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Quick Response Code-based Pop-Up Book Media: Plant Reproduction Systems Topic for Grade VI Elementary School

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ABSTRAK

Penggunaan media pembelajaran inovatif yang berbasis teknologi digital dapat memberikan dampak positif terhadap peningkatan kualitas proses pembelajaran. Penelitian ini bertujuan untuk mengembangkan sebuah media pop-up book berbasis quick response code pada topik cara perkembangbiakan tumbuhan yang telah teruji validitasnya. Penelitian ini dilaksanakan melalui lima tahapan pada model ADDIE. Penelitian ini hanya dilaksanakan hingga tahap pengembangan saja. Pengumpulan data dilaksanakan dengan metode kuesioner. Instrumen penilaian yang digunakan untuk menguji validitas media pop-up book pada penelitian ini adalah rating scale dengan lembar penilaian media pembelajaran. Subyek penelitian ini adalah media pop-up book berbasis quick response code pada topik cara perkembangbiakan tumbuhan untuk kelas VI SD dengan validitas media sebagai objek penelitian. Penilaian dilaksanakan oleh empat orang ahli yang terdiri dari dua orang dosen dan dua orang guru kelas enam. Hasil penilaian kemudian dihitung rata-ratanya untuk mengetahui validitas media pop-up book berbasis quick response code yang telah dibuat. Dari hasil penilaian oleh empat orang ahli, diperoleh skor rata-rata validitas media sebesar 93%, skor rata-rata validitas materi 96% serta validitas media oleh praktisi rata-rata sebesar 98% dengan kualifikasi sangat baik. Berdasarkan hasil tersebut, dapat disimpulkan bahwa media pop-up book berbasis quick response code pada topik cara perkembangbiakan tumbuhan kelas VI SD sudah valid dengan kategori sangat baik.

ABSTRACT

The use of innovative learning media based on digital technology can have a positive impact on improving the quality of the learning process. This study aims to develop a media pop-up book based on a quick response code on the topic of plant propagation that has been tested for validity. This research was conducted through five stages in the ADDIE model. This research was only carried out until the development stage. Data collection was carried out using a questionnaire method. The assessment instrument used to test the validity of the pop-up book media in this study was a rating scale with a learning media assessment sheet. The subject of this study was pop-up book media based on quick response code on the topic of plant reproduction systems for grade VI elementary schools with the validity of the media as a research object. The assessment was carried out by four experts consisting of two lecturers and two sixth grade teachers. The results of the assessment are then averaged to determine the validity of the pop-up book media based on the quick response code that has been made. From the results of the assessment by four experts, an average media validity score of 93% was obtained, the material validity average score was 96% and the media validity by practitioners was an average of 98% with very good qualifications. Based on these results, it can be concluded that the pop-up book media based on the quick response code on the topic of plant reproductive systems for grade VI elementary schools is valid in the very good category.

1. INTRODUCTION

Education is one aspect that is the key to the success of educational development and human resource development. Education in elementary schools is very important to prepare young people who are ready to survive in globalization (Susilowati & Suyatno, 2021; Zein, S, 2017). The development of an increasingly sophisticated era must be in harmony with the progress of national education. The quality of education in a country reflects the progress of that country. In order to create competitive talent (HR) in a globalized world, especially in the current Industry 4.0 era, we need to improve the quality of education in our country. The Industrial Age 4.0 requires humans to master the 4C elements: critical thinking and problem solving, communication, collaboration, and creativity, as highlighted by the World Economic Forum (WEF) (Herlina et al., 2022; Roblek et al., 2016). Human Resources who have mastered the 4C elements are created through high-quality training that emphasizes mastery of the 4C elements (Tang et al., 2020; Yu & Wan Mohammad, 2019). Quality education can be achieved through quality learning processes and learning media.

