages: preparation of the educational booklet; appearance and content validation with 21 judges and validation with a target audience of 53 adolescents. The drafting, elaboration, and assembly of the material's layout were performed through data retrieved from the integrative review and interviews. The digital booklet was entitled "Uncomplicating Environmental Health", with 29 pages in the A5 half-page format (14.8 cm width and 21.0 cm height), configured in landscape layout mode, made available for free, and accessible via mobile and fixed devices. The booklet was validated regarding appearance and content, with an overall Content Validity Index of 0.95, and judges' validation through the Suitability Assessment of Materials tool was considered "superior". The booklet achieved the target audience's positive agreement for validation. It was considered valid to be used in health education for adolescents.*

Key words *Teaching materials, Adolescent, Sustainable Development, Health Education, Validation study*

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Introduction

Health education aims at appropriating new strategies that can conduct interventions based on knowledge and information directed at the needs of the target population¹. This fact allows the use of educational technologies as an alternative to foster information and new ways to promote health, thus enhancing the user's autonomy to include participatory intervention models^{2,3}.

Technologies are known efficient tools in the communication process to promote new life habits⁴. We can see the relevance of developing educational activities for the adolescent audience to sensitize them to act as knowledge multipliers⁵.

Educational technologies for adolescents emerge as an innovative model in the health promotion debate, regulating the elaboration and use of tools through interactive and dynamic processes^{6,7}. Studies point out that educational technologies enhance learning playfully when directed at adolescents, arousing interest in building spaces for the dissemination of relevant life themes^{8,9}.

Several technological resources and techniques can be adopted to facilitate the educational process in health education, such as folders, serial albums, guidance notebooks, handouts, and booklets, available in printed and digital versions¹⁰. Among technologies, the digital booklet encourages the development of sustainable practices for the adolescent audience^{11,12}.

Although studies on the elaboration and validation of educational technologies for the adolescent audience have been developed^{13,14}, work on educational technologies for sustainable practices still needs to be identified. In the face of this gap, it is necessary to develop a digital booklet to support adolescents in acquiring knowledge about health and the environment.

Thus, this study aimed to describe developing and validating a digital booklet focused on sustainable practices that favor adolescent health-promoting actions.

Methods

Study design and period

This four-stage methodological research was conducted from July 2019 to December 2020 to elaborate and validate health-applicable educational technologies¹⁵.

Data collection

The research project was elaborated and submitted to the Research Ethics Committee (CEP) in the first stage. In the second step, data was collected through an integrative review, carried out in pairs by two independent researchers, in the following databases: Medical Literature Analysis and Retrieval System Online (MEDLINE), Latin American and Caribbean Center on Health Sciences Information (LILACS), Web of Science, and the SciELO library. We employed Descriptors in Health Sciences (DeCS) "Sustainable Development", "Health Care", "Adolescent", and "Sustainable Development Indicators", using the Boolean operator AND to select the articles.

In the data collection stage, semi-structured interviews were also held with adolescents to know their perception of the relationship between health, environment, and sustainable development to verify which contents needed to be included in the digital booklet. Inclusion criteria were age 10-19, being regularly enrolled in the school chosen for validation, and having school attendance equal to or greater than 70%.

Thirteen teenagers from an Elementary School II of the public education network in the Geoparque Araripe territory, from a municipality in the Metropolitan region of Cariri, Ceará, Brazil, in May 2020 selected by convenience participated in this stage. Remote interviews were held through audio-recorded telephone calls. Thematic content analysis was developed in three phases: pre-analysis, material exploration, and processing of the results¹⁶.

Booklet elaboration

The third stage included drawing up the illustrations and content, subsidized through data from the integrative review and semi-structured interviews, and observing the need for a brief, plain text with simple and intelligible language for the intended audience^{17,18}.

The images were selected from the internet in the public domain, and Adobe Illustrator CS3 programs were later used for the illustrations. Adobe InDesign CS6 was used for the booklet's layout by a professional designer.

