DEVELOPMENT OF A CONSTRUCTIVISM-BASED STATISTICS MODULE FOR CLASS VIII JUNIOR HIGH SCHOOL STUDENTS

by Jitu Halomoan Lumbantoruan

Submission date: 29-Mar-2021 09:46AM (UTC+0700)
Submission ID: 1544926895
File name: Jurnal_Jitu_Halomoan,Scopus_Q4.pdf (1.4M)
Word count: 5438
Character count: 30330

Solid State Technology
Volume: 64 Issue: 2
Publication Year: 2021

DEVELOPMENT OF A CONSTRUCTIVISM-BASED STATISTICS MODULE FOR CLASS VIII JUNIOR HIGH SCHOOL STUDENTS

Jitu Halomoan Lumbantoruan[1], Stevi Natalia[2]
[1,2] FKIP-UKI Mathematics Education Study Program, Jakarta. Indonesia
jituhalomoan.lumbantoruan@gmail.com

Abstract

This study aims to produce a constructivist-based statistics module product. The Statistics module development is carried out to help overcome students' understanding of the concepts of Statistics. This research uses the Research and Development (R&D) research method, which refers to Robert Maribe Branch's development. The module products to be made are discussed with junior high school teachers and validated by validating material experts, learning experts, and Class VIII junior high school teachers. The validated module products were tested on a small scale with a sample of 6 people, and the statistics module was tested on a large scale with 16 students and 26 students who responded to the module. The data collection technique used was a questionnaire for needs analysis, validation of material experts, learning experts, teachers, and student responses to the statistics module. The material expert gave an assessment score of 73.23 with good interaction, knowing experts and teachers 93.33 with excellent conversations, small-scale trials 85.71 with outstanding businesses, and large-scale trials 81.81. good. The statistics module's effectiveness can be seen from the tests given before using the module and after using the module. The pre-test scores were with a mean of 23.12 and the post-test mean values of 96.25. The mean difference between before using and after using it has a mean range of 75.13. The validation of material experts, learning experts, teachers, small and large scale trials, and student responses and test results shows that the constructivist-based statistics module is feasible, practical, and useful.

Keywords: constructivist, module, statistics

A. INTRODUCTION

Mathematics is a field of study that students often find difficult. Indonesia's achievements can be seen by acquiring the Program for International Student Assessment (PISA) scores in 2018. Indonesia is ranked 72 out of 78 countries. The average PISA score of OECD member countries in mathematics is 489, while Indonesia's PISA score for mathematics is 379. Based on the 2018 PISA data below, it is known that there is a distance of 110 between the average general scores of the PISA participating countries and Indonesia.

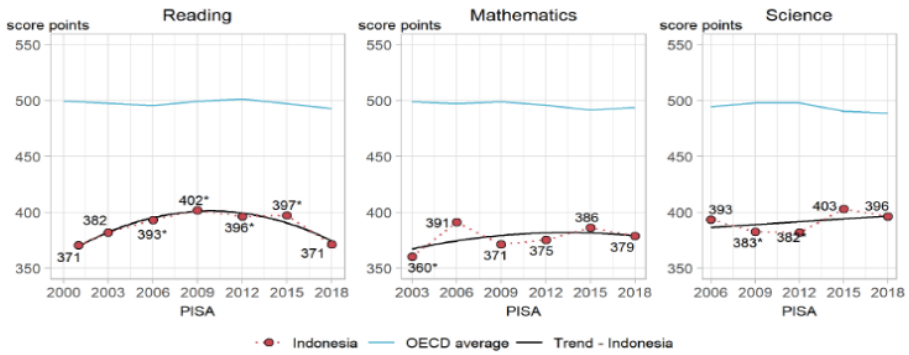


Figure 1. PISA Indonesia 2000-2018

Heruman (2007) procedures in mathematics train the mind both qualitatively and quantitatively. Difficulties in understanding mathematical concepts, terminology, principles, and algorithms result in unattainable subject objectives and poor mathematics learning outcomes. Johnson and Rising (1972) mathematics is a method of thinking, organizing, logical proof. The process and subject aids applied and provided by teachers in schools must train students to work on math problems. Nadeak (2019) argues that there needs to be a concept in learning management and aids in conveying the educator's material content. The low learning outcomes obtained by students confirm the 2000-2018 Indonesian PISA data. The results of field observations and students' interest in mathematics learning are still lacking, and it can be seen from unsatisfactory student learning outcomes.

