



Development of Science Module Based on Scientific Approach to Improve Science Process Skills of Elementary School Students

Pengembangan Modul IPA Berbasis Scientific Approach untuk Meningkatkan Keterampilan Proses Sains Siswa Sekolah Dasar

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Abstract

This research aims to develop a science module based on a scientific approach to improve science process skills. This research is research and development. This research uses ADDIE development model which has 5 stages, namely analysis, design, development, implementation, and evaluation. This research only reached the implementation stage. The research was carried out at Hamas IT Elementary School. The research subjects were 18 class VI students. The object in this research is VI science module based on a scientific approach. Data collection techniques are observation, interviews, questionnaires, tests. Data analysis in research is: (a) feasibility analysis science module based on a scientific approach and (b) effectiveness analysis science module based on a scientific approach. Based on the validation results for the product developed, namely a science module based on a scientific approach, show that the material expert validation results are 94.56%, including the very feasible category. Meanwhile, the results of media expert validation, namely 88.70% included in the very worthy category. The results of the pretest that were carried out showed that only 1 student completed it and 17 students did not complete it with a percentage of 44%. Meanwhile, the results of the posttest that had been carried out showed that 18 students completed the test with a percentage of 78%. Based on the explanation above, it can be concluded that the scientific approach based science module developed is suitable and effective for use by sixth grade students at Hamas IT Elementary School.

Keywords: module; natural sciences; scientific approach; science process skills

Abstrak

Penelitian ini bertujuan untuk mengembangkan modul IPA berbasis pendekatan saintifik untuk meningkatkan keterampilan proses sains. Penelitian ini merupakan penelitian dan pengembangan. Penelitian ini menggunakan model pengembangan ADDIE yang memiliki 5 tahapan yaitu analysis, design, development, implementation, dan evaluation. Penelitian ini hanya sampai pada tahap implementation. Penelitian dilaksanakan di SD IT Hamas. Subjek penelitian yaitu siswa kelas VI yang berjumlah 18 orang siswa. Objek dalam penelitian ini yaitu VI modul IPA berbasis pendekatan saintifik. Teknik pengumpulan data yaitu observasi, wawancara, angket, tes. Analisis data pada penelitian yaitu: (a) analisis kelayakan modul IPA berbasis pendekatan saintifik dan (b) analisis keefektifan modul IPA berbasis pendekatan saintifik.

Berdasarkan hasil validasi pada produk yang dikembangkan yaitu modul IPA berbasis pendekatan saintifik diketahui bahwa hasil validasi ahli materi yaitu 94,56% termasuk kategori sangat layak. Sedangkan, hasil validasi ahli media yaitu 88,70% termasuk kategori sangat layak. Hasil uji coba pretest yang telah dilakukan diketahui bahwa hanya 1 siswa yang tuntas dan 17 siswa yang tidak tuntas dengan persentase 44%. Sedangkan, hasil uji coba posttest yang telah dilakukan diketahui bahwa 18 siswa yang tuntas dengan persentase 78%. Berdasarkan penjelasan di atas, dapat disimpulkan bahwa modul IPA berbasis pendekatan saintifik yang dikembangkan layak dan efektif untuk digunakan siswa kelas VI di SD IT Hamas.

Kata kunci: modul; IPA; pendekatan saintifik; keterampilan proses sains

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Introduction

Education has an important role in creating a generation that is ready to face future challenges. This is in line with Vediany & Arif (2023) who say that education has an important role in preparing the young generation to face challenges and demands in real life. To prepare the young generation who are ready to face challenges through the education that students receive at school. When at school, students will receive various knowledge explained by the teacher in class.

In explaining science learning materials, teachers are constrained by the teaching materials used. Because the teaching materials used are very difficult for students to understand. Students also become less interested in participating in the learning process in class. If left unchecked, this will have a negative impact on every elementary school student.

Based on observations and interviews conducted by researchers with class VI teachers at SD IT Hamas, it is known that science learning is considered difficult by students, the teaching materials used by teachers do not make students interested in reading and studying them, students find it difficult to understand concepts, and the teacher's explanations in providing learning materials.

One of the teaching materials that can be used by teachers to support teaching and learning activities is modules. Modules are components of teaching materials that are systematically arranged which contain structured learning experience packages designed to help students achieve certain learning goals (Prasetiowati et al., 2023). This is in line with Zandrato et al (2022) who say that modules are teaching materials that are prepared in a complete and structured manner, containing a set of planned learning experiences and created to help master structured learning objectives. Teachers can use the module in science lessons. Natural science is a science that studies all phenomena that occur in nature (Rosmalinda et al., 2023). By studying science lessons, students will get many benefits in their lives. This is supported by Jannah & Atmojo (2022) who say that having an understanding of natural science can provide benefits to human life considering that humans always live side by side with nature. Therefore, science education is given from an early age, namely at elementary school level.