Booklet validation by judges

In the fourth stage, the material prepared was validated by consulting with experts in the area of interest responsible for validating the content,

the technology's appearance, and the target audience. Expert judges were selected by snowball sampling or by convenience, in which they were asked to suggest other participants¹⁹ when finding a subject meeting the eligibility criteria necessary to participate in the study.

Experts should meet at least two of the following criteria: having skills/specialized knowledge that make them an authority on the subject; having special skills in a certain type of study (Nursing; Educational Technology; Adolescent Health; Sustainable Development; SDG 3); passing a specific test to identify judges; or having a high ranking assigned by an authority²⁰.

The sample size was calculated using the formula: $n = Z\alpha^2 \cdot P(1-P) / e^2$, where "P" is the expected proportion of experts, indicating the adequacy of each item, and "e" refers to the acceptable proportional difference against what is expected. The following values were considered for the calculation: $Z\alpha^2 = 1.96$; $P = 0.85$; $e = 0.15$, obtaining a sample of 22 judges²¹. However, we decided to work with 21 judges²² to avoid a tie.

The survey of eligible health experts was conducted on the Lattes Platform of the National Council for Scientific and Technological Development (CNPq) portal, using the following keywords: Nursing, Sustainable Development, Adolescent, Educational technology in health, and Validation of instruments.

Contact was made electronically with 42 judges who met the established criteria and were invited to participate in the study through an invitation letter, and 21 responded to the request. After agreeing to participate in the research, the access link to the Google Forms questionnaire was sent via e-mail with a kit containing the Informed Consent Form, the judge characterization questionnaire, the booklet, and the validation protocol.

The Digital Booklet Analysis Protocol was organized into two instruments: the first considered the internal content, and the second evaluated the booklet as a whole. In the first, a Likert-type scale was used, where each item judged contained five valuation levels: 1) Very little; 2) Little; 3) Average; 4) Much, and 5) Very Much. Regarding the items marked options 1, 2, or 3, we asked to describe why the option was considered, providing space for the judges to discuss opinions and suggestions.

The second instrument is the SAM (Suitability Assessment of Materials). It provides an opportunity to assess content, language, graphic illustrations, motivation, and cultural adequacy¹⁷.

Target audience validation

The target audience validated the second version of the digital booklet after the adjustments suggested by the judges. Fifty-three teenagers from a public school in Crato, Ceará, Brazil, participated in this stage, which was also the stage for the semi-structured interviews. Data were collected remotely through Google Forms questionnaire via message through the WhatsApp application.

The same criteria established in the interview were considered as inclusion criteria. An adapted questionnaire²³ was adopted, with items characterizing the subjects and the evaluative items from the booklet about the organization, writing style, appearance, and motivation of the educational material domains.

Data analysis

The Content Validity Index (CVI)²⁴ was used in the experts' analysis of the instruments, calculated from three mathematical equations: S-CVI/Ave (mean of the content validation indexes for all the scale indexes); S-CVI/UA (proportion of items on a scale that reach scores 4 "Much" and 5 "Very much") and the I-CVI (Content validity of individual indices)²⁵. An index equal to or greater than 78% ($CVI \geq 0.78$) for the individual assessment of each item was deemed acceptable.

The agreement between the judges regarding the evaluation of the booklet was performed through the Intraclass Correlation Coefficient (ICC), with a significance level of 5%. As a result, the Likert scale items of the instruments applied to the judges were evaluated by proportions.

Concerning the SAM analysis, the booklet was considered as "superior" educational material if it reached between 70% and 100% of the scores; "adequate", if between 40% and 69%; and "inadequate", if between 0 and 39%.

The data judged by the experts were compiled in a Microsoft® Office 365 spreadsheet and analyzed using the Statistical Package for the Social Sciences (SPSS) software, version 20.0, and later arranged in tables. However, the essay responses were read and analyzed, and the observations suggested, when relevant, were accepted and included in the material.

Validated items with agreement equal to or greater than 75% of positive responses were considered for data analysis with the target population.

