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Improving Concept Understanding and Environmental Awareness with Digital Comics

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Abstract: Education is a conscious and planned effort to create a learning atmosphere and process that enables students to actively develop their potential to possess religious spiritual strength, self-control, personality, intelligence, noble character, and the skills they need. society, nation and state. The function of education is to develop skills and then shape the character or personality of students so that they grow into more dignified people. In addition, education has the process of instilling the skills needed to participate in democratic activities. The aims of this study were: to analyze the need for digital comics learning media, to describe the design of digital comics learning media development, and to prove the effectiveness of using digital comics media for fourth-grade elementary school students in Purwodadi District, Grobogan Regency. This research is a research development or Research and Development (R&D) using the Borg and Gall model development method which aims to develop digital comic learning media for fourth-grade elementary school students by paying attention to three quality aspects, namely valid, practical, and effective. Data analysis consists of qualitative data and quantitative data. The results of the needs analysis show that students and teachers need the products developed in this study. An overall average score of validation from linguists, materials, and media expert's consecutive is 3.07; 2.94; 3.17. So, it can be said that all three including in the "Eligible" criteria. Eligibility is also supported by the results of student and teacher questionnaire responses which show an average score of 3.25 and 3.26 with the criteria of "Very Good". Digital conflicts are proven to be effective in science learning, this can be seen from the increase in the results of the pretest and post-test in the experimental class A by 34.66 and the experimental class B by 30.16. The suggestion I would like to convey is that teachers should analyze and identify learning media suitable for teaching and learning within the framework of skeletal growth, in pursuit of the learning intent to be achieved, and embedded in educational characteristics, teachers can use the digital cartoons developed in this study as a learning medium, aimed at increasing understanding of natural resource concepts and teaching fourth graders about environmentally conscious roles, the use of comics as a learning medium should pay attention to the appropriateness standards in terms of language, materials, and media. Comics that meet appropriate standards can have a significant impact on the learning outcomes to be achieved, other researchers can use the results of research and development as a reference for research and development of similar products, but with different research or different materials and grades.

Keywords: Digital Comics, Concept Understanding, Environmental Awareness, Process Skills, Science Education

1. Introduction

According to Act No. 20 year 2003, Education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have religious spiritual strength, self-control, personality, intelligence, noble character, and the skills they need. society, nation, and state. The function of education is to develop abilities, then shape the character or personality of students so that they grow into more dignified individuals. In addition, education also functions as a process of inculcating the skills needed for participation in democratic activities.

Every learning must have a goal to develop 3 aspects of learning, namely cognitive, affective and psychomotor aspects. Likewise, with learning science in elementary schools. As explained by Hussein et al. (2019) in his book entitled "Elementary Science Learning" in learning, there are 3 kinds of learning outcomes to be developed, namely

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knowledge, from attitudes commonly called scientific attitudes, and skills commonly known as process skills in science learning.

Learning science or science in Indonesia has very low results. Based on the results of the PISA (*Program for International Student Assessment*) test in 20l8, Indonesia got a score of 396 for Science. Meanwhile, the average PISA score for OECD (*The Organization for Economic Co-operation and Development*) member countries is 489. This means that Indonesia is below the average. And this is a big homework for the world of education in Indonesia. This has inspired the writer's desire to conduct further research on the causes of the low level of scientific skills in Indonesia. Because the writer found the same fact in grade IV Elementary School in Dabin V, Purwodadi sub-district. From the results of the PAS for science subjects for class IV semester 2 of the 2020/202l Academic Year in one elementary school, data was found that only 45% of students whose scores exceeded the Minimum Completeness Criteria (KKM) () of 70.00. This is confirmed by the results of another PAS grade IV elementary school in Dabin.

Apsari & Aditya (2019) was found that there was a significant influence between the use of digital comic media on the effectiveness of improving the learning outcomes of fifth-grade students elementary school. Rohmanurmeta & Dewi (2020) state the digital comic learning media based on religious character values are very feasible to be implemented in elementary schools. The above studies arouse the author's desire to conduct the same research, namely the development of digital comics but with a different base and application.

The author thinks that it is necessary to develop a learning media that can solve the problems mentioned above. Because the success and effectiveness of learning cannot be separated from the selection of appropriate methods, strategies, and media. Advances in the IT field require teachers to innovate in developing a media that is following the characteristics of students and can motivate their enthusiasm for learning. The development of digital comic media is expected to be a support for teachers in delivering material so that learning objectives can be achieved. Digital comics media are media that are clear and easy to understand and have informative and educative functions. Wide use with illustrations, a light storyline, with a realistic character that attracts students. The right use of comics in the learning process will greatly help students to understand the material presented (Anuar, Nizar, & Ismail, 2021).