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The learning carried out is expected to be right on target according to graduate competency standards. These objectives include the development of attitudes, knowledge and skills that are developed in the learning process (Fırat & Laramee, 2018; Salimi, Moh, 2020; Yazon et al., 2019). The fields of attitudes, knowledge and skills of students need to be developed in a balanced way in order to produce high-quality talents who are ready to survive in global competition. The three competency areas are achieved through different processes. The field of attitude is developed through practice, appreciation, life and acceptance. The realm of knowledge is developed by memorizing, understanding, applying, analyzing, evaluating, and creating. The field of skills is developed by observing, asking, trying, discussing, presenting and creating activities. Learning must involve all students to participate actively. So that educators must be able to create a conducive learning space (Salimi, Moh, 2020; Song, 2018). This learning must be done in all subjects, including Natural Sciences (IPA) subjects. Learning natural sciences in elementary schools is an initial foundation given to students, in learning natural sciences students will be able to improve their knowledge, skills and scientific attitudes. So that science subject is not solely about mastering knowledge in the form of facts and concepts, but also investigations and discoveries (Sukmasari & Rosana, 2017; Young et al., 2018).

Planning in starting learning is very important to be done by the teacher. As well as designing what models are used, what approaches are taken, and what media are used in the learning process so that later the learning process becomes directed, and learning achievements can be fulfilled (Aliyyah et al., 2021; Yuliana et al., 2022). Qualified teachers have the ability to successfully impart knowledge to their students. Teachers must also be able to teach, educate and train students better so that they not only know the knowledge gained at school, but also apply it in everyday life. Teacher skills in preparing learning media used in the teaching and learning process are very necessary. As we know, the teacher's role in the learning process is to become a mediator and facilitator. As a mediator, the teacher is responsible for preparing the necessary facilities for his students. As a facilitator, teachers must have good knowledge and understanding of learning media (Anggraini et al., 2020; Hau et al., 2020). Learning media is an intermediary tool as well as a means of communicating and conveying the meaning of the message conveyed which aims to assist teachers in providing material or understanding students in achieving the goals of learning (Huertas-Abril, 2021; Wibawa, 2017). Therefore, learning media has a very important role in learning activities.

Media and also material is an important component to be developed in a lesson. It is very common to find teachers who rarely develop materials and learning media for various reasons. Teachers often only do learn according to the material in the student book (Apriyanti et al., 2020; Istri Aryani & Rahayuni, 2016). Even though the materials contained in student books can still be developed according to the learning needs of students. The results of observations and interviews conducted at SD in Sukasada District, show that all grade VI teachers in the cluster are still lacking in developing material, even rarely, and learning media are also rarely developed for various reasons, such as time constraints, the many demands that must be met in implementing the 2013 Curriculum, readiness in carrying out learning. This is supported by the results of a questionnaire on 9 grade VI teachers at SD in Sukasada District, stating that 78% of teachers said it was necessary to develop learning materials in science content and the remaining 22% stated that it was very necessary to develop material in science content. The impact of material limitations will be felt in the learning process and also in learning outcomes based on an analysis of student scores, it can be seen that learning outcomes without the use of media are very low.

To reduce the impact of the problems above, it is necessary to develop a learning media in which there is development of material from science learning content in student books. Media that can be developed is pop-up book media based on the Quick Response code. Pop-up books are three-dimensional books that allow interactive motion and filling in attractive displays (Arip & Aswat, 2021; Dewanti et al., 2018). Teachers and students at SD Sukasada District, have a fairly high interest in developing quick response code-based pop-up book media. This can be proven by the results of distributing questionnaires of the 9 grade VI teachers, 78% of teachers agreed if the science content material in student books was developed in the form of quick response code-based pop-up book media, while 22% of other teachers stated that they strongly agreed. Of the 27 grade VI students, 74% of students stated that science content material needed to be developed in a pop-up book based on a quick response code, while 26% stated it was very necessary.

Based on the background of these problems, the learning media that needs to be developed is pop-up book media based on quick response codes on the topic of plant propagation. Pop-up book media based on quick response code is media that can assist teachers in the learning process and contains a qr code where there is material development on the topic of plant propagation in the media. The use of learning media does not require that each student has one learning media and also a device, because the pop-up book media based on the quick response code can be used in groups so that learning time is efficient and makes it easier to use learning media. The purpose of this study is to develop and analyze the validity of media. So that later this media can be used in the learning process where this media has uniqueness and usefulness in the learning process.

2. METHOD

This research is a qr code-based pop-up book media development research on the topic of plant propagation. The model used in this study is the ADDIE model (Analyze, Design, Development, Implementation, Evaluation). The selection of this model is based on a consideration regarding this model being developed systematically and being able to stand on a theoretical foundation of learning design. This model is structured programmatically with systematic sequences of activities in an effort to solve learning problems related to learning resources that suit the needs and characteristics of learning. This model consists of five steps, namely: (1) analysis, (2) design, (3) development, (4) implementation, and (5) evaluation (Branch, 2010).

