



Development of nearpod-based e module on science material "energy and its changes" to improve elementary school student learning achievement

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ABSTRACT

This study aims to (1) know the process of creating e-module-based learning media on energy materials and their changes in Nearpod applications for elementary students, (2) know the feasibility of energy learning e-module media products and their changes to the Nearpod application for elementary school students who are eligible for use in Natural Science learning. This study uses a Research and Development (R&D) model. Based on preliminary studies, there is still a lack of interactive learning media based on technology to support and increase the enthusiasm of students' learning. A learning media is needed that can help teachers and students with learning activities. This research is based on previous preliminary studies that have been carried out, and the aim is to conduct a feasibility test of a research product developed. The development model used is the ADDIE model. The data collection techniques used are interview and questionnaire methods. Data analysis used descriptive percentage analysis. The results of the analysis showed media expert validation = 72.31% with Agree criteria, Material experts = 83.07% with Strongly Agree criteria, Feasibility test of teachers at SDN 1 Tukak Sadai and SDN 2 Tukak Sadai = 97.86% with the criteria of Strongly Agree and the product feasibility test on students = 95.28% with the criteria of Strongly Agree. This contributes to the Nearpod-Based Development of E-Modules to Improve the Learning Achievement of Elementary School Students.


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1. Introduction

Education is a learning and learning activity that gathers and includes closely related components, and education can determine the development and progress [1], [2]. Students can develop their potential through an integrated learning process. Learning as a process is a component in improving the learning process of interacting [3], [4]. Media can facilitate the learning process and help teachers and students easily understand learning [5], [6]. One of the components in the process is teaching materials. Teaching materials developed by teachers must contribute and effectively make students more active in learning and improve learning outcomes [7], [8]. According to Joseline M. Santos [9], teachers are expected to prepare learning materials that will be delivered to students efficiently in a short time but containing the core in the learning presented [10].

Teaching materials that students can use in learning independently is one of the modules [11]. According to N. Umamah [12], a complete and systematically prepared learning resource contains learning materials and guides to support or support the learning process to achieve the objectives in

the learning process. This is because learning with the help of innovative media and a suitable learning model can increase students' learning interest and thinking to influence students' learning achievements [13], [14]. The module designed is an effort of educators who involve learners to learn independently. This module contains at least the main components of the teaching materials source. Teaching materials are systematically arranged with language that learners can easily understand according to their level of knowledge and class age. They can learn independently, and then students can measure their level of mastery of the material discussed in each module unit. Modules are referred to as a medium for self-learning because they have been equipped with instructions for learning without teachers directly [15].

According to Rahmatsyah [16], Electronic module or e-module were defined as a learning media that contains various components that can support the learning process, namely the presence of text, images, graphics, audio, animation, and video learning that can be accessed in the computer in the learning process. Students can learn independently with their abilities and speed to complete the module package quickly and self-learning through the module [17]. On the contrary, while students are slow to learn, they will also be slow to complete the lesson. Materials packaged in a more practical form in modules allow students to learn faster or slower according to their abilities [18]. So that this electronic module is compiled and presented through technology media, and students can learn independently without the help of a teacher. Therefore, the utilization of technology is expected, especially the application of learning media in schools. Learning media can provide encouragement, desire, motivation, and stimuli in the learning process and psychologically impact students [19].

Nearpod is a web-based learning application that facilitates and controls interactivities during the learning experience settings [20]. Furthermore, students need to have more opportunities to collaborate and be active in learning [21]. Mattar [22] Shows that one of the main advantages of using Nearpod is to support student learning activities more actively in class with the various types of features that Nearpod provides to engage students in class. Therefore, Nearpod is considered one of the solutions that can improve student interaction, actively participate in the classroom, and support learning resources and be accessible on smartphones, tablets, and laptops [23]. Based on the results of preliminary studies that have been conducted through field study activities by conducting observations or direct surveys and through interview activities to analyze the needs of interactive learning media development, teachers are still minor variation in the development of interactive learning media and limited development of technology-based learning media in the science learning process [24]. The analysis results were compiled by 14 grade III and IV teachers from 9 different elementary schools in the 2020-2021 school year. From the results of the background exposure, this study aims to conduct a feasibility test of a research product developed not to assess the effectiveness of e-module-based media products. Therefore, this study wanted to develop a Nearpod-based module on science material "Energy and Its Changes" to improve the learning achievements of elementary school students.