1	Pendidikan Agama dan Budi Pekerti (Katholik)	75	83	90	-	-	-	-	-	-	87	80	88	-	-	-	-	-	-	84	A
2	Pendidikan Pancasila dan Kewarganegaraan	75	98	94	-	-	-	-	-	-	96	81	100	-	-	-	-	-	-	91	A
3	Indonesia	75	91	80	-	-	-	-	-	-	86	1	84	-	-	-	-	-	-	43	A
4	Mathematics	70	72	1	93	-	-	-	-	-	55	40	1	90	-	-	-	-	-	44	A
5	Indonesian History	71	73	80	-	-	-	-	-	-	76	78	80	-	-	-	-	-	-	79	B
6	English	75	80	83	77	-	-	-	-	-	80	84	80	80	-	-	-	-	-	81	A

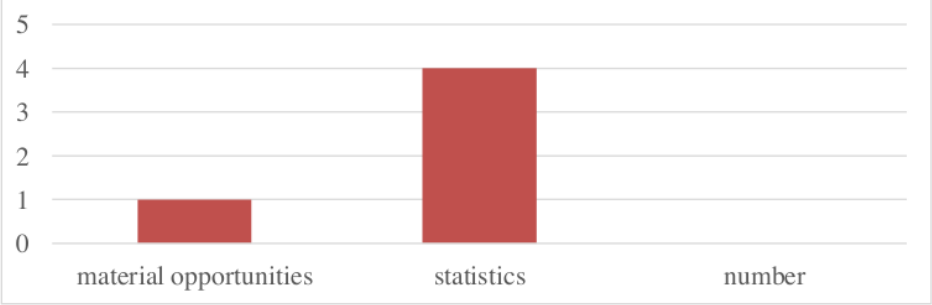
Figure 2. Student Statistics Learning Outcomes 1

1	Pendidikan Agama dan Budi Pekerti (Katholik)	75	80	-	-	-	-	-	-	-	80	80	-	-	-	-	-	-	-	80	A
2	Pendidikan Pancasila dan Kewarganegaraan	75	97	-	-	-	-	-	-	-	97	81	-	-	-	-	-	-	-	81	A
3	Indonesia	75	91	-	-	-	-	-	-	-	91	1	-	-	-	-	-	-	-	1	A
4	Mathematics	70	72	-	-	-	-	-	-	-	72	40	-	-	-	-	-	-	-	40	A
5	Indonesian History	71	73	-	-	-	-	-	-	-	73	78	-	-	-	-	-	-	-	78	B
6	English	75	80	-	-	-	-	-	-	-	80	84	-	-	-	-	-	-	-	84	A

Figure 3. Student Statistics Learning Outcomes 2

The material in the value of the 11th column is Material Mathematics with Statistics material. The two learning outcomes above show that students get a score below the average in the statistical material. The first and second students scored 40 for Statistics material. When asked why students considered Statistics subject to be very difficult and unattractive to learn because of the complicated formulas, the examples given did not represent the questions asked and errors in the concept. Abstract Statistics subjects that are still teacher-centered make students' understanding of statistics less precise. Therefore we need learning media that helps students to improve students' conceptual performance. One of the learning theories that emphasize the learning process and builds understanding of concepts is constructivism in the research journal Habibi (2014). The subject of mathematics using constructivism is a learning system that facilitates students developing and developing their knowledge from the initial competencies. Constructivist mathematics subjects can empower students' thinking patterns because they are slowly guided toward a more complex understanding of concepts.

