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# Developing Science Learning Media: Hainthec Quartet Cards (Harmony in the Ecosystem)

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**Abstract:** In the science learning of harmony in ecosystem material, students still have difficulty in understanding the abstract concepts in the harmony in ecosystem material. The purpose of this study is to determine the development process, media feasibility and student responses. The research method used is the ADDIE development model (Analyze, Design, Develop, Implement, and Evaluate). The results of the feasibility test of this study by three media experts obtained an average percentage of 89.16% with a very feasible category. The results of the feasibility test by three material experts obtained an average percentage of 93.33% with a very feasible category. The results of the feasibility test by three language experts obtained an average percentage of 90.22% with a very feasible category. The results of the small group student response questionnaire obtained an average percentage of 90.48% with a very feasible category, the results of the large group student response questionnaire obtained an average percentage of 87.74% with a very feasible category and the results of the teacher response questionnaire obtained an average percentage of 92% with a very feasible category, so that the Hainthec quartet card learning media can be used as a learning medium. The conclusion of this study is that the Hainthec quartet card learning media produced received a response that was Very Suitable for use in learning. This is based on assessments by media experts, material experts and language experts as well as responses from small group trial students, large group trial students and teachers. The suggestions of this study are: 1) In the development of the Hainthec quartet card learning media, the media is still made using the usual (free) Canva application. 2) It is necessary to pay attention to suggestions and input from experts. 3) Pay more attention to the material contained in the learning media to minimize errors.

**Keywords:** Research and Development, Media, Science Learning, Hainthec Quartet Cards.

## PRELIMINARY

Ecosystems are the study of the interconnected relationships between living things, resulting in a reciprocal relationship between living (biotic) and nonliving (abiotic) components (Herianto, 2017). Studying ecosystems enables students to understand that all living things are interdependent and fosters awareness of the importance of environmental protection. However, ecosystems are often difficult to learn. Students

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struggle with science and science ecosystems because they encounter unfamiliar scientific concepts, requiring a deeper understanding (Swistiyawati & Indrayani, 2024). Therefore, teachers can improve their learning strategies to address student learning difficulties and enhance student understanding. The choice of learning strategies must be tailored to student characteristics, the learning material, and the learning objectives (Syaripudin, 2024). The use of appropriate learning strategies will benefit both teachers and students. Teachers can link learning strategies with technology to make the learning material more engaging.

Technology is a means or tool for conveying messages and assisting in problem-solving through science, thereby achieving specific goals (Suryadi, 2020). The use of technology media will facilitate teachers in delivering material and help students grasp and understand the subject matter more easily (Syarifuddin & Utari, 2022). One type of technology widely used in education today is the Canva application. Canva is a graphic design application accessed online with the help of the internet. It is used to create social media graphics, presentations, posters, documents, and other visual content (Siregar et al., 2022). The Canva application provides a variety of ready-made templates that can be edited via mobile phone or computer anytime and anywhere. Thus, teachers can utilize the Canva application to create engaging learning materials, thereby increasing the effectiveness of more innovative learning methods.

A learning method is a method teachers can use to convey learning material to students to achieve learning objectives (Akhiruddin et al., 2020). In addition to methods, media are also needed in learning activities. Learning media is anything educators can use to convey messages to students, stimulating their thoughts, feelings, attention, and interest in learning, effectively achieving learning objectives (Zainiyati, 2017). Various available learning media can be used to meet students' learning needs, one of which is visual media. Visual media plays a crucial role in the learning process because it can facilitate understanding, strengthen memory, foster student interest, and provide connections between the content of the lesson and the real world, ensuring effective learning (Nurfadhillah et al., 2021).

One type of visual media adapted from games that can be used in learning activities is the quartet card learning media. Quartet cards are easy to play, small in size, and offer a variety of images, making them easy for students to play both during and after class

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(Mariani & Setiawati, 2022). Quartet cards are considered highly engaging as learning materials because they are interactive, fostering interaction between students and other students, encouraging communication and collaboration between groups. Quartet cards can also be used as a solution in science learning.

