Problem Based E-Book on Social and Natural Sciences Learning Subjects for Fifth Grade of Elementary Schools

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A B S T R A K

Keterbatasan keterampilan guru dalam mengembangkan media pembelajaran yang inovatif mempengaruhi hasil belajar siswa pada mata pelajaran IPAS. Penelitian ini dilaksanakan dengan tujuan untuk mengembangkan produk berupa e-book untuk meningkatkan hasil belajar siswa, serta menganalisis kevalidan, kepraktisan, dan efektivitas dari produk yang dikembangkan. Penelitian ini merupakan penelitian pengembangan dengan model ADDIE. Penelitian ini melibatkan dosen ahli serta siswa kelas V sekolah dasar. Metode pengumpulan data menggunakan kuesioner dan tes. Kemudian data dianalisis secara deskriptif kuantitatif dan uji statistik. Teknik analisis kuantitatif digunakan untuk menguji pada tahap rancang bangun dan validitas produk yang dikembangkan. Selain itu, Teknik ini digunakan untuk mengolah data yang diperoleh melalui angket/kuesioner sebagai deskriptif persentase. Kemudian uji statistic dilakukan melalui Uji-t berguna untuk menguji perbedaan pada nilai rata-rata hitung antara dua kelompok sampel yang berkorelasi dan sampel yang independen. Hasil penelitian menunjukkan bahwa keseluruhan hasil validitas pengembangan bahan ajar e-book memiliki persentase sangat baik dan layak digunakan dalam proses pembelajaran. Berdasarkan hal tersebut dapat disimpulkan bahwa media e-book berbasis problem based learning efektif diterapkan pada Mata Pelajaran IPAS di kelas V Sekolah Dasar. Penelitian ini memberikan dampak positif bagi pengajar, yakni memperluas pengetahuan guru dalam pengembangan serta memanfaatkan media pembelajaran dalam proses pembelajaran sehingga pengajar tidak dominan menggunakan metode ceramah.

A B S T R A C T

The limitations of teacher skills in developing innovative learning media affect student learning outcomes in the subject of social and natural sciences. This study was conducted with the aim of developing a product in the form of an e-book to improve student learning outcomes, as well as analyzing the validity, practicality, and effectiveness of the product developed. This study is a development research with the ADDIE model. This study involved expert lecturers and fifth grade elementary school students. The data collection method used questionnaires and tests. Then the data was analyzed descriptively quantitatively and statistically. Quantitative analysis techniques were used to test the design and validity stages of the products developed. In addition, this technique is used to process data obtained through questionnaires as descriptive percentages. Then statistical tests were carried out through the t-test which is useful for testing differences in the average value of the calculation between two correlated sample groups and independent samples. The results of the study showed that the overall validity results of the development of e-book teaching materials had a very good percentage and were suitable for use in the learning process. Based on this, it can be concluded that e-book media based on problem based learning are effectively applied to the subject of social and natural sciences in fifth grade elementary schools. This research has a positive impact on teachers, namely expanding teachers' knowledge in developing and utilizing learning media in the learning process so that teachers do not predominantly use lecture methods.

1. INTRODUCTION

Education is a conscious and planned effort made to create an atmosphere and learning process in such a way that students are actively able to develop their potential for spiritual religious strength, self-

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discipline, personality, intelligence, noble morals, and the skills needed by themselves and society (Indarta et al., 2022; Mentari et al., 2018).Teaching can be defined as a way of changing ethics and behavior by individuals or society in an effort to realize independence in order to mature or make humans mature through education, learning, guidance and coaching (Liana et al., 2021; Putrislia & Airlanda, 2021).

Until now, the curriculum applied in education, namely the independent learning curriculum, was initiated by Mr. Nadiem Makarim who changed and established the Independent Curriculum as an improvement on the 2013 curriculum. Science is one of the subjects that has changed in this curriculum. Students must be able to develop critical and rational thinking skills. Learning with science and scientific concepts means trying to provide experience and improve abilities (Liana et al., 2021; Maulida, 2022). In the independent program, science and social studies are combined into science. The goal of science in the independent program is to develop interest, curiosity, play an active role and be able to develop knowledge and skills (Priambudi et al., 2024; Rusdiana & Wulandari, 2022).Based on the explanation above, it can be concluded that IPAS is the science of living and non-living organisms in the universe and their interactions, and examines human life as individuals and social beings interacting with their environment. In general, science is defined as a combination of various knowledge that is arranged logically and systematically taking into account cause and effect. This knowledge includes natural knowledge and social knowledge(Maulida, 2022; Priambudi et al., 2024). At the Elementary School level, it is expected that educational institutions can develop increasingly advanced technology so that it will have a good impact on students' abilities, otherwise there will be disparities in learning outcomes.