2. Method

The type of method used in this study is using research and development (R&D) methods [25]. The research and development method is applied by educators to create a specific learning product and test the success and feasibility of the learning product [26]. This research was conducted from March 17, 2021, – June 5, 2021. The selection of samples of respondents in this study was conducted at SDN 1 Tukak Sadai and SDN 2 Tukak Sadai in the even semester of 2020/2021. The number of respondents from SDN 1 Tukak Sadai and SDN 2 Tukak Sadai amounted to 46 students consisting of 19 female and 27 male students. Data collection techniques and procedures in this study used a questionnaire or an assessment questionnaire using Google Form to learn media on energy materials and their changes to students at SDN 1 Tukak Sadai and SDN 2 Tukak Sadai [27]. The development procedure in this study uses the selected model, namely the ADDIE development model, as for the stages in developing e Nearpod-based modules [28], see Fig. 1.

The techniques and procedures for data collection in this study used questionnaires or assessment questionnaires on learning media on energy materials and their changes in students at SDN 1 Tukak Sadai and SDN 2 Tukak Sadai. This questionnaire uses a Likert scale that is a five-scale questionnaire sheet [29]. Alternative answers are 5 with categories of Highly Agree/Very Valid (HA), Agree/Valid (A), Less Agree/Less Valid (LA), Disagree/Invalid (D), and Strongly Disagree (SD). How to fill out this questionnaire sheet is with a checkmark in one of the alternative columns of answers that best suits the student's choice (respondent).

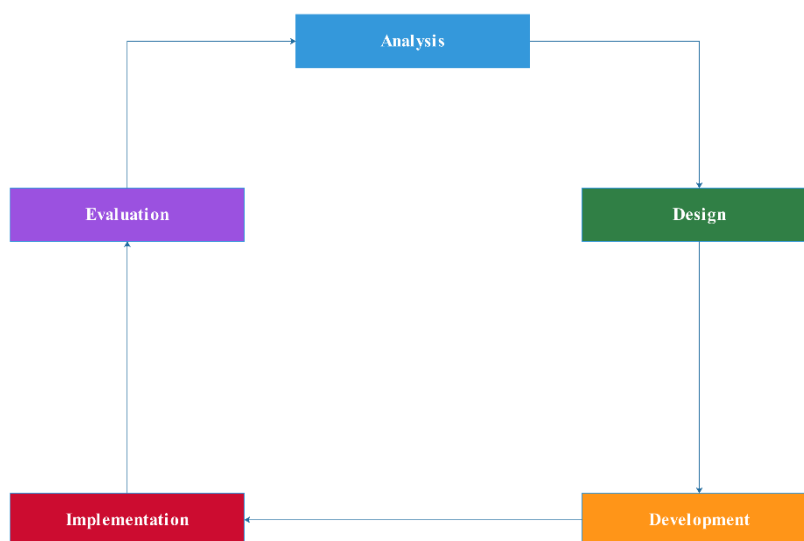


Fig. 1. ADDIE Model

As for scoring the respondent's answer is if the respondent answered Strongly Agree / Very Valid (SA) was given a score of 5, Agree / Valid (A) was given a score of 4, Less Agree / Less Valid (LA) was given a score of 3, Disagree / Invalid (D) was given a score of 2, and Strongly Disagreed (SD) was given a score of [30] (see Table 1). The questionnaire method is used to test the validity of products in E Development Nearpod-Based Module on Science Material "Energy and Its Changes" To Improve Learning Achievement of Elementary School Students. The questionnaire method is used by data collection techniques conducted by giving respondents several questions or written statements to be answered [31]. The percentage is a way to express numbers as part of the whole, where the whole is written as 100%. Obtained equation, Percentage = (Sum of Parts/Total Sum) x 100%.

Table 1. Percentage and validity criteria

Percentage Range	Criteria
81% - 100%	Strongly Agree / Very Valid
61% - 80%	Agree / Valid
41% - 60%	Less Agree / Less Valid
21% - 40%	Disagree / Invalid
0% - 20%	Strongly Disagree / Very Invalid

3. Results and Discussion

1) *Nearpod-based e-module assessment after being tested by media experts, material experts, and feasibility tests for teachers and students*

This development research produces products in the form of teaching materials e Nearpod-based IPA modules equipped with various features, including Instructions, Table of contents, learning indicators, Learning achievements, Concept Maps, Quiz games, Materials, Simulations, Evaluations, and Bibliography. This research product media was developed to help teachers teach grade IV students with the aim of students being able to learn independently.

