



# Aquascape Media for Learning Ecosystem Materials in Elementary Schools

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## ABSTRAK

Guru saat ini belum mampu mengakomodir kebutuhan media sesuai dengan perkembangan kognitif siswa. Diperlukan media pembelajaran yang baik yang disesuaikan dengan karakteristik siswa. Media aquascape merupakan media pembelajaran yang sesuai dengan karakteristik siswa pada tahap perkembangan kognitif operasional konkrit. Tujuan penelitian ini adalah mengembangkan media aquascape dalam pembelajaran materi ekosistem. Pendekatan penelitian ini menggunakan penelitian dan pengembangan yang secara khusus menggambarkan tahap uji coba pengembangan media ini. Tahapan yang akan menjadi fokus penelitian adalah pengujian media aquascape pada aspek media dan materi. Teknik angket digunakan untuk mengumpulkan data kelayakan media dan materi aquascape. Analisis data angket ahli media dan materi dilakukan dengan menggunakan teknik kuantitatif. Hasil penelitian menunjukkan bahwa media aquascape yang dikembangkan berdasarkan penilaian dari dua ahli media dari kalangan akademisi dan praktisi, diperoleh skor persentase rata-rata sebesar 91,06%. Hasil penilaian ahli materi dari akademisi dan praktisi mendapatkan rata-rata persentase skor 95,53%. Hasil uji kelayakan dari ahli media dan materi berkisar antara 81% sampai 100% yang berarti media Aquascape layak dan siap diterapkan tanpa perlu revisi dan hasil uji keefektifan menunjukkan bahwa pretest dan posttest pada uji lapangan utama menunjukkan bahwa media aquascape efektif digunakan dalam pembelajaran.

## ABSTRACT

A Nowadays teacher has not been able to accommodate the media needs by the cognitive development of students. Good learning media that adapted to the characteristics of students is needed. Aquascape media is learning media that accordance with the characteristics of students at the stage of concrete operational cognitive development. The purpose of this study was to development of aquascape media in learning ecosystem materials. This research approach uses research and development which specifically describes the trial phase of this media development. The stage that will be the focus of the research is the aquascape media test on the media and material aspects. The questionnaire technique was used to collect data on the feasibility of media and aquascape materials. Analysis of the media and material expert questionnaire data was carried out using quantitative techniques. The results showed that the aquascape media that was developed was based on the assessment of two media experts from academics and practitioners, and obtained an average percentage score of 91.06%. The results of the assessment of material experts from academics and practitioners get an average percentage score of 95.53%. The appropriate test results from media and material experts are in the range of 81% to 100%, which means that the aquascape media is feasible and ready to be applied without the need for revision and the results of the effectiveness test showed that the pretest and posttest on the main field test showed that Aquascape media was effectively used in learning.

## 1. INTRODUCTION

Learning activities must be arranged in such a way that they can be student-centered. Furthermore, student-centered learning is defined as learning that can give students the freedom to be active in obtaining information so that they will get a deep understanding and improve the quality of students and develop potential according to their characteristics (Antika, 2014; Rachmadtullah et al., 2020). Student centred learning experiences real learning and students take an active role and experience firsthand what they will learn. In addition, student learning that is following the concept can bring students to learn well by directing what they learn and can have more free control in the learning (Trinova, 2003; Yu & Wan Mohammad, 2019). This concept can also be supported by the use of learning media to provide students with direct experience in learning material.

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The existence of media in learning activities is proven to have a significant influence, which is of course in a better direction. Media can clarify the delivery of information and delivery of messages to provide smoothness and improve learning processes and outcomes (Agustini et al., 2020; Rosalina & Suhardi, 2020; Yuliana & Budianti, 2015). In line with the previous opinion, the media has a role that can clarify learning materials when the teacher explains (Mustika, 2015). In addition, learning media can make some abstract concepts clearer so that they can be accepted by students more easily (Hasiru et al., 2021). Based on the media understanding above, it can be understood together that the existence of media in learning can help clarify the delivery of information, especially for concrete media because it can convey abstract things through concrete things. This is certainly very good because the level of cognitive development of elementary school students is at a stage where they can only solve a problem related to concrete things.