One of the learning emphasized in science learning in the independent curriculum is problem-based learning. Problem Based Learning (PBL) is a student-centered teaching method where they learn through solving real problems. This approach not only helps students understand the material in depth, but also develops critical thinking, collaboration, and problem-solving skills (Dewi & Bayu, 2022; Kusumaningrum & Siswanto, 2024). In the context of science and natural sciences, the application of PBL allows students to connect theory with practice through challenging projects that are relevant to everyday life. Thus, PBL is expected to increase students' interest and achievement in science and natural sciences subjects and prepare them to face future challenges better.

Unfortunately, the hope of improving students' critical thinking skills through PBL learning is still not running optimally. Based on the results of field observations, it was found that in the learning process, teachers only use teacher books and student books. Teachers only occasionally use learning media such as learning videos, PowerPoint (PPt) which are used during learning. Teachers use learning media such as PowerPoint (PPt) and learning videos taken from the internet. The facilities and infrastructure in schools are also adequate such as: wifi, electricity, LCD projectors, but in their use in the learning process they are still very less than optimal, so that students also have difficulty in understanding the learning. In addition, teachers are also not yet skilled in using digital-based learning media in delivering material, in the learning process teachers are not yet able to use varied learning methods, especially in the content of science learning. it was found that the teacher using lecture learning methods, group discussions, and assignments so that learning in class less interesting for students (Hotimah, 2020; Liana et al., 2021).

In the implementation of learning, teachers are still limited in developing learning media so that in the learning process, teachers... using learning media PowerPoint (PPt) and Learning Videos via the Youtube Playform in the subject of science and natural sciences. Teachers do not know about the existence of other supporting learning media such as electronic books (e-books), teachers do not know how to use the electronic books and how to make them especially in science and natural sciences learning, the learning tools used by teachers are still not varied enough and have not been packaged attractively, teachers only use textbooks from the library, teachers have not been able to make electronic books independently, and teachers state that digital books in science and natural sciences learning need to be developed and applied for future learning (Faiz & Soleh, 2021; Wu & Amzah, 2023).

Based on these problems, a solution is needed by developing learning media that can support the science learning process. One of the learning media that can be used is an e-book. E-books are one of the learning media that can be used in the learning process so that they can attract students' attention (Adam & Suprapto, 2019; Sumarsono & Anggaryani, 2022). Through e-books, students' creativity and activity in the learning process can be improved. In times like today, the use of technology in education is very important to implement. In addition to following the development of the times, it also makes it easier for educators and students to carry out the learning process. In this case, the development of e-books as a learning medium was chosen as one of the solutions with the development of the times when technology began to be used. This development certainly requires an interesting learning model so that students are more motivated to Study (Andaresta & Rachmadiarti, 2021; Arfat et al., 2023). One of the models that can be applied in the development of e-books is problem based learning. Learning that uses the problem based

learning model will make students more active because this model requires students to be able to think and be able to solve existing problems (Efendi et al., 2022; Febrianti, 2021).

E-book is an innovation in learning because it can be accessed using digital media such as computers, notebooks and mobile phones (Hanikah et al., 2022; Sumarsono & Anggaryani, 2022). The advantage of using e-books is that they are more practical without having to bring printed books provided by the school. Other advantages of e-books include not being easily damaged, easy to use and can be accessed anywhere. The development of e-books is very much needed in the learning process because e-books contain animations, learning videos, evaluations and many other features that can be accessed so that they are very useful for these users (Dewi & Bayu, 2022; Nurhasanah et al., 2023).

This research is supported by previous research that discusses the Independent Curriculum, the research discusses the implementation of the Independent Learning Curriculum in schools (Indarta et al., 2022; Rahmadayanti & Hartoyo, 2022; Wahyuni & Rahayu, 2021). In addition, there is research related to the use of e-books in learning. The study stated that the use of e-books in the learning process has a significant impact, because it obtained validity results according to the trial subjects respectively as many as 91.67%, 96.87%, 100%, 96.67%, 98.33%, and 96.33% overall with a very good category and suitable for use. From these results, students can learn independently, the process experienced by students becomes more meaningful and is able to attract students' interest in learning in the learning process (Puspita et al., 2021; Rusdiana & Wulandari, 2022). This research has a novelty because it develops e-book media based on problem based learning that can support science learning. With this e-book, the learning and teaching process becomes easier. Teachers can create learning materials in the form of e-books and then send them to students. So that e-books can increase students' enthusiasm for reading and student learning outcomes will increase.