1.1 Research Objectives

This study was conducted to improve conceptual understanding and environmental awareness in learning science in grade IV elementary school. Results of the gathered data will be used as a basis for proposing intervention materials to enhance students' academic performance.

2. Literature Review

2.1 Instructional Media

According to Puspitarini & Hanif (2019) media is anything that can carry information between the source and recipient of the message. Everything that can be used to facilitate the delivery of information from the source to the recipient of the message can be categorized as media. Learning media is used by the teacher as a tool in conveying the material so that it is easier for students to accept and understand the material presented by the teacher so that learning objectives can be achieved optimally. Dwijayani (2019) argue that learning media can be used if it fulfills 3 main functions, namely motivating interest or action that can be realized with drama or entertainment techniques, presenting information, whose form of presentation serves as an introduction, report summary or background knowledge. The presentation can be in the form of drama, entertainment, or motivational techniques, providing instructions, and containing activities that must be carried out by students in the learning process. Aksa (2017) makes a simpler media classification as follows: 1) non-projected media; 2) projected media; 3) audio media; 4) video media; 5) computer-based media; and 6) multi-media kits.

2.2 Digital Comics

Digital comics are comics in the form of electronic-based digital formats that not only display the storyline, but can also be inserted into games, animations, films, or other applications that make it easier for readers to follow and enjoy each story and the storage can be done online or through certain gadgets (Sukmanasa, Novita, & Maesya, 2020). Dwiputra et al. (2020) stated the advantages and disadvantages of digital comics learning media are arranged according to the needs and characteristics of students, can be accessed via computers, laptops, and smartphones whose distribution can be done with several data transfer access in the form of flash drives, CD Room, Bluetooth, share it, can also be sent via several chat services such as email, WhatsApp, Facebook, etc. Making it easier for product distribution, visualization of material into comic form can provide a new atmosphere for students so that students do not easily feel bored with material that is only in the form of text, the weakness of this digital comic learning media is the manufacturing process which requires several stages, namely scenarios, visualization of scenarios, and so on. in drawing, editing, layout, and digitizing comics.

2.3 Science Learning

Nawzad, Rahim, & Said (2018) argue that Natural Science comes from three terms involved, namely Science, Science, and Nature. Knowledge is everything that humans know. In life, humans have a lot of knowledge. Knowledge of

religion, education, health, economics, politics, society, and the natural surroundings are examples of knowledge possessed by humans. Natural knowledge means knowledge of the universe and its contents. Science is scientific knowledge, scientifically acquired knowledge, meaning that it is obtained by the scientific method. With this understanding, science can be interpreted as a science that studies the causes and effects of events that exist in nature.

Hussein et al. (2019) wrote several theories in learning that have been put forward by several experts that can be used as a basis in developing science learning, including Behavioral Learning Theory, Cognitive Development Theory, and Constructivism Learning Theory. Demetrion (2020) explained that the application of 21st-century skill-based behavioristic learning theory used in learning is one way to build student character according to learning needs and goals. The application aims to produce students with character with comprehensive abilities critically, creatively, and innovatively, collaborating and communicatively. Science learning cannot be separated from the use of media. The use of learning media will help students more easily understand the material. With the use of multimedia in the learning process, it will foster a comfortable and interesting learning atmosphere, so that students will be more interested in the learning process and students will better understand the material provided (Puspita, Muchlas, & Kuat, 2020).

3. Methodology

3.1 Research Design

This research is a research development or *Research and Development (R&D)* using the Borg and Gall model development method which aims to develop learning media for science digital comics based on students' environmental care characters by paying attention to three quality aspects, namely valid, practical, and effective.

3.2 Respondents of The Study

The data in this study consisted of data on problems in the field, data on needs, data on the feasibility of the product being developed, and data on the effectiveness of the product. The sources for obtaining the data were teachers and fourth grade elementary school students in the Guidance Region 5 Regional Coordinator of Purwodadi District, Grobogan Regency as well as experts consisting of material experts, linguists, and media experts. Type data obtained from research and development of this is data qualitative and data quantitative. Data qualitative obtained from results observations, interviews, and studies documents to find out learning problem. Data quantitative analyzed using techniques analysis statistics to know the need, feasibility, and effectiveness digital comics from validation expert material, expert media, and expert language, and effectiveness of digital comic to improve understanding through a closed questionnaire.