A good learning media is a media that is adapted to the characteristics of students. As is known, elementary school students are at a stage where their logical thinking is only limited to concrete things, they have not been able to solve a problem if the problem is not a real problem. Students at the age of 7-12 years are classified in the stage of concrete operational development where children at this age have difficulty completing logical tasks if there is no physical object related to the task in front of them (Juwantara, 2019; Suniyasih et al., 2020; Suryansah & Suwarjo, 2016). Another opinion says that students at the concrete operations stage can think logically about concrete things but have not been able to solve abstract problems (Marinda, 2020). Students at the age of 7-11 years can understand something, but only tangible objects (Astuti et al., 2019; Mifroh, 2020). Seeing the characteristics of students as described above, the appropriate media is adapted to the characteristics of the students to be taught. Good media are real or real media that can be seen, touched, and manipulated by students.

Some of the studies above are expected in classroom learning. However, the reality on the ground is not as good as imagined. As is known from observations learning in grade 5<sup>th</sup> SDN Kalipelus still does not use media that is following the characteristics of students. The learning carried out has not been able to accommodate the media needs by the cognitive development of students. Although teachers have tried to improve learning, there are still shortcomings in the development of media that should be able to support learning, especially ecosystem materials. This is due to the limitations of various aspects, starting from the teacher's time which is sometimes not enough to design media development, to creativity which is also limited. If these limitations are not addressed immediately, it is feared that the learning will not achieve the desired goals optimally.

Taking into account the existing problems mentioned above, it can be seen that learning should be able to accommodate the needs according to the characteristics of 5<sup>th</sup> grade elementary school students. Ideal learning is expected to utilize appropriate media. One of the media that is still rarely used in learning and accordance with the characteristics of students at the stage of concrete operational cognitive development is aquascape media. Aquascape is the manipulation of aquatic ecosystems applied to aquariums (Hutabarat et al., 2022; Raharjo et al., 2018). In addition, aquascape is defined as an artistic skill in arranging stones, aquatic plants, and other components in an aquarium. Aquascape is an art that creates an artificial freshwater ecosystem in an aquarium (Raharjo et al., 2018; Sutabri et al., 2019). Therefore, many say that this media is classified as a three dimensional media, namely miniature.

Aquascape media is known to be one type of miniature media that has several advantages as in previous studies carried out. In research that develops a miniature media, it is a learning media that is feasible to use and good for improving student learning outcomes on science content (Nurochmah et al., 2019; Setyowati & Mintohari, 2020). It can said that the application of miniatures affects student learning outcomes. In addition, the classroom action research carried out informed that the use of miniature media was proven to increase students' activities and science learning outcomes (Hanifah, 2014; Pratama et al., 2022). Based on a series of previous studies have been carried out, reflecting that a miniature media that is applied to learning can improve student learning outcomes. Aquascape media is a medium that is used as a miniature to describe the occurrence of ecosystem processes that exist in an aquarium, so indirectly by developing aquascape media to be applied in a lesson, it is expected to improve student learning outcomes.

Referring to the explanation mentioned above, it is known that miniature media has various advantages and successes. Taking some of the successes of the miniature-based media, it was then adjusted to the needs of students and problems in the field, so this research was focused on developing the feasibility of aquascape media to be further used to teach freshwater ecosystem materials. It is hoped that the research to test the development of this media and can have a good impact on learning in general, and for freshwater ecosystem materials in particular.

## 2. METHOD

This study uses a research and development (R&D) approach. The research and development is research that produces a product. The resulting product is then applied to learning. The product developed in this research is a miniature freshwater ecosystem in the form of aquascape media. The process of implementing this research is based on reference data from exploratory study activities and needs analysis which shows that the subject requires the development of aquascape media, thus media development is carried out with a focus on testing the feasibility of media and materials. The aspects of the media that were tested were the variables of media material availability, media material safety, media material resistance, media size, the proportion of details, coloring composition, practicality, and the suitability of the media with the level of student's cognitive development. The aspects of the material tested are the feasibility of the content, the feasibility of the language, and the feasibility of the presentation.

The subjects involved in this study were 2 media experts, namely academics and practitioners, and 2 material experts, namely academics and practitioners. The data collection technique used is a questionnaire. The questionnaire technique was used to collect data on the feasibility of media and aquascape materials. Analysis of the media and material expert questionnaire data was carried out using quantitative techniques (Pratama et al., 2022). The feasibility category of a product produced is presented in Table 1.