This research was conducted with the aim of producing e-book products based on problem based learning and analyzing the validity, practicality and effectiveness of E-Book media Based on Problem Based Learning in helping to learn the subject of science for grade V in Elementary Schools. Through this research, it is expected to expand teachers' knowledge in developing and utilizing learning media in the learning process so that teachers do not predominantly use the lecture method. This research has a novelty by developing an e-book based on Problem Based Learning (PBL) to support the learning of science subjects in Elementary Schools. This innovation not only integrates the use of digital technology in the form of e-books, but also combines it with the PBL learning model that emphasizes real problem solving and critical thinking skills. The developed e-book is equipped with interactive features such as animation, learning videos, and evaluations, which are designed to increase student engagement and motivation. In addition, this study fills the gap in the literature regarding the application of e-books that focus on PBL, as well as overcoming the limitations of the use of traditional learning media that are currently still common in schools.

2. METHOD

This study uses development research. The development model used as a reference in this PBL-based e-book development research is the ADDIE development model (analyze, design, development, implementation and evaluation). The first stage, namely analysis in the ADDIE development research model, is to analyze the product and analyze the feasibility and requirements for product development. The second stage, namely design, contains design activities, which is the process of starting to design concepts and content in the product. The third stage, namely development, contains activities to realize the real form of the product design that has been previously made. The fourth stage, namely implementation, functions to obtain an evaluation of the product that has been made. The last stage, namely evaluation, this stage is carried out to provide feedback to product users, the results of the evaluation will later be used as a revision of the product so that it can be improved.

The trial was conducted to see to what extent the product made could achieve the targets and objectives of the research subjects. The subjects involved in this study were three expert lecturers and 33 fifth grade students at SD Negeri 1 Dauh Peken. The type of data used in this study is quantitative. The data collection method was carried out through questionnaires and tests. InThe instruments used are presented in Table 1, Table 2, Table 3, Table 4, and Table 5.

Table 1. The Subject Content Expert Instruments

No	Aspect	Indicator	Item No.	Number of Items
(1)	(2)	(3)	(4)	(5)
	A. Curriculum	a. Suitability of material to achievement Learning (CP).	1	3
		b. Suitability material with Channel Learning Objectives (ATP).	2	
		c. Suitability of the material with Learning Objectives (TP).	3	
	B. Material	a. Breadth of material.	4	8
		b. Material sequence.	5	
		c. Completeness of materials.	6	
		d. Availability of supporting examples.	7	
		e. Depth of material.	8	
		f. Attractionmaterial.	9	
		g. The material is supported by appropriate illustrations.	10	
		h. The concepts presented can be explained logically.	11	
	C. Linguistics	a. Use of appropriate and consistent language.	12	6
		b. Accuracy of spelling in the material.	13	
		c. Language according to EYD.	14	
		d. The sentence structure is correct.	15	
		e. Frankness and communicativeness.	16	
		f. Sentence does not give rise to double meaning.	17	
	D. Evaluation	a. Suitability of evaluation questions withlearning objectives.	18	3
		b. Suitability of the level of difficulty of the evaluation questions.	19	
		c. Suitability of the questionsevaluation withmaterial components.	20	
Many Grains				**20**

Table 2. The Learning Design Expert Instruments

No.	Aspect	Indicator	Item No.	Number of Items
(1)	(2)	(3)	(4)	(5)
A.	Objective	a. Clarity of learning objectives.	1	4
		b. Conformity of the summary with objective.	2	
		c. Learning objectives have been achieved contains ABCD (Audience, Behavior, Condition, Degree).	3	
		d. Consistency between learning outcomes, ATP, learning objectives, materials, and evaluation in a coherent manner.	4	
B.	Strategy	a. Clarity of user goals.	5	8
		b. The learning stages have been sequentially according to the sequence of the material.	6	
		c. Learning steps are written clearly.	7	
		d. Give examples events that are in accordance with the material.	8	
		e. Presentation of E-books according to steps or syntax Problem Based Learning learning model.	9	
		f. Strategy presentation of material is capable motivate students.	10	
		g. Providing opportunities for students learn independently.	11	
		h. Accuracy of feedback from student answers.	12	
C.	Evaluation	a. Given an evaluation for measure students' abilities.	13	3
		b. Clarity of instructions for working on the questions.	14	

Table 3. The Validation Instrument of Learning Media Experts

No	Aspect	Indicator	Item No.	Number of Items
(1)	(2)	(3)	(4)	(5)
A.	Technical	a. Ease of use of media.	1	2
		b. Clear instructions for use.	2	
B.	Navigation	a. Ease of using feature buttons navigation.	3	
		b. Navigation icon layout.	4	3
		c. Selection of attractive navigation icon colors.	5	
C.	Visual	a. The cover design is made attractively.	6	9
		b. The letters used are interesting and easy to read.	7	
		c. Accuracy in selecting font size.	8	
		d. Placement of titles, subtitles, and illustrations does not interfere with understanding.	9	
		e. Use of font variations (Bold, Italic, all capital, small capital) No excessive.	10	
		f. Accuracy use of spaces in text.	11	
		g. Selection of appropriate background.	12	
		h. Conformity of the image to the material.	13	
		i. Appearance balanced layout	14	
E.	Audio & Video	a. Clarity of video sound.	15	6
		b. A combination of interesting text, images and videos.	16	
		c. Accuracy of video duration.	17	
		d. Clarity of video background sound.	18	
		e. Image quality on video.	19	
		f. Clarity sound effects.	20	
Many Grains				**20**

