Integrated Science Learning Devices on Substances and Their Characteristics Material with Character Enrichment Through the Application of Problem-Based Learning

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ABSTRACT

Purpose of the study: The purpose of this study is how to find out the process of developing learning devices using the PBL model with character enrichment in the substance material and its characteristics which were developed according to experts.

Methodology: The research design used by researchers is a quantitative research type of quasi-experimental design using a pretest-posttest control group design. It is done to investigate causal hypotheses about causation that can be manipulated by comparing one or more experimental groups that are treated with one comparison group that is not treated.

Main Findings: Based on the analysis of the data and the discussion above, it can be concluded that the students' ability in science subjects on the substance and its characteristics is in the good category. This shows that the application of problem-based learning models can improve students' thinking skills. This is reinforced by testing the hypothesis through the independent sample t-test that there is a significant difference between before being given treatment and after being given treatment

Novelty/Originality of this study: Following the era of the industrial revolution 5.0, character-based learning must be developed. Therefore, this research produces science learning tools with problem-based learning in the material and its characteristics.

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1. INTRODUCTION

Education can be used as one of the right solutions to shape and foster the personality of students. Nevertheless, there needs to be extra effort from educators so that this can be realized. Within the scope of character education, it can be formed through director indirect learning and is carried out continuously so that students can understand and practice it in life everyday [1]-[3]. Through education, it is hoped that students will have a future that still has a faith and piety where one side with the other will make these students have intelligence, skills, and independence by being able to carry out a competition with pther students is an aspiration and the obsession of this human in his life that cannot be negotiable later. This, a generation that has this future is later expected to be able to carry out a preparation by being able to survive, compete and have aquality of self that is able to compete in the appropriate field or those that have been previously masterd. Intellectual iintelligence without being followed by noble character and morals will not have more value. Therefore, character and morals are something that is very basic and complementary. People who have no character or

noble character are referred to as uncivilized humans and have no selfesteem or value at all. Noble character or character must be built, while building noble character requires means, one of which is the path of education.education can be done anywhere, not only in schools or madrasas, but also at home (family), as well in the community.

In connection with the increasing urgency of implementing character education in Indonesia, the curriculum center for the research and development agency of the ministry of national education in its publication entitled guidelines for implementation of character education states that character education is essentially aimed at forming a nation that is strong, competitive, has noble character, is moral, tolerant, works together, patriotic spirit, developing dynamically, science and technology oriented, all of which are imbued with faith and piety to god almighty based on Pancasila [5]. Character is a series of attitudes, behaviors, motivations, and skills [6], [7]. Character includes attitudes such as the desire to do the best, intellectual capacity, such as critical attitude and moral reasoning, behavior such as being honest and responsible, defending moral principles in situations full of injustice, interpersonal and emotional skills that enable one to interact effectively in various situations. Circumstances, and a commitment to contribute to the community and society. According to the ministry of national education, character is a persons's character, character, morals, or personality which is formed from the results of internalizing various virtues that are belived and used as the basis for perspective, thinking, behaving, and acting [8].

The national character curriculum, which was initiated and implemented in all educational institutions in this country, is a manifestations of our government's concern in preparing a storng and superior national character in the future, including in this case anticipating the next generation of the nation to avoid actions that are negative, especially in facing the challenges and conditions of society that are increasingly worrying, so this is where character education is needed in the formation of people with good and religious personalities. Character education must be developed from basic education to the higher education level to balance soft skills properly, influenced by a positive environment and exemplary teachers, school environment, family environment, social environment, society to the government must be a model for students in the context of forming the character of the Indonesian nation [9]-[11].

Character education is directed at emphasizing certain values such as respect, responsibility, honesty, caring, and fairness and helping students to understand, pay attention to and apply these values in their own lives to achieve success in life. The results of social psychology research show that successful people in the world are determined by the role of knowledge by 18% the remaining 82% is determined by emotional skills, soft skills (character), and the like [12]. Character education plays a role in realizing the creation of a golden generation of a nation while at the same time increasing students' social competence to live in society. The movement to strengthen character education designed by the ministry of education and culture (2017) indentified 5 main character values that are interrelated to form a value network that needs to be developed as a priority, namely religious, nationalist, independent, mutual cooperation, and integrity.

Natural Sciences is a science that studies the natural surroundings and their contents. This means that science studies all objects that exist in nature, events and symptoms that appear in nature, science can be interpreted as an objective knowledge. Science is related to how to systematically find out about nature, so that it is not only the mastery of a collection of knowledge in the form of facts, concepts, or principles but also the process of discovering the KTSP curriculum [13]. Problem based learning is a learning approach in which students work on authentic problems with the intention of constructing their own knowledge, developing inquiry and higher order thinking skills, developing independence and self-confidence [14]-[18]. The purpose of using this teaching method is to provide basic skills and techniques to students so they are able to solve problems rather than memorizing ongoing learning material. With this teaching method, the teacher provides students with the ability to solve problems using critical thinking.