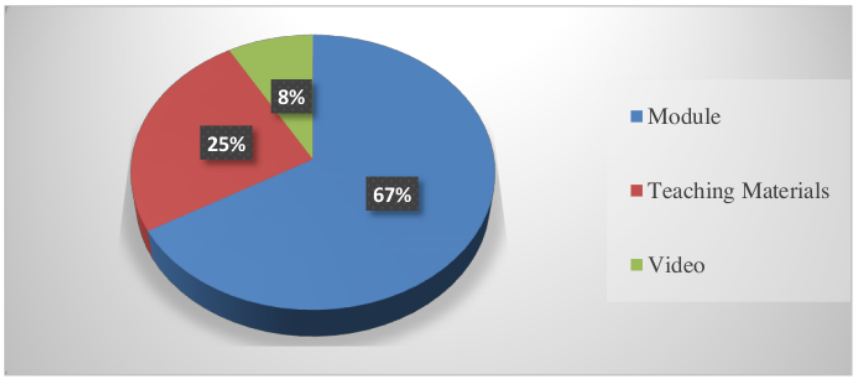
Arsyad (2013) in understanding a complex learning concept requires media. Media is an inseparable part of the teaching and learning process and method. There are two essential elements in a teaching and learning process: the teaching method and the form or media in delivering lessons. These two aspects are interrelated. The choice of one particular teaching method will influence the appropriate type of instructional media. Supardi (2019) states that the ineffective use of subject media is one factor due to the lack of effective and efficient information sources in understanding a book's primary source in the classroom's learning process. Besides, the provision of facilities and infrastructure in books or textbooks in school libraries is still limited. This results in students only relying on the teacher's explanation on the blackboard as a source and media for the subject. Time is wasted because students have to copy back to the notebook. These problems make the subjects in the classroom still centered on the teacher (teacher-centered). This is considered to hinder the smooth teaching and learning process. Depdiknas (2008) states that modules are printed teaching materials designed to be studied independently by students. Modules are materials that are arranged systematically and attractively, which include material content, methods, and evaluation that can be used to achieve the expected competencies. Module development can present subjects that can be carried out by students independently or topics in class—one of the many materials that are considered difficult and require more useful resources in statistics lessons. Statistics is a vital mathematics subject matter because it is widely used in everyday life. Statistics are used to process and analyze data so that they can be used to make decisions and even predict future conditions. This material certainly has a vital role in the progress of human life. The results of the researcher interview with the teacher "In your opinion, what material do you need to make assistive devices?"



Bar Chart 1. Material is Difficult

In diagram 1 above, the teacher argues that statistics are one of the mathematics materials that students do not like and are considered problematic because students have difficulty calculating manually and presenting data in groups. The teacher is also aware of the lack of tools in the learning process to be less effective and efficient. The researcher asked the teacher, "What alternative media do you think can facilitate students' understanding in the learning process or as a learning process aid" and the teacher's answer

was the Teaching Module. The teacher's solution is also strengthened by the student's response in choosing a tool like what is expected in the learning process.



Pie Chart 1. Student Responses

Based on pie chart one above, about 67% answered that they needed a module that was a useful, effective, and more practical learning aid. Students added that they expected learning methods that were easy to understand and could adapt to students' initial abilities. The research will research the development of teaching modules in statistics subjects based on a constructivist approach from the description above. Through this development, researchers hope to help teachers in the teaching and learning process in class and help students understand statistical concepts to improve student learning outcomes in Statistics lessons. The researcher raised the research title is " *Pengembangan Modul Mata Pelajaran Statistika Berdasarkan Pendekatan Konstruktivisme pada Siswa Kelas VIII*."

Research Formulation

1. What is the phase of producing a construction-based statistics module?
2. How is the feasibility of the statistics subject module based on Class VIII junior high school students' constructivism approach?
3. How is the improvement of student learning outcomes of SMP Keas VIII in statistics material through the statistics module aids?

Purpose of Research

1. It can make it easier to understand statistical concepts and help students learn independently in improving better learning outcomes.
2. Can be input and consideration in the development of modules for other subjects among teachers.
3. Can be an input or consideration in providing various learning methods and media in schools' mathematics subject matter.
4. Adding experience and knowledge in developing science, methods, strategies, and communication and developing module products used as teaching and learning process aids.

