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# Development of quantum learning modules in science learning materials for animal and human movement organs toeincrease interest and learning outcomes of fifth grade elementary school students

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**ABSTRACT**

This study aims to describe the procedure for developings Quantum Learnings modules, to produce appropriate Quantum Learning module products, and to produce effective Quantum Learning module products to increase students' interest in learning and learning outcomes. This research uses research and development procedures. Research and development with the ADDIE model. The methods of collecting data are questionnaires, tests, and interviews. Testing the questionnaire instrument using validity and reliability tests. The test instrument was tested with validity, reliability, discriminatory test, and level of difficulty. The questionnaire instrument for learning interest from 36 items tested was valid and reliable, there were 30 items. Data analysis techniques include product data analysis, initial data analysis, and final data analysis (differentiation test). The results showed that the Quantum Learning Science module that had been developed met the eligibility criteria, in this case it reached the validity of both material experts and media experts of 85.6% > 70%. The science module product with the Quantum Learning (QL) approach that was developed shows its effectiveness in increasing interest in learning and learning outcomes.



## INTRODUCTION

Natural science is a science in the field of the universe, both in the form of objects on the surface of the earth, inside the earth, and in outer space, both those that can be seen with the naked eye and those that cannot be seen. However, there are still some students who have not been able to make science learning interesting and fun. Science learning needs something that can be used to attract students, develop students' talents and interests, and create a pleasant classroom atmosphere. as is the case with using the learning module. The module in question is, of course, one that can present science materials that support science learning while also being attractively packaged to increase students' interest in learning.As student learning interest increases, it is likely that student learning outcomes will also increase. Of course, the module developed refers to the quantum learning model.

Increasing science learning outcomes using the Science module is the result of research conducted by Rusmiati, Santyasa, and Warpala (2013). The results of the study show that the learning outcomes before and after applying the contextual science module are not the same. In this case, there is a difference in the learning outcomes of students after implementing the contextual science module compared to before implementing the module. In terms of conversion, the learning outcomes at Semarapura 2 Public Elementary School indicate that the average posttest score of students is 81.67, which is included in a good qualification because it is above the KKM score of 70. In terms of the mean or posttest mean being greater than the mean or pretest mean, the application of the Science module can improve students' science learning outcomes.

Isdiyono (2013) investigated the development of science teaching materials for grade 5 elementary schools based on simple demonstration tools with strategy inquiry-discovery and direct reading thinking activities.The results show that by applying teaching materials, the average results of LKS1 and LKSe2 have a score of 8.5 in good categories, 8.34 in good categories, and 8.35 in good categories. The results of the final evaluation showed a score of 7.25 for good categories for individual

trials, 8.62 for very good categories for small group trials, and 7.25 for good categories for large groups.Learning science Theme 1: Animal and Human Movement Organs, learning is still conventional and less interesting. In addition, during the observation at the home visit in June 2020, it was discovered that class V SDN students in Kec. Jatipuro Kab. Karanganyare, especially at SD Negeri 03 Jatipurwo, SD Negeri 01 Ngepungsari, and SD Negeri 03 Ngepungsari, are not actively involved in the learning process and listen more to the teacher's es explanati.nStudentsnts' interest in the material is still very lackinass can be seenfrommthethe little question and answer activity that is seen during the home visitxplanations, students' interest in the material is still very lacking, this can be seen only a little question and answer activity. In addition, science learning only relies on handbooks and worksheets, so it makes students feel difficult, bored, and tired of participating in eIPA learning. Low student learning outcomes resulted from a lack of interest in learning. Based on the documentation data, it is known that of the 7 students in class V at SDN 03 Jatipurwo, 57.1% have not passed the Teaching Mastery Criteria (KKM: 70). SDN 01 Ngepungsari of 10 students who have not passed the KKM is 40%, and SDN 03 Ngepungsari of 17 students who have not passed the KKM is 47.1%.

These various problems need a solution so that they can be solved immediately. One solution is the development of print modules based on quantum learning. Researchers chose to use the IPA Quantum Learning Module because they felt it would be able to increase students' interest and learning outcomes.The basic reason for the development of print modules during a pandemic like today is that the location of the SD Jatipuro District, Karanganyar Regency, is in a remote area on the border with Wonogori Regency, where the area is very difficult and most students do not have cellphones, so learning has to be carried out remotely. home visits.