Ethical aspects

The study was submitted for evaluation to the Research Ethics Committee (CEP) through *Plataforma Brasil* and approved under Opinion No. 3.839.083, in compliance with Resolution No. 466/2012. We underscore that such technology is registered at the Brazilian Book Chamber under ISBN No. 978-65-00-13665-4. We used the Revised Standards for Quality Improvement Reporting Excellence (SQUIRE 2.0)²⁶.

Results

The integrative review guided the theoretical content to be addressed in the booklet preparation stage, listing the sustainable practices aligned with the targets of the Sustainable Development Goal (SDG) #3 for adolescents. The search resulted in 471 articles by cross-referencing the descriptors. However, only 12 articles were included in the final sample.

Sustainable practices developed for the adolescent population were identified from the integrative review's data, namely: access to health services, mental, sexual, and reproductive health policies, income generation programs, implementation of health-oriented public policies, healthy diet adoption programs, equity in health services, and health education.

In the interviews, we identified that 11 adolescents were female and two were male, aged 12-14. Two were seventh-graders, two eighth-graders, and nine were ninth-graders in Elementary School II. The data showed that the adolescents' perception of the relationship between health and the environment is permeated by themes such as pollution, deforestation, and climate change.

These data allowed us to identify the most relevant points to be included in the booklet and start the construction process. The booklet was prepared in the digital version, with free and open access. The first version of the booklet contained 29 pages in A5 half-page format (14.8 cm width and 21.0 cm height) with a landscape layout.

The prepared booklet is titled "Uncomplicating Environmental Health" and is divided into five domains under the following subtitles: "What is health and the environment?"; "What is sustainable development?"; "What are the Sustainable Development Goals?"; "What are sustainable health practices?"; and "What are the advantages of developing sustainable practices?".

Verdana font size 12 was used for information and Komika Title for cover and subtitles, with cover title size 40 and subtitles 26-31. Key words in informative texts were enlarged, and bold markers were used in pink, orange, red, and green.

We opted for colorful illustrations to attract the attention of adolescents and facilitate learning. We sought characters that considered racial, ethnic, and gender diversity features so that the booklet could include the adolescent audience. Thus, Black, white, and brown characters, a trans character, and a wheelchair user were included.

We tried to use colors that referred to the SDGs. We opted for an illustration that referred to the daily life of adolescents, such as the self. We included a test with questions for memorizing the topics addressed in the material to ensure the booklet's interactivity with the adolescents. Figure 1 shows some pages of the booklet's final version.

Expert judges and the target audience (adolescents) validated the educational booklet. Twenty-one expert judges from the health area participated. Most were female (76.2%), and 47.6% were from Ceará. Regarding the area of expertise, 76.1% corresponded to nursing and 57.1% to adolescent health and other areas. The mean age of the participants was 41.3, with a standard deviation of 9.6. The mean time of teaching experience in years was 14.1, with a standard deviation of 9.7.

Most professionals proved to be quite experienced in all items, with high percentages for most, except for master's and doctoral advisorship items (90.4%) and evaluation boards of these modalities (23.8%).

Seven judges scored 1 for S-CVI/AVE concerning language clarity, agreeing with all the items evaluated. The S-CVI of the mean S-CVI/AVE of the judges and I-CVI scored higher than 0.9. Regarding practical pertinence, 11 judges scored 1, six scored 0.9, and three scored 0.8 for the S-CVI/AVE. The I-CVI, SCI/AVE, and S-CVI indices were higher than 0.96, showing that most judges deemed that the 29 items of this stage were "much" and "very much" recommended.

As for the theoretical relevance, ten judges scored 1, six judges scored 0.9, three judges scored 0.8, and one judge scored 0.75 for the S-CVI/AVE. The I-CVI, SCI/AVE, and S-CVI indices were higher than 0.95 for the 29 items evaluated. The overall CVI, calculated based on the mean of all items, scored 0.95, as shown in Table 1.



Figure 1. Pages from the Booklet entitled “Uncomplicating Environmental Health”. Crato-CE, Brazil, 2021

Source: Authors.