Media and Learning Resources

Seels & Glasgow (1990) state that the grouping of various media types, when viewed from the point of view of technological development, is divided into traditional tools and the latest technology tools. Pannen (1995) educators design and create learning models that are easy to understand in a book, teaching material, or module. Seels & Richey (1994) argue that the learning concept chosen is science development in technology.

It means the process of translating specifications and designs into physical or print form. Sungkono (2003) developing printed learning modules that are considered effective and efficient and of high quality must adapt to necessary learning abilities and learning. Therefore, the printed learning module must be designed and designed to pay attention to the material's correctness and pay attention to the accuracy of communication, module construction, presentation, pedagogy, language to avoid abstract material, and it is necessary to use visuals. Sadiman in Warsita (2008) states that in the development of technology, subjects use three basic principles that need to be used as references in their development and utilization, namely:

1. The system approach (system approach)
2. Learner-oriented (learned centered)
3. Utilization of learning resources as much as possible (utilizing learning resources)

Constructivism Approach

Habibi (2014) The constructivism approach is a learning system that facilitates students to build their knowledge from the initial experience.

Subakti inside. Supardi (2019) constructivism learning is a material or solution that is compiled from within a person. Meanwhile, Ika Lestari (2013) states that teaching material or teaching modules to be made must be competency-based.

B. RESEARCH METHODS

This research's method is the Research and Development (R&D) research method (Robert Maribe Branch, 2009). Sugiyono (2009) states that Robert Maribe Branch developed Instructional Design (Subject Design) with the ADDIE development model. ADDIE stands for Analysis, Design, Development, Implementation, and Evaluation. Widyoko (2009), in the evaluation phase, must be carried out so that the subsequent learning process becomes more effective. Arikunto & Suharsimi (2006), in conducting research, some procedures or approaches must be carried out: analysis, design, development, testing, and evaluation. The following is an overview of the flow of this research.

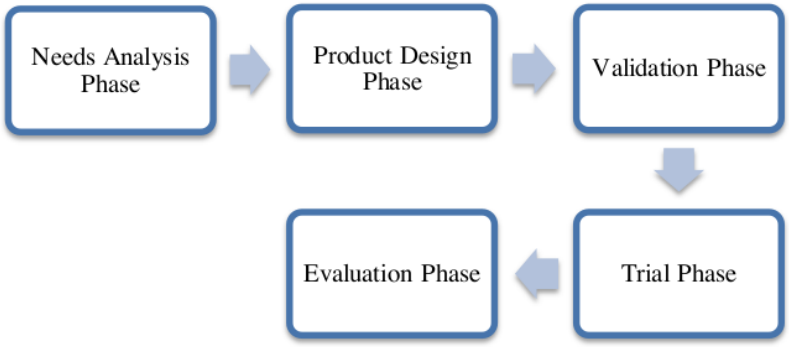


Figure 4. ADDIE Development (Robert Maribe Branch, 2009)

Place and Time of Research

The product of this research will be tested on students of SMP-Negri Jakarta Timur and SMP Private Bekasi, Class VIII, having their address at Jalan Ceger, District Cipayung, East Jakarta City, and SMP Yadika Jatirangga. The expected timeframe for completion in this research is from May 2020-August 2020. This research will last for four months, starting from the complete needs analysis phase, the product preparation phase, the product validation phase, the trial phase, the evaluation phase, and the final stage—preparation of reports.

Data Collection Technique

Anas Sudijono (2003) argues for data collection techniques

1. Interview
   They were identifying problems related to statistics subjects and analyzing efforts to solve statistics problems. Interviews can be conducted with teachers and students in collecting data related to the issues to be studied.
2. Questionnaire instrument
   The instrument that will be shared will contain several positive and negative statements. Tools will be given to respondents.
3. Learning Outcomes Test
   To determine the level of understanding of mathematical concepts can be done by giving a pre-test and post-test.