Referring to the problem of low interest in learning and low science learning outcomes for fifth grade students, the researchers developed a science module based on quantum learning as an alternative to overcoming the problem of low interest in learning and low science learning outcomes. Nasiroh (2014: 152) says that with the intermediary of modules, at least the teacher can relate learning so that learning becomes more meaningful, fun, and easy to understand.

The purpose of this research is to: 1) describe the procedure for developing the Quantum Learning module in science learning in class V on Animal and Human Organs; 2) produce Quantum Learning module products in science learning in class V on material for Organs of Movement of Animals and Humans that are appropriate to increase interest in learning and student learning outcomes; and 3) produce a Quantum Learning module in science learning in class V on material for Organs of Movement of Animals and Humans that are effective in order to increase interest in learning and student learning outcomes.

## RESEARCH METHODS

This research uses a research and development (R&D) approach. Research and development are carried out using the ADDIE model. The ADDIE development model consists of five stages, which include analysis, design, development, implementation, and evaluation (Sugiyono, 2015: 200). This research will be conducted on fifth-grade elementary school students in Jatipuro District, Karanganyar Regency, to be exact, SDN 3 Jatipurwo, SDN 1 Ngepungsari, and SDN 3 Ngepungsari. when the research was conducted in the odd semester of the 2020–2021 academic year.

The research subjects consisted of students, teachers at SDN 3 Jatipurwo, SDN 1 Ngepungsari, and SDN 3 Ngepungsari, and expert lecturers. The object of this study is to determine the feasibility of the Quantum Learning IPA module for class V. Teachers and students are the source for obtaining the data needed for the Quantum Learning IPA class V module; lecturers are experts as data sources in assessing and repairing the Quantum Learning IPA module for class V; and trials of the learning model were carried out on students and teachers.

The population of all fifth grade teachers and fifth grade elementary school students in Jatipuro District, Karanganyar Regency, is 28 SD. Samples were taken using the cluster random sampling technique. From the random results, it fell on SDN 3 Jatipurwo, SDN 1 Ngepungsari, and SDN 3 Ngepungsari. Data collection uses the methods of observation, questionnaires, tests, and documentation.

Data analysis was carried out three times, first to analyze e-product data. Data from the assessment of the feasibility of the quantum learning module were analyzed descriptively. Second, the researcher analyzes the initial data, in which he or she first tests the data for normality to determine whether the statistics use parametric or nonparametric statistics.Normality test using Kolmogrov-

Smirnov, with the criterion that if the p-value is greater than 0.05, the confounding or residual variables are normally distributed; if the p-value is less than 0.05, the interfering or residual variables are not normally distributed (Ghozali, 2011).

Third, the final data analysis This analysis is to determine the effectiveness of applying the quantum learning module. This research applies the before-after experimental model by comparing learning interests and learning outcomes before and after applying the quantum learning module in learning. The t-test formula using one group pre-test and post-test (design 2) is as follows:

$$t = \frac{MD}{\sqrt{\frac{\sum d^2}{N(N-1)}}}$$ (Arikunto, 2013)

Keterangan:
t = t-*Test*
MD = *Mean defferences*
$\Sigma d^2$ = Individual deviation from MD
N = Number of subjects

## RESULTS AND DISCUSSION

### 1. The procedure for developing the Quantum Learning Module for eIPA Learning in Class EV Material Organs of Movement Animals and Humans

The development of the Quantum Learning module in science learning in Class V on Animal and Human Organs Movement material refers to the ADDIE model, namely analyze, design, develop, implement, and evaluate.

a. Analysis Stage

Based on the results of the analysis of the needs of the quantum learning module, media were selected according to the needs of teachers and students to increase interest in learning and science learning outcomes. It was concluded that the characteristics of the module needed by students and teachers of class V at SDN 03 Jatipurwo, SDN 01, and 03 Ngepungsri were modules with the characteristics of having both form and content that were attractive to students. The module must also make science learning more interesting and fun.

b. Design Stage

The product design stage of the Quantum Learning IPA module material for Animal and Human Movement Organs in the development process is carried out in four steps: curriculum analysis, determining the title of the module, providing code, and writing the module. The first step is analyzing the curriculum to determine the materials included in the module. In determining the material, the analysis is carried out by looking at the subject matter being taught as well as the competencies and learning outcomes that students must have.

