Development of Science Literacy-Based Physics Magazine on Vibration and Wave Material for Class VIII SMP/Mts

Sovia Mas Ayu[1], Asmara Dewi[2], Isma Oktaviani[3]
[123]Pascasarjana UIN Raden Intan Lampung
Jl. Z.A. Pagar Alam, Labuhan Ratu, Bandar Lampung

Corresponding author
[2]dasmara254@gmail.com

Abstract: This study aims to: (1) Determine the feasibility of scientific literacy-based physics magazines based on the opinion of the validator (2) Know students' responses to the attractiveness of scientific literacy-based physics magazines. This research is an R&D research that adopts the development from Borg & Gall with stages namely potentials and problems, data collection, product design, design validation, product revision, and product testing. The research subjects involved consisted of experts (material experts and media experts), teachers, and students of class VIII SMP/MTs. The types of data generated are quantitative and qualitative data which are analyzed with the guidelines of the assessment category criteria to determine product quality. The results obtained are: (1) The feasibility of the final product of physics magazine based on scientific literacy based on expert judgment is very feasible, with an average percentage of material expert validation of 90.7%, an average percentage of media experts is 91%, an average percentage -the average percentage of religious experts is 93%, and the average percentage of magazine experts is 93% (2) The response of students to the attractiveness of physics magazines based on scientific literacy as a learning medium obtained in the small group test is good with an average score of 76%. The field test obtained good criteria with an average score of 79%. Science literacy-based physics magazines were declared feasible and received a positive response to be used as learning media.

Keywords: Development, physics magazine, scientific literacy, vibrations, waves.

Introduction

With the rapid development of science and technology in the 21st century, the world of education is faced with ever-greater challenges to improve human resources. Information and communication technologies are developing rapidly.(Kennedy & Sundberg, 2020) One of the areas that were significantly affected was the education sector.(Zobrist et al., 2009) To keep up with rapid technological developments, education must have a great interest in keeping up with technological developments. Therefore, it is necessary to improve the quality of education so that it can support the development of an increasingly advanced era, and all aspects of education, both educators and students, must be able to have good relationships and interrelationships.(Pasmore et al., 2019) Based on this, education has an important role in improving the quality of human resources.(Chipukuma et al., 2020)

According to the verse above, education and human life are inextricably linked because, through education, people should be able to master knowledge that will aid them in understanding the natural world around them.(Steffe & Ulrich, 2020) To improve educational quality, education and learning are both connected to how students' personalities and behaviors are formed.(Rissanen et al., 2019) Many factors can affect classroom learning, and these factors can come from students and educators. Improving the quality of education does not only refer to increasing the potential development of students; educators are required to make learning more innovative to encourage students to learn optimally in class or independently.(Jiang et al., 2021) One of the subjects that need to be improved is physics. Physics is a part of science that has an important

ISSN 2829-3355 | EISSN 2828-8467

role in life.(Akben, 2020) One of the abilities that students are expected to master after studying science is scientific literacy. Scientific literacy is defined as the ability to use scientific knowledge, identify questions, and draw conclusions based on facts to understand the universe and its changes as a result of human activities.(Oliver et al., 2021)
Scientific literacy skills are very important for students to have.(Afandi et al., 2019) Students who have scientific literacy skills will have strong scientific thoughts and attitudes to be able to effectively communicate knowledge and research results to the general public.(Sharon & Baram-Tsabari, 2020) Participants who have scientific literacy are people who can use scientific concepts and have the scientific process skills to assess them in making everyday decisions in dealing with other people, society, and the environment, including social and economic development.(Valladares, 2021) So, when students have scientific literacy skills, they can use scientific concepts, solve problems and not easily believe in issues circulating in society without empirical evidence.(Lederman, 2019)

The results of the assessment using PISA questions on the scientific literacy of students in Bandar Lampung obtained very low results. According to the report's findings, an average score of 27.27 ± 2.28. (R et al., 2019) The scientific literacy competence of public school students is higher than that of private school students, and the scientific literacy of female students is higher than that of male students, but the difference between the two is not significant.(Chen et al., 2021) Questionnaire analysis shows that the external factors that influence scientific literacy are the learning methods used by science teachers, the educational backgrounds of students' parents, and the professionalism of science teachers, while the internal factors that influence the education majors students are interested in.(You et al., 2021) Therefore, there should be teaching materials or learning resources that can increase students' scientific literacy and help them learn independently.(Lai et al., 2019)

The use of media in learning can generate new desires and interests, increase motivation, and stimulate learning activities. and even affect students psychologically.(Li & Chu, 2021) Magazines can be one solution.(Nasar et al., 2019) A magazine is a print medium that resembles a book, but in its presentation, it is much more interesting and lighter.(Rogelberg et al., 2022) because the portion of the picture is larger than the book and the explanation and language used are shorter, denser, and clearer. This is because sight leaves a longer impression and is easier to understand and remember.(Marshall et al., 2019)

Magazines are widely known among teenagers, but it is still rare to find magazines with educational backgrounds.(Maree, 2021) even though magazines can be an alternative source of learning because the forms presented are interesting and provide complete information.(Granić & Marangunić, 2019) Magazines in this context are physics magazines that are used as learning resources to understand physics subject matter while at the same time giving pleasure to students studying physics.(Nückles et al., 2020) As a learning resource, physics magazines can support students' understanding of the material presented by educators and provide an interesting learning experience.(Margot & Kettler, 2019)

Based on pre-research conducted at SMP Negeri 28 Bandar Lampung, SMP Al-Huda Jati Agung, and SMP Negeri 9 Metro, information was obtained that the learning process was still monotonous and only centered on the teacher. This makes students less active in the learning process. While the learning resources used in class still use books, prints, and LKS, Not many learning resources use magazines as material for independent teaching; when the learning process takes place, some students do not pay attention to the material presented by the teacher and prefer to chat with a friend. The library itself has no such independent learning resources as a physics magazine. The limitations of students in learning in class are still depending on the teacher and learning resources used to be one cause of students' scientific literacy skills are still low.