Based on interviews with class teachers at SDN 008 Samarinda Ilir, the main factor significantly impacting the ecosystem learning process is that the teaching materials used are not appropriate for student characteristics. For example, the teacher still uses scientific language that students don't understand, the teacher doesn't relate ecosystems material to students' real lives when delivering it, the teaching materials still use standard PPT designs, the teaching materials are monotonous and colorless, and the teacher forgets to translate the scientific language. As a result, some students still lack understanding of the ecosystems material presented by the teacher. Based on the data obtained by the researcher, it shows that out of 27 students, 13 students can understand the ecosystem material and as many as 14 other students still do not understand the ecosystem material. The results of interviews with teachers and pre-research questionnaires distributed by researchers to students found that students need educational media that is interesting so that students can be active in learning activities, so the use of Hainthec quartet card learning media can help teachers and students in learning activities in the classroom.

The development of the Hainthec Quartet Card (Harmony in the Ecosystem) science learning media aims to determine the development process, media feasibility and student responses. With the Hainthec Quartet Card media, it is hoped that it can provide a fun and interesting learning experience and help students understand the abstract concepts in the Harmony in the Ecosystem material. This media is also expected to provide benefits for teachers, in increasing their creativity by utilizing various media, one of which is the Hainthec Quartet Card media so that the learning process in the classroom becomes active, fun and not stressful.

## METHOD

This study used the ADDIE model, a development method with five stages: Analysis, Design, Development, Implementation, and Evaluation. The purpose of this study was to determine the development process, media feasibility, and student responses.

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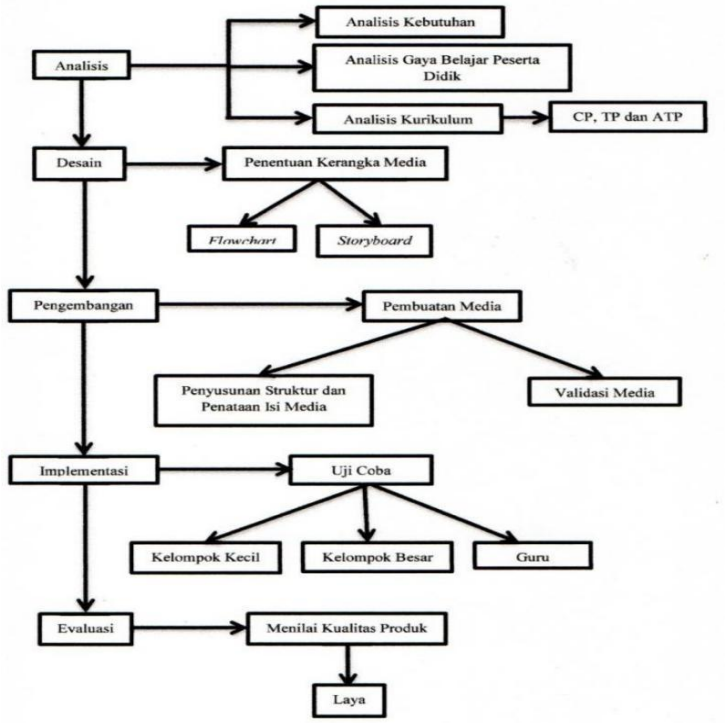


**Figure 1. Development Implementation Procedure (Modified from Sari, Sari, & Inda Rahmayani, 2017)**

The research was conducted in the VB class of SDN 008 Samarinda Ilir for three days, October 28, 29, and 30, 2024. The trial subjects in this research and development consisted of a feasibility test conducted by media experts, material and language experts, a small group trial, and a large group trial. The trial object was the Hainthec quartet cards learning media. Data collection techniques used questionnaires, interviews, and documentation. The research instruments used were interview guidelines, a student learning style questionnaire, a media expert questionnaire, a material expert questionnaire, a language expert questionnaire, a teacher response questionnaire, and a student questionnaire. Data analysis techniques included expert validation data analysis and media practicality analysis. The expert validation test aimed to assess the feasibility and validity of the learning media. The validation criteria are as follows:

**Table 1. Aspects of Validation Criteria**

| No | Validation | Indicators |
|---|---|---|
| 1 | Media | Design, Illustration, Typography, Layout |
| 2 | Matery | Material Suitability, Content Suitability, Material Presentation |
| 3 | Language | Clearness, Readability, Clarity |