Data analysis technique

Selviani (2017), the resulting product has passed the expert validation stage and is in small-scale trials. Widyoko (2009), module validation

$$\text{Module Validation } \bar{x} = \frac{1}{\text{Validator Count}} \times \frac{\sum x}{n}$$

Table 1. Expert Validation Achievements

Conversion Scored	Validation Score Range	Criteria

$\bar{x} > \bar{x}_t + 1{,}8\, sb_i$	$> 3{,}4$	Very good
$\overline{\bar{x}_t + 0{,}6\, sb_i <_i \bar{x} \leq \bar{x}_t + 1{,}8\, sb_i}$	$2{,}8 < x \leq 3{,}4$	Good
$\overline{\bar{x}_t - 0{,}6\, sb_i <_i \bar{x} \leq \bar{x}_t + 0{,}6\, sb_i}$	$2{,}2 < x \leq 2{,}8$	Pretty good
$\overline{\bar{x}_t - 1{,}8\, sb_i <_i \bar{x} \leq \bar{x}_t + 0{,}6\, sb_i}$	$1{,}6 < x \leq 2{,}2$	Not good
$\bar{x} > \bar{x}_t - 1{,}8\, sb_i$	$< 1{,}6$	Bad

$$\text{Effectiveness} = \frac{\text{The number of students who completed}}{\text{The number of students who took the test}} \times 100\%$$

The completeness of student learning outcomes will be seen from the calculation of the P-value (Widyoko, 2009)

Table 2. Conversion of Student Learning Outcomes

Percentage (%)	Category
p>80	Very good
60<p≤80	Good
40<p≤60	Pretty good
20<p≤40	Not good
p≤20	Bad

Practicality Module

Table 3. Conversion of Qualitative Data Into Student Response Criteria

Conversion Scored	Validation Score Range	Criteria
$\bar{x} > \bar{x}_t + 1{,}8\, sb_i$	$> 3{,}4$	Very good
$\overline{\bar{x}_t + 0{,}6\, sb_i <_i \bar{x} \leq \bar{x}_t + 1{,}8\, sb_i}$	$2{,}8 < x \leq 3{,}4$	Good
$\overline{\bar{x}_t - 0{,}6\, sb_i <_i \bar{x} \leq \bar{x}_t + 0{,}6\, sb_i}$	$2{,}2 < x \leq 2{,}8$	Pretty good
$\overline{\bar{x}_t - 1{,}8\, sb_i <_i \bar{x} \leq \bar{x}_t + 0{,}6\, sb_i}$	$1{,}6 < x \leq 2{,}2$	Not good
$\bar{x} > \bar{x}_t - 1{,}8\, sb_i$	$< 1{,}6$	Bad

Modules are said to be practical if $2{,}8 < X < 3{,}4$ (Widyoko, 2009)

C. RESULTS AND DISCUSSION

Research Result

The result of this research is a constructive-based statistics module product. The results of this module product are used as tools for students in understanding the concepts of statistical material. The resulting statistical module is to follow the research style.

The First Phase Needs Analysis

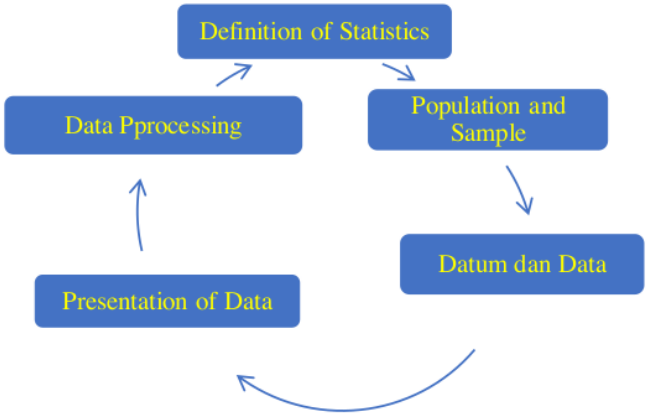
The analysis of the statistics module's needs has been contained in a background where students think about 67% need the module as a learning aid. The teacher believes that students do not like statistics material. The researcher also analyzed the statistical material syllabus as shown below:

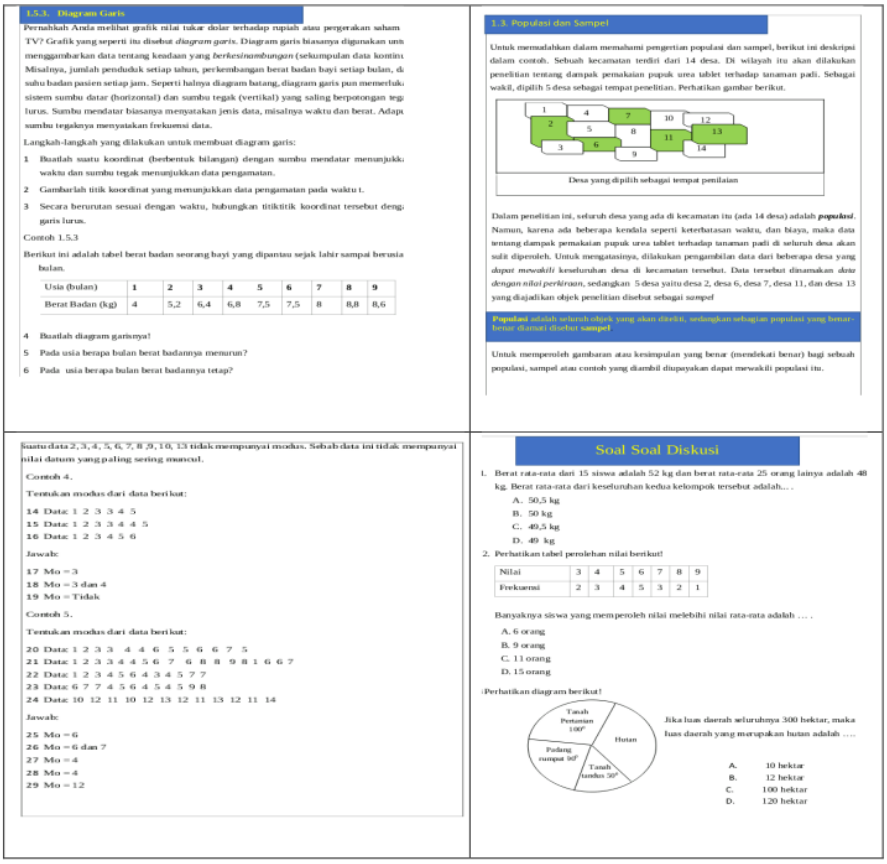
Table 4. Statistic Material Syllabus for Class VIII Junior High School K13 Curriculum.

Basic competencies	1.1 Analyze data based on data distribution, average value, median, mode, and data distribution to conclude, make decisions, and make predictions.
	1.2 Present and solve problems related to data distribution, mean, median, mode, and data distribution to draw conclusions, make decisions, and make predictions.
Competency Standards for Junior High School National Examination Graduates (SKL UN) in Statistics material	1. Students understand: presenting data in tables, line diagrams, bar charts, pie charts, mean, median, mode, data distribution. 2. Students can apply knowledge: presentation of data in the form of tables, line diagrams, bar charts, and pie charts, mean, median, mode, data distribution. 3. 3. Students can complete correctly and correctly: data presentation in the form of tables, line charts, bar charts, and pie charts, mean, median, mode, data distribution, and the probability of an event.
Goal	1. Able to understand the definitions of Statistics and Statistics correctly and adequately 2. Able to distinguish well between statistics and statistics 3. Understand the concept of presenting data, and be able to interpret the data presented in the form of tables, line charts, bar charts, and pie charts 4. Understand the concept of mean, and be able to use it in problem-solving 5. Understand the concept of the median, and be able to use it in problem-solving 6. Understand the concept of mode, and be able to use it in problem-solving 7. Understand the concepts of Sample Space, Sample Points, and Events and use them in problem-solving.