Through scientific literacy-based physics magazines, it is expected that students can gain knowledge about technological developments by knowing the benefits and impacts on the

environment and society. In addition, students can relate the lessons learned to everyday life and apply them. Therefore, researchers conducted research and development under the title "Development of Science Literacy-Based Physics Magazine on Vibration Material and Waves for Class VIII SMPs and MTs." This is expected to provide benefits for educators and students as a learning resource to create learning effectiveness and increase students' scientific literacy.

This research was conducted at SMP Negeri 28 Bandar Lampung, SMP Negeri 9 Metro, and SMP Al-Huda Jati Agung. After conducting preliminary research at SMP N 28 Bandar Lampung, SMP Negeri 9 Metro, and SMP Al-Huda Jati Agung, during the observation, namely by distributing questionnaires to class VIII students and conducting interviews with science subject educators, information was obtained that students only used LKS books and printed books in the learning process, so students need updates in the form of learning media. This study uses a qualitative approach and is supported by quantitative data in the form of product feasibility data, which contains suggestions and responses from validators and students' responses. Then it is changed to quantitative data in the form of numbers from the product feasibility score by processing the formulation of the numbers for the development stage. This research uses research and development research methods or development research. The development research approach and methods are guided by Borg and Gall. The result is a physics magazine based on scientific knowledge of vibration and wave material. Development procedures are the steps used to create a product. The research procedure used is the research model developed by Borg and Gall. However, due to limited time, cost, and manpower, this research will be carried out until the 7th stage, namely product revision. The following are the research steps carried out by the researcher: preliminary research, needs analysis, media design, validation, evaluation, media revision, and media implementation. Data for this study is gathered through questionnaires, interviews, observation, and documentation. 8 The instrument used in collecting this data is a validation sheet in the form of a questionnaire using a Likert scale, which is used to find out whether the instrument that has been designed is valid or not. The validation sheet in the study consisted of 5 types; namely, in this technique, the researcher gave a questionnaire to media experts, and material experts gave a response questionnaire to physics teachers and VIII-level students. In this study, data collection instruments included questionnaires, interviews, and documentation. Before distributing the instrument sheet to the field, the supervising lecturer is consulted. After being declared good by the supervising lecturer, validation is carried out first by the validator. If the validity of the instrument is determined by the validator, it can be used in the field. The data analysis technique in this study was qualitative analysis, which involved describing and interpreting qualitative data such as comments and suggestions from educator validators, as well as students. Quantitative data in the form of numbers obtained from questionnaires were first analyzed, which would later be analyzed qualitatively. Data in the form of responses to the product test from the questionnaire assessment were analyzed statistically with the assessment provisions and five scoring rules.

Materials and Methods

Study area

Materials The research and development method (research and development) is a research method used to produce certain products and test the effectiveness of these products. To be able to produce certain products, research is used to analyze the needs and to test the effectiveness of the product so that it can function in the wider community, research is needed to test the effectiveness of the product.

In this study, researchers used the Bord and Gall development model. Borg and Gall suggest that 10 steps of research and development must be carried out, but in this research, the researcher limits the steps to only seven due to the limited time, energy, and costs required. as shown in the following chart:

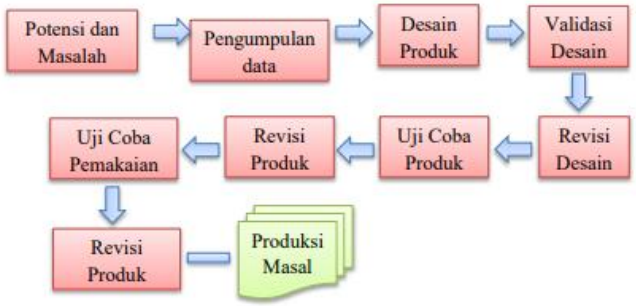


Figure 1: Steps for using the Research and Development (R&D) Method

Based on several research and development methods mentioned above, this research uses the Borg and Gall model, which has been modified by Sugiyono. In development research, ten development steps are needed to produce a final product that is ready to be expected in educational institutions. However, due to limited time, cost, and energy, this research will be carried out until the 7th stage (seven), namely product revision..

Physics learning in junior high school aims to enable students to master physics concepts and their interrelationships and be able to use scientific methods based on science literacy skills to solve problems or issues faced by society in terms of economic, social, health, environmental, and other issues so that they do not easily believe in issues circulating in society without empirical evidence. Based on this assumption, the researcher attempted to create a physics magazine based on science literacy, in the form of a semi-scientific magazine (a semi-popular magazine), because later this magazine contains physics knowledge with a more interesting presentation and uses light language. In its visualization, this magazine will be designed in full color and equipped with examples of images or events in everyday life that support the explanation of the material and make it easier to understand. This magazine has a specialty in the evaluation system, the evaluation is made like a game, such as matching two statements, and experiments are conducted in everyday life. Science literacy-based physics magazines on vibration and wave materials can improve students' science literacy skills because they are compiled based on competencies that are part of science literacy, namely aspects of content, context, and science processes in everyday life. Science literacy-based physics magazines developed aim to attract students' attention so that learning is interesting and not monotonous and so that students' science literacy skills can increase..

Data analysis

The data analysis technique in this research is qualitative analysis, which involves describing and interpreting qualitative data such as comments and suggestions from educator validators as well as students. First, quantitative data in the form of numbers obtained from questionnaires are analyzed, followed by a qualitative analysis. Data from the questionnaire assessment in the form of product test responses were analyzed statistically under the provisions of the assessment with five scoring rules, as shown in Table 2.