Development of Nearpod-Based E Module on Science Materials "Energy and Its Changes" To improve the learning achievement of elementary school students, researchers have carried out the stages of validity and feasibility tests. The validity test consists of a media expert test and a material expert test. Furthermore, the feasibility test was conducted by grade IV teachers at SDN 1 Tukak Sadai and SDN 2 Tukak Sadai. While the next feasibility test was conducted by students as the primary respondents in this development research. The results of the media expert test, material expert that has been carried out by the researcher, and overall product feasibility tests can be seen in Table 2.

Table 2. Product Validation and Feasibility Test Results

No.	Validity and Feasibility Test	Validity Result (%)	Criteria
1.	Media Expert Test	72.30%	Agree
2.	Material Expert Test	83.07%	Strongly Agree
3.	Feasibility Test in Teacher I	98.57%	Strongly Agree
4.	Feasibility Test in Teacher II	97.14%	Strongly Agree
5.	Feasibility Test in Teacher I & Teacher II	97.85%	Strongly Agree
6.	Feasibility Test in Students	95.27%	Strongly Agree

This module e is developed using the ADDIE model, which consists of 5 stages (Fig. 1), including the analysis stage, design stage, development stage, implementation stage, and evaluation stage. The first stage is the analysis stage. This stage of the analysis is done to obtain the results of identification of initial needs data from teachers and students through interviews that have been conducted by researchers about learning activities using e neared-based modules. The learning environment can include learning culture in schools, learning culture in the classroom, educator interaction with students and student interaction with students, the potential involvement of students in the learning process, availability of learning resources, availability of information technology, and other supporting facilities [32]. Then the next stage of this analysis is to focus on the learning materials selected for media creation. Moreover, researchers choose the energy and change materials by adjusting the needs of teachers and students.

The second stage is the design stage. This stage of design is done in the development of e neared-based modules for designing. The design phase includes creating a flowchart design, storyboard, e module concept map, e module framework, learning materials, game quiz questions, and evaluation questions. The third stage is development. At this stage, creating media is done by adjusting to the stage of the storyboard that has been designed. At this stage, the media that has been completed is created and validated by media experts and material experts to be used in the learning process. At this stage of development is done to collect materials or materials teaching materials, while the material is obtained from science textbooks class IV and other books relevant to the material raised in the e-module.

The fourth stage is the implementation stage. At this stage of implementation is done first test media experts and expert test material by validators. The goal is to find out the results of validation by media experts and material experts. Implementation results in the form of validation conducted by media and material experts. This implementation stage was conducted with 46 grade IV students consisting of 2 schools, namely SDN 1 Tukak Sadai and SDN 2 Tukak Sadai found that the use of learning media integrated with the text, images, animation, audio, and video effectively increases motivation, making it easier for students to understand the material concept [33]. The fifth stage is the evaluation stage. After the trial, this evaluation stage is evaluated to the validity and feasibility of media experts, material experts, and teachers. Because of the validation results from media experts, materials, and teachers, many criticisms, suggestions, and inputs on the products. Therefore, before conducting actual product trials to the research, learners must resolve all aspects of deficiencies that have been assessed by media experts, materials, and teachers. From this evaluation stage has been completed, researchers began to research by conducting product trials on 46 samples of students consisting of 2 schools, namely SDN 1 Tukak Sadai and SDN 2 Tukak Sadai.

2) Nearpod based e-module media assessment by media experts.

