

# Development of Students' Worksheet Based on Quantum Learning Model to Improve Students' Creative Thinking Ability of 4<sup>th</sup> Grade Elementary School

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**Abstract.** This study aims to develop a student's worksheet based on Quantum Learning that is feasible, interesting, easy, useful and effective to improve the ability of creative thinking students in 4th grade of Elementary School. The type of research and development that refers to the theory Borg & Gall. This research was implemented in grade IV of elementary school number 11 Metro Pusat, Indonesia. The subject were 54 students divided into experiment class (27) and control class (27) with purposive sampling technique. The results showed that student's worksheet based on Quantum Learning is feasible, interesting, easy, useful and effective.

**Keywords:** Students Worksheet, Quantum Learning, Creative Thinking.

## 1 Introduction

The demands of the 4.0 era industrial revolution in the 21st century need to be faced wisely, because the challenge is getting tougher. This challenge is addressed with various abilities that need to be mastered to be able to compete in the era of revolution 4.0. One of them is the ability to think creatively. In line with this, National Education Association states that one of the 21st century skills is Learning and Innovation Skills which consists of 4 aspects, namely Critical thinking, Communication, Collaboration, and Creativity [1].

Having the ability to think creatively allows students to build idea or new notion through mental activities. This is in line with the opinion of Suryadi and Herman, creative thinking skill is cognitive skill to generate and develop new ideas, new ideas as a development of previously ideas and divergent problem solving skills (from various points of view) [2].

To support the success of educators in delivering lesson concepts, an educator must prepare several components of teaching materials; one of them is the student's worksheet. According to Prastowo, student's worksheet is a printed teaching material in the form of paper sheets containing material, summaries, and instructions for implementing learning tasks that must be done by students which refer to the basic competence that must be achieved [3]. Student's worksheet loads activities that contain the stages that must be done by students in finding concepts. Student's worksheet is a form of teaching material that is often used by educators in delivering learning topics. Student's worksheet it self contains material or questions or assignments to be completed by students.

Factor that can support the development of students' creative thinking abilities is to choose the right learning strategy in it, including the selection of learning models. One of them is the Quantum Learning model which can be integrated with student's worksheet teaching materials. Research conducted by Zeybek shows that the quantum learning model has helped students to improve learning achievement skills, has positively influenced students' attitudes towards learning, has increased their level of readiness and made learning more enjoyable because it regulates the learning environment to solve various senses of learning [4]. Furthermore, Acat's research shows that quantum learning not only contributes to improving student achievement, but also develops students' attitudes [5]. For this reason, primary schools should be encouraged to use quantum learning models. Then Fajrin *et al.* conducted research that developed quantum learning-based textbooks [6]. The results of the student questionnaire obtained from the average results of all components showed a percentage of 70.3% responded positively and 20.7% did not respond positively. Meanwhile, based on the product validation test from several experts, it shows that the product is valid and feasible when used in the learning process.

There are 6 research results related to the variables in this study. Research conducted by Anwar *et al.* examined A Comparison of Creative Thinking Abilities of High and Low Achievers Secondary School Students [7]. The results showed that there was no difference between high achievers and low achievers in terms of creative thinking abilities. However, girls and students who came from urban areas found better in their creative thinking. Arvyati's research, creative thinking is also defined as the ability to think about someone in developing ideas or notions that are smooth (fluent), flexible (flexible), original (originality) and elaborative (complicated) [8]. Creative thinking is a way of thinking that allows not only one answer to an issue. In the creative learning process, different thinking is used (the thought process controls every aspect of the direction and produces many types of alternative solutions).

Research conducted by Fajrin *et al.*, this research developed a quantum learning-based textbook using the AMBAK technique using a 4-D development model [6]. The results of the student questionnaire obtained from the average results of all components showed a percentage of 70.3% responded positively and 20.7% did not respond positively. Meanwhile, based on the product validation test from several experts, it shows that the product is valid and feasible when used in the learning process. Meanwhile according to Zeybek, this model occurs of six stages that are Enroll, Experience, Label, Demonstrate, Review and Celebrate [4]. This formula is known as TANDUR, namely Tumbuhkan, Alami, Namai, Demonstrasikan, Ulangi dan Rayakan.

Furthermore, research conducted by Utami with the results of the study showed that learning geography using worksheets received a very good response from students [9]. This is shown by active students to express opinions, ask questions, discuss in groups. Data, pictures and maps on worksheets also attract the attention of students in learning geography. Meanwhile, research conducted by Lee with research results revealed that worksheets can be useful in terms of academic achievement, as a support for textbooks; worksheets can be used to add information for certain classes [10]. In addition, worksheets can be used by students to construct knowledge.