Therefore, to support the learning process teachers can use science modules based on a scientific approach. The scientific learning approach is a process designed in such a

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way that students actively construct concepts in learning (Hufri 2018). The scientific approach has several characteristics, including (a) student centred, (b) involving scientific process skills in constructing concepts, laws or principles, (c) involving cognitive processes that have the potential to stimulate intellectual development, especially students' higher order thinking skills, and (d) can develop student character (Putri, 2022). The scientific approach is also carried out in a pleasant atmosphere, because it involves children directly in the learning process, and gives children full opportunities to try and discover their own knowledge (Afif et al., 2022).

By using a science module based on a scientific approach to support the learning process in the classroom, it is hoped that it can improve students' science process skills. Fatmawati et al (2022) say that science process skills are scientific skills that include psychomotor skills and cognitive skills as a reference in determining concepts, theories and principles in developing pre-existing concepts. This is in line with Yuniastuti in SD et al (2022) who said that science process skills are physical and mental skills related to basic abilities that are possessed, mastered and applied in a scientific activity, so that scientists succeed in getting something new. Science process skills can be trained in students during the process of building knowledge, they create and use information, carry out research processes, and practice solving problems in the environment (Subeki et al., 2022). Based on the description above, researchers will develop a module based on a scientific approach to improve science process skills for elementary school students.

Research methods

This research is research and development. The development model used in this research is the ADDIE model which has 5 stages, namely analysis, design, development, implementation, and evaluation (Rayanto, 2020). This research only reached the implementation stage. This research was carried out at SD IT Hamas. The research subjects were 18 class VI students. The object in this research is VI practicum-based module. Data collection techniques are observation, interviews, questionnaires, tests. Data analysis in research is: (a) feasibility analysis science module based on a scientific approach, and (b) effectiveness analysis science module based on a scientific approach.

Table 1. Likert Scale Criteria (Kesumawati et al, 2022)

No	Answer	Score
1	Very good	4
2	Good	3
3	Enough	2
4	Not good	1

$$NP = X 100\% \frac{R}{SM} \quad (\text{Parinduri et al, 2022})$$

Information:

- N.P = Desired percent value
- R = Intermediate score obtained
- BC = Maximum score
- 100% = Fixed number

Table 2. Percentage of Eligibility Criteria (Hafshari & Arini, 2023)

No	Score	Classification
1	81%	Very Worth It
2	61%	Worthy
3	41%	Decent Enough
4	21%	Not feasible
5	0% X < 20%	Totally Not Worth It

The formula for calculating the results of students' science process skills is:

$$P = \frac{f}{N} \times 100\% \quad (\text{Lubis et al., 2023})$$

Information :

- P :Percentage
- f :Frequency
- N :Total Activity Number

Results and Discussion

The results of research on the development of science modules based on a scientific approach using the ADDIE development model. The stages in the research are as follows:

Analysis

At this stage the researcher analyzed the problems that occurred in class VI students at SD IT Hamas which were related to the science learning process. Then the researcher
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conducted interviews with class VI teachers to obtain information. Next, researchers analyzed student characteristics. Then, researchers also analyzed the learning process in the classroom, facilities and teaching materials used by teachers in providing learning materials. By carrying out this analysis, it is hoped that the learning objectives will be achieved.

Design

The next stage, the researcher will design module based on a scientific approach. The researcher created this design based on the analysis carried out by researchers at SD IT Hamas.

Development

At this stage, the product that has been designed will be validated by material experts and media experts. The purpose of validation is to determine whether the product being developed is feasible or not. The products developed are: The science module is based on a scientific approach that has been validated by material experts and media experts. During validation, experts provide suggestions and input so that the product being developed can be improved. After receiving suggestions and input from experts, the researchers then improved the science module based on a scientific approach in accordance with the suggestions and input from experts. The results of the validation that have been carried out can be seen in the following table:

Table 3. Validation ResultsModule Based on a Scientific Approach

No	Assessment Aspects	Percentage (%)	Eligibility Criteria
1	Materials Expert	94.56%	Very worthy
2	Media Expert	88.70%	Very worthy

Based on the validation results on the product developed, namely a science module based on a scientific approach, it is known that the material expert validation results are 94.56%, including the very feasible category. Meanwhile, the results of media expert validation, namely 88.70% included in the very worthy category.