As for the appearance’s validity measured by the SAM instrument, 90% of the responses were classified as “superior”, showing that the booklet had high appearance standards at this point, as shown in Table 2.

The Intraclass Correlation Index (ICC) was applied for language clarity, practical pertinence, and theoretical relevance, which inferred a score higher than 0.937 (<0.001) for this booklet, meaning that the language material was easy and suitable for adolescents.

Although the judges highly evaluated the booklet, suggestions were accepted to improve the content and appearance of the technology, ensuring the best quality of the educational material. Some of the main changes were modifying the title to use textual elements that allow a greater understanding for readers and in the image; adding the item spirituality and changing “Physical activity” to read “Lifestyle”, understanding that this aspect encompasses more broadly other elements such as sleep, physical activity, food,

Table 1. Distribution of Content Validity Indexes (CVI) for each item, according to the expert judges' analysis. Crato-CE, Brazil, 2021.

Booklet pages S-CVI/UA*	Assessment		
	Language Clarity	Practical Pertinence	Theoretical Relevance
P01	0.810	0.762	0.857
P02	0.810	0.905	0.905
P03	0.905	0.952	0.952
P04	0.857	1.000	0.905
P05	1.000	0.905	0.905
P06	0.905	0.952	0.952
P07	0.952	0.952	0.905
P08	0.810	0.905	0.810
P09	0.905	0.857	0.857
P10	1.000	1.000	0.952
P11	1.000	1.000	1.000
P12	0.952	1.000	1.000
P13	1.000	1.000	1.000
P14	1.000	1.000	1.000
P15	0.810	0.857	0.857
P16	0.905	0.952	0.952
P17	0.905	1.000	1.000
P18	0.952	0.952	0.952
P19	1.000	1.000	0.952
P20	1.000	1.000	1.000
P21	1.000	1.000	1.000
P22	1.000	1.000	1.000
P23	1.000	1.000	0.952
P24	0.952	0.952	0.952
P25	1.000	1.000	1.000
P26	1.000	1.000	1.000
P27	0.952	1.000	1.000
P28	1.000	1.000	1.000
P29	1.000	1.000	1.000
Mean I-CVI**	0.944	0.962	0.952
S-CVI/Ave***	0.944	0.962	0.952

*S-CVI/UA - proportion of items on the scale that reached a score of 4 "Much" and 5 "Very much"; **I-CVI - content validity of individual items. ***S-CVI/Ave - Mean validation indices for all scale indices.

Source: Authors.

relationships, and stress management; rewriting the text and replacing technical terms for better understanding of the text.

Fifty-three adolescents participated in the target audience validation stage. The participants were aged 12 to 16; most were female (64.1%); 37.7% were seventh-graders, 32.0% were eighth-graders, and 30.1% were ninth-graders in Elementary School II.

We observed an agreement in the positive responses of adolescents for each evaluative aspect concerning the organization, text clarity,

adequate illustrations, and motivation regarding acting or thinking about sustainable practices (94.3%), revealing the booklet's adequacy to the target audience, as shown in Table 3.

The adolescents made no suggestions. At the end of the questionnaire, we asked them to respond regarding the developed material, and all of them favorably commented on the technology, emphasizing the accessible language and understandable images:

Educational, it teaches how to care for the environment and us. In other words, pretty cool (A17).

Table 2. Appearance validity assessment - SAM. Crato-CE, Brazil, 2021.