Table 4. The Individual and Small Group Trial Instruments

No	Aspect	Indicator	Item No.	Number of Items
(1)	(2)	(3)	(4)	(5)
A.	Appearance	a. The E-Book display is attractive.	1	5
		b. The writing can be read easily.	2	
		c. The images in the E-book are clearly visible.	3	
		d. The colors presented in the E-book are harmonious.	4	
		e. Videos can help clarify the material in the E-book.	5	
B.	Material	a. The material in the E-book can be understood easily	6	3
		b. The material discussed in each video is presented clearly.	7	
		c. The questions/problems are in accordance with the material so that there is no difficulty in answering them.	8	
C.	Motivation	a. E-Books raise enthusiasm for learning science	9	2
		b. This e-book can increase interest in learning	10	
D.	Operation	a. This e-book is easy to use	11	1
Many Grains				**11**

Table 5. The Pre-Test and Post-Test Instruments

Learning Outcomes	Learning objectives	Cognitive Level						Amount Question
		C1	C2	C3	C4	C5	C6	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Students carry out an action, make a decision or solve a problem related to daily life based on their understanding of the material they have studied.	Students can describe the relationship between living things related to food in the form of a food chain.				✓			7,10

Learning Outcomes	Learning objectives	Cognitive Level						Amount Question
		C1	C2	C3	C4	C5	C6	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Students can identify the role of living things in the food chain.		✓					1,5
	Students can describe the relationships between creatures in food webs in larger ecosystems.				✓			15,19
	Students can describe food webs as a form of transfer.energybetween living things				✓			13,16,17
	ParticipantStudents can translate food webs into food pyramids			✓				6,9
	ParticipantStudents can relate the size of the population of living things based on the food pyramid					✓		7,8
	Students can describe the role of food webs in ecosystem balance.				✓			2,3,4
	Students can relate phenomena that occur in an ecosystem to food webs.					✓		10,12,20
	Students can understand the role of humans in maintaining ecosystem balance.			✓				11,14,18
	Total Indicators							**20**

In this development study, data analysis was conducted to gain a concrete understanding of the success of the developed e-book. The results obtained will be used as material for developing this e-book. Quantitative descriptive data analysis techniques and statistical tests were used in this development. Quantitative analysis techniques were used to test the design and validity stages of the developed product. In addition, this technique was used to process data obtained through questionnaires as descriptive percentages. Then statistical tests were carried out through the t-test which is useful for testing differences in the average value between two correlated sample groups and independent samples. From the results of the pre-test and post-test which will later be carried out on students, they will be analyzed using the t-test to determine the differences in the results of multimedia implementation. Before applying the t-test to the analysis of research data, prerequisite tests are needed first, namely the normality test and the homogeneity test of variance.

3. RESULTS AND DISCUSSION

Results

Research on the development of e-books based on problem based learning in the subject of science for grade V of SD Negeri 1 Dauh Peken Tabanan in the 2023/2024 Academic Year using the ADDIE model which has stages of analysis, design, development, implementation and evaluation stages. The first stage in this study is the analysis stage, carried out by conducting needs analysis, characteristics analysis, and facilities analysis. Analysis activities are needed to determine existing problems and find solutions to problems that can be offered. The second is the design stage, carried out through several stages, namely designing software, designing storyboards, designing assessment instruments, and designing learning implementation plans. The third stage, namely development, is the production stage carried out, namely teaching materials by making designs so that they become the desired product. The results of the developed products are presented in Figure 1.

Figure 1. The Results of Research Products.

After the product is developed, it is continued with the implementation stage, namely the application of media. The results of the development are applied to the learning process which aims to determine the efficiency and effectiveness of the product that has been made. And finally the evaluation stage, the implemented product will be evaluated and reviewed by experts, both learning content experts, learning media design experts and learning media experts. In individual tests and small group tests, students also provide assessments and evaluations of learning animation video products. At this stage, the aim is to test the feasibility and to optimize the products that have been developed.

The products developed in this study passed the validity test, practicality test, and media effectiveness test. The results of data analysis in e-book teaching materials are in the form of review results from the teaching material validity test, namely the expert test of learning material content, expert test of learning design, expert test of learning media, individual test and small group test. The results of the analysis of the validity of the development data are presented in Table 6.

Table 6. The Percentage of Results of the Validity Test of the Development of Teaching Materials.