The steps for problem-based learning, according to Wang (2015), suggest that five stages must be carried out in this learning model, namely: 1) giving orientation about the problem to students, 2) organizing students to research, 3) assisting independent and group investigations, 4) develop and present results and 5) analyze and evaluate the process of solving problems [19]-[21]. To improve student learning activities, teachers must be able to choose and present a practical and strategic learning approach. One of them is the problem-based learning model. In this model, there are stages in its implementation. One of them is group discussions, where students have to do activities within the group, such as expressing opinions, solving problems, and becoming peer tutors. The PBL learning model will effectively help improve student learning activities because it requires students to participate in group discussions. With this activity, it is hoped that student learning activities will increase, which will impact learning outcomes. The novelty of this research is a following the era of the industrial revolution 5.0, character-based learning must be developed. This research produces science learning tools with problem-based learning in the material and its characteristics. Therefore, this study aims to discover the process of developing learning devices using the PBL model with character enrichment in the substance material and its features developed according to experts.

2.   RESEARCH METHOD

This research is research development (Research and Development). The development research model used in this research is the ADDIE development model. Branch [14] this model consists of 5 parts namely: analysis (analysis), design (design), development (development), implementation (implementation) and evaluation (evaluation). This model is included in the procedural model so that its descriptive nature indicates more specific and accurate stages in producing a product. Therefore, the researcher chose to use this model.
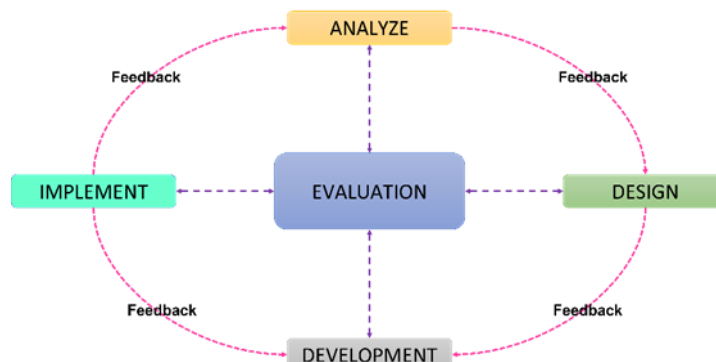

Figure 1. The steps of the ADDIE development model according to Branch.

The subjects in this study were students at the MTsN 2 Jambi City, using total sampling technique, where the number of samples in this study totaled 28 students. After learning was carried out in each class according to the treatment previously mentioned, the researcher then gave valid questions to the subjects who were the focus of this study. After they filled out the questions, the researcher corrected and analyzed them using SPSS 24. In this study, the data analysis used by researchers was in the form of descriptive statistics and inferential statistics, where the descriptive statistics while for inferential statistic used is the normality test Kolmogrov Smirnov.

In the analysis of results using a quantitative approach while a qualitative approach is used in the development analysis by using a pretest-posttest control group design. It is done to investigate wheter there are differences before and after using learning devices. This research design is applied because it is in accordance with the research objectives, where the aim is to find out whether there is a difference after applying the learning device and before applying the learning device. This study uses descriptive statistics in the form of mean, min and max and uses inferential statistics. The inferential statistic used is the normality test Kolmogrov Smirnov.

The categories of the expert validation questionnaire are used as follows:

Table 1. Categories of Eligibility for Learning Videos

Interval	Category
81.25 – 100.0	Very Feasible
62.5 – 81.24	Feasible
43.75 – 62.49	Feasible
25.0 – 43.74	Very not Feasible

3.   RESULTS AND DISCUSSION

As determinat of the conceptual feasibility of the learning tool used in this study, an expert review process was carried out by material experts and learning design esperts. suggestions and comments from the validator are used as material for revising and improving the based PBL and character enrichment learning tool in substance material and its changes to increase students understanding of concepts and interest in entrepeneur. the following are the results of the validation of material expert and learning design expert

Table 2. Validation results by experts

Validator	Score (%)	category
Expert Material	90	very worth it
Learning design expert	96	very worth it

Material validation was carried out twice. At the first validation results obtained a total value of 40 out of a maximum value of 40 out of a maximum value of 56 with an average of 2,86 with good criteria. At the second validation obtained a result of 46out of a maximum score of 56 with an average of 3,28 with very good

criteria. And learning design expert the first and second validation results obtained the same number of values of 33 with an average of 3,3 with good criteria.

The effectiveness of learning tools is measured using the learning outcomes of students before and after the character-based learning model through the application of the PBL model of learning materials on substances and their changes as well learning outcomes (cognitive, affective and psychomotor) that can be used to see whether there is an influence or not from the use of character based pbl learning model on the subject matter and its changes which are developed using the instrument of learning achievement test question.