4. Findings and Discussion

4.1 Findings

The need for products in the form of digital comic learning media in this study is aimed at increasing understanding of the concept of natural resource materials in fourth-grade elementary school students. Data on product requirements were obtained from interviews and questionnaires. Interview sources were fourth-grade teachers at Public Primary School No. 2 Kalongan, Public Primary School No. 1 Ngraji, and Public Primary School No. 2 Kedungrejo. The collection of needs analysis data is carried out using several techniques, namely interviews, questionnaires, and observations.

Based on the problems encountered, there are also interview items that ask about the teacher's needs for learning media that can improve students' understanding of the concept of student resources in science subjects. Interviews with teachers on the items of student learning styles obtained information that most students have a visual learning style. Needs data was also obtained through a questionnaire with the data sources being fourth-grade students at Public Primary School No. 2 Kalongan, Public Primary School No. 1 Ngraji, and Public Primary School No. 2 Kedungrejo every 10 students and the fourth-grade teacher of the school. Based on the results of interviews and filling out questionnaires, it can be analyzed that the level of need for digital comics is considered quite high, so digital comics are needed in improving the understanding of the concept of natural resources for fourth-grade elementary school students in Dabin V, Purwodadi District, District Grobogan.

After seeing firsthand the teaching and learning process of natural resource material science lessons in grade IV Public Primary School No. 2 Kalongan, Public Primary School No. 2 Kedungrejo, and Public Primary School No. 1 Ngraji in the 2021/2022 semester 2 academic year, the following things were found: 1) The three elementary schools mentioned above using the 2013 curriculum since the 2016/2017 school year in grade IV; 2) In the teaching and learning process, teachers rely more on textbooks from certain publishers and have not found the right way to make students more active and enthusiastic in participating in the science learning process, especially natural resource materials; 3) Most fourth-grade students do not like learning science so the scores they achieve have not reached the Minimum Completeness Criteria (KKM) that have been set by their respective schools on the content of science lessons; 4) The data from the pre-test results show that the fourth-grade elementary school students have not mastered the concept of natural resource material in science learning for grade IV semester 2.

From the results of interviews and field observations obtained data that there is a need for learning media by

paying attention to the content of the lesson material, the ease of obtaining the media to be used, digital comics learning media are easy to obtain, the skills of educators in using them, the allocation of time and materials.

Based on needs analysis and literature review, the design of digital comic development to improve understanding of the concept of natural resources for fourth-grade elementary school students in Purwodadi District, Grobogan Regency has three stages that are planning, process, and evaluation. Stage planning consists of formulating goals, analyzing student characteristics, analyzing curriculum, and collecting material resources. The process stage consists of compiling the components of the comic content such as introduction, content, Closing, element intrinsic story, and anatomy comic. Stage The evaluation contains a test of understanding the concept of natural resources. At the planning stage, several steps are taken as follows: 1) Formulate purpose. The purpose of writing this book is to improve the character of caring for the environment, and understanding concepts and learning outcomes of natural resource material science; 2) Curriculum analysis. At this stage, the researcher analyzes the curriculum including Graduate Competency Standards (SKL), Content Standards, and Standards Process; 3) Gathering Resources Material. This activity was carried out with discussions with fourth-grade teachers, supervisors, the Canva team, and colleagues which were carried out separately and gradually. It is intended that the products developed are following the curriculum and student characteristics. Digital comics contain material that is packaged in the form of illustrated stories as reading material for students on activity literacy in school which can be accessed using.

4.2 Discussion

Results collection data which has obtained in the study this analyzed accordingly analysis data which has determined. Representation results analysis data is proof of how the need, feasibility, and effectiveness of digital comics in increasing understanding draft natural resources on student class IV as if base in Dabin V districts Purwodadi District Grobogan. Based on the results analysis need show that Digital comics are needed to improve understanding of the concept of natural resources for fourth-grade elementary school students in Dabin V, Purwodadi District, Grobogan Regency. The results of the analysis also show the need for smartphone use that can help students understand the subject matter. As revealed by Raulan & Fatimah (2018) states the teaching materials using Webtoon Digital Comic by integrating the use of ICT in learning activities can increase awareness of the application of ICT to facilitate learning activities.

Based on the results of the needs analysis, the researchers developed a digital comic to improve the understanding of the concept of natural resources for fourth-grade students in Dabin V, Purwodadi District. The thing this is strengthened by the opinion Sugiyono (2018) who stated that research and development (R&D) is a basic research activity to obtain information on user needs assessment, then proceed with development to produce products and assess product effectiveness.