**Table 1.** Product Feasibility Percentage Scale

No	Achievement Level	Qualification	Description
1	81-100%	Very Feasible	The media is very feasible, no need for revision
2	61-80%	Feasible	The media is feasible, no need for revision
3	41-60%	Quite Feasible	The media is very feasible, no need for revision
4	21-40%	Less Feasible	The media is not feasible, needs revision
5	<20%	Very Less Feasible	The media is very not feasible, needs revision

## 3. RESULT AND DISCUSSION

### Result

In developing this Aquascape media, researchers went through several stages namely information gathering and preliminary studies, product planning, initial product development, expert tests and initial field tests, revision of initial field test results, implementation of main field tests, revision of results main field test. The development process begins with collecting information and preliminary studies. Information collection by researchers at this stage includes collecting data from journals, books, and the internet. The information obtained by the researcher is collected as a reference in assessing the need for a material. From this study it was found that there is a need for a medium in freshwater ecosystem material. As for the preliminary study conducted by researchers in the form of field observations to schools. The results of the field study found that most of the learning materials for freshwater ecosystems were limited to media in the form of images and worksheets so that they were not sufficient to link abstract learning materials to students' understanding. The results of preliminary studies in the field obtained the fact that learning activities on ecosystem material were not only carried out in theory, but also in practice so that it was necessary to develop media that could connect abstract material concepts with student understanding. The media that allows it to be real is media that can be seen from three dimensions, one of which is Aquascape media.

At the planning stage, the product is prepared based on the findings in information gathering and preliminary studies, both in the form of literature studies and field observations. The Aquascape media developed by this researcher begins with planning the tools and materials to be used. The tools needed include long tweezers, sand scraper, scissors, and super glue. While the materials needed are aquariums measuring 25 cm x 25 cm x 25 cm and 35 cm x 35 cm x 35 cm, filters (hang on back and rear sump), z200 and z300 chandeliers, sand, soil, rocks, wood, plants, home bacteria, starter bacteria, and fauna. After that, development planning is carried out so that the planning process is carried out systematically.

In the initial product development stage, preparation, designing aquascape sketches, making hardscape series, sticking plants to hardscape, inserting and arranging hardscape, inserting planting media and planting, carrying out media maintenance, and making media use manuals. It is at this stage of product development that it takes up a lot of time, because you have to collect material first from various

sources and create a tutorial design from start to finish. After the media has been successfully developed, the researcher submits it to media experts and materials for testing.

The product feasibility test results data come from two subjects, namely academics and practitioners. The data processing related to the feasibility test of this product is divided into two categories, namely the feasibility test on the media and material aspects. The results of the feasibility test for each category will be presented and discussed in the following description. The media feasibility test process is carried out by two experts from academics and practitioners. The things that are tested related to the feasibility of a product in terms of the media produced include the materials used are easy to obtain, durable to use, durable, proportional to learning, can describe the material being studied, product packaging is attractive, not abstract, affordable cost, safe to use when The manufacture is also used, can be taken to the classroom or laboratory, and has the right size or small size but can represent learning needs. Meanwhile, for the scoring of the things being tested, it consists of a scale of 1 to 4 where a score of 1 means strongly disagree, a score of 2 means disagree, a score of 3 means agree, and a score of 4 means strongly agree. The media experts who conducted this due diligence came from academics and practitioners, where media experts from academia included two teachers, and media experts from practitioners, namely two lecturers. The results of the media feasibility test from academics and practitioners are presented in [Table 2](#).

**Table 2.** The Results of Media Feasibility Test from Academics

No	Tested Indicators	Score
1	The materials used are easy to get	4
2	The price is affordable	3
3	Equipment is safe to use during manufacture	3
4	Equipment is safe to use when in use	3
5	Equipment durable in use	4
6	Durable material used for a long time	4
7	Media is easy to bring to class/laboratory	3
8	Media has a size according to needs	3
9	Proportional media for learning	4
10	The media describes the material being studied	4
11	The color of the product is attractive and natural	4
12	Media has a small size but represents the learning needs of students	3
13	The media looks real	4
14	Students can directly touch and manipulate media	4
<b>Total Score</b>		<b>50</b>

Based on [Table 2](#), it can be seen that the results of the media feasibility test conducted by academics of the 14 indicators contained in the questionnaire, 8 indicators scored 4, and 6 indicators scored 3. The results of the summation of scores obtained were 50 points. Furthermore, the acquisition score was reprocessed to measure the percentage level of media validity which got a result of 89.28% which based on the percentage classification was in the very feasible category. So it can be seen that the aquascape media according to media experts from academics has the feasibility to be applied to learning. The results of the feasibility test carried out by practitioners can be seen in [Table 3](#).