No	Test Subject	Validity Results (%)	Qualification
1	Learning Content Expert Test	92.00	Very good
2	Learning Design Expert Test	94.66	Very good
3	Learning Media Expert Test	91.00	Very good
4	Individual Test	94.67	Very good
5	Small Group Test	94.00	Very good

Based on the table of percentage of the results of the validity test of the development of e-book teaching materials, it can be concluded that the overall validity results of the development of e-book teaching materials have a very good percentage and are suitable for use in the learning process. After going through the validity test, it is continued with the effectiveness test. The effectiveness of the product of the development of e-book teaching materials in its application uses the test method. The questions given in the form of multiple choices aim to collect the value of student learning outcomes before and after using the teaching materials. The goal is to determine the level of effectiveness in using e-book teaching materials on the emergence of learning outcomes which are carried out by using the t-test for correlated samples. Before conducting the effectiveness test of the e-book teaching material product using the test method, first conduct a trial of the learning test instrument and prerequisite test. The results of the prerequisite test, namely the normality test and the homogeneity test, are presented in Table 7 and Table 8.

Table 7. The Results of Normality Test

Data		Kolmogorov-Smirnova			Shapiro Wilk		
		Statistics	Df	Sig.	Statistics	df	Sig.
Science	Pretest	0.127	33	0.191	0.960	33	0.262
Learning Values	Posttest	0.147	33	0.066	0.943	33	0.083

Table 8. The Results of Homogeneity Test

	Parameters	Levene Statistics	df1	df2	Sig.
Science Learning Values	Based on Mean	3.240	1	64	0.077
	Based on Median	3.246	1	64	0.076
	Based on Median and with adjusted df	3.246	1	56.299	0.077
	Based on trimmed mean	2.998	1	64	0.088

Based on the normality and homogeneity tests, the results show that the sample comes from a normally distributed population, and the sample is declared homogeneously distributed. After going through the prerequisite test, it is continued with a hypothesis test using a correlated t-test analysis with the product moment formula. The results of the t-test are presented in Table 9.

Table 9. The T-Test Results

Pair	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Pair 1 Posttest – Pretest	26.030	12.223	2.128	21.696	30.364	12.234	32	0.000

Based on the results of the t-test calculation, it can be seen that the t_{count} is 12.234 with a df of 32, the t_{table} is 1.694. Therefore, $t_{count} > t_{table}$ (12.234 > 1.694), so that H_0 is rejected and H_1 is accepted. The conclusion is that there is a significant difference before using e-book learning materials based on problem based learning in the subject of science and after using e-book learning materials based on problem based learning in the subject of science.

Discussion

The stages of development research in the ADDIE model are: (1) Analysis, (2) Design/planning (Design), (3) Development (Development), (4) Implementation/execution (Implementation), and (5) Evaluation/feedback (Evaluation) (Cahyadi, 2019; Usta & Güntepe, 2017). The first stage carried out is the analysis stage which is divided into needs analysis, student characteristics analysis and facilities analysis. This stage aims to find out that fifth grade students at SD Negeri 1 Dauh Peken Tabanan need e-book teaching materials. The design stage is the stage where researchers determine basic competencies (KD), compile materials and create storyboards. The third stage of development, at this stage researchers create products in the form of e-book teaching materials according to the design stage made. The fourth stage is implementation, this stage is carried out for the application of the media that has been made. Finally, the fifth stage of evaluation, this stage aims to present the results of research on teaching materials and student learning abilities so that researchers can find out how feasible the product is.

Related to the Description of the Quality of the E-Book of the Science Subject Matter, it is assessed based on the assessment of Content Experts, Instructional Design Experts, and Media Experts. At this stage, the quality of the e-book is determined according to the experts in subject matter, subject matter design, and learning media experts. The method of this assessment uses the questionnaire method. The following is a presentation of the assessment results. The assessment results from the learning content experts have a very good qualification with a score of 92% with comments that improvements need to be made in each sentence starting with a capital letter. The assessment results from the learning design experts obtained a percentage of 94.66% with a very good qualification with several revisions, namely the developer's name is written on the front cover, some texts & backgrounds need to be more contrasted, images are numbered and titled, there is an error in the page title of the concept map, learning objectives have ABCD elements. The provision of these comments and suggestions is used as a guideline in designing an interesting and

easy-to-understand e-book. The assessment from the learning media experts was obtained at 91% with a very good qualification. Suggestions and comments were also given by the lecturer of learning media, namely not to have a lot of empty space, use San Serif fonts, identifying words for elementary school children are not yet common (use simple language/words), increase visual messages and each image contains a picture caption. Based on the assessment of experts, it can be concluded that this e-book media is declared valid for use in learning (Rahim et al., 2020; Saddhono et al., 2020).