At the development stage, the researcher realized the simple design that had been made. To create digital comics through the Canva application, there are several stages to go through as following creative with comics, publication, validation, and revision. After the product design stage, the digital comics developed were validated by experts to determine their feasibility of digital comics (Cap & Black, 2012). In this development, expert validators consist of language experts, material experts, and media experts. Furthermore, from the validation results obtained quantitative data, namely the number of questionnaire scores, and qualitative data, namely comments and suggestions from experts. In the validation process, the researcher also received some suggestions and input from the validator.

Table 1: Recapitulation of Expert Validator Assessment Results

No.	Validator Type	Overall Average Score	Criteria
1	Linguist Validator	3.07	Worthy
2	Material Expert Validator	3.11	Worthy
3	Media Expert Validator	3.1 0	Worthy

The overall average score of validation from linguists, materials, and media experts consecutive is 3.07; 2.94; 3.17. So, it can be said that all three include in the "Eligible" criteria. The results of filling out questionnaires for student and teacher responses to the use of digital comics developed in this study have met the specified criteria, namely at least "Good".

Table 2: Recapitulation of Student Response Questionnaire Results

No.	Trial Type	Overall Average Score	Criteria
1	Initial Trial	3.16	Well
2	Extended Trial	3.2 7	Very Good

Table 3: Recapitulation of Teacher Response Questionnaire Results

No.	Trial Type	Overall Average Score	Criteria
1	Initial Trial	3.08	Well
2	Extended Trial	3.26	Very good

Overall from the explanation above, it can be concluded that the development of digital comics that have been developed is feasible use to improve the understanding of the concept of natural resources for fourth-grade elementary school students in Dabin V Purwodadi district. This is in line with research conducted by Akcanca (2021) which shows that the use of digital comics in learning is feasible and effective for increasing the ability application draft virus in Biology subjects in class X high school.

The digital comic revision based on the results of the main field test is then used in the field implementation test. Field implementation tests were carried out to determine the effectiveness of digital comics in increasing understanding of draft natural resources and the environmental care character of fourth-grade elementary school students in Dabin V, Purwodadi District, Grobogan Regency. The field test was carried out using a quasi-experimental research method. The experimental class selected was class IV at Public Primary School No. 2 Kalongan with 24 students and class IV and class IV at Public Primary School No. 1 Kalongan with 27 students, while the control class used was class IV Public Primary School No. 1 Ngraji as much 25 students. Data used for measuring the effectiveness of digital comics in this study were the pretest and post-test scores of the test of understanding the concept of natural resources and the results of observations of caring characters. environment.

The effectiveness of the digital comics developed in this study was sought based on the data from the pretest and posttest results of understanding the concept of natural resources, as well as the results of the assessment of environmental care characters before and after learning in fourth-grade elementary school students in Dabin V. Purwodadi District for the experimental class and the control class. The data taken to determine the effectiveness of the developed product must meet the prerequisite tests, namely the normality test and homogeneity test first.

Shapiro Wilk technique with data processing using the Statistical Product and Service Solutions (SPSS) program. 16.0) with a significance of 0.05. Results test normality data understanding the concept of natural resources can be seen in the Table 4.

Table 4: The Results of the Normality Test of the Pretest Data for Understanding the Concept of Natural Resources

Tests of Normality

	Class Type	Kolmogorov-Smirnov [a]			Shapiro-Wilk		
		Statistics	df	Sig.	Statistics	df	Sig.
Pretest Results	Experiment Class A	.179	24	.055	.949	24	.260
	Experiment Class B	.091	27	.200*	.985	27	.951
	Control Class	.136	25	.200*	.945	25	.193

Based on the results one could see that results test normality data. The pretest of understanding the concept of natural resources using the Shapiro Wilk technique showed a significance value > 0.05, namely 0.260, 0.951, and 0.193. The decision taken is that Ha is accepted and H0 is rejected, meaning that the data is distributed normally.

Results test homogeneity data pretest understanding draft natural resources with use technique Lavene's Test show Mark significance > 0.05 that is 0.998. Thereby could be decided that Ha accepted and H0 rejected which means data originated from a population which homogeneous. After conducting the test precondition next conducted test statistics to measure the effectiveness of digital comics which were developed to improve the understanding of the class concept of natural resources IV elementary school at Dabin V Pu rwodadi . Based on the results of the normality test which show that the data is normally distributed, the statistical test used is test statistics parametric that is t-test in Paired Sample t-test and Independent Sample t-test.

The T-test in pairs conducted on data results tests understanding draft natural resources of the experimental class before and after learning by using digital comics. The results of hypothesis testing carried out using a paired sample t-test (Paired Sample T-test) on the results of the experimental class understanding of natural resource concepts are as following in the Table 5.