Table 1. Scoring rules

Katagori	Skor
Sangat Setuju (SS)	5
Setuju (S)	4
Kurang Setuju (KS)	3
Tidak Setuju (TS)	2
Sangat Tidak Setuju (STS)	1

1.) Calculate the percentage of the feasibility of each aspect with the following formula:

Likert scale formula

$$P = \frac{}{} \times 100\%$$

Description:

P: Percentage

Σx: Number of respondents' answers in one item

Σxi: The number of ideal values in the item

2.) Calculate the average presentation of all respondents with the formula :

$$P = \frac{}{} X\ 100\%$$

Description:
f = the frequency for which the percentage will be sought
N = number of frequencies
P = percentage number

3.) Converting the average score obtained into a qualitative value by the assessment criteria in the table.

Table 2. Criteria Scale

Persentase	Keterangan
0% - 20%	Sangat Kurang Baik
20% - 40%	Kurang Baik
40% - 60%	Cukup Baik
60% - 80%	Baik
80% - 100%	Sangat Baik

Based on these criteria, the product is said to be good if the percentage is ≥ 60% seen from all aspects so that science literacy-based physics magazines can be used in the learning process.

Results and Discussion

The result of the research conducted by the researcher is to develop a product in the form of a science literacy-based physics magazine on vibration and wave material for class VIII SMP and MTs that is valid according to the assessment of validators and interesting according to the responses of students. The steps in the development of physics magazines can be explained by researchers through the following steps:

1. Potential and Problems

The potential of this research and development is to develop a science literacy-based physics magazine on vibration and wave material for class VIII SMP / MTs. The potential for product development is useful for minimizing problems in the classroom. The following are some of the results of the needs analysis, among others:

a. In learning, teachers still use a lot of printed media and LKS, so teachers need quite a lot of time which results in teachers not maximizing time in delivering material.
b. Limited independent learning resources for students
c. Lack of development of innovative and interesting learning media
d. There is no renewal of physics magazines based on science literacy that helps students in improving their science literacy.

The results of the needs analysis show that educators have not created effective and creative learning that supports students' science literacy, therefore researchers try to develop science literacy-based physics magazines that can improve students' science literacy skills.

2. Data Collection

Reference sources used for data collection of science literacy-based physics magazine products come from journals, books, and the internet. The reference is useful to know what is needed in making physics magazines such as how to use CorelDraw X7, the content in each magazine, and the source of images in the magazine.

Whereas the physics magazine uses vibration and wave material. The results of the information obtained will later be used as a basis for developing science literacy-based physics magazine products on vibration and wave material class VIII SMP / MTs.

3. Product Design

After the information-gathering stage, the next step is to plan media development. The product to be developed is a science literacy-based physics magazine that can help teachers and students in the learning process. At the initial development stage of science literacy-based physics magazine using CorelDraw X7 software. This program serves to help create a physics magazine design before being printed.

The development of physics magazines based on science literacy is emphasized in magazine design, material and practice questions, and images that support learning. The design on each page of this physics magazine varies to give an interesting impression to be used in learning. material. which is associated with everyday life so

that it can improve the science literacy of students. The format of the developed science literacy-based physics magazine development is, namely, the outer front cover, inner front cover, editor, editorial, content, initial provision, main presentation, scientist, physics info, physics around us, simple experiments, islamcopedia, physics notes, short stories, practice question games, aphorisms, author biography, and back cover.

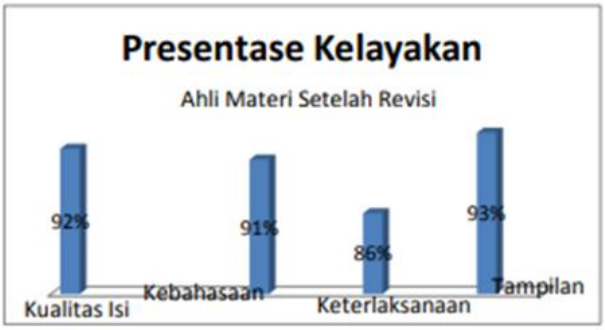
4. Design Validation

After the product has been developed, the next step is to test the feasibility of science literacy-based physics magazine products by validating the product. Validation is a stage used to determine the feasibility of the product to be used. Validation is carried out by validators according to their fields. This product is validated by material experts and media experts. The validators are physics lecturers whose job is to assess the products and instruments that will be used by researchers. The validated instrument is a product feasibility instrument. The material expert validators were carried out by 3 lecturers namely Mrs. Sri Latifah, M.Sc, Mr. Antomi Seregar, M.Pd, M.Si, and Mr. Ajo Dian Yusandika, M.Sc. Media expert validators were carried out by 2 lecturers, namely Dr. Yuberti, M.Pd, and Mr. Irwandhani, M.Pd.

Material validation with assessment indicators includes content quality, language, implementation, and visualization display. Media experts aim to see the feasibility of materials developed in science literacy-based physics magazines. It is known that in the 1st assessment aspect about the quality aspects of the content of science literacy-based physics magazines get a percentage of the feasibility of initial assessment before revision sebesa86%.In the 2nd assessment aspect language gets a feasibility percentage of 88%. The 3rd assessment aspect about the implementation gets a feasibility percentage of 73% and the 4th assessment aspect about the appearance of visualization gets a feasibility percentage of 70%. The average assessment of the material expert validator on the feasibility percentage before revision is 80% with feasible criteria. Furthermore, the validation assessment by the material expert after revision is in the 1st assessment aspect on the quality aspect of the physics magazine content obtained a percentage of 92%.In the 2nd assessment aspect of the language aspect in physics, the magazine obtained a percentage of 91%. In the 3rd assessment aspect about the implementation of physics, magazines get a percentage of 86%, and in aspect, k3 4 about the appearance of visualization get a percentage of 93%. Thus, the average assessment of the material expert validator at the post-revision stage is 91% of the eligibility percentage.