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## RESULTS

### 1. Analysis Stage

The analysis stage, carried out by analyzing various things to determine students' needs, including: a) Needs Analysis, carried out by distributing pre-research questionnaires to students to determine whether the media created can suit students' needs. Based on the results of the pre-research questionnaire, students need educational media that is interesting so that students can be active in learning activities. The use of Hainthec quartet card learning media can be a solution in helping teachers and students in learning activities in the classroom. b) Analysis of Student Learning Styles, aims to determine students' learning styles towards science learning. In the analysis of student learning styles, it was carried out by giving a learning style questionnaire to all students in class VB. Based on data from the learning style analysis of class VB students, 18 students had visual learning styles, 5 students had auditory learning styles, and 4 students had kinesthetic learning styles. c) Curriculum Analysis: A curriculum analysis was conducted to determine the curriculum used. Two curricula were implemented: the 2013 curriculum and the Merdeka curriculum. The 2013 curriculum was implemented in grades 3 and 6, and the Merdeka curriculum was implemented in grades 1, 2, 4, and 5.

### 2. Design Stage

The design phase of the Hainthec Quartet Card learning media product involves creating design sketches. These sketches consist of a flowchart and a storyboard. The flowchart illustrates the design flow for creating the media. The storyboard illustrates the learning media that will be included in the card.

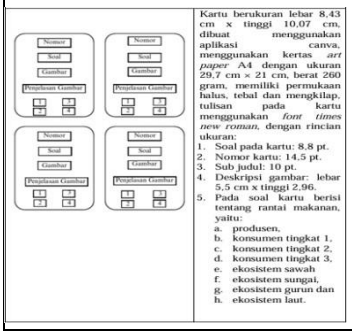
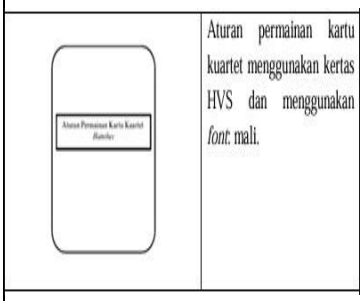
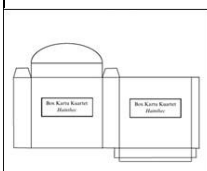
| Front of Card Quarte | Card Game Rules Quarte | Media Packaging (Box) Quarte Card |
|---|---|---|
|  Kartu berukuran lebar 8,43 cm x tinggi 10,07 cm, dibuat menggunakan aplikasi canva, menggunakan kertas *art paper* A4 dengan ukuran 29,7 cm × 21 cm, berat 260 gram, memiliki permukaan halus, tebal dan mengkilap, tulisan pada kartu menggunakan *font times new roman*, dengan rincian ukuran:<br>1. Soal pada kartu: 8,8 pt.<br>2. Nomor kartu: 14,5 pt.<br>3. Sub judul: 10 pt.<br>4. Deskripsi gambar: lebar 5,5 cm x tinggi 2,96.<br>5. Pada soal kartu berisi tentang rantai makanan, yaitu:<br>a. produsen,<br>b. konsumen tingkat 1,<br>c. konsumen tingkat 2,<br>d. konsumen tingkat 3,<br>e. ekosistem sawah<br>f. ekosistem sungai,<br>g. ekosistem gurun dan<br>h. ekosistem laut. |  Aturan permainan kartu kuartet menggunakan kertas HVS dan menggunakan *font*: mali. |  Kemasan (kotak) kartu kuartet menggunakan kertas *glossy* yang biasa digunakan untuk mencetak foto dengan memiliki permukaan halus dan mengkilap, menggunakan *font open sans*, dan judul kartu 33 pt. Sedangkan *box* (kotak) kartu menggunakan kertas *art paper* A4 warna putih, berukuran 29,7 *cm* × 21 *cm*, berat 260 gram, memiliki permukaan halus, tebal dan mengkilap. |

**Figure 2. Hainthec Quartet Card Media Storyboard**

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## 3. Development Stage

Development stage, at this stage what is done is producing Hainthec quartet card learning media according to the flowchart and storyboard designs that have been made previously.