Table 5: Hypothesis Test Results Data Understanding Concepts of Natural Resources Experiment Class

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Class A Pretest - Class A Posttest	-3.46667E1	8.12225	1.65795	-38.09639	-31.23694	-20,909	23	.000
Pair 2	Class B Pretest - Class B Posttest	-3.01111E1	3.43437	.66094	-31.46970	-28.75252	-45.558	26	.000

Paired t-test results from data on understanding the concept of natural resources in the experimental class showed results <0.05, ie 0.000. Thus, it can be decided that $_{Ha\ is}$ accepted and H0 $_{is}$ rejected, meaning that there are differences in students' understanding of the concept of natural resources before and after participating in learning using digital comics.

T-test independent (*Independent Sample T-Test*) understanding draft natural resources conducted with the help of the *SPSS 16.0 program* obtained the following results in the Table 6.

Table 6: Independent T-Test Results for Understanding the Concept of Natural Resources

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Test Results	Equal variances assumed	7.895	.007	12.046	47	.000	22.302	1.851	18.577	26.026
	Equal variances not assumed			12.151	41.164	.000	22.302	1,835	18.595	26.008
Test Results	Equal variances assumed	.278	.601	9.365	50	.000	21.204	2.264	16.657	25.752
	Equal variances not assumed			9.406	49.944	.000	21.204	2.254	16.676	25.732

Based on these results, it can be seen that the significance value of the independent t-test of understanding the concept of natural resources is <0.05, which is 0.000. Therefore, it can be concluded that Ha is accepted and H0 is rejected, meaning that there are differences in understanding draft students who follow learning use digital comics with students who do not use digital comics.

Digital comics are proven to be effective in natural resource science learning, this can be seen from the increase in pretest and post-test results in experimental class A by 34.66 and experimental class B by 30.16. The increase can be seen in the Table 7.

Table 7: Average Test Scores for Understanding the Concept of Natural Resources

No.	Class	Average Score	
		Pretest	Posttest
1	Class IV Public Primary School No. 1 Kalongan	52.88	87.54
2	Class IV Public Primary School No. 2 Kalongan	56.33	86.44

In the control class, learning only uses books provided by the school and no use digital comics. Summary results evaluation understanding draft natural resources and character care for the environment in the control class can be seen in the Table 8.

Table 8. Summary of Assessment Results in the Control Class

No.	Data Collection Aspect	Average Score	
		Before Learning	After Learning
1	Understanding the concept of natural resources	55.08	65.24

By description so concluded that Digital comics are effectively used to improve understanding of the concept of natural resources and environmental care characters for fourth-grade elementary school students in Dabin V, Purwodadi District, Grobogan Regency. This strengthens the results of previous studies that prove the effectiveness of digital comics, including: 1) Wicaksono, Japar, & Utomo (2021) who states that digital comic learning media is very effectively applied to the PJJ model; 2); Izzah & Ma'sum (2021) stated that digital comic products in Arabic are very valid and suitable to be used as a medium for learning Arabic maharah qira'ah for class X Aliya Madrasa (MA) Almaarif Singosari students; 3) Mustikasari et al. (2020) states that digital comics have proven to be effective in applying the concept of spatial construction to fifth-grade elementary school students

5. Conclusions and Recommendations

Based on the results of research and discussion, several conclusions can be conveyed as follows: The following are: 1) Digital comics are needed by students and teachers to improve understanding of the concept of natural resources and environmental care characters for fourth-grade elementary school students in Dabin V, Pu rwodadi District, 2) Digital comics are suitable to be used to improve understanding of the concept of natural resources and environmental care characters. fourth-grade elementary school students in Dabin V District Purwodadi, 3) The digital comic developed in this research effectively increases understanding of draft natural resources student class IV SD in Dabin V districts Pu rwodadi.

The suggestions that the author wants to convey are as follows: 1) The teacher should analyze and determine the appropriate learning media to be used in teaching and learning in skeleton increase results study following the intention of learning which wants to achieve as well as embed education characters; 2) Teachers can use digital comics developed in this study as a medium in learning that aims to improve understanding of the concept of natural resources and instill environmental care characters in fourth-grade students elementary school; 3) The use of comics as a learning medium should pay attention to the appropriateness standards in the form of the appropriateness of language, materials, and media. Comics that meet the appropriate criteria will have a significant impact on the learning objectives that will be achieved; 4) Researchers other could use the results of study and development as a reference in conducting research and development of similar products but with different studies or materials and class levels different.

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Conflict of Interest

The authors declare no conflicts of interest.

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