**Table 3.** The Results of Media Feasibility Test from Practitioner

No	Tested Indicators	Score
1	The materials used are easy to get	4
2	The price is affordable	3
3	Equipment is safe to use during manufacture	4
4	Equipment is safe to use when in use	4
5	Equipment durable in use	3
6	Durable material used for a long time	4
7	Media is easy to bring to class/laboratory	3
8	Media has a size according to needs	3
9	Proportional media for learning	4
10	The media describes the material being studied	4
11	The color of the product is attractive and natural	4
12	Media has a small size but represents the learning needs of students	4

No	Tested Indicators	Score
13	The media looks real	4
14	Students can directly touch and manipulate media	4
<b>Total Score</b>		<b>52</b>

Based on Table 3, it is explained that of the 14 indicators listed in the questionnaire 10 of them scored 4 and the other 4 got a score of 3. Furthermore, to determine the level of media validity, a percentage calculation was carried out which got a result of 92.85%. If classified, then the percentage is in a very decent qualification. So that it can be seen that the feasibility of the media according to practitioners is feasible to be applied in learning. After the scores that have been given by these two experts, then the writer analyzes by adding up all the scores given from each aspect presented on the questionnaire and looking for the percentage. The average percentage of media feasibility test results from academics gives a score of 89.28%. Meanwhile, media experts from practitioners gave a score with a percentage of 92.85%. From the two percentage results, the average is calculated which results in 91.06%. Thus, this percentage is in the range of 81 to 100%, so it can be concluded that aquascape media in learning ecosystem materials, especially freshwater ecosystems, is very feasible to be applied without revision. The material feasibility test was carried out by two material experts from academics and practitioners. The aspects that were tested related to the feasibility of a product in terms of material included suitability with the learning content, the language used, and the presentation of the material used. Meanwhile, the scoring of the items tested is the same as the scoring conducted on the media feasibility test consisting of a scale of 1 to 4. The results of the material feasibility test conducted by academics and practitioners are presented in Table 4.

**Table 4. The Results of Material Feasibility Test from Academics**

No	Tested Indicators	Score
1	Conformity of indicators with KD	4
2	Conformity of learning objectives with indicators	4
3	Conformity of learning activities with objectives	4
4	Conformity of learning activities with the material	4
5	The material makes students learn PAKEM demanding 4C.	4
6	The material according to the level of cognitive development of students	4
7	The resulting sentence does not have a double meaning	4
8	The language used is in accordance with the student's thinking level	4
9	The collapse of the material concept	4
10	Consistent presentation in the learning step	4
11	The attractiveness of media presentation	4
12	Student learning independence	4
13	The language in the manual is easy for students to understand	3
14	Conformity with good and correct Indonesian language rules	3
<b>Total Score</b>		<b>54</b>

Based on Table 4, it can be seen that the results of the material feasibility test from academics obtained as many as 12 indicators getting a score of 4 and 2 indicators getting a score of 3 so the total is 54 points. Furthermore, the score is reprocessed to determine the level of validity by calculating the percentage. Based on the results of the calculation of the percentage of material validity, the results obtained are 96.42%. So it can be seen that this media learning material is classified as a very feasible qualification. Meanwhile, the results of the material due diligence from practitioners are shown in Table 5.

**Table 5. The Results of Material Feasibility Test from Practitioner**

No	Tested Indicators	Score
1	Conformity of indicators with KD	3
2	Conformity of learning objectives with indicators	4
3	Conformity of learning activities with objectives	4
4	Conformity of learning activities with the material	4
5	The material makes students learn PAKEM demanding 4C.	4
6	The material according to the level of cognitive development of students	4
7	The resulting sentence does not have a double meaning	4
8	The language used is in accordance with the student's thinking level	4
9	The collapse of the material concept	4
10	Consistent presentation in the learning step	4

No	Tested Indicators	Score
11	The attractiveness of media presentation	4
12	Student learning independence	4
13	The language in the manual is easy for students to understand	3
14	Conformity with good and correct Indonesian language rules	3
<b>Total Score</b>		<b>53</b>

Table 5 shows the results of the material feasibility test conducted by practitioners who got the results that of the 14 indicators there were 11 indicators scored 4, and the remaining 3 indicators scored 3, where the overall score was 53 points. The calculation of the percentage of the feasibility of the material gets a score of 94.64%. The score obtained is classified as a very decent qualification. The material feasibility test carried out by the two material experts is also the author of the analysis by adding up all the scores given from each aspect given to the questionnaire and looking for the percentage.