Based on the results of the material expert assessment, it is known that the feasibility percentage score is in the very feasible category, so the product can already be used in junior high school / MTs class VIII, especially physics subjects on vibration and wave material.

Graph 1. Material Validation Results Before Revision



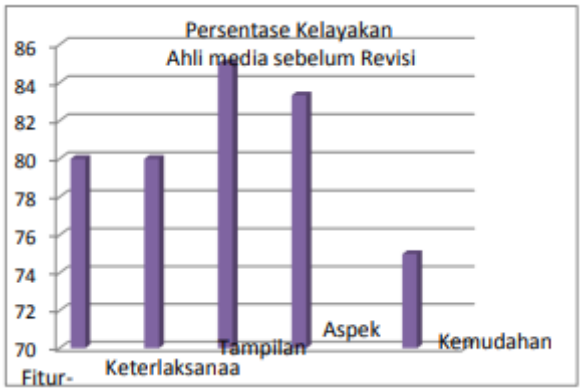
Graph 2. Material Validation Results After Revision

Graph 1. and Graph 2. explain that the assessment of all material by expert validators per an aspect of assessment has increased between before and after the revision. In the aspect of content quality assessment, the initial percentage was 86% to 92% with very feasible criteria; in the aspect of language, it was 89% to 91% with very

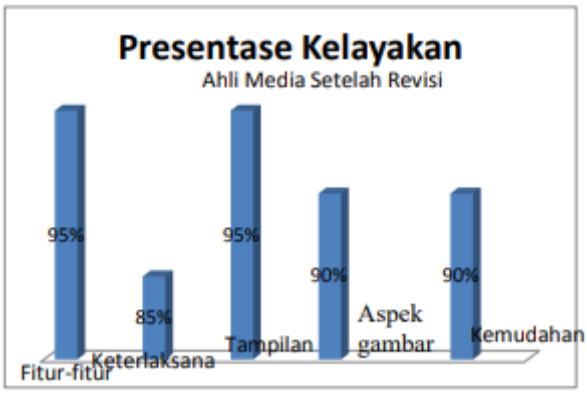
feasible criteria, in the aspect of implementation, it was 73% to 86% with very feasible criteria, and in the aspect of visualization, we got an initial percentage of 70% to 93% with very feasible criteria. The average percentage of all aspects before revision was 80% and after the revision was 91% with very feasible criteria.

In the assessment by media expert validation above, it can be seen that a percentage of 80% is assigned to the feasibility of the initial assessment before revision in the first assessment aspect about the features of science literacy-based physics magazines. The second assessment aspect is about implementation and obtaining an 80% feasibility percentage. The third assessment aspect, the magazine's appearance, receives an 85% feasibility percentage. In the 4th aspect assessment about the image aspect, it gets a percentage of 83%, and in the 5th aspect assessment about ease of use, it gets a feasibility percentage of 75%. The average assessment of media expert validators on the feasibility percentage before revision is 81% with very good criteria. Furthermore, the assessment of validation by material experts after revision obtained a percentage of 95% in the first assessment aspect of the physics magazine's features, a percentage of 85% in the second assessment aspect of the physics magazine's implementation aspect, a percentage of 95% in the third assessment aspect of the physics magazine's appearance, a percentage of 90% in the fourth assessment aspect of the image aspect, and a percentage of 90% in the fifth assessment aspect of the image aspect. Thus, the average assessment of media expert validators at the post-revision stage is 91% of the feasibility percentage.

Based on the results of the material expert assessment, it is known that the feasibility percentage score is in the "very good" category. Then the product can already be used in junior high school and MTs Class VIII, especially in physics subjects on vibration and wave material.



Graph 3. Media Validation Results Before Revision



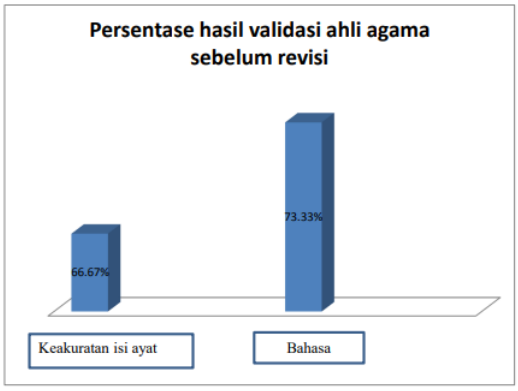
Graph 4. Media Validation Results After Revision

In Graph 3. and Graph 4. it is explained that the assessment of all media expert validators per an aspect of assessment has increased between before and after the revision. In evaluating the magazine's features, initial percentages ranged from 80% to 95% with very realistic standards, from 80% to 85% with very realistic standards for implementation, from 85% to 95% with very realistic standards for the magazine's appearance, from 83% to 90% with very realistic standards for images, and from 75% to 90% with very realistic standards for convenience. The average percentage of all aspects before revision was 81%, and after revision it was 91%, with very feasible criteria.

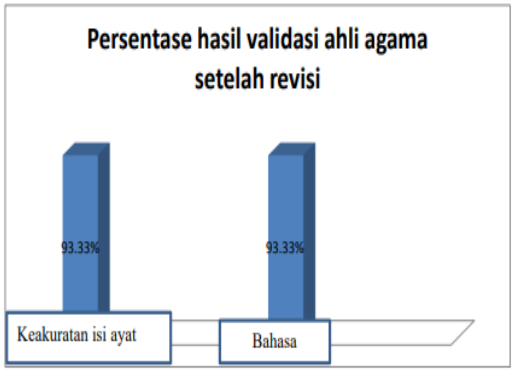
Based on the assessment by the religious expert validation above, it can be seen that in the first assessment aspect about the accuracy of the magazine content, the percentage of the feasibility of the initial assessment before revision is 66%. In the second assessment aspect about language, it gets a feasibility percentage of 73%. The average assessment of religious expert validators on the percentage of feasibility before revision is 70% with decent criteria. Furthermore, the validation

assessment by religious experts after revision, namely in the first assessment aspect of the accuracy of the magazine content, obtained a percentage of 93%. In the second assessment aspect, the linguistic aspect of the physics magazine received a percentage of 93%. As a result, the average assessment of religious expert validators at the post-revision stage is 93% eligibility.