Next, the Practicality Test of E-Books Based on Individual and Small Group Trials was conducted. After the assessment by experts, namely learning content experts, learning design experts, and learning media experts, it was continued with individual and small group trials. Individual trials were conducted by students with three students having diverse learning achievements, one student had high learning achievements, one student had moderate learning achievements and one student had low learning achievements. For small group trials, it was conducted by 9 students with 3 different categories each, namely three students had high learning achievements, three students had moderate learning achievements and three students had low learning achievements. The results of the individual trial were 94.67 and the small group trial was 94%, both of which had very good qualifications. Based on these results, it can be stated that e-books based on problem based learning are practical to use in supporting the science learning process that takes place in elementary schools (Susilawati & Rusdinal, 2022; Tang, 2021).

Finally, the E-Book Teaching Material Effectiveness test was carried out. The test method was carried out to determine the effectiveness of the application of problem-based teaching materials. The test method was tested using multiple-choice question sheets on 25 sixth grade students of SD Negeri 1 Dauh Peken Tabanan with pretest and posttest. From the pretest and posttest scores of 25 students, a t-test was carried out for correlated samples. Judging from the average value, the students' scores increased. This can be proven based on students' answers when answering the test. The majority of students' answers were wrong during the pretest, but correct in the posttest. The increase in students' average scores was due to the problem-based teaching materials used during the learning process. So that students are more enthusiastic in learning (Francisca et al., 2022; Kusumaningrum & Siswanto, 2024).

The results of this study are in line with previous studies that discussed the Independent Curriculum, the study discussed the implementation of the Independent Learning Curriculum in schools. The independent curriculum emphasizes increasing active student involvement in the learning process. Research shows that this approach is more flexible and student-centered, allowing them to explore their interests and talents in more depth (Indarta et al., 2022; Rahmadayanti & Hartoyo, 2022; Wahyuni & Rahayu, 2021). In addition, the results of this study are also in line with research related to the use of e-books in learning. The study stated that the use of e-books in the learning process has a significant impact, because it obtained validity results according to the trial subjects respectively as many as 91.67%, 96.87%, 100%, 96.67%, 98.33%, and 96.33% overall with a very good category and suitable for use. From these results, students can learn independently, the process experienced by students becomes more meaningful and is able to attract students' interest in learning in the learning process (Puspita et al., 2021; Rusdiana & Wulandari, 2022). This study develops e-book media based on problem based learning that can support science learning. With this e-book, the learning and teaching process becomes easier. Teachers can create learning materials in the form of e-books and then send them to students. So that e-books can increase students' enthusiasm for reading and student learning outcomes will increase.

This development research has implications that can provide a positive impact for teachers, namely expanding teacher knowledge in developing and utilizing learning media in the learning process so that teachers do not predominantly use the lecture method. This research has an impact on increasing student learning outcomes and motivation in science lessons by implementing problem-based learning. Through this research, it is able to support teachers in utilizing school facilities that have so far been underutilized in supporting the learning process. The advantages of this research lie in the integration of technology and innovative learning methodologies. PBL-based e-books not only facilitate access to teaching materials through digital platforms, but also encourage students to think critically and actively in solving problems. In addition, interactive features in e-books can increase student motivation and enrich their learning experiences, making them a very useful tool in the context of modern education.

4. CONCLUSION

Based on the results of the study, it is known that the quality of the description of the quality of the e-book of the content of the science subject according to the learning content expert gets a very good qualification, the instructional design expert gets a very good qualification, and the learning media expert gets a very good qualification. The description of practicality based on individual and small group trials gets a very good qualification. Based on the description of practicality, the product developed is suitable for use

to support the learning process in science subjects at V SD Negeri 1 Dauh Peken Tabanan. Based on the effectiveness test, the calculated t value was found to be greater than the t table. So H0 is rejected and H1 is accepted. Therefore, it can be concluded that e-book media based on problem based learning is effectively applied to the Science Subject of Grade V at SD Negeri 1 Dauh Peken Tabanan in the 2023/2024 Academic Year.

5. REFERENCES

Adam, A. S., & Suprapto, N. (2019). One-stop physics E-Book package development for senior high school learning media. *International Journal of Emerging Technologies in Learning*, *14*(19), 150–158. https://doi.org/10.3991/ijet.v14i1910761.

Andaresta, N., & Rachmadiarti, F. (2021). Pengembangan E-Book Berbasis STEM Pada Materi Ekosistem untuk Melatihkan Kemampuan Literasi Sains Siswa. *Berkala Ilmiah Pendidikan Biologi (BioEdu*, *10*(3), 635–646. https://doi.org/10.26740/bioedu.v10n3.p635-646.