Based on the validity test results of the assessment of media experts, they get the following suggestions/input. In principle, this application is perfect, it can stimulate students to learn unconsciously through smartphones, but several things need to be improved: 1. The application display is not symmetrical in all areas handphone; 2. There are typos in writing, and the font selection seems too "stiff"; 3. Need an additional back button to return to the previous menu (not to the home button); and 4. If possible, Quiz and evaluation are 1 part of this APK so that it does not require a 3rd party (although you can via the web). The media expert's assessment scores 72.30% in the Agree/Valid category, presented in Table 3. Based on Fig. 2 of the validation percentage from the table of media experts, the results are obtained from several aspects. In the aspect of content conformity obtained a percentage of 80% with the criteria "Agree," the content that contains following the learning achievements and learning indicators, the aspect of conformity of the display obtained a percentage of 66.66% with the criteria "Agree" product display made following the material and the intended

achievements so that when making designs and drawings adjust learning achievements, aspects of software engineering obtained a percentage of 76% with the criteria "Agree" application is easy to use so that it can be used as a self-taught material for students. Media experts have validated teaching materials that can be used in the learning process [34], [35].

Table 3. Product Validation Assessment Results by Media Experts

No.	Aspect	Item No	Percentage Average	Criteria
1.	Content suitability	1 and 2	80%	Agree
2.	Display suitability	3, 4, 5, 6, 7 and 8	66.66%	Agree
3.	Software engineering	9, 10, 11, 12 and 13	76%	Agree
Average			72.30%	Agree

So that overall obtained the average value of some aspects of media experts by 72.30% with the criteria "Agree." The use of e-modules can improve students' critical thinking skills because e-modules make learning more enjoyable with animated videos, images, text, and audio so that students are more active in asking questions and enthusiastically studying the material [36].

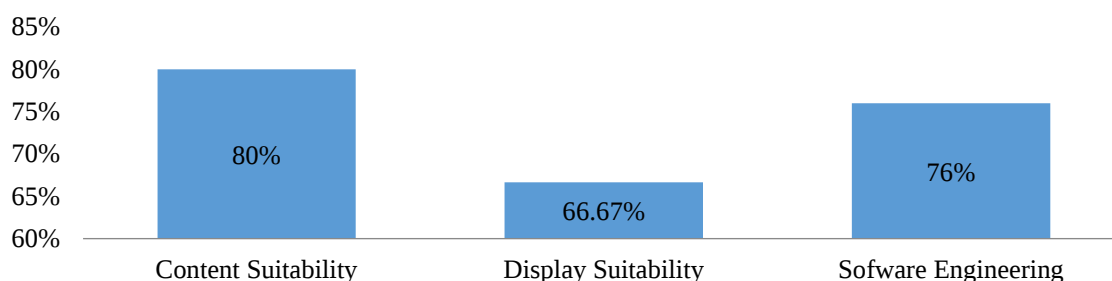


Fig. 2. Percentage chart of assessments by media experts

3) Nearpod based e-module media assessment by material experts.

Based on the test validity assessment material results, experts get suggestions/inputs as follows, 1. Need an explanation on what menu can be accessed with hp or laptop or both; 2. The Bibliography is replaced with a Name with Reading Material; 3. The number of achievements is small while the indicators are many; and 4. Forms of Energy in materials if you can use drawing pictures, so students understand. Media expert rating score 83.07% in the Strongly Agree / Very Valid category and presented in Table 4.

Table 4. Product Validation Assessment Results by Material Experts

No.	Aspect	Item No	Percentage Average	Criteria
1.	Material aspect	1, 2, 3, 4, 5, 6, and 7	80%	Agree
2.	Serving eligibility	8, 9, 10 and 11	90%	Strongly Agree
3.	Evaluation	12	80%	Agree
4.	Contextual	13	80%	Agree
Average			83.07%	Strongly Agree

Based on the validation percentage results from the Table 4, the value of several aspects of the Material Expert is obtained. Material aspects obtained a percentage of 80% with the criteria "Agree" material content inserted into electronic modules are organized systematically, in addition to the completeness of the material following RPP, aspects of presentation eligibility obtained a percentage of 90% with the criteria "Strongly Agree" indicates the product made can be an independent teaching material for learners, evaluation aspect obtained a percentage of 80% with the category "Agree."

Contextualization aspects have obtained a percentage of 80% with the criteria "Agree." The teaching materials developed have been validated by material experts and used by students [34]. So

that the average percentage value of some aspects is 83.07% with the criteria "Strongly Agree." (Fig. 3) E-modules are said to be good if described simply and easily understood so that information is conveyed clearly and e-modules are easy to understand [37].