THEME 1
Organs of Movement of Animals and Humans

The second step is to give the module a title. In determining the title of the module, the researcher is guided by the basic competencies or subject matter that are in accordance with the curriculum. One competency can be used as the title of the module if the competency can be selected.

**IPA MODULE BASED ON QUANTUM LEARNING CLASSES V SD/MI**

The third step, namely providing the module code. Providing this module code, to make it easier to manage modules, so it is very necessary to have a code in the module.

**IPA MODULE CLASSES VSD/MI**

The fourth step, namely writing the module, In carrying out the steps of preparing the module, there are five important points to keep in mind as a reference in the process of writing the module. First, formulate the basic competencies that need to be mastered. The basic competencies listed in the module are taken from the specific guidelines for the 2013 curriculum.

**Making Simple Models of Human and Animal Locomotion Tools**

Second, the researcher determines the means of evaluation or assessment. This step is about criterion items, namely a number of questions or tests used to determine the level of success of students in mastering a basic competency in the form of behavior. Third, compiling material: the steps for compiling material for the Quantum Learning Science Module based on up-to-date references that have relevance from various sources, such as books, the internet, magazines, or research journals Fourth, sequence the teaching. Fifth, the module structure dictates that, generally, the module must contain at least seven main components.

c. Development Stage (Development)

The science module with the Quantum Learning approach that was developed was consulted with the validators, namely media experts, material experts, and learning experts, to get validity. The results of the validity test were obtained from media experts, material experts, and learning experts through three meetings. The validation results from the first learning expert provide input: 1) it is necessary to clarify the product of the Quantum Learning module, seeing as its purpose seems to be for learning materials for teachers; 2) the structure needs to be equipped. In the second meeting, suggestions were given: 1) the layout needs to be aligned; 2) write relevant references only. The meeting of the three media expert validators provided suggestions, namely: 1) the writing was enlarged; 2) there were a lot of pictures; and 3) each sub-chapter was given a color to make it more attractive.

After being revised and consulted with learning experts, there are more inputs, including: 1) please improve the concept map; 2) in each chapter, please provide a summary; and 4) in principle, this can be run. While the assessment by material experts and media experts on the Science module was conducted with the quantum learning approach, input suggestions were given, namely: 1) the material was complete; 2) the writing is good; 3) the preparation has varied.

d. Implementation Stage

Science module implementation using a quantum-learning approach for fifth grade students at SDN 03 Jatipurwo, SDN 01 and 03 Ngepungsari, Jatipuro District, Karanganyar Regency.

**Table 1 Observation Results of Class V Students at SDN 03 Jatipurwo**

| Information | Students Listen to the Teacher's Explanation | Active Learners Ask Questions | Active Learners Answer Questions | Learners Participate in learning actively | Learners Respond Positively to the QL Module |
|---|---|---|---|---|---|
| Amount | 23 | 23 | 22 | 19 | 25 |
| Percentage | 82% | 82% | 79% | 68% | 89% |
| Average | 80% | | | | |

**Table 2 Observation Results of Class V Students at SDN 01 Ngepungsari**

| Information | Students Listen to the Teacher's Explanation | Active Learners Ask Questions | Active Learners Answer Questions | Learners Participate in learning actively | Learners Respond Positively to the QL Module |
|---|---|---|---|---|---|
| Amount | 36 | 33 | 30 | 31 | 36 |
| Percentage | 90% | 83% | 78% | 75% | 90% |
| Average | 83% | | | | |

**Table 3 Observation Results of Class V Students at SDN 03 Ngepungsari**

| Information | Students Listen to the Teacher's Explanation | Active Learners Ask Questions | Active Learners Answer Questions | Learners Participate in learning actively | Learners Respond Positively to the QL Module |
|---|---|---|---|---|---|
| Amount | 60 | 54 | 55 | 62 | 63 |
| Percentage | 88% | 79% | 81% | 91% | 93% |
| Average | 86% | | | | |