Arfat, S., Simamora, A. H., & Sudarma, I. K. (2023). Scientific Approach E-Book on Science Content for VI Grade Elementary School Students. *Jurnal Pendidikan Dan Pengajaran*, *56*(2), 324–336. https://doi.org/10.23887/jpp.v56i2.65175.

Cahyadi, R. A. H. (2019). Pengembangan bahan ajar berbasis ADDIE model. *Halaqa: Islamic Education Journal*, *3*(1), 35–42. https://doi.org/10.21070/halaqa.v3i1.2124.

Dewi, I. D. A. M. P., & Bayu, G. W. (2022). E-Book Berbasis Problem Based Learning Materi Bangun Ruang Muatan Matematika Kelas VI SD. *Jurnal Edutech Undiksha*, *10*(2), 353–363. https://doi.org/10.23887/jeu.v10i2.48606.

Efendi, M. A., Siswono, T. Y. E., & Mariana, N. (2022). Pengembangan E-Book Berbasis Pemecahan Masalah Untuk Meningkatkan Pemahaman Konsep Siswa Kelas V Sekolah Dasar. *Jurnal Pendidikan, Sains Sosial, Dan Agama*, *8*(1), 339–351. https://doi.org/10.53565/pssa.v8i1.486.

Faiz, A., & Soleh, B. (2021). Implementasi pendidikan karakter berbasis kearifan lokal. *JINoP (Jurnal Inovasi Pembelajaran*, *7*(1), 68 77. https://doi.org/10.22219/jinop.v7i1.14250.

Febrianti, F. A. (2021). Pengembangan Digital Book Berbasis Flip PDF Professional untuk Meningkatkan Kemampuan Literasi Sains Siswa. *Caruban: Jurnal Ilmiah Ilmu Pendidikan Dasar*, *4*(2), 102. https://doi.org/10.33603/caruban.v4i2.5354.

Francisca, F., Zahra, J. O. V, Anggraeni, S. H., & Aeni, A. N. (2022). Pengembangan E-book BUDIMAS "Buku Digital Agama Islam" untuk Pembelajaran PAI pada Siswa Sekolah Dasar. *Jurnal Basicedu*, *6*(3), 5268–5277. https://doi.org/10.31004/basicedu.v6i3.3043.

Hanikah, H., Faiz, A., Nurhabibah, P., & Wardani, M. A. (2022). Penggunaan Media Interaktif Berbasis Ebook di Sekolah Dasar. *Jurnal Basicedu*, *6*(4), 7352–7359. https://doi.org/10.31004/basicedu.v6i4.350.

Hotimah, H. (2020). Penerapan Metode Pembelajaran Problem Based Learning Dalam Meningkatkan Kemampuan Bercerita Pada Siswa Sekolah Dasar. *Jurnal Edukasi*, *7*(3), 5. https://doi.org/10.19184/jukasi.v7i3.21599.

Indarta, Y., Jalinus, N., Waskito, W., & Samala, A. D. (2022). Relevansi kurikulum merdeka belajar dengan model pembelajaran abad 21 dalam perkembangan era society 5.0. *Edukatif: Jurnal Ilmu Pendidikan*, *4*(2), 3011–3024. https://doi.org/10.31004/edukatif.v4i2.

Kusumaningrum, D. A., & Siswanto, J. (2024). Pengaruh Model Pembelajaran Problem Based Learning Terhadap Hasil Belajar Matematika Kelas V SDN Wonotingal Semarang. *Didaktik : Jurnal Ilmiah PGSD STKIP Subang*, *10*(2), 22 – 31. https://doi.org/10.36989/didaktik.v10i2.2802.

Liana, L., Wiryokusumo, I., & Leksono, I. (2021). Pengembangan E-Book Berbasis Problem Based Learning Pada Pelajaran Bahasa Jawa Kelas IV Sekolah Dasar. *JINOTEP (Jurnal Inovasi Dan Teknologi Pembelajaran): Kajian Dan Riset Dalam Teknologi Pembelajaran*, *8*(3), 289–298. https://doi.org/10.17977/um031v8i32021p289.

Maulida, S. I. (2022). Pengembangan E-book Berbasis Problem Based Learning pada Materi Perubahan Lingkungan dan Daur Ulang Limbah untuk Siswa di MAN Karangasem. *Jurnal Pendidikan Biologi Undiksha*, *9*(2), 116–129. https://doi.org/10.23887/jjpb.v9i2.49582.

Mentari, D., Sumpono, S., & Ruyani, A. (2018). Pengembangan media pembelajaran e-book berdasarkan hasil riset elektroforesis 2-d untuk mengukur kemampuan berpikir kreatif mahasiswa. *PENDIPA Journal of Science Education*, *2*(2), 131–134. https://doi.org/10.33369/pendipa.2.2.131-134.