| Front of Card Quarte | Card Game Rules Quarte | The Finished Hainthec Quartet Card Box |
|---|---|---|
|  Pada bagian depan kartu berisi tentang, yaitu: 1. Nomor kartu 2. Soal 3. Gambar 4. Penjelasan jawaban pada kartu 5. Jawaban dari soal pada kartu |  Aturan permainan kartu kuartet *Hainthec* digunakan sebagai petunjuk/ cara dalam bermain kartu kuartet *Hainthec*. |  Bagian luar *box* (kotak) tempat menyimpan media ditutupi dengan kertas kemasan luar yang sudah dibuat. |

**Figure 3. Hainthec Quartet Card Media Prototype**

The development of the Hainthec Quartet Card learning media involved several stages, including: a) Developing the structure and content of the learning media. The Hainthec Quartet Card learning media structure was developed by preparing the materials and tools for making the media. These materials and tools included a laptop, mobile phone, Wi-Fi, art paper, glossy paper, a box, and a printing press. Meanwhile, the content of the learning media was organized, namely organizing the material to be presented in the media, tailored to the learning objectives based on the Merdeka Curriculum. b) Creating the Hainthec Quartet Card media with the topic "Harmony in the Ecosystem" was done using the Canva application and printed on A4 art paper measuring 21.0 x 29.7 cm. c) Re-examining the created media before validation.

The Hainthec Quartet Card learning media was tested for its feasibility and validity by nine experts: three media experts, three material experts, and three language experts. The assessment results from the media experts, material experts, and language experts are as follows:

**Table 2. Media Expert Validation Results**

| Media Expert | Score Obtained | Maximum Score | Result |
|---|---|---|---|
| Validator | I74 | 80 | 92,5% |
| Validator II | 63 | 80 | 78,75% |
| Validator III | 77 | 80 | 96,25% |
| **Average Percentage** | **89,16%** | | |
| **Category** | **Very Worthy** | | |

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Based on the percentage of the assessment questionnaire by media expert validation in the table above, it is known that the learning media is declared Very Appropriate because it meets the criteria ≥ 81%. The media before being revised on the Hainthec quartet card had the same color, namely Level II Consumer and Rice Field Ecosystem. After the media revision, the color of the Rice Field Ecosystem changed to pink and the color of Level II Consumer remained the same.

**Tabel 3. Hasil Validasi Ahli Materi**

| Media Expert | Score Obtained | Maximum Score | Result |
|---|---|---|---|
| Validator I | 75 | 80 | 93,75% |
| Validator II | 74 | 80 | 92,5% |
| Validator III | 75 | 80 | 93,75% |
| **Average Percentage** | **93,33%** | | |
| **Category** | **Very Worthy** | | |

Based on the percentage of the assessment questionnaire by media expert validation in the table above, it is known that the learning media is declared Very Appropriate because it meets the criteria ≥ 81%. The media before being revised on the Hainthec quartet card had the same color, namely Level II Consumer and Rice Field Ecosystem. After the media revision, the color of the Rice Field Ecosystem changed to pink and the color of Level II Consumer remained the same.

**Table 4. Results of Validation by Linguists**

| Media Expert | Score Obtained | Maximum Score | Result |
|---|---|---|---|
| Validator I | 66 | 75 | 88% |
| Validator II | 67 | 75 | 89,33% |
| Validator III | 70 | 75 | 93,33% |
| **Average Percentage** | **90,22%** | | |
| **Category** | **Very Worthy** | | |

Based on the percentage of the assessment questionnaire by the validation of language experts in the table above, it is known that the learning media is declared Very Appropriate because it meets the criteria ≥ 81%.

## 4. Implementation Stage

The next stage is the implementation stage. At this stage, the Hainthec Quartet card media will be implemented and used by students and teachers. This stage will be carried out twice: a small group trial of 13 students and a large group trial of 27 students. Then, students and teachers will be given a questionnaire to provide feedback on the learning media that has been used. The results of the questionnaire

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assessment given by students and teachers in the small group trial and the large group trial are as follows:

**Table 5. Small Group Student Response Results**

| Aspects Assessed | Score Obtained | Maximum Score | Result |
|---|---|---|---|
| Interest Aspect | 175 | 195 | 89,74% |
| Usability Aspect | 355 | 390 | 91,02% |
| Readability Aspect | 117 | 130 | 90% |
| **Average Percentage** | **90,48%** | | |
| **Category** | **Very Worthy** | | |

Based on the calculation of the average percentage of the assessment questionnaire by students, the results of the responses of small group students in the table above show that the learning media is declared Very Appropriate because it meets the criteria ≥ 81%.