The average value of this percentage has reached the expected target of 70%. Thus, the IPA module with the quantum-leaning approach can be said to be interesting. This is due to the activeness of students in taking part in science learning material on the Organs of Animal and Human Movement, which shows that students listen more to the teacher's explanations, become more active in asking and answering questions, become more active in participating, and become more responsive to the Quantum Module Learning positively.

e. Evaluation Stage

The results of the latest revision of media experts, material experts, and learning experts related to the Science module questionnaire using the Quantum Learning approach show that from the 40 prototype assessment questionnaire items, the average percentage is 86.3%. Material experts provide an average percentage of 85.6%. Learning experts provide an assessment with an average percentage of 85%. Thus, the average percentage of the questionnaire assessment among the three validators is 85.6%. The percentage gain of 85.6% indicates the Science module with the Quantum Learning approach developed in the Science learning material Animals and Human Organs to increase students' interest in learning and science learning outcomes is included in the criteria 81–100 and is "very eligible."

**2. Results of the Development of the Quantum Learning Module in Science Learning in Class V on Material for Eligible Organs of Animal and Human Movement to Increase Learning Interest and Student Learning Outcomes**

**Table 4. Learning Interest of Class V Students at SD Negeri 03 Jatipurwo**

| | Average Score | Differences | % Increased |
|---|---|---|---|
| *Pretest* | 63,71 | 28,4 | 44,6% |
| *Posttest* | 92,14 | | |

The learning interest of fifth grade students at SDN 03 Jatipurwo, after learning using the science module with the quantum learning approach, has increased, namely by 44.6%.

**Table 5. Learning Interest of Class V Students at SDN 01 Ngepungsari**

| | Average Score | Differences | % Increased |
|---|---|---|---|
| *Pretest* | 68,3 | 27,3 | 40% |
| *Posttest* | 95,6 | | |

The learning interest of fifth grade students at SDN 01 Ngepungsari, after learning using the science module with the quantum learning approach, has increased, namely by 40%.

**Tabel 6. Minat Belajar Siswa Kelas V SDN 03 Ngepungsari**

| | Average Score | Differences | % Increased |
|---|---|---|---|
| *Pretest* | 68,12 | 25,8 | 37,8% |
| *Posttest* | 93,88 | | |

The learning interest of fifth grade students at SDN 03 Ngepungsari, after learning using the science module with the quantum learning approach, has increased, namely by 37.8%.

Overall, the learning interest score of fifth grade students at SDN 03 Jatipurwo, SDN 01, and SDN 03 Ngepungsari, Jatipuro District, Karanganyar Regency, both before and after implementing the science module with the quantum learning approach can be seen in Table 7 below.

**Table 7. Average Score of Student Learning Interest**

| School name | Prior Average Score | Average Score After | Increase Percentage |
|---|---|---|---|
| SDN 03 Jatipurwo | 63,71 | 92,14 | 44,6% |
| SDN 01 Ngepungsari | 68,30 | 95,60 | 40% |
| SDN 03 Ngepungsari | 68,12 | 93,88 | 37,8% |

**Table 8. Average Science Learning Outcomes of Grade V Students at SDN 03 Jatipurwo**

| | Average Score | Differences | % Increased |
|---|---|---|---|
| *Pretest* | 51,43 | 33,6 | 65,3% |
| *Posttest* | 85 | | |

The results of learning science for class V students at SDN 03 Jatipurwo, after learning using the Science module with the Quantum Learning approach has increased, namely by 65.3%.

**Table 9. Average Science Learning Outcomes of Class V Students of SDN 01 Ngepungsari**

| | Average Score | Selisih | % Increased |
|---|---|---|---|
| *Pretest* | 58 | 21 | 36,2% |
| *Posttest* | 79 | | |

The results of learning science for class V students at SDN 01 Ngepungsari, after learning using the Science module with the Quantum Learning approach has increased, by 36.2%.