The development of qr code-based pop-up book media on the topic of plant propagation is implemented through several stages. The stages are: (1) analysis (analyze); (2) design (design); (3) development; (4) implementation (implementation); and (5) evaluation (evaluation). Figure 1 is show the ADDIE model development method.

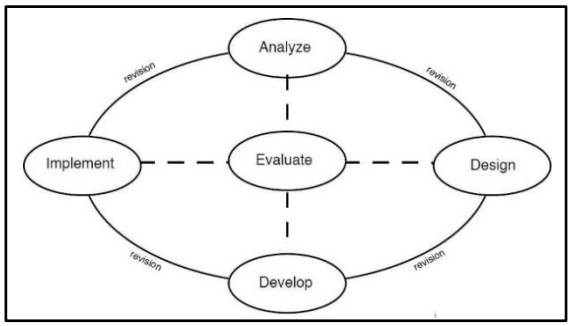

Figure 1. ADDIE Model Development Method

The product development research trial was carried out by reviewing the pop-up book media based on the quick response code that had been developed. The review was carried out by several experts so that they could find out the eligibility of the media whether the pop-up book media based on the quick response code was appropriate to use or not. Product Trial Design can be seen in Figure 2.

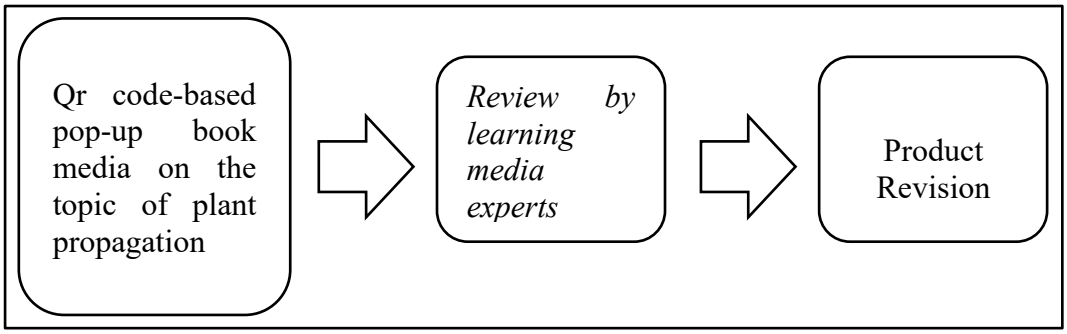

Figure 2. Product Trial Design

The validity of the qr code-based pop-up book media which was developed using an assessment instrument in conducting a test. Media assessment refers to aspects of validity which include aspects of format, content, language, practicality, and effectiveness. The five aspects that have been mentioned are made in the form of instruments based on the criteria for each aspect. As for each of these aspects, namely: (1) the criteria for the cover aspect, which includes media identity and also the attractiveness of the cover; (2) the format aspect criteria, which includes color, text, font, and layout; (3) the criteria for the aspect of the content include the suitability of the material with the indicators, the ability of the media to explain the material, the completeness of the material, and the attractiveness of the material in the media being developed; (4) the criteria for language aspects include the use of language in media, language standard, sentence effectiveness, and word usage; (5) the criteria for practical aspects in it relate to the use of media; and (6) the criteria for effective aspects are also related to the use of a medium. The learning media validation sheet grid is presented in Table 1.

Table 1. Grid of Qr Code Based Pop-Up Book Media Validity Sheets

No.	Aspect	Indicator	Number of Items	Item Number
1	Cover	Identity media	1	1
		Cover attractiveness	1	2
		Compatibility of colors, text, and images on pop-up book media based on qr code.	1	3
2	Format	The use of fonts and font size is easy to read.	1	4
		Appropriateness of the layout of the pop-up book media based on the qr code.	1	5
		Correspondence between the material on the pop-up book media based on the qr code and the indicators on the syllabus.	1	6
3	Fill	Completeness of material/information contained in the qr code-based pop-up book media.	1	7
		The contents of the qr code-based pop-up book media arouse students' curiosity.	1	8
		The language used in the pop-up book is easy to understand.	1	9
4	Language	Standard language used in the pop-up book.	1	10
		The effectiveness of the sentences used.	1	11
5	Practical	The use of qr code-based pop-up book media does not require a lot of supporting facilities.	1	12
6	Effective	The use of qr code-based pop-up book media can be repeated.	1	13

The instrument can be said to be good when the instrument meets the requirements of content validity. Content validity is used to measure the validity level of the pop-up book media instrument grid based on the quick response code. The content validity test was carried out using the Gregory formula, namely by using expert judgment. The 2 x 2 cross tabulation used to measure content validity can be seen in Table 2.