The results of the average percentage of material feasibility tests from academics get a score of 96.42% with very decent qualifications, while the results of material feasibility tests from practitioners get a score of 94.64% with very decent qualifications. Based on the two percentage results, then the average is taken with 95.53%, this result is in the range of 81 to 100%, which means that the aquascape media material is classified as very feasible and ready to be applied in learning ecosystem materials without revision. The results of research related to the feasibility test of developing aquascape media in learning this ecosystem material will then be discussed regarding the findings produced in this study.

The effectiveness of using Aquascape media was done by comparing student scores during the pretest and posttest to find out the differences before and after the treatment, namely the provision of Aquascape media in learning. The data obtained are as detailed in the table and analyzed with a one group pretest-posttest design using the Microsoft Excel application on the data analysis menu with the t-test formula: Paired Two Samples for Means.

The hypothesis for Indonesian content is  $H_0$  = there is no difference in increasing the average score of Indonesian content before and after using Aquascape media.  $H_a$  = there is a difference in the increase in the average score of Indonesian content before and after using Aquascape media. The criterion is to accept  $H_0$  if  $-t_{table} < t_{count} < t_{table}$ . The t table value for 28 degrees of freedom and a probability of 0.05 is -1.70113. Based on the table above, it can be seen that the t-count value is -7.10346, if included in the t-count criteria there is no t-table value, so  $H_0$  is rejected. Because  $H_0$  is rejected,  $H_a$  is accepted. So it can be concluded that there are differences in the average score of Indonesian content before and after using Aquascape media.

Based on the results of the analysis, the hypothesis for SBdP loading is  $H_0$  = there is no difference in the increase in the average SBdP loading score before and after using Aquascape media.  $H_a$  = there is a difference in the increase in the average SBdP loading score before and after using Aquascape media. The criterion for this analysis is that  $H_0$  is accepted if  $-t_{table} < t_{count} < t_{table}$ . The t table value for 28 degrees of freedom and a probability of 0.05 is -1.70113. Table 4.13 explains that the t count for the SBdP load is -13.5332. So it can be seen that the calculated t value does not exist among the t tables. So it can be concluded that  $H_0$  is rejected and  $H_a$  is accepted which states that there is a difference in the average SBdP loading score before and after using Aquascape media.

Furthermore, the hypothesis for science content is  $H_0$  = there is no difference in increasing the average score of science content before and after using aquascape media.  $H_a$  = there is a difference in the increase in the average IPA load score before and after using Aquascape media. The criteria are that  $H_0$  is accepted if  $-t_{table} < t_{count} < t_{table}$ . The t table value for 28 degrees of freedom and a probability of 0.05 is -1.70113. Based on the results of the t-test analysis, it can be seen that the t value for the IPA load is -7.50122. Thus the calculated t value does not exist between the t tables, so it can be concluded that  $H_0$  is rejected and  $H_a$  is accepted, which means there is a difference in the increase in the average IPA content score before and after using Aquascape media.

The implementation of the main field test results has been carried out and there are no significant obstacles, and some of the notes in the initial field test have been implemented in the main field test and are running well. Besides that, based on the results of the validity test of student responses, it can be seen that on average students feel happy in using Aquascape media. Students are also interested in the appearance of the media and don't feel bored in using Aquascape media. Students are interested in learning because of Aquascape media, students even want to have Aquascape media. Finally, students become aware of the material presented because of this media. Furthermore, based on the results of the pretest and posttest data analysis, it shows that there are differences in the increase in value for all content so that this media is considered very effective for use in learning ecosystem material. Thus, this media can be applied on an ongoing basis for learning purposes in the schools studied and other schools with similar needs.