**Table 10. Average Science Learning Outcomes of Grade V Students at SDN 03 Ngepungsari**

| | Average Score | Differences | % Increased |
|---|---|---|---|
| *Pretest* | 63,82 | 16,5 | 25,8% |
| *Posttest* | 80,29 | | |

The results of learning science for class V students at SDN 03 Ngepungsari after using the Science module with the Quantum Learning approach have increased by 25.8%.

Overall, the results of science learning for fifth grade students at SDN 03 Jatipurwo, SDN 01, and SDN 03 Ngepungsari Kec. Jatipuro, both before and after implementing the Science module with the quantum learning approach, can be seen in Table 11 below.

**Tabel 11. Average Science Learning Outcomes**

| School name | Prior Average Score | Average Score After | Increase Percentage |
|---|---|---|---|
| SDN 03 Jatipurwo | 51,43 | 85 | 65,3% |
| SDN 01 Ngepungsari | 58 | 79 | 36,2% |
| SDN 03 Ngepungsari | 63,82 | 80,29 | 25,8% |

**3. The Level of Effectiveness of the Quantum Learning Module in Science Learning in Class V on Animal and Human Organs to Increase Interest in Learning and Student Learning Outcomes**

a. The Effectiveness of the Quantum Learning IPA Module to Increase Interest in Learning

**Table 12 shows the results of the Paired Samples Test of Students' Learning Interest at SD Negeri, 03 Jatipurwo.**

| | *Paired Differences* | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | *95% Confidence Interval of the Difference* | | | | |
| | *Mean* | *Std. Deviation* | *Std. Error Mean* | *Lower* | *Upper* | t | df | Sig. (2-tailed) |
| pretest-posttest | 28.429 | 2.370 | .896 | 26.236 | 30.621 | 31.730 | 6 | .000 |

The t-count value is 31.730 with a p-value of 0.000. The tcount value is greater than the ttable value of 2.447 (31.730 > 2.447), or a p-value of 0.000 0.05. This means that there is a significant difference in the learning interests of fifth grade students at SDN 03 Jatipurwo before and after using the QuantumeLearning module in the learning processes of natural sciences, organo-materials, animal behavior, and human movement.

**Table 13. Results of the Paired Samples Test of Students' Interest in Learning at SDN 01 Ngepungsari**

| | *Paired Differences* | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | *95% Confidence Interval of the Difference* | | | | |
| | *Mean* | *Std. Deviation* | *Std. Error Mean* | *Lower* | *Upper* | t | df | Sig. (2-tailed) |
| pretest-posttest | 27.300 | 3.561 | 1.126 | 24.753 | 29.847 | 24.246 | 9 | .000 |

The t-count value is 24.246 with a p-value of 0.000. The tcount value exceeds the ttable value of 2.262 (24.246 > 2.262), yielding a p-value of 0.000 0.05.This means that there is a significant difference in the learning interest of fifth grade students at SDN 01 Ngepungsari before and after applying the Quantum Learning module to learning science material on the organs of movement of animals and humans.

**Table 14. Results of the Paired Samples Test of Students' Learning Interest at SDN 03 Ngepungsari**

| | *Paired Differences* | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | *95% Confidence Interval of the Difference* | | | | |
| | *Mean* | *Std. Deviation* | *Std. Error Mean* | *Lower* | *Upper* | t | df | Sig. (2-tailed) |
| pretest-posttest | 25.765 | 4.338 | 1.052 | 23.534 | 27.995 | 24.490 | 16 | .000 |

The t-count value is 24.490 with a p-value of 0.000. The tcount value is greater than the ttable value of 2.291 (24.490 > 2.291), or a p-value of 0.000 0.05. This means that there is a significant difference in the learning interest of fifth grade students at SDN 03 Ngepungsari before and after using the Quantum Learning module in learning science material on the organs of movement of animals and humans.

b. The Effectiveness of the Science Quantum Learning Module to Improve Learning Outcomes

**Table 15. Results of the Paired Sample t-Test of Science Learning Outcomes of SDN03 Jatipurwo Students**

| | Paired Differences | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | 95% Confidence Interval of the Difference | | | | |
| | Mean | Std. Deviation | Std. Error Mean | Lower | Upper | t | df | Sig. (2-tailed) |
| pretest-posttest | 33.571 | 12.150 | 4.592 | 22.335 | 44.808 | 7.311 | 6 | .000 |

The t-count value is 7.311 and the t-table value is 2.447 (7.31 > 2.447) with a p-value of 0.000  0.05. This means that there is a significant difference in the science learning outcomes of fifth grade students at SD N 03 Jatipurwo between the pretest and posttest.