Table 3. Student pretest dan posttest data

Aspect	Pretest	Posttest	N-Gains
Understanding concept	59.28	75.71	0.41

The result of the analysis of student learning outcomes show that there is an average difference between the pretest and posttest. this means that there is an effect of the use of character based PBL model learning tools on substance material and its changes in improving learning outcomms. Character based PBL model learning device products on substance and its changes were developed to increase students understanding of concepts.

The use of learning tools developed has been compared with learning tools that are already available from the ministry of education. to see a comparison of the two learning devices the researcher used an inferential atatistical test. unvariate normality test was carried out using kolmogrov smirnov. the data is called normal if the probability or p > 0,05. univarite normality test results are presented in the following table.

Table 4. Normality Test Result

		Pretest	Posttest
N		28	28
Normal Parameters[a,b]	Mean	59.29	75.71
	Std. Deviation	12.745	11.031
Most Extreme Differences	Absolute	.192	.242
	Positive	.192	.242
	Negative	-.162	-.223
Kolmogorov-Smirnov Z		1.016	1.279
Asymp. Sig. (2-tailed)		.254	.076

a. Test distribution is Normal.
b. Calculated from data.

Based on the data in table 4. it can be seen that the value of sig. > 0,05 then the data is normally distributed. homogeneity test was carried out with SPSS descriptive statistics based on the results of levene's test of equality of eror variances. if the sig. > 0,05 then the data is homogeneous. the results of the homogeneity test of understanding the concept can be seen in the following table 5.

Table 5. Variable Homogeneity Test Result

Levene Statistic	df1	df2	Sig.
.189	3	22	.903

Based on the results of the analysis of the homogeneity test data using SPSS, a significant value of 0.903 was obtained, greater than 0.05, so it can be concluded that the data is homogeneous.

Table 6. Independent Sample T-Test for Understanding concept

	T	df	Mean	Std.Deviation	95% confidence interval	
					Lower	Upper
Understanding concept	2.328	28	7.629	2.451	5.317	13.142
	2.328	53.979	7.629	2.451	5.317	13.142

From table 4 it can be seen that the value is obtained (t count) with the value of t table. The t-table value can be found in table t with a significance value of 0.05 (2-sided test) with degrees of freedom (df) 28. In this study, the results for t table are 1.70113. While for the value of t count can be seen in table 6. (column t) which is 2.328. The hypothesis testing criteria is that there is a rejection value of H0 [23]. So, it can be concluded that there is a significant difference between students' critical thinking abilities between the control class which is

taught using PBL and the experimental class which uses discovery learning. It can be seen from table 6 that the average value of student interest is 7.629, which means it can improve students' conceptual understanding in substance material.

The learning activities carried out by students at each meeting have changed for the better. Students are more active in participating in learning and do not feel bored during the learning process. This proves that problem-based learning tools are more practical than traditional education. PBL is designed to help students develop thinking and problem-solving skills, learn adult roles and become independent learners [24]-[30]. This model provides an attractive alternative for teachers who want to move beyond more teacher-centered approaches to challenge students with the active learning aspect of the model [31]-[34].

There are three objectives of problem-based learning: to help students develop investigative and problem-solving skills, to provide opportunities for students to learn the experiences and roles of adults, and to enable students to improve their thinking skills and become independent students. The purpose of PBL, according to Rusman, is mastery of learning content from heuristic disciplines and developing problem-solving skills. PBL is also related to learning about a wider life (lifetime learning), skills in interpreting information, collaboration and team teaching, and reflective and evaluative thinking skills [35]. Trianto states that PBL aims to help students develop thinking and problem-solving skills, learn authentic adult roles and become independent learners [36]. In line with this opinion, problem-solving is one of the problem-based teaching strategies in which the teacher helps students to learn to solve through learning experiences.

Through problem-based learning, students can actively participate in solving the difficulties experienced by students during the science learning process in class. In science learning, the teacher correctly applies the problem-based learning model to increase learning outcomes. The discussion above shows that the indicator of success is achieved. There is an increase in student learning outcomes in-class learning activities using the problem-based learning model.

4. CONCLUSION

The conclusion of this study is that learning using the based PBL learning model can increase student understanding of concepts as indicated by the by the average difference. From the data obtained, the posttest results were higher than the pretest, namely with an average pretest score of 59,28 while for the posttest with an average score of 75,71.

Based on the results of the research that has been done, the researchers provide suggestions as follows: 1) The researcher suggests that future researchers in the field of development be able to developprint based and ebook based worksheet to produce better learning media so that students become interested and motivated in learning, 2) Product development in the future can be carried out on other materials, not only limited to material, not only limited material substances and their class VII characteristics. However, it is also possible to develop science materials for class VIII and IX, 3) in using science worksheets, it is expected that teachers control the use of time for learning activities efficiently because problem-based learning takes a relatively long time.

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