## Discussion

Referring to the results of the research that has been done, the authors obtained findings related to the feasibility test for the development of aquascape media in learning this ecosystem material. The things that will be discussed include aspects that are tested by media and material experts and the findings obtained by the author are reflected in previous research. For the first finding, the feasibility test carried out by media experts was in terms of the type of material to be used, it seems that both experts gave the same response where the aspect of the material used was easy to obtain and obtained a score of 4 and the affordable price aspect received a score of 3. This means that both experts agree that the materials for making aquascape media are easy to obtain at affordable prices. The most important thing that must be considered in making a learning media is that the materials used are widely distributed in the market at low prices (Pratama et al., 2022; Qorinasari, 2020; Tegeh & Kirna, 2013). Furthermore, in terms of the safety of materials for use, the two experts have different opinions where on the aspect of safe materials used during manufacture and use, where academics give a score of 3 and practitioners give a score of 4. This shows that in making aquascape media it must be under the supervision of teachers for safety when use. A good learning media is a media that provides security and comfort during its formation and use (Aji et al., 2018; Masturah et al., 2018; Rejekiningsih et al., 2021).

On the aspect of the durability of the materials to be used, the two experts agree that this aquascape media is a medium that is durable to use, and can withstand being used for a long time, where academics give a score of 4 for aspects of material durability and material resistance, while practitioners give a score of 3 on the aspect of durability and a score of 4 for the aspect of material resistance. Aquascape media is a medium whose main ingredient is an aquarium in which elements such as sand, plants, etc. form an ecosystem so that it requires the involvement of students and teachers in maintaining this media so that it is durable and long-lasting (Ramadhila et al., 2022; Sutabri et al., 2019). Furthermore, in terms of the size of the product used, this aquascape media is quite easy to carry to the classroom or laboratory and has a size that fits the needs during learning, where both experts agreed to give a score of 3 for each aspect of the media, easy to carry to the classroom/laboratory and the media has a size that suits your needs. In making an aquascape that is used as a learning medium, the thing to consider is that the size of the aquarium must be adjusted to the needs, considering that this media is a flexible tool that is easy or difficult to bring to class depending on the size of the aquarium as the main ingredient for making aquascapes (Hutabarat et al., 2022; Ramadhila et al., 2022).

From the components of the proportion of product details to be used, the two experts agreed to give a score of 4 for each aspect of proportional media for learning, and the media described the material being studied. This illustrates that aquascape media can be used to explain material about ecosystems. Aquascape-based learning media is very suitable for discussing ecosystem materials (Java et al., 2021; Raharjo et al., 2018). Then for the components of the product coloring composition to be used, the two experts agreed that aquascape media was able to provide beauty in terms of the coloring produced, where both academic experts and practitioners gave a score of 4 which means they strongly agree that the color of the product is attractive and natural. In developing a learning media, the coloring aspect must also be considered so that it is interesting for students to pay attention to (Susanto et al., 2019; Tegeh & Kirna, 2013).

On the practicality component of the product to be used, academic experts gave a score of 3 and a score of 4 was given to expert practitioners for the media aspect which has a small size but represents the learning needs of students. The formation of a product in developing learning media is based on the needs of students, so the resulting learning media must represent the student's needs for learning media (Fahmi et al., 2019; Nurrita, 2018). Furthermore, for the product suitability component with the level of cognitive development of students to be used, both experts agreed to give a score of 4 which means academic experts and practitioners strongly agree that aquascape media is a tangible medium, and students can directly touch and manipulate the media. This is following the opinion of previous study who revealed that aquascape media is a learning media that can deliver abstract learning material into reality (Java et al., 2021).

Furthermore, regarding the results of the material feasibility test showing that the developed aquascape media is feasible and can be applied, the authors obtained a second finding related to the responses given by material experts from academics and practitioners who tested it, which in terms of feasibility with the learning content to be used, both The expert gave the same response where for the aspect of the suitability of the learning objectives with the indicators, the suitability of the learning activities with the objectives, and the suitability of the learning activities with the material received a score of 4, while for the aspect of the suitability of the indicator with KD a score of 3 was given by the material expert from the practitioner. This means that the two experts strongly agree that the aquascape

media to be used is under the content of the material contained in the curriculum. The learning media that will be developed by an educator must pay attention to the feasibility of the material contained in it, if it is not following the content of the material then the media is not feasible to apply (Buchori, 2019; Wisada et al., 2019). In addition, previous study said that a learning media is appropriate to use if it has met the feasibility of the content of a material (Tegeh & Kirna, 2013).