SAM items	Inadequate (0)		Adequate (1)		Superior (2)	
	N	%	N	%	N	%
The objective is evident, facilitating the prompt understanding of the material.	0	0.00	0	0.00	21	100.00
The content addresses information related to sustainable practices that favor health-promoting actions.	0	0.00	0	0.00	21	100.00
The purpose of the material is limited to the objectives, so viewers can reasonably understand in the time allowed.	0	0.00	1	4.76	20	95.24
The reading level is adequate for the understanding of the adolescent audience.	0	0.00	2	9.52	19	90.48
The conversational style makes the text easier to understand.	0	0.00	2	9.52	19	90.48
The vocabulary uses common words.	0	0.00	5	23.81	16	76.19
The cover attracts attention and portrays the purpose of the material.	1	4.76	0	0.00	20	95.24
The illustrations present key visual messages so the readers can understand the main points independently, without distractions.	0	0.00	3	14.29	18	85.71
The text or figures interact with the readers, leading them to solve problems, make choices, or show skills.	0	0.00	3	14.29	18	85.71
Desired behavior patterns are modeled or well demonstrated.	0	0.00	1	4.76	20	95.24
There is a motivation for developing sustainable practices. That is, people are motivated to learn because they believe that tasks and behaviors are feasible.	0	0.00	4	19.05	17	80.95
The material is culturally appropriate to the target audience's logic, language, and experience.	0	0.00	2	9.52	19	90.48
It shows culturally appropriate images and examples.	0	0.00	2	9.52	19	90.48
Total/Mean	0.08	0.37	1.92	9.16	19.00	90.48

Source: Authors.

Anyone can understand what is written on each page (A35).

It was cool and interesting because it made me review my attitudes (A28).

Discussion

Educational technology in health for adolescents unifies guidelines and facilitates the teaching-learning process to understand their health-disease process better^{27,28}.

This study developed and validated a digital booklet for adolescents as a tool to promote health education practices to guide adolescents on the health-environment relationship. Printed or digital educational materials are presented as devices that contribute to the communication process in health education practices to increase adherence and understanding of the subject ad-

ressed by the target audience for whom they are intended²⁹.

This study built and validated an educational booklet for preventing adolescent metabolic syndrome. It points out the relevance of involving the target audience in elaborating technology to identify content, reflecting on its demands, and making the elaboration of technology visible to stir adolescents' interest in the subject³⁰.

The results of the integrative review and the semi-structured interviews with the adolescents were organized linearly for the textual elaboration and illustration of the booklet on sustainable practices. Thus, we started the textual elaboration from the selection of the content. We aimed to combine contents with rich information, objectivity, and simple and everyday language for the adolescent public since this type of language allows a greater understanding of the theme addressed¹⁷.

Table 3. Assessment of the target audience regarding the booklet's organization, writing style, appearance, and motivation. Crato-CE, Brazil, 2021.

	Positive answers		Negative answers		Impartial answers	
	N	%	N	%	N	%
1 Organization						
1.1 Did the cover catch your attention?	46	86.79	3	5.66	4	7.54
1.2 Is the content sequence adequate?	51	96.22	0	0.00	2	3.77
1.3 Is the electronic booklet's structure organized?	42	79.24	2	3.77	9	16.98
2 Writing style						
2.1 Regarding the understanding of the sentences, they are:	50	94.33	1	1.88	2	3.77
2.2 Written content is:	51	96.22	0	0.00	2	3.77
2.3 The text is:	49	92.45	1	1.88	3	5.66
3 Appearance						
3.1 The illustrations are:	49	92.45	1	1.88	3	5.66
3.2 Do the illustrations complement the text?	52	98.11	1	1.88	0	0.00
3.3 Do pages or sections seem organized?	49	92.45	4	7.54	0	0.00
4 Motivation						
4.1 In your opinion, will any teenager who reads this booklet understand what it is about?	42	79.24	4	7.54	7	13.20
4.2 Did you feel motivated to read the booklet until the end?	43	81.13	5	9.43	5	9.43
4.3 The educational material addresses the issues necessary for adolescents to develop sustainable practices that favor their health condition.	48	90.56	0	0.00	5	9.43
4.4 Did the educational booklet suggest you act or think about sustainable practices?	50	94.33	2	3.77	1	1.88

Source: Authors.

This work highlights the need that it seeks to understand the context of the population for which it is intended when elaborating an educational material, allowing a participatory, communicative approach and approximation with the target audience's health context²⁷. Adolescents' participation allowed their active involvement in the material production process, which facilitated identifying the contents to be included in the booklet.