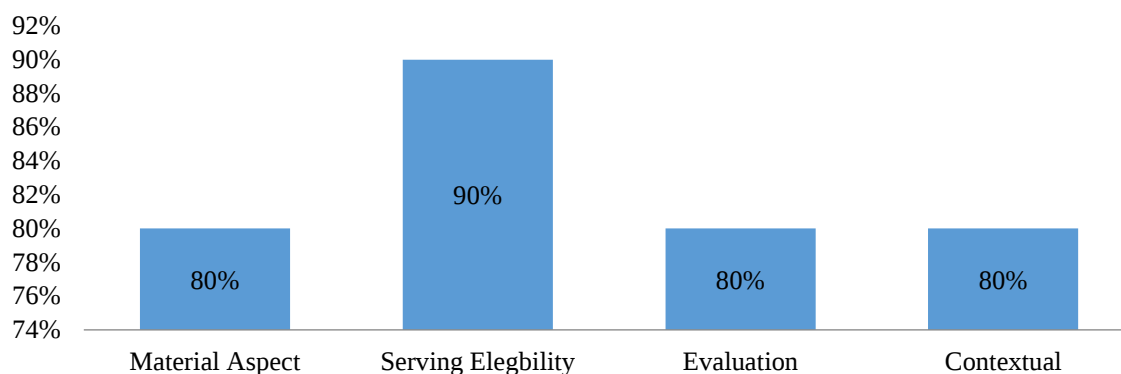


Fig. 3. Percentage chart of assessment by material experts

4) Assessment of the feasibility test of Nearpod-based e-module media by the teacher

Developmental tasting activities obtained from quantitative data of product feasibility test results in teachers and empirical trials in students. Following the results of the developed tasting activities, feasibility tests on product development will be conducted at this stage. E module in grade IV by the teacher in terms of visual aspects, material content, and aspects of language and writing. The media created is then graded by teachers from each different school. Namely, there are two teachers. The data obtained in quantitative data are product feasibility questionnaires and suggestions and inputs from grade IV teachers in each school.

Table 5. Product Feasibility Test Results by Guru

No.	Aspect	Item No	Percentage Average	Criteria
1.	Visual	1, 2, and 3	96.66%	Strongly Agree
2.	Content of the material	4, 5, 6, 7, 8, 9, 10, 11 and 12	97.77%	Strongly Agree
3.	Language and writing	13 and 14	100%	Strongly Agree
Average			97.85%	Strongly Agree

Assessment of the feasibility test by grade IV teachers at SDN 1 Tukak Sadai and SDN 2 Tukak Sadai. Based on the product feasibility test results, the teacher received the following suggestions/inputs; 1. Suggestions for Learning Videos if possible do not use an internet connection to access them; 2. Conclusion It is feasible to use for students; and 3. Overall it is good, but it is much better if the e-module application can be accessed without being limited by students, especially in the quiz game, simulation, and evaluation features.

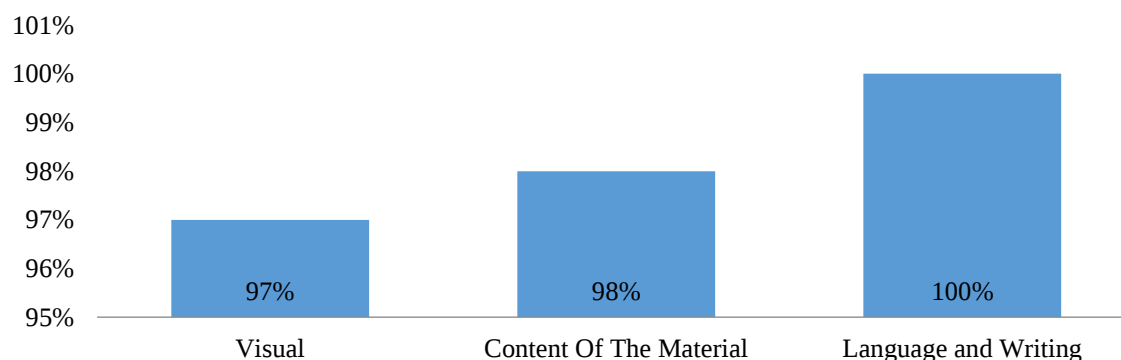


Fig. 4. Percentage chart of feasibility test assessments by teachers

The results of the media feasibility by the teacher get a score of 97.85% in the category of strongly agree / very valid and are presented in Table 5. Based on the results of the validation percentage from the Table 5, the value of several aspects of the product feasibility assessment by the teacher is obtained. In the visual aspect obtained percentage of 96.66% with the criteria "Strongly Agree," aspects of material content obtained percentage of 97.77% with the criteria "Strongly Agree" and aspects of language and writing obtained a percentage of 100% with the criteria "Strongly Agree" (See Fig. 4). Teaching materials developed and tested by teachers can help teachers in the learning process [38]. So that the average percentage value obtained from some aspects of 97.85% with the criteria "Strongly Agree."