Based on the results of the religious expert assessment, it is known that the feasibility percentage score is in the very feasible category. Then the product can already be used in junior high school / MTs class VIII, especially physics subjects vibration and wave material.



Graph 5. Religious Validation Results Before Revision



Graph 6. Results of Religion Validation After Revision

In Graph 5. and Graph 6. is explained that the assessment of all religious expert validators per an aspect of assessment has increased between before and after the revision. In the aspect of assessing the accuracy of the content of the verse, initially, the percentage was 66%–93% with very feasible criteria. The average percentage of all aspects before the revision was 70%, and after the revision, it became 93% with very feasible criteria.

In the assessment by the magazine expert validation above, it can be seen that in the first assessment aspect about the completeness of the material, the percentage of the feasibility of the initial assessment before revision is 73%. In the second assessment aspect, the activities supporting the magazine get a feasibility percentage of 73%. The third assessment aspect, about the material's omnipresence, receives a 100% for feasibility. In the 4th assessment aspect about the use of notation, symbols and units get a percentage of 60%. In the fifth assessment area, the presentation's usefulness and meaning were taken into consideration, and a feasibility percentage of 75% was given. In the sixth assessment area, students were encouraged to participate, and a feasibility percentage of 80% was given. In the seventh assessment area, the general appearance was given a feasibility percentage of 65%. In the eighth assessment area, the anatomy of the physics magazine was given a feasibility percentage of 75%. In the ninth assessment area, language was given a feasibility percentage of 75%. A percentage of 70% was obtained in the 11th assessment aspect about the completeness and suitability of the rubric; a percentage of 73% was obtained in the 12th assessment aspect about the magazine's appearance; a percentage of 80% was obtained in the 13th assessment aspect about the magazine cover; a percentage of 80% was obtained in the 14th assessment aspect about the layout; and a percentage of 70% was obtained in the 15th assessment aspect about readability. The average assessment of magazine expert validators on the feasibility percentage before revision is 73% with decent criteria.

In addition, the validation assessment performed by magazine experts after revision, particularly in the first assessment component regarding the completeness of the material, reveals a feasibility percentage of 93% of the initial assessment's feasibility prior to revision. The second assessment aspect of the magazine's activities received an 86% feasibility percentage. The third assessment aspect, about the material's omnipresence, receives a 100% for feasibility. In the 4th assessment aspect about the use of notation,

symbols and units get a percentage of 100%. In the 5th assessment aspect of the presentation, considering meaningfulness and usefulness, we got a feasibility percentage of 86%, in the 6th assessment aspect involving students actively, we got a percentage of 100%, in the 7th assessment aspect about the general appearance, we got a percentage of 100%, in the 8th assessment aspect about the anatomy of the physics magazine, we got a percentage of 95%, in the 9th assessment aspect about language, we got a percentage of 88%, in the 10th assessment aspect about the appearance of the picture, we got a percentage of 100%, In the 11th assessment aspect about the completeness and suitability of the rubric, a percentage of 90% was obtained, in the 12th assessment aspect about the appearance of the magazine, a percentage of 86% was obtained, in the 13th assessment aspect about the magazine cover, a percentage of 93% was obtained, in the 14th assessment aspect about the layout, a percentage of 100% was obtained, in the 15th assessment aspect about readability, a percentage of 90% was obtained, and in the 16th assessment as The average assessment of magazine expert validators on the percentage of feasibility before revision is 93% with "very feasible" criteria.

Based on the results of the magazine's expert assessment, it is known that the feasibility percentage score is in the "very feasible" category. Then the product can already be used in junior high school and MTs Class VIII, especially in physics subjects involving vibration and wave material.

5. Design Revision

Physics magazines that have been validated by material experts and material experts then the next stage is to improve the design of physics magazines by the criticisms and suggestions given by the experts. The results of validation by the validator provide information to researchers related to weaknesses in science literacy-based physics magazine products.

Based on the criticisms and suggestions given by the material experts, the researchers made improvements to the content and material to perfect the physics magazine product so that it could be feasible to use before the field trial. The physics magazine was assessed by 3 lecturers who have expertise in the field of physics, namely validator 1 Mr. Ajo Dian Yusandika, M.Sc, validator 2 Mrs. Sri Latifah, M.Sc, and validator 3 Mr. Antomi Saregar, M.Pd, M.Si. The improvements made are to add more examples of various kinds of waves and more varied images. Improvements are made to clarify the content of the material and improve the material that is not by the theory contained in the science literacy-based physics magazine. Material improvements are made to match the material with the image and clarify the material in the physics magazine so that it can be easily learned. Islamcopedia's improvement is to add verses of the Qur'an associated with vibration and wave material and multiply the verse to increase the reference source of the verse in the physics magazine.

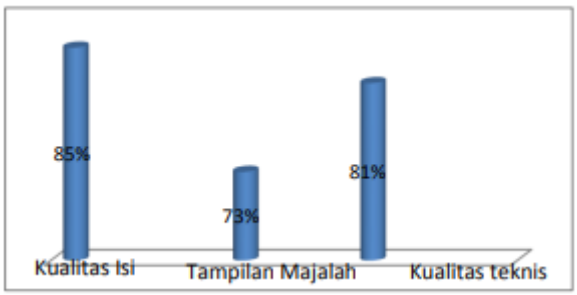
Based on the criticisms and suggestions given by the media experts, the researchers made improvements according to the suggestions given so that the physics magazine can be better and more feasible to use before being tested. The improvement of the front cover is to remove the himafi symbol and remove the name of the author and his supervisor. This was done to make it look tidier and simpler. The inside front cover was improved by adding the name of the second supervisor, Prof.Dr.H.Syaiful Anwar, M.Pd., and removing the himafi symbol. The editor's improvement is to add the names of the supervisors, material experts, and media experts to the physics magazine. Improvements were made by adjusting the picture with the content of the short story, namely about the ocean. Improvements are made by including image reference sources in physics magazines taken from the internet or other sources.