In the language aspect which includes the material for making students learn PAKEM demanding 4C, the material is following the level of student's cognitive development, the sentences generated do not cause double meanings, and the language used is by the students' thinking level, both material experts from practitioners and academics give a score of 4. This means that the developed aquascape media has met the feasibility in terms of the language used in learning. A learning media developed must lead students to be able to understand a learning concept which of course the language used from the media is easily understood by students as readers (Ramadhila et al., 2022; Suniyasih et al., 2020). Furthermore, in terms of material presentation which includes aspects of the coherence of the material concept, the sequence of presentation in the learning steps, the attractiveness of media presentation, student learning independence, the language in the manual is easy for students to understand, and conformity with good and correct Indonesian language rules, where both experts agreed to provide score 4. The process of making a learning media needs to pay attention to the presentation of the material to be used, the attractiveness of the resulting media will make students enthusiastic about learning it (Amali et al., 2020; Hanisah et al., 2022).

Seeing Indonesia's natural potential and the opportunity to make aquatic plants an alternative economic source for the community, it is necessary to disseminate information about aquatic plants. Dissemination of water plant cultivation technology that has developed in the community can be one of the first steps to motivate and provide an example to other communities about water plant cultivation technology and other businesses related to aquatic plants and aquascape. An aquascape that contains fish, rocks, and aquatic plants, but can also create an aquascape with only aquatic plants or only rocks. Various types of aquatic plants such as bonsai, rocks, and trees can be used according to each person's theme, style, and taste in aquarium design. The purpose of an aquascape is to create an underwater scene, but it is also necessary to consider the technical aspects of caring for aquatic plants. A closed aquarium system requires a balance of many factors for a successful aquascape. These factors include filtration, keeping carbon dioxide at a level sufficient to support photosynthesis in water, fertilization, lighting, and algae control (Ramadhila et al., 2022; Sutabri et al., 2019). Aquascape is a suitable learning media because it facilitates students' independent learning and allows direct observation of objects with the help of a preparation guide. In addition, Aquascape adds insight into the construction of aquatic ecosystems, teaches how to solve problems and find solutions, inspires the audience, and makes the room feel beautiful, fresh, cool, comfortable, and beautiful, present and provides insight into the combination of land and sea (Hutabarat et al., 2022; Ramadhila et al., 2022).

The results of the calculation for learning Indonesian language content obtained a t-count value of -7.10346, meaning that the t-count criterion is not among the t-table values, so  $H_0$  is rejected, so there is a difference in the average score of Indonesian content before and after using Aquascape media. Meanwhile, for the t count on the SBdP load of -13.5332, it means that the t count value does not exist between the t tables, so  $H_0$  is rejected and  $H_a$  is accepted which states that there is a difference in the average SBdP load score before and after using Aquascape media. Furthermore, the calculated t value of IPA load is -7.50122. Thus the calculated t value does not exist between the t tables, so that  $H_0$  is rejected and  $H_a$  is accepted, which means that there is a difference in the increase in the average IPA content score before and after using Aquascape media. From the results of testing the three learning contents, it can be understood that Aquascape media is effectively used in learning on fresh water ecosystem material. These results are in accordance with previous study that revealed that mini aquascape media can improve learning outcomes in science material (Salahudin, 2018). This was stated by other study that state there are differences in student learning outcomes where those who use learning media are higher than those who use conventional learning (Wisada et al., 2019).

The implication of this study is create learning media about water ecosystems can train students in perseverance, thoroughness, perseverance, creativity, teach the importance of responsibility and cleanliness, and teach the mind to never give up on creating something better. Aquascape media is a learning media that can describe a real ecosystem, allowing students to connect the material with everyday life. The limitation of this research lies in the scope of the research which is still very small and limited. Therefore, it is hoped that future research will be able to deepen and broaden the scope of research related to the development of aquascape media.



#### 4. CONCLUSION

At the validation test stage, an assessment of the feasibility of the developed media was carried out in terms of material and language with an average percentage of more was categorized as valid, while in terms of media obtaining were categorized as valid. At the main field test stage, it was carried out by giving a pretest and posttest to test the effectiveness of the media. At the revision stage of the results of the main field test students became more understanding and interested in learning with Aquascape media. The results of the pretest and posttest tests on the main field test show that Aquascape media is effectively used in learning.

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