5) Assessment of the feasibility test of Nearpod-based e-module media by the students

Assessment e Nearpod-based modules in students after validation by media experts, material experts, and due diligence on teachers. Based on the results of the feasibility test on 46 students, overall get an average of 95.27% with the criteria Strongly Agree / Very Valid in general, students feel helped by the existence of research products developed [34] and presented in Table 6. Based on the Fig. 5 of the validation percentage from the Table 6, the value of several aspects of the assessment of students was obtained. In the software aspect obtained a percentage of 93.04% with the criteria "Strongly Agree," material aspects obtained percentage of 96.41% with the criteria "Strongly Agree" and aspects of visual communication obtained percentage of 96.30% with the criteria "Strongly Agree." So that the average value on some aspects is 95.27% with the criteria "Strongly Agree." So, teaching materials are said to be practical if the ease of use, time efficiency in learning, and the benefits of using e-modules can be done repeatedly [37], [39].

Table 6. Product Feasibility Test Results by students

No.	Aspect	Item No	Percentage Average	Criteria
1.	Software	1 and 2	93.04%	Strongly Agree
2.	Material Aspect	3, 4, 5 and 6	96.41%	Strongly Agree
3.	Visual communication	7 and 8	96.30%	Strongly Agree
	Average		95.27%	Strongly Agree

It can be concluded that e Nearpod-based module is feasible and can be used as an alternative to improve the understanding of materials in science learning. Because of the assessment of 46 students in 2 schools through questionnaires or questionnaires obtained results of 95.27% with the criteria "Strongly Agree," which shows that the material IPA "Energy and Its Changes" in e module based nearpod to the category "Strongly Agree." Research products developed can help teachers and students learn [34], [40]. The resulting product is an electronic module application that can be utilized by learners in the learning process.

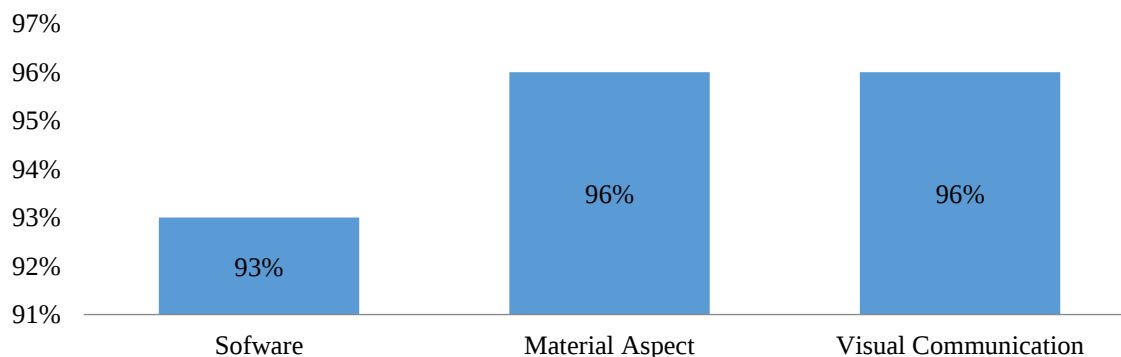


Fig. 5. Percentage chart of feasibility test assessments by students

4. Conclusion

This research contributes to improve knowledge students, according to the findings of the research and development and development that has been done, the nearpod-based modules have excellent quality, both in material aspects and media aspects. Judging from the assessment of media experts, material experts, and due diligence on teachers, the nearpod-based modules get excellent criteria. It can be concluded that using nearpod-based modules on science materials "energy and change" is feasible for grade IV elementary school students.

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- Author contribution** : AF: Conceptualization, writing, and data analysed. ZH: Supervision and critical revision.
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