6. Product trial

After the product is validated and then revised and declared fit for use by both experts, the product in the form of a physics magazine is tested in three schools, namely at SMP Negeri 28 Bandar Lampung, SMP Negeri 9 Metro, and SMP Al-Huda Jati Agung. The trial was conducted to determine the response of students and educators to the level of attractiveness of the physics magazine product. The trial was conducted during the learning process, then students were asked to fill out a

response questionnaire after students were given a science literacy-based physics magazine product on vibration and wave material.

The questionnaire was distributed to find out the response of educators to the assessment of physics magazine products. The assessment was carried out by 3 (three) educators in the field of science studies at SMP Negeri 28 Bandar Lampung, SMP Negeri 9 Metro, and SMP Al-Huda Jati Agung. recapitulation of the results of the response of educators conducted on three science subject teachers in grade VIII in three schools. The results obtained are in the assessment of the 1st aspect of the quality of the content getting a percentage of 85%.In the 2nd assessment aspect of the appearance of the magazine got a percentage of 73%, and in the assessment of the 3rd aspect of technical quality got a percentage of 81%. The average assessment of the expert review test by the 8th-grade science subject teacher is with a percentage of 80% with very good criteria.



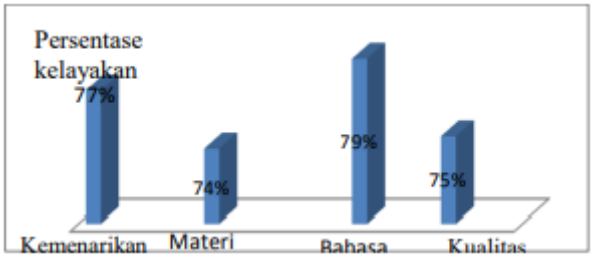
Graph 7. Recap of Teacher Response Assessment

Graph 7. explains the results of the recapitulation of the responses of science subject teachers in three schools with details of the aspect assessment, namely the aspect of content quality at 85%, the appearance of the magazine at 73%, and the aspect of technical quality at 81%, for an average of 80% very good criteria. This means that physics magazines are suitable for use in learning after validation by teachers, so the product is ready to be tested.

The next stage is the product trial of science literacy-based physics magazines. The small group trial used 10 respondents from VIII grade students in three schools, namely, SMP Negeri 28 Bandar Lampung, SMP Negeri 9 Metro, and SMP Al-Huda Jati Agung, to see the students' responses to the product that the researchers developed. The small group trial was used to determine student evaluations of a limited number of physics magazines developed.

The results of the small group trial, the magazine product reached an average percentage of 76% with good criteria, which means that the physics magazine developed by the researcher has a high degree of feasibility to be used as a tool in learning in the odd semester of class VIII SMP and MTs.

The results of the small group trial showed that the aspect of interest received a percentage of 77%, the material aspect received a percentage of 74%, the assessment of the language aspect received a percentage of 78%, and the aspect received a percentage of 74% for the assessment of the technical assessment. The overall number of aspects met good criteria, so that the physics magazine is, in the opinion of students, very interesting as teaching material. Broadly speaking, the results of the small group trial can be seen in the following graph:



Graph 8. Graph of Small Group Trial Results

A total of 92 students participated in the field test, including 32 students from SMP Al-Huda Jati Agung school, 29 students from SMP Negeri 9 Metro school, and 31 students from SMP Negeri 28 Bandar Lampung school. The trial process was the same as the small group trial, namely, filling out the learner response assessment questionnaire. the results of the assessment of the content quality aspect of the feasibility percentage of 78%, the material aspect of 78%, the language aspect of 80%, and the technical quality aspect of 78%. Thus, the average percentage of field tests at SMP Negeri 28 Bandar Lampung with attractive criteria is 79%.

The results obtained from the field test through the questionnaire of students of SMP Negeri 9 Metro in the aspect of content quality obtained a percentage of 86%, the material aspect reached a percentage of 84%, the language aspect reached a percentage of 82%, and the aspect of technical

quality reached a percentage of 87%. The average percentage value is 85%, which is a very interesting criterion.

In a field test conducted through student questionnaires at Al-Huda Jati Agung Junior High School, the content quality aspect reached a percentage of 72%, the material aspect reached a percentage of 72%, the language aspect reached a percentage of 76%, and the technical quality aspect got a percentage of 75%. The average percentage value is 74%, which meets interesting criteria.

The physics magazines' interpretations have shown interest, so the product does not need to be revised. In general, students consider science literacy-based physics magazines to be something new, the material displayed becomes new knowledge for students, and the content in the magazine is easy to understand. This is because the writing in a simple magazine is not excessive in letters, the language used is communicative, and the varied images make students interested in reading it.

1. Product revision

Based on the results of the field trial, the science literacy-based physics magazine is feasible and gets a positive response to make it a learning resource.

Based on the results of research conducted in the three schools SMP Negeri 28 Bandar Lampung, SMP Negeri 9 Metro, and SMP Al-Huda Jati Agung, it is known that the learning process is limited in place and time, learning resources are less varied, there are no adequate alternative learning resources to improve science literacy.