The first and second researches are about the importance of having the ability to think creatively in order to develop ideas and notions that can produce many alternative solutions. While the third and fourth research are a description of the effectiveness of using quantum learning models with steps known as TANDUR (Tumbuhkan, Alami, Namai,

Demonstrasikan, Ulangi dan Rayakan). The fifth and sixth researchs are a study that shows the use of student's worksheet in the learning process can help students find lesson concepts easily.

To see learning using integrated worksheets with the Quantum Learning model that can improve creative thinking ability is still rare. And the feasibility, attractiveness and effectiveness of a student's worksheet cannot be measured yet. So, the objectives in this study are:

1. Producing student's worksheet based on quantum learning that is feasible to improve student's creative thinking ability of 4th grade elementary school.
2. Producing student's worksheet based on quantum learning that is attractive, easy and useful for students of 4th grade elementary school.
3. Knowing the effectiveness of student's worksheet based on quantum learning to improve student's creative thinking ability of 4th grade elementary school.

## **2 Methods**

### **2.1 Procedure**

The development procedure in this research refers to Borg and Gall's theory, namely (1) Potential and Problems, (2) Data Collection, (3) Product Design, (4) Design Validation, (5) Design Revision, (6) Product Testing, and (7) Product Revision (8) Trial Use, (9) Revision of the final product, and (10) Mass Production. However, this research was limited to stage 9. For stages 10, it was not carried out.

### **2.2 Research Population and Participants**

This research was implemented in grade IV of elementary school number 11 Metro Pusat, Indonesia. The subjects were 54 students divided into experiment class (N=27) and control class (N=27) with purposive sampling technique.

### **2.3 Data Collection Technique**

In this study, the basic techniques in data collection were questionnaire and test. Questionnaire were used as data collection techniques to media experts, material experts, linguists, and teacher of grade four. While test were used as data improving creative thinking ability of students grade four. Data collection activities were obtained from questionnaire and test, based on the guidelines that had been developed based on the aspect that had been observed which was operationally based on the indicators of creative thinking ability.

The analysis could be assessed from five aspects, namely feasibility, attractiveness, essiness, usefullnes, and effectiveness. The feasibility, attractiveness, essiness, usefullnes analysis of Student's Worksheet are obtained from the product validation. This analysis involved several phases, including the recapitulation of statements obtained from the validator, finding the average of validity level for each criterion, calculating the average score of each aspect, calculating the total averages, and matching the total averages with the category of validity of a predefined category as can be seen in table 1 and table 2.

**Table 1.** Validity Criteria for Material, Media, Language, and Experts Educator

Presentation	Interpretation
81% – 100%	Very valid, very thorough, usable
61% - 80%	Quite Valid, quite effective, usable with minor fixes
41% - 60%	Less valid, less effective, less complete, not to be used
21% - 40%	Invalid, ineffective, incomplete, unusable
0%– 20%	Very invalid, very ineffective, very incomplete, unusable

Source: Akbar [11]

**Table 2.** Criteria for attractiveness, easiness, and usefulness of the product

Criteria			Average
Attractiveness	Easiness	Usefulness	
Very Attractive	Very Easy	Very useful	3,26 - 4,00
Attractive	Easy	Useful	2,51 - 3,25
Less Attractive	Less easy	Less useful	1,76 - 2,50
Not Attractive	Difficult	Useless	1,01 - 1,75

Source: Akbar [11]

The effectiveness of student worksheet based on quantum learning to improve students' creative thinking ability obtained through the pretest and posttest scores. Based on the research results, the students' scores obtained were subsequently converted into student grades. Then, the result was analyzed by calculating n-Gain with criteria referred to Sundayana in table 3.

**Table 3.** Criteria of N-Gain

Gain Ternormalisation score	Interpretation
$-1,00 \leq g < 0,00$	Decreased
$g = 0,00$	Constant
$0,00 < g < 0,3$	Low
$0,30 \leq g < 0,70$	Medium
$0,70 \leq g \leq 1,00$	High

Source: Sundayana [12]

To prove the significance of the differences between the two groups, it is necessary to test using the Independent Sample T Test.  $H_0$  is accepted if the t count  $< t$  table, while  $H_0$  is rejected if the t value  $> t$  table with  $\alpha = 0.05$ .

### 3 Result and Discussion

#### 3.1 Feasibility of the product

The feasibility of LKPD products based on quantum learning to improve students' creative thinking ability is carried out at the design validation stage. Analysis of students' worksheet feasibility was carried out with validation by experts and teachers. Material validation (Mr. Dr. Irawan Suntoro, MS), media validation (Mrs. Dr. Adelia Hasyim, M.Pd), language validation (Mr. Dr. Mulyanto Widodo, M.Pd), and validation of grade IV teacher (Ms.