Listening to adolescents showed the need for technology to address issues that would facilitate the identification of elements regarding issues involving environmental health by adolescents, to reflect on the dimensions that traverse the health and environment concepts, considering that the

health-environment relationship is articulated with themes not restricted to pollution, deforestation, and climate change, but that can identify the factors responsible for the health-disease process³¹.

Our work sought colorful illustrations to attract the attention of adolescents and facilitate learning. Thus, illustrations are important, as they allow greater readability and understanding of a text, and they attract readers, awakening and maintaining their interest in reading, complementing and reinforcing the import of the message. Furthermore, people should identify themselves with illustrations³².

Choosing illustrations close to their reality allows adolescents to imagine themselves expe-

riencing the reported events per their needs³⁰. In this context, the use by characters who portray social inclusion complies with what is stated in the Brazilian Constitution, which guarantees everyone the right to inclusion through equality and respect for human dignity and people's social function³³.

The prepared material needed to be formatted with illustrations to encourage adopting sustainable adolescent practices, making it more appropriate for the public. It also needed clear, understandable, and objective content, with simple words familiar to their daily lives¹³.

Regarding the CVI validity, the responses of the health expert judges agreed. Based on the responses, the "Uncomplicating environmental health" educational booklet showed content validity with a global CVI of 0.95, suggesting that it represents the content to be addressed on developing sustainable practices.

Other methodological studies also validated their materials with higher rates: the educational booklet for caregivers of children with gastrostomy obtained a CVI of 0.93³⁴; the booklet to promote the bond between mothers and newborns in the NICU obtained a CVI of 0.92 from the experts³⁵.

Regarding the SAM, we observed that the booklet exceeded the established score, which shows agreement with the responses of the experts who evaluated it. Its classification was similar to other studies that built and validated booklets^{36,37}. The Intraclass Correlation Index considered that the booklet showed satisfactory percentage regarding language and practical and theoretical relevance among the judges.

The observations and suggestions made by the judges contributed to reformulating the text's wording and revising illustrations, which was essential to improve the quality and reliability of the information in the educational material for its final version^{34,38}.

The validation of the material elaborated with the adolescents indicated that its content was developed according to their reality, observing a positive evaluation regarding the material, highlighting the relevance of the evaluation process

by the target audience as a way of identifying whether the material portrays the reality of the people for whom it is intended, and sensitizing them regarding the adoption of new behaviors³⁹.

Digital technologies allow adolescents to interact more, accessing resources of varied interests in health-promoting practices. In this context, it provides adolescents with access to health education in a fun, playful, and universally accessible way, promoting significant learning regarding adopting healthy habits⁴⁰.

We infer that the prepared booklet can produce knowledge and discussions on health and the environment, allowing adolescents to approach and take ownership of the information in the technology and greater leadership concerning decision-making in their health-disease process.

A limitation of the study is the sample size during the interviews in the data collection process for preparing the booklet due to the COVID-19 pandemic and the low number of studies on environmental health, construction, and validation of technologies for adolescents on health-promoting practices, hindering the comparison and discussion of the results. Thus, disseminating the study's results may narrow this gap.

Conclusion

The prepared booklet is a valid and reliable instrument in terms of appearance and content to be used in promoting the health of adolescents regarding the development of sustainable practices. Thus, the technology fulfilled its purpose of being a health education tool. The booklet may facilitate the implementation of practices to promote the health of adolescents, stir their leadership and sensitize them regarding care for the environment and health.

We underscore that a tool developed with the participation of the target audience can sensitize these people toward better care of their health, as it expands their participation to achieve a healthy life, promoting health and well-being for all people through sustainable practices.

Collaborations

SAA Alves worked on the conception, design, analysis, and interpretation of data, drafting the article, and approved the version to be published. KN Silva, MFAS Machado, EGR Cavalcante, and GA Albuquerque approved the version to be published. IMP Bezerra worked on the conception, design, drafting the article or its critical review and approved the version to be published. MSV Lopes worked on the conception, design, drafting the article or its critical review, and approved the version to be published.

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