Table 2. Calculation of Content Validity According to Gregory

Judges	***Judges I***		
	Judges Rating	**Less relevant**	**Highly relevant**
Judges II	Less relevant	A (– –)	B (– +)
	Highly relevant	C (+ –)	D (+ +)

The content validity value obtained based on the calculation reflects all the test items being tested. The validity level of the test can be seen based on the content validity coefficient category. Content validity coefficient categories can be seen in Table 3.

Table 3. Content Validity Coefficient Criteria

Coefficient	Validity
0.80 – 1.00	Very high
0.60 – 0.79	Tall
0.40 –0.59	Currently
0.20 – 0.39	Low
0.00 -0.19	Very low

The average score obtained was then converted using a scale of five conversion guidelines to determine the validity of the pop-up book media being developed. The five scale conversion guidelines used can be seen in Table 4.

Table 4. Five Scale Conversion Guidelines

Level of Achievement (%)	Qualification/Predicate	Description
90-100	Very good	No revision needed
75-85	Good	Little revision
65-74	Enough	Revised to taste
55-64	Not good	Many things were revised
1-54	Very Not Good	Repeated product creation

3. RESULT AND DISCUSSION

Result

The procedures carried out in developing pop-up book media on the topic of plant propagation for class VI SD in Cluster V Sukasada District for the 2022/2023 academic year are explained based on the stages of analysis, design and development (analyze, design, development). Analysis of the syllabus, teacher's books, student books, and the grade VI curriculum at SD Cluster V, Sukasada District was carried out in order to find out the core competencies and basic competencies that would become a requirement in determining the learning completeness of Grade VI SD students. Another objective of this analysis is to find out the scope of science material, especially on the topic of plant propagation, to be used as a reference in developing learning materials and media. The results show that natural science material, especially on the topic of the solar system, is still lacking in breadth, depth, and completeness. Basic competencies and indicators of competency achievement in the cognitive domain of the solar system topic for class VI SD can be seen in Table 5.

Table 5. Basic Competency and Competency Achievement Indicators on the Topic of Plant Propagation

Basic Competency	Competency Achievement Indicators
3.1 Comparing the ways of reproduction of plants and animals.	3.1.1 Evaluating generative reproduction in plants. 3.1.2 Evaluating types of generative reproduction in plants. 3.1.3 Evaluate the method of vegetative propagation of plants. 3.1.4 Evaluating vegetative propagation of plants.

The design phase is carried out with activities such as designing pop-up book media on the topic of plant propagation for class VI SD in Cluster V, Sukasada District, for the 2022/2023 school year. This design phase starts from the activity of determining a Basic Competency (KD) and also Competency Achievement Indicators (GPA). Basic Competency and Competency Achievement Indicators will be a reference in finding and developing material on how to propagate plants for grade VI elementary schools. After getting the next material the material that has been developed will be compiled and presented with a simplification so that class VI elementary school students can more easily understand. Furthermore, the development material is packaged in a pop-up book media sketch. After the sketch is complete, guidance is given to the supervisor to get input/suggestions. The input/suggestions given by the supervisor are used in improving a media design that has been made. The design details that have been designed can be seen in Figure 3.

Figure 3. Design Details of Pop-Up Book Learning Media

This development stage is carried out after the design activities have been improved based on the input of the supervisor, then developed into media forms. Media is made with the main ingredient in the form of glossy paper measuring 42.0 cm x 29.7 cm (A3). The pop-up book media on the topic of plant propagation consists of a cover page, start page, Basic Competency page, indicators, user manual, nine content pages, one conclusion page, one games page, and the back cover page. In addition to glossy paper, media production uses cardboard to increase

the thickness of the media, uses manila paper to attach material to make it look embossed and other attributes. The images and videos used in the media are obtained via the internet. Where the images and videos are tailored to the needs of the media. The application used is the Canva application, and the qr generator application. The results of the editing will be applied and printed in the form of a pop-up book. The results of the pop-up book learning media according to the design can be seen in Figure 4.