Second Phase of Module Product Design

In this phase, the researcher has designed a Class VIII SMP statistics module. The following is a concept map and an overview of the statistics module contents before being validated by material experts, validating learning experts, and teachers. This concept becomes the basis for compiling a complete statistics module.





1.5.3. Diagram Garis

Pernahkah Anda melihat grafik nilai tukar dolar terhadap rupiah atau pergerakan saham TV? Grafik yang seperti itu disebut *diagram garis*. Diagram garis biasanya digunakan unt menggambarkan data tentang keadaan yang *berkesinambungan* (sekumpulan data kontin Misalnya, jumlah penduduk setiap tahun, perkembangan berat badan bayi setiap bulan, di suhu badan pasien setiap jam. Seperti halnya diagram batang, diagram garis pun memerluk sistem sumbu datar (horizontal) dan sumbu tegak (vertikal) yang saling berpotongan tegi lurus. Sumbu mendatar biasanya menyatakan jenis data, misalnya waktu dan berat. Adapu sumbu tegaknya menyatakan frekuensi data.

Langkah-langkah yang dilakukan untuk membuat diagram garis:

1 Buatlah suatu koordinat (berbentuk bilangan) dengan sumbu mendatar menunjukk waktu dan sumbu tegak menunjukkan data pengamatan.

2 Gambarlah titik koordinat yang menunjukkan data pengamatan pada waktu t.

3 Secara berurutan sesuai dengan waktu, hubungkan titiktitik koordinat tersebut deng garis lurus.

Contoh 1.5.3

Berikut ini adalah tabel berat badan seorang bayi yang dipantau sejak lahir sampai berusia bulan.

Usia (bulan)	1	2	3	4	5	6	7	8	9
Berat Badan (kg)	4	5,2	6,4	6,8	7,5	7,5	8	8,8	8,6

4 Buatlah diagram garisnya!

5 Pada usia berapa bulan berat badannya menurun?

6 Pada usia berapa bulan berat badannya tetap?

1.3. Populasi dan Sampel

Untuk memudahkan dalam memahami pengertian populasi dan sampel, berikut ini deskripsi dalam contoh. Sebuah kecamatan terdiri dari 14 desa. Di wilayah itu akan dilakukan penelitian tentang dampak pemakaian pupuk urea tablet terhadap tanaman padi. Sebagai wakil, dipilih 5 desa sebagai tempat penelitian. Perhatikan gambar berikut.

Desa yang dipilih sebagai tempat penilaian

Dalam penelitian ini, seluruh desa yang ada di kecamatan itu (ada 14 desa) adalah ***populasi***. Namun, karena ada beberapa kendala seperti keterbatasan waktu, dan biaya, maka data tentang dampak pemakaian pupuk urea tablet terhadap tanaman padi di seluruh desa akan sulit diperoleh. Untuk mengatasinya, dilakukan pengambilan data dari beberapa desa yang *dapat mewakili* keseluruhan desa di kecamatan tersebut. Data tersebut dinamakan *data dengan nilai perkiraan*, sedangkan 5 desa yaitu desa 2, desa 6, desa 7, desa 11, dan desa 13 yang diajadikan objek penelitian disebut sebagai *sampel*

Populasi adalah seluruh objek yang akan diteliti, sedangkan sebagian populasi yang benar-benar diamati disebut **sampel**

Untuk memperoleh gambaran atau kesimpulan yang benar (mendekati benar) bagi sebuah populasi, sampel atau contoh yang diambil diupayakan dapat mewakili populasi itu.

Suatu data 2, 3, 4, 5, 6, 7, 8 ,9, 10, 13 tidak mempunyai modus. Sebab data ini tidak mempunyai nilai datum yang paling sering muncul.

Contoh 4.

Tentukan modus dari data berikut:

14 Data: 1 2 3 3 4 5
15 Data: 1 2 3 3 4 4 5
16 Data: 1 2 3 4 5 6

Jawab:

17 Mo = 3
18 Mo = 3 dan 4
19 Mo = Tidak

Contoh 5.