**Table 16. Results of the Paired Sample t-Test Results for Learning Science for Students of SDN 01 Ngepungsari**

| | Paired Differences | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Std. Error Mean | 95% Confidence Interval of the Difference | | | | |
| | Mean | Std. Deviation | | Lower | Upper | t | df | Sig. (2-tailed) |
| pretest-posttest | 21.000 | 6.992 | 2.211 | 15.998 | 26.002 | 9.498 | 9 | .000 |

The t-count value is 9.498 and the t-table value is 2.262 (9.498 > 2.262) with a p-value of 0.000  0.05. This means that there is a significant difference in the science learning outcomes of fifth grade students at SD N 01 Ngepungsari between the pretest and posttest.

**Table 17. Results of the Paired Sample t-Test of Science Learning Outcomes of SDN 03 Ngepungsari Students**

| | Paired Differences | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Std. Error Mean | 95% Confidence Interval of the Difference | | | | |
| | Mean | Std. Deviation | | Lower | Upper | t | df | Sig. (2-tailed) |
| pretest-posttest | 16.471 | 7.859 | 1.906 | 12.430 | 20.511 | 8.641 | 16 | .000 |

The t-count value is 8.641 and the t-table value is 2.291 (8.641 > 2.291) with a p-value of 0.000  0.05. This means that there is a significant difference in the science learning outcomes of fifth grade students at SDN 03 Ngepungsari between the pretest and posttest.

**Discussion**

The process of the Class V Science Module with the Quantum Learning Approach to Increase Learning Interest and Learning Outcomes is carried out through 5 stages, namely:

a. The analysis phase begins with analyzing the problems and needs.
b. Design stage In designing science modules with a quantum learning-based approach, it is carried out in 4 steps: curriculum analysis, determining module titles, coding, and writing modules.
c. The development stage, or product development stage; in this stage, the Quantum Learning-Based Science module is consulted by the three media, material, and learning experts for validity using an assessment questionnaire. The module was consulted three times.

d. In this stage, the implementation stage was carried out on fifth grade students at SD Negeri 03 Jatipurwo, SD Negeri 01, and 03 Ngepungsari. During the learning process, students looked very enthusiastic; their activeness in participating in learning showed a significant increase.
e. The evaluate stage—in this stage, the IPA module with a QL-based approach—shows that from media experts, the average percentage of 40 prototype assessment questionnaire items is 86.3%.Material experts provide an average percentage of 85.6%. The average percentage rating given by learning experts is 85%.Thus, the average percentage of the questionnaire assessment among the three validators is 85.6%. The percentage gain of 85.6% indicates that the science module product based on Quantum Learning, which was developed in science learning to increase interest in learning and science learning outcomes, is included in the Very Eligible criteria.

## CONCLUSION

The science module with a quantum learning-based approach developed shows that it is very feasible, as can be seen from the average learning interest of the fifth grade students at SD Negeri 01 Jatipurwo and SD Negeri 01 and 03 Ngepungsari Jatipuro District showing an increase after implementing the QL-based IPA module. Similarly, student learning outcomes revealed that the average student learning outcomes improved after the QL-based Science module was implemented in science learning.

The Science Module product with the developed Quantum Learning (QL) approach has demonstrated effectiveness in increasing learning interest and outcomes. It is known that there is a significant difference in the average score of students' interest in learning between the pretest and posttest (p-value 0.05). The t-count value of 40.576 is greater than the t-table value of 2.036 (40.576 > 2.036) with a p-value of 0.000  0.05. Similarly, students' learning outcomes were tcount 24.246 > ttable 2.036. This means that there is a significant difference in the learning interests of students and the learning outcomes of students in class V at SDN 03 Jatipurwo, SDN 01, and SDN 03 Ngepungsari between the pretest and the posttest. There is a significant difference, indicating that quantum learning-based modules are effective for improving science learning outcomes.

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