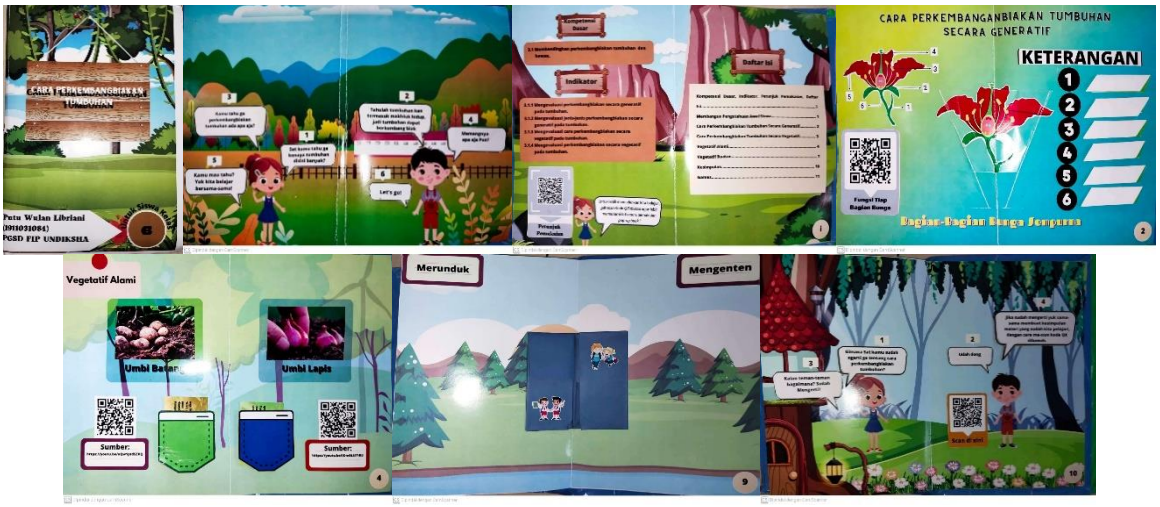

Figure 4. The Results of the Pop-Up Book Learning Media According to the Design

The pop-up book media on the topic of plant propagation was then tested by experts, both media experts, material experts and practitioners to evaluate the media that had been developed. The test carried out by the expert test was carried out by giving an assessment sheet containing the feasibility of pop-up book media on the topic of how to reproduce plants both in terms of media quality, use of media, and material contained in the media to two lecturers and two class VI teachers. The assessment sheet used is a checklist with a 1-5 rating scale technique. After testing and obtaining an assessment score, the score will be averaged using the Mean formula. In knowing the average media validity score, it will be converted with a scale of five conversion guidelines to determine the qualifications of the media being developed. Not only does the score contain the score sheet, but there is also a comment column to provide criticism and suggestions for the media that has been developed.

The validity of the pop-up book media on the topic of plant propagation can be determined by analyzing the data from expert test results. The assessments obtained from material experts, media and practitioners will be analyzed and then the average score obtained will be calculated. In knowing the average media validity score, it will be converted with a scale of five conversion guidelines to determine the qualifications of the media being developed. The average score obtained from material experts, media experts and practitioners can be seen in Table 6.

Table 6. Average Validation Scores of Media Experts, Material Experts and Practitioners

No.	Expert	Validity Results	Qualification
1	Media Expert Test	96%	Very good
2	Material Expert Test	93%	Very good
3	Practitioner	98.5%	Very good

Based on Table 6, an average media validation score of 96% is obtained, an average material validation score is 93%, and an average practitioner validation score is 98.5%. Assessments based on each expert and practitioner get an average with a score range of 90% - 100%. Based on the five-range scale conversion guidelines, the qualifications are very good. So it can be concluded that the results of the average pop-up book media validation score as a whole can be declared valid and feasible to use with very good qualifications.