Implementation

At this stage A science module based on a scientific approach that has been developed and declared very feasible by experts, will then be tested on class VI students

at SD IT Hamas. The trial will be carried out in two stages, namely pretest and posttest. This trial was carried out to determine improvements students science process skills. The results of student trials can be seen in the following table:

**Table. Student Pretest and Posttest Test Results
Science Process Skills**

No	Student's	Pretest	Criteria	Posttest	Criteria
1	E1	30	Not Completed	70	Complete
2	E2	40	Not Completed	80	Complete
3	E3	70	Complete	90	Complete
4	E4	60	Not Completed	80	Complete
5	E5	20	Not Completed	50	Complete
6	E6	50	Not Completed	70	Complete
7	E7	30	Not Completed	70	Complete
8	E8	60	Not Completed	90	Complete
9	E9	40	Not Completed	70	Complete
10	E10	50	Not Completed	80	Complete
11	E11	30	Not Completed	90	Complete
12	E12	40	Not Completed	80	Complete
13	E13	40	Not Completed	70	Complete
14	E14	20	Not Completed	90	Complete
15	E15	40	Not Completed	90	Complete
16	E16	60	Not Completed	90	Complete
17	E17	20	Not Completed	70	Complete
18	E18	60	Not Completed	80	Complete
Amount			800		1410
Percentage			44%		78%

Based on the results of the pretest that was carried out, it was found that only 1 student completed it and 17 students did not complete it with a percentage of 44%. Meanwhile, the results of the posttest that had been carried out showed that 18 students completed the test with a percentage of 78%.

Discussion

This research develops a science module based on a scientific approach to improve science process skills. The research model in the research is the ADDIE development

model which consists of analysis, design, development, implementation, and evaluation. The product developed was obtained from the results of validation carried out by material experts and media experts who had received advice and input from experts. After validation by experts, it can be concluded that the product developed, namely a science module based on a scientific approach, is suitable for use.

Based on the validation results on the product developed, namely a science module based on a scientific approach, it is known that the material expert validation results are 94.56%, including the very feasible category. This is supported by Zalukhu et al (2023) who said that the validation results for material experts with a percentage of 95% were categorized as very feasible. Faizah et al (2023) said that the results of material validation, with a percentage of 90%, were categorized as very feasible. Novianti & Lubis (2023) said that the material validation results with a percentage of 97% were in the very feasible category.

Based on the validation results on the product developed, namely the science module based on a scientific approach, it is known that the validation results from media experts, namely 88.70% included in the very worthy category. This is supported by Sutrisno et al (2023) who said that the validation results from media experts with a percentage of 84% were categorized as very feasible. Lubis et al (2023) said that the results validation media experts amounted to 93.80% including the appropriate category.

Based on the results of the pretest that was carried out, it was found that only 1 student completed it and 17 students did not complete it with a percentage of 44%. Meanwhile, the results of the posttest that had been carried out showed that 18 students completed the test with a percentage of 78%.

There is several supporting research in this research, including: research conducted by Aninindya et al (2022) which states that the scientific approach based module obtained a material appropriateness score of 96%, linguistics 95%, and graphics 97%. Based on the research results, modules based on a scientific approach are very feasible and can be used in the learning process. This is in line with research by Rahman et al (2019) which states that the validity of the media was tested on subject content experts, design experts, media experts, individual trials, small groups and field trials. The results were sequentially 95.3%, 85, 2%, 92%, 94.6%, 96.08%, and 97.06%. The results

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of the effectiveness test which were analyzed using inferential statistical techniques (t-test) obtained an average pretest result (62.5) < average posttest result (88.3). After carrying out manual calculations using the t-test, the results showed that t_{count} (9.521) > t_{table} with $db = n_1 + n_2 - 2 = 10$ at the 5% significance level, namely 1.812. So $t_{count} > t_{table}$, then based on the provisions if $t_{count} > t_{table}$ then H_0 is rejected and H_1 is accepted. This means that there is a significant difference in student learning outcomes before using the scientific approach based module and after using the scientific approach based module.

Based on the results and discussion above and supported by previous research, it can be concluded that the science module based on a scientific approach is feasible and effective for use with class VI students at SD IT Hamas.

Conclusion

This research is research and development. The development model is the ADDIE development model which has 5 stages, namely analysis, design, development, implementation, and evaluation. This research only reached the implementation stage. This research was carried out for sixth grade students at SD IT Hamas.

The validation results for the product developed, namely a science module based on a scientific approach, show that the material expert validation results are 94.56%, including the very feasible category. Meanwhile, the results of media expert validation, namely 88.70% included in the very worthy category. The results of the pretest that were carried out showed that only 1 student completed it and 17 students did not complete it with a percentage of 44%. Meanwhile, the results of the posttest that had been carried out showed that 18 students completed the test with a percentage of 78%.

Based on the explanation above, it can be concluded that the scientific approach based science module developed is suitable and effective for use by sixth grade students at Hamas IT Elementary School.

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