The success of the teaching and learning process is characterized by good student achievement. The factors that influence learning include the performance of educators, facilities and infrastructure that support learning facilities, school management, curriculum, students, syllabus and teaching materials, learning aids or media, and the role of parents, communities, stakeholders, and others.45

Schools that utilize alternative learning resources are still very few, especially for physics learning, and many schools do not have physics magazines that can be used as independent learning resources.

At the junior high school level, for example, students have difficulty understanding the material, therefore it is hoped that the existence of this science literacy-based physics magazine can help students understand the material, especially vibration and wave material in class VIII junior high school / MTs.

The initial steps taken in the preparation of the physics magazine include determining the idea, analyzing the material used, preparing the CorelDRAW X7 application, and adjusting the material with science literacy based. Physics magazine content consists of cover, editor, editorial, content, initial provision, main presentation, scientist, physics info, physics around us, simple experiments, islamicopedia, physics notes, short stories of wave physics, physics quiz, and aphorisms and biography of the author.

Based on the data obtained by the validators that the physics magazine based on science literacy is said to be feasible for use at the level of junior high school / MTs class VIII. Validators consist of 3 material experts and 2 media experts who are experts in their fields.

To produce a product in the form of a science literacy-based physics magazine, the researchers used the research and development procedures of the Borg and Gall model which were only limited to the seventh stage, namely potential and problems, data collection, product design, design validation, design revision, product trials, and product revision. The reason for using only seven stages is that in the seventh the product has reached a state that is suitable for use. The success of the development of physics magazines can be seen by using a Likert scale measurement of 1-5 which is then adjusted to the range of feasibility and attractiveness values.

After going through the validator stage, the physics magazine was then tested on the educator's response consisting of three teachers of SMP Negeri 28 Bandar Lampung, SMP Negeri 9 Metro, and SMP Al-Huda Jati Agung. The educator's response covers aspects of media quality, media display, and technical quality. Furthermore, after obtaining data and analyzing the results it was stated that the physics magazine was very

interesting to use with an average percentage of 80%.

Product trials for students, consisting of small group trials and field trials of science literacy-based physics magazines were tested in three schools SMP Negeri 28 Bandar Lampung, SMP Negeri 9 Metro, and SMP Al-Huda Jati Agung. The trial began with demonstrating and explaining the physics magazine and then students were asked to fill out a response questionnaire to the physics magazine obtained.

The small group trial was given to 10 students from each school of SMP Negeri 28 Bandar Lampung, SMP Negeri 9 Metro, and SMP Al-Huda Jati Agung. The test covered 4 aspects, namely interest, material, language, and technical quality. Based on the recapitulation of the small group trial on class VIII students get a percentage assessment of 76% attractiveness and it can be concluded that the science literacy-based physics magazine is interesting to use in the learning process.

Improving the quality of education requires learning innovation, starting from formal and non-formal education levels. In addition to being more efficient, the learning process is also expected to be more enjoyable and educate students to cover all attitudes, namely both intellectual, spiritual, and others.

As a result, the product, which takes the form of a science literacy-based physics magazine, is expected to make learning easier for students and to improve students' science literacy.

Some advantages and disadvantages of science literacy-based physics magazines are obtained based on the existing results. This development product has the following advantages:

1) Science literacy-based physics magazine can be an interesting and educational additional learning resource reference and can increase students' reading motivation.
2) Learning media in the form of physics magazines can minimize the limitations of facilities and infrastructure in the learning process.
3) The product can maximize learners based on a fun learning style.
4) Science literacy-based physics magazines can be used independently or in groups because the magazine presents the material very concisely.

The products of this development have shortcomings, namely the material developed in science literacy-based physics magazines only material vibrations and waves odd semester class VIII.

From the advantages and disadvantages of this science literacy-based physics magazine, it is expected not to reduce or affect the performance of this product itself. Where physics magazine products as a tool used by educators to convey material well to make it easier for students to understand it.

Conclusions

Based on the results of research and development of science literacy-based physics magazines on vibration and wave material for class VIII SMP and MTs, several conclusions were obtained, including 1) The development of science literacy-based physics magazines is very feasible to use in learning. The feasibility of the product is based on the assessment of material experts and media experts, with a percentage assessment of 90.7% in the category of "very feasible" and 90% in the category of "very feasible." 2) The attractiveness of the production response of physics subject teachers in SMP Negeri 28 Bandar Lampung, SMP Negeri 9 Metro, and SMP Al-Huda Jati Agung is very interesting, obtaining an average percentage of 80%. The results identify that this science literacy-based physics magazine is very interesting and has been feasible to be applied to students at the junior high school level (MTs Class VIII Even Semester), and product attractiveness in small group trials and large group trials conducted at SMP Negeri 28 Bandar Lampung, SMP Negeri 9 Metro, and SMP Al-Huda Jati Agung is very interesting and effective against the science literacy-based physics magazine developed. In each trial, the percentage of attractiveness performed by the three schools was 76% for small-group trials and 79% for large-group trials. These results identify that this science literacy-based physics magazine is very interesting.

References

Afandi, Sajidan, Akhyar, M., & Suryani, N. (2019). Development Frameworks of the Indonesian Partnership 21st-Century Skills Standards for Prospective Science Teachers: A Delphi Study. *Jurnal Pendidikan IPA Indonesia*, *8*(1). https://doi.org/10.15294/jpii.v8i1.11647

Akben, N. (2020). Effects of the Problem-Posing Approach on Students' Problem Solving Skills and Metacognitive Awareness in Science Education. *Research in Science Education*, *50*(3), 1143–1165. https://doi.org/10.1007/s11165-018-9726-7

Chen, J., Zhang, Y., Wei, Y., & Hu, J. (2021). Discrimination of the Contextual Features of Top Performers in Scientific Literacy Using a Machine Learning Approach. *Research in Science Education*, *51*(S1), 129–158. https://doi.org/10.1007/s11165-019-9835-y