Nurhasanah, P., Putri, R. H., & Yanuar, S. B. (2023). *Pengembangan E-Book Interaktif untuk Meneladani Perilaku Jujur pada Siswa Kelas 2 SD dari Kisah Nabi Muhammad* (Vol. 7, pp. 4351–4357). https://doi.org/10.31004/jptam.v7i1.5927.

Priambudi, E. A. D., Azzahra, S. A., Utami, N. C. M., & Taofik, T. (2024). Upaya Meningkatkan Hasil Belajar Ipa Dengan Model Project Based Learning Pada Siswa Kelas IV SDN Lubang Buaya 13. *Dharmas*

Education Journal (DE_Journal, *4*(1), 201–208. https://doi.org/10.56667/dejournal.v4i1.963.

Puspita, E. I., Rustini, T., & Dewi, D. A. (2021). Rancang Bangun Media E-Book Flipbook Interaktif Pada Materi Interaksi Manusia Dengan Lingkungannya Sekolah Dasar. *Journal of Educational Learning and Innovation (ELIa*, *1*(2), 65–84. https://doi.org/10.46229/elia.v1i2.307.

Putrislia, N. A., & Airlanda, G. S. (2021). Pengembangan E-Book Cerita Bergambar Proses Terjadinya Hujan untuk Meningkatkan Minat Membaca Siswa di Sekolah Dasar. *Jurnal Basicedu*, *5*(4), 2036–2044. https://doi.org/10.31004/basicedu.v5i4.1032.

Rahim, F. R., Suherman, D. S., & Muttaqiin, A. (2020). Exploring the effectiveness of e-book for students on learning material: A literature review. *Journal of Physics: Conference Series*, *1481*(1). https://doi.org/10.1088/1742-6596/1481/1/012105.

Rahmadayanti, D., & Hartoyo, A. (2022). Potret Kurikulum Merdeka, Wujud Merdeka Belajar di Sekolah Dasar. *Jurnal Basicedu*, *6*(4), 7174–7187. https://doi.org/10.31004/basicedu.v6i4.3431.

Rusdiana, N. P. M., & Wulandari, I. G. A. A. (2022). E-Book Interaktif Materi Siklus Air pada Pembelajaran IPA untuk Meningkatkan Hasil Belajar Siswa Kelas V Sekolah Dasar. *MIMBAR PGSD Undiksha*, *10*(1), 54–63. https://doi.org/10.23887/jjpgsd.v10i1.45180.

Saddhono, K., Ridwan, M., Suherman, A., Anwar, K., & Putri, N. Q. H. (2020). The Development of Interactive E-book of Teaching Indonesian for Speaker of Other Language (TISOL) Containing Local Wisdom with Scientific-Thematic Approach. *Journal of Physics: Conference Series*, *1573*(1). https://doi.org/10.1088/1742-6596/1573/1/012002.

Sumarsono, L. M. A., & Anggaryani, M. (2022). Pengembangan E-book Menggunakan Kvisoft Flipbook Maker untuk Meningkatkan Hasil Belajar Siswa pada Materi Fluida Statis. *IPF: Inovasi Pendidikan Fisika*, *11*(2), 24–32. https://doi.org/10.26740/ipf.v11n2.p24-32.

Susilawati, T., & Rusdinal. (2022). Pengembangan Media Pembelajaran E-Book Berbasis Blended Learning Tematik Terpadu Di Kelas Iv Sekolah Dasar. *Jurnal Cakrawala Pendas*, *8*(2), 378–387. https://doi.org/10.31949/jcp.v8i2.2285.

Tang, K. Y. (2021). Paradigm shifts in e-book-supported learning: Evidence from the Web of Science using a co-citation network analysis with an education focus 2010–2019. *Computers and Education*, *175*(June), 104323. https://doi.org/10.1016/j.compedu.2021.104323.

Usta, N. D., & Güntepe, E. T. (2017). Pre-Service Teachers' Material Development Process Based on the ADDIE Model: E-book Design. *Journal of Education and Training Studies*, *5*(12), 199. https://doi.org/10.11114/jets.v5i12.2820.

Wahyuni, L., & Rahayu, Y. S. (2021). Pengembangan E-Book Berbasis Project Based Learning (PjBL) untuk Melatihkan Kemampuan Berpikir Kreatif pada Materi Pertumbuhan dan Perkembangan Tumbuhan Kelas XII SMA. *Berkala Ilmiah Pendidikan Biologi (BioEdu*, *10*(2), 314–325. https://doi.org/10.26740/bioedu.v10n2.p314-325.

Wu, Z., & Amzah, F. (2023). Researching the Effects of E-book on Children's Emergent Reading Conducted from 1999 to 2022: A Bibliometric Review. In *Language Related Research* (Vol. 14). https://doi.org/10.29252/LRR.14.3.12.