Deasy Vivta Rini, S.Pd). The recapitulation of the results of the expert and educator validation assessment can be seen in table 4.

**Table 4.** Product Validation Recapitulation

No	Validator	Score
1	Material Experts	86,90
2	Media Experts	89,77
3	Language Expert	88,63
4	Teacher of Grade IV	93,90
<b>Average</b>		<b>89,80</b>

Table 4 shows that the average assessment score of 89.90, it is classified into very feasible category. Students worksheet developed follows the students worksheet requirements according to Darmojo, namely didactic requirements, construction requirements, and technical requirements to become a good and proper of students worksheet [13]. Dictactic requirements, namely requirements that must follow the principles of effective teaching and learning, constructive requirements, namely with regard to the use of language, sentence structure, vocabulary, difficulty level and technical requirements are the requirements for the preparation of students worksheet in terms of writing, pictures, and appearance.

### 3.2 The attractiveness, Easiness, Usefulness of the products

The test of attractiveness, easiness and usefulness of the product are carried out at the end of the lesson. The results of the assessment of the attractiveness, easiness and usefulness of the test can be seen in table 5.

**Table 5.** Results of the LKPD Attractiveness, Easiness, and Usefulness

No	Type of Test	Average	Criteria
1	Attractiveness	3,85	Very Attractive
2	Easiness	3,72	Very Easy
3	Usefulness	3,81	Very useful

Table 5 shows the results for the attractiveness test which consist of five indicators and got a score of 154 from a maximum score of 160. After being converted the final score, it got 3.85 in the category "Very Attractive". Meanwhile, the result of the easiness test which consists of 4 indicators gets a score of 119 out of a total score of 128. After being converted, the final score got value of 3.72 in the "Very Easy" category. The result of the next assessment is the LKPD usefulness test. The assessment of the usefulness test obtained a score of 61 from a total score of 64. The final score was 3.81 with the category "Very Useful". This indicates that student's worksheet based on quantum learning model were feasible to be studied independently by students; they feel interested, easy and useful. Supported by Sugiyanto's, quantum learning model can focus on quality and meaningful interactions and emphasize the meaning and quality of the learning process [14].

### 3.3 The Effectiveness of Student's worksheet to Improve Student' Creative Thinking Ability on Experiment class and Control class

The effectiveness test was obtained from the pretest and posttest results given to the experimental class and the control class. Furthermore, we look for the average of the

N-Gain of each class. The results of increasing students' creative thinking skills can be seen in the following table.

**Table 6.** Recapitulation of N-Gain Comparison of Creative Thinking Ability in Experiment Class and Control Class

Average	Experiment Class	Control Class
Pre-Test	58,49	53,21
Post-Test	81,17	61,73
N-Gain	0,53	0,16
Criteria	Medium	Low

To prove the significance of the differences between experiment class and control class, it is necessary to conduct test by using the Independent Sample T Test. The test criterion is if  $t \text{ count} \geq t \text{ table}$  with  $\alpha = 0.05$  then  $H_a$  is accepted. And vice versa if  $t \text{ count} < t \text{ table}$  then  $H_a$  is rejected. The results of hypothesis testing for the ability to think creatively can be seen in table 7.

**Table 7.** Result of T-Test

Component			Results
t tabel (0,05)	t count	Index	
2,006	8,14	$t \text{ count} > t \text{ table}$	$H_a$ is accepted

Based on calculations with  $D_k = 52$  and a significance level of 0.05 (5%), the results of  $t \text{ count} = 8,14$ , while  $t \text{ table} = 2,006$ . It is known that  $t \text{ count} > t \text{ table} = 8,14 > 2,006$ , it can be said that  $H_0$  is rejected and  $H_a$  is accepted. It can be concluded that there is a difference between the effectiveness of creative thinking ability using student's worksheet based on quantum learning and those don't use student's worksheet. It is in line with research conducted by Zeybek (2017) shows that the quantum learning model has helped students to improve learning achievement skills, has positively influenced students' attitudes towards learning, has increased their level of readiness and made learning more enjoyable because it regulates the learning environment to solve various senses of learning.

## 4 Conclusion

Student's worksheet were assessed and given input by material experts, media experts, linguists, and teacher reviewers with the criteria "very complete" and "usable". The content and construct of validity showed that the student worksheet had the highest category. It is also effective by the results of pretest and posttest scores of creative thinking ability in experiment class with N-gain (53%) and classified into "medium" category and it is greater than control class (16%) which have category "low".

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