Chipukuma, H. M., Halwiindi, H., Zulu, J. M., Azizi, S. C., & Jacobs, C. (2020). Evaluating fidelity of community health worker roles in malaria prevention and control programs in Livingstone District, Zambia-A bottleneck analysis. *BMC Health Services Research*, *20*(1), 612. https://doi.org/10.1186/s12913-020-05458-1

Granić, A., & Marangunić, N. (2019). Technology acceptance model in educational context: A systematic literature review. *British Journal of Educational Technology*, *50*(5), 2572–2593. https://doi.org/10.1111/bjet.12864

Jiang, Z., Wu, H., Cheng, H., Wang, W., Xie, A., & Fitzgerald, S. R. (2021). Twelve tips for teaching medical students online under COVID-19. *Medical Education Online*, *26*(1). https://doi.org/10.1080/10872981.2020.1854066

Kennedy, T. J., & Sundberg, C. W. (2020). *21st Century Skills* (pp. 479–496). https://doi.org/10.1007/978-3-030-43620-9_32

Lai, A.-F., Chen, C.-H., & Lee, G.-Y. (2019). An augmented reality-based learning approach to enhancing students' science reading performances from the perspective of the cognitive load theory. *British Journal of Educational Technology*, *50*(1), 232–247. https://doi.org/10.1111/bjet.12716

Lederman, N. G. (2019). Contextualizing the Relationship Between Nature of Scientific Knowledge and Scientific Inquiry. *Science & Education*, *28*(3–5), 249–267. https://doi.org/10.1007/s11191-019-00030-8

Li, X., & Chu, S. K. W. (2021). Exploring the effects of gamification pedagogy on children's reading: A mixed-method study on academic performance, reading-related mentality and behaviors, and sustainability. *British Journal of Educational Technology*, *52*(1), 160–178. https://doi.org/10.1111/bjet.13057

Maree, J. G. (2021). The psychosocial development theory of Erik Erikson: critical overview. *Early Child Development and Care*, *191*(7–8), 1107–1121. https://doi.org/10.1080/03004430.2020.1845163

Margot, K. C., & Kettler, T. (2019). Teachers' perception of STEM integration and education: a systematic literature review. *International Journal of STEM Education*, *6*(1), 2. https://doi.org/10.1186/s40594-018-0151-2

Marshall, N. J., Cortesi, F., de Busserolles, F., Siebeck, U. E., & Cheney, K. L. (2019). Colours and colour vision in reef fishes: Past, present and future research directions. *Journal of Fish Biology*, *95*(1), 5–38. https://doi.org/10.1111/jfb.13849

Nasar, Z., Jaffry, S. W., & Malik, M. K. (2019). Textual keyword extraction and summarization: State-of-the-art. *Information Processing & Management*, *56*(6), 102088. https://doi.org/10.1016/j.ipm.2019.102088

Nückles, M., Roelle, J., Glogger-Frey, I., Waldeyer, J., & Renkl, A. (2020). The Self-Regulation-View in Writing-to-Learn: Using Journal Writing to Optimize Cognitive Load in Self-Regulated Learning. *Educational Psychology Review*, *32*(4), 1089–1126. https://doi.org/10.1007/s10648-020-09541-1

Oliver, M., McConney, A., & Woods-McConney, A. (2021). The Efficacy of Inquiry-Based Instruction in Science: a Comparative Analysis of Six Countries Using PISA 2015. *Research in Science Education*, *51*(S2), 595–616. https://doi.org/10.1007/s11165-019-09901-0

Pasmore, W., Winby, S., Mohrman, S. A., & Vanasse, R. (2019). Reflections: Sociotechnical Systems Design and Organization Change. *Journal of Change Management*, *19*(2), 67–85. https://doi.org/10.1080/14697017.2018.1553761

R, N., Rinanto, Y., & Ramli, M. (2019). Scientific literacy profile in biological science of high school students. *JPBI (Jurnal Pendidikan Biologi Indonesia)*, *5*(1), 9–16. https://doi.org/10.22219/jpbi.v5i1.7080

Rissanen, I., Kuusisto, E., Tuominen, M., & Tirri, K. (2019). In search of a growth mindset pedagogy: A case study of one teacher's classroom practices in a Finnish elementary school. *Teaching and Teacher Education*, *77*, 204–213. https://doi.org/10.1016/j.tate.2018.10.002

Rogelberg, S. G., King, E. B., & Alonso, A. (2022). How we can bring I-O psychology science and evidence-based practices to the public. *Industrial and Organizational Psychology*, *15*(2), 259–272. https://doi.org/10.1017/iop.2021.142

Sharon, A. J., & Baram-Tsabari, A. (2020). Can science literacy help individuals identify misinformation in everyday life? *Science Education*, *104*(5), 873–894. https://doi.org/10.1002/sce.21581

Steffe, L. P., & Ulrich, C. (2020). Constructivist Teaching Experiment. In *Encyclopedia of Mathematics Education* (pp. 134–141). Springer International Publishing. https://doi.org/10.1007/978-3-030-15789-0_32

Valladares, L. (2021). Scientific Literacy and Social Transformation. *Science & Education*, *30*(3), 557–587. https://doi.org/10.1007/s11191-021-00205-2

You, H. S., Park, S., & Delgado, C. (2021). A closer look at

US schools: What characteristics are associated with scientific literacy? A multivariate multilevel analysis using PISA 2015. *Science Education*, *105*(2), 406–437. https://doi.org/10.1002/sce.21609

Zobrist, J., Sima, M., Dogaru, D., Senila, M., Yang, H., Popescu, C., Roman, C., Bela, A., Frei, L., Dold, B., & Balteanu, D. (2009). Environmental and socioeconomic assessment of impacts by mining activities—a case study in the Certej River catchment, Western Carpathians, Romania. *Environmental Science and Pollution Research*, *16*(S1), 14–26. https://doi.org/10.1007/s11356-008-0068-2