**Table 6. Results of Large Group Student Responses**

| Aspects Assessed | Score Obtained | Maximum Score | Result |
|---|---|---|---|
| Interest Aspect | 348 | 405 | 85,92% |
| Usability Aspect | 711 | 810 | 87,77% |
| Readability Aspect | 244 | 270 | 90,37% |
| **Average Percentage** | **87,74%** | | |
| **Category** | **Very Worthy** | | |

Based on the calculation of the average percentage of the assessment questionnaire by students, the results of the responses of large groups of students in the table above show that the learning media is declared Very Appropriate because it meets the criteria ≥ 81%.

**Table 7. Results of Teacher Response Questionnaire**

| Aspects Assessed | Score Obtained | Maximum Score | Result |
|---|---|---|---|
| Appearance Aspect | 18 | 20 | 90% |
| Material Presentation Aspect | 14 | 15 | 93,33% |
| Benefits Aspect | 14 | 15 | 93,33% |
| **Average Percentage** | **92%** | | |
| **Category** | **Very Worthy** | | |

Based on the calculation of the average percentage of the assessment questionnaire by teachers in the table above, the learning media is declared Very Appropriate because it meets the criteria ≥ 81%.

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**5. Evaluation Stage**

The evaluation phase is the final step, conducted to assess the quality of the product after testing it with small groups of students, large groups, and teachers. Therefore, if student and teacher ratings are low, the media will be revised. The validation results from media experts yielded an average percentage of 89.16%, material experts 93.33%, and language experts 90.22%, resulting in the Hainthec Quartet Cards learning media being rated as Very Suitable as a learning medium. Similarly, the questionnaire assessment results from small groups of students yielded an average percentage of 90.48%, large groups 87.74%, and teachers 92%. Based on the results obtained from students and teachers as users, the media was rated as Very Suitable for use as a learning medium because the Hainthec Quartet Cards were considered highly innovative, enjoyable, and able to engage students actively in the learning process.

## DISCUSSION

1. Learning Media Development Process

The research was motivated by the fact that ecosystem material is often difficult to learn. Students have difficulty learning ecosystem material in science due to unfamiliar scientific concepts that require a deeper understanding (Swistiyawati & Indrayani, 2024). Therefore, researchers developed learning media to create a pleasant learning atmosphere that helps students understand the learning material. This is in line with research conducted by Damayanti, Enawaty, & Masriani, 2021, which stated that learning activities using media create a more pleasant atmosphere and make it easier for teachers to explain the material because students are more enthusiastic, enjoy learning, and do not feel sleepy. One type of media adapted from game media that can be used in learning activities is the quartet card learning media. Quartet card media is a learning media that is easy to play, has a small shape and has a variety of images, making it easier for students to play both during class hours and outside of class hours (Mariani & Setiawati, 2022). Learning through quartet cards can be an alternative way to empower students to play a greater role in the learning process, enabling them to become subjects rather than mere objects of learning (Lestari & Arsyad, 2020). Furthermore, the use of quartet cards enriches students' learning

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experiences, as they collaborate with their peers in groups and create a dynamic learning environment (Arfiana, Umam, Alfiansyah, & Bakhtiar, 2024).

In the analysis phase, researchers conducted a needs analysis of students and teachers. This analysis involved distributing a pre-research questionnaire to determine whether the media developed met their needs. Based on the results of the pre-research questionnaire, students needed engaging educational media to actively engage them in learning activities. This finding aligns with research by Walidiati, Tahir, & Rahmatih, 2023, which states that engaging learning media is crucial because the more engaging the media, the more motivated and interested students are in the learning process. Researchers also analyzed student learning styles to determine their preferences for science learning. There are three learning styles: visual learning, which involves viewing pictures or diagrams; auditory learning, which involves listening to oral explanations or discussions; and kinesthetic learning, which involves physical movement and the use of hands (Asnawi et al., 2023).