Discussion

This research is a research that develops pop-up book media based on a quick response code on the topic of how to propagate plants for class VI elementary school in Cluster V, Sukasada District, academic year 2023/2024. This development research uses the ADDIE model (Analyze, Design, Development, Implementation, Evaluation). The selection of this model is based on a consideration regarding this model being developed systematically and being able to stand on a theoretical foundation of learning design. This model is structured

programmatically with systematic sequences of activities in an effort to solve learning problems related to learning resources that suit the needs and characteristics of learning. This model consists of five steps, namely: (1) analysis, (2) design, (3) development, (4) implementation, and (5) evaluation. Due to the writer's limitations in terms of time, manpower, and finances, this development research was only carried out in the analyze, design, and development stages, while the implementation and evaluation stages were not carried out.

At the development stage, pop-up book media development activities are carried out in accordance with the design that has been consulted and received input or suggestions from the supervising lecturer. Then tests were carried out by media experts and science learning to review the media that had been developed. The expert test was carried out by providing an assessment sheet containing the feasibility of pop-up book media on the topic of how to reproduce class VI elementary schools to material experts, media and practitioners (Buchori, 2019; Ramadhani & Muhtadi, 2018). The data reviewed by experts and practitioners were then analyzed and obtained a validity score with an average score ranging from 90% - 100%. The average results are converted with a scale of five conversion guidelines so that it can be concluded that the results of the average pop-up book media validation score as a whole can be declared valid and feasible to use with very good qualifications (Dewanti et al., 2018; Wulandari et al., 2020).

Based on the explanation above, it can be said that the pop-up book media that has been developed has tested its validity with very good qualifications and is appropriate when applied in teaching and learning activities at the sixth grade level of elementary schools. The use of pop-up book media as a learning medium will have a very positive impact, especially on students (Nabila et al., 2021; Wulandari et al., 2020). In addition to attracting pop-up books, it will make it easier for students to receive material so students don't get bored with the learning material that will be delivered. Another advantage of pop-up books is that they give a real impression in a learning process, so students feel directly involved and students will put the material contained in pop-up book media in long term memory (Eri Karisma et al., 2020; Pratiwi et al., 2020).

This research obtained results that were in line with the results of research that had been carried out that found the six validators, the average validation questionnaire was 94.83% (very valid/interesting). Based on these results, it can be concluded that the pop-up book learning media assisted by the qr code of flat shape material that has been developed is worthy of further testing to see its effectiveness in learning (Anisa Fitri, 2018). Other research conducted were divided into two cycles, it can be concluded that (1) in cycle one there was an increase in student learning outcomes from 53.9 to 68.3 with an average increase of 14.4; (2) in cycle two it increased again to 86.1 with an average increase of 17.8 and with a completeness of 88.9%; (3) The study scores reached the KKM and reached the target where more than 85% of students earned ≥70 (Arip & Aswat, 2021). From these results it was stated that using pop-up media could improve student learning outcomes in the Science subject Theme 1 Animal and Human Movement Organs in class V SD Negeri 1 Lawela, South Buton Regency. The third research that is relevant to this research is research conducted that found the pop-up book media is suitable for use with a percentage score from material experts 88% in the very feasible category and a percentage score from media experts 78% in the practical category (Yara & Taufik, 2021). After the use of pop-up book media in small groups, the results were 87% in the very practical category. So that the pop-up book media for class V thematic learning based on local wisdom is categorized as very feasible and very practical to use in the learning process.

Based on the process and results of this research, the following suggestions can be made. (1) To teachers, the results of this study can be used as a reference if they want to develop learning media on different topics. (2) To the school principal, the results of this research can be used to facilitate teacher creativity in developing media, such as providing a special place to store learning media that has been developed so that it does not spoil quickly. Provide motivation and encouragement to teachers to be more enthusiastic in carrying out the development of learning media in schools. (3) To other researchers, this research can be used as a reference for developing instructional media related to quick response code-based pop-up book media on the topic of how to reproduce plants in grade VI elementary schools. This media can be further tested to find out its effectiveness in teaching and learning activities in grade VI of elementary school. Other researchers can continue this research to the implementation stage through experimental type research.

4. CONCLUSION

This research provides results that have been implemented which can be used as a reference in stating that the media that has been developed is valid with an average media validation of 96%, an average material validation score of 93%, and an average practitioner validation score of 98.5%. Assessments based on each expert and practitioner get an average with a score range of 90% - 100%. Based on the five-range scale conversion guidelines, the qualifications are very good. So it can be concluded that the results of the average score of pop-up book media validation based on the quick response code on the topic of class VI plant propagation methods in Cluster V, Sukasada sub-district, have been tested with very good qualifications.

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