The analysis of student learning styles was conducted by administering a learning style questionnaire to all students in class VB. Based on the results of the student learning style analysis, in class VB, there are 18 students with visual learning styles, 5 students with auditory learning styles, and 4 students with kinesthetic learning styles. Finally, researchers conducted a curriculum analysis to determine the curriculum used. Based on the results of the curriculum analysis, two curricula were implemented: the 2013 curriculum and the Merdeka curriculum. The 2013 curriculum was implemented in grades 3 and 6, and the Merdeka curriculum was implemented in grades 1, 2, 4, and 5.

In the design stage, the researcher designed the Hainthec quartet card media based on the analysis. The Hainthec quartet card learning media was created using a design tool called the Canva application, which is free and commonly used, to produce an attractive design and was printed using art paper. Then, in the development stage, the researcher structured and arranged the content of the Hainthec quartet card learning media in accordance with learning standards, as well as creating questions related to the harmony in the ecosystem material. After the media was created, the media was re-examined before being validated by media experts, material experts, and language experts. The results of the three experts' assessments, including suggestions and input,

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will be used to improve the media so that it is suitable for use as a learning medium. Next, the implementation stage, in this stage, two trials will be conducted, namely a small group trial and a large group trial. Finally, the evaluation stage, in this stage, the product will be evaluated so that improvements can be made to perfect the learning media that has been created. At this stage, it was carried out to determine the feasibility of the Hainthec quartet card learning media which was obtained from the results of the teacher and student assessment questionnaire as users.

2. Feasibility of Learning Media Development

The results of the feasibility of the Hainthec quartet card media were obtained from the results of an assessment questionnaire by 9 experts, namely three media experts, three material experts and three language experts, indicating that the media is Very Suitable to be applied as a learning medium. Based on the results of validator I, validator II and validator III media experts, an average percentage of 89.16% was obtained with the category "very suitable". Based on the results of validator I, validator II and validator III material experts, an average percentage of 93.33% was obtained in the category "very suitable". Based on the results of validator I, validator II and validator III language experts, an average percentage of 90.22% was obtained with the category "very suitable". The results of this development research are supported by the results of previous research by Ariyanti (2020) which states that validation of the feasibility of material, media and language is carried out to revise the product according to the suggestions of each expert so that the media is suitable for use as a learning medium, so that it is worthy of being tested on students. Although the Hainthec Quartet Cards are considered very suitable as a learning medium, several suggestions and input from media and material experts are needed. 1) There are similarities in the colors of the Second-Level Consumers and the Rice Field Ecosystem. 2) In the Desert Ecosystem, the types of plants and animals, such as kangaroos, should be specified. 3) The Feasibility section of the Core Competency and Core Competency Outcomes (KI) and Basic Competencies (KD) should be adjusted to the latest curriculum, and the images and text on the Desert Ecosystem should be enlarged and clarified.

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3. Student and Teacher Responses

Based on the results of the small group trial, an average student response of 90.48% was obtained, categorized as "very suitable" for use as a learning medium. The results of the large group trial, an average student response of 87.74% was obtained, categorized as "very suitable" for use as a learning medium. Meanwhile, the results of the teacher assessment responses, categorized as "very suitable" for use as a learning medium, were categorized as 92%. The results of this development research are supported by the results of previous research by (Nurazizah, Saputra, & Setiadi, 2024) which stated that small-scale trials were conducted to improve the media before conducting large-scale trials, large-scale trials and teacher trials were conducted to observe student and teacher responses when using media in classroom learning activities. Judging from the results of student and teacher responses, it can be said that the Hainthec quartet card learning media is able to create a pleasant learning atmosphere so that it helps students in understanding the learning material. This is in line with research by (Pratiwi, Suranata, & Yudiana, 2023) which stated that learning activities through play will liven up the learning atmosphere and generate high learning enthusiasm so that learning activities become more enjoyable.

## CONCLUSION

Based on the results of the research that has been conducted, it can be concluded that the Hainthec quartet card learning media is Very Suitable for use in learning. This is based on assessments by media experts, material experts, and language experts. In addition, the Hainthec quartet card media also received very good responses from students in small group trials, students in large group trials, and teachers. This is based on the results of the small group student response questionnaire, the results of the large group student response questionnaire, and the results of the teacher response questionnaire are in the Very Suitable category.

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