Tentukan modus dari data berikut:

20 Data: 1 2 3 3 4 4 6 5 5 6 6 7 5
21 Data: 1 2 3 3 4 4 5 6 7 6 8 8 9 8 1 6 6 7
22 Data: 1 2 3 4 5 6 4 3 4 5 7 7
23 Data: 6 7 7 4 5 6 4 5 4 5 9 8
24 Data: 10 12 11 10 12 13 12 11 13 12 11 14

Jawab:

25 Mo = 6
26 Mo = 6 dan 7
27 Mo = 4
28 Mo = 4
29 Mo = 12

Soal Soal Diskusi

1. Berat rata-rata dari 15 siswa adalah 52 kg dan berat rata-rata 25 orang lainya adalah 48 kg. Berat rata-rata dari keseluruhan kedua kelompok tersebut adalah... .
   A. 50,5 kg
   B. 50 kg
   C. 49,5 kg
   D. 49 kg
2. Perhatikan tabel perolehan nilai berikut!

Nilai	3	4	5	6	7	8	9
Frekuensi	2	3	4	5	3	2	1

Banyaknya siswa yang memperoleh nilai melebihi nilai rata-rata adalah ... .
A. 6 orang
B. 9 orang
C. 11 orang
D. 15 orang

Perhatikan diagram berikut!

Jika luas daerah seluruhnya 300 hektar, maka luas daerah yang merupakan hutan adalah ....

A. 10 hektar
B. 12 hektar
C. 100 hektar
D. 120 hektar

Figure 5. Module Design Before Validation

Third Phase Expert Validation

1. Validation Material Expert

The validation of statistical material experts looks at the validity of the statistical module based on the constructiveness in terms of the content of the learning material, namely Statistical Definition, statistics, data, mean, median, mode, standard deviation, and variance.

Table 5. Validation Material Expert

Rated Aspect	Average	Interpretation
Module Contents	79,23	Baik

The validation results by material experts showed that the average percentage of the overall aspect assessment was 79.23, which shows each sub materials statistical material in terms of the accuracy of the content and the content's presentation has a reasonable interpretation. The module is categorized as valid 3.2.

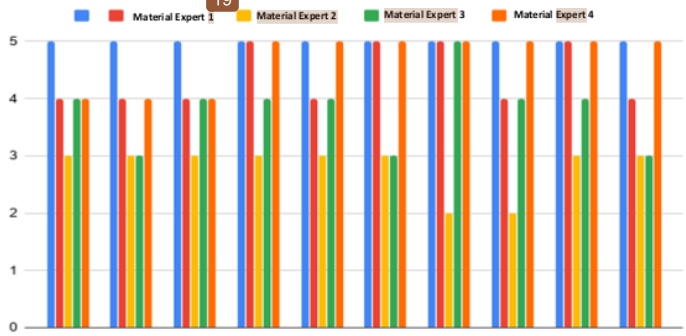


Figure 6. Statistical Material Expert Validation

From these results, the statistical material or statistics module based on a constructive is suitable for use in learning mathematics subjects in statistics material. Before material experts comment on module improvements, material experts first validate the syllabus and lesson plans. After going through several repairs of the statistics module from the experts, the last stage the researcher returned to show the statistics module that had been repaired simultaneously gave a questionnaire to the material expert to be assessed on the validity of the module made. Many inputs provided by material experts At the end of the validation questionnaire, material experts are asked to suggest constructive-based statistical materials.

2. Learning Expert Validation

The validation of learning experts looks at the validity of the constructive-based statistics module regarding the modules' usefulness and learning resources included in the learning process. Learning experts and teachers focus on consistency of constructive use in each material presented and sample questions given in the statistics module. Learning experts and teachers provide input on revisions and improvements in the statistics module. These inputs include completing each material with at least two

sample questions, adjusting the practice questions to the examples in the statistics module, making basic concepts, and defining them in the sub-material.

Table 6. Expert Validation of Learning

Model Aspects	Average	Interpretation
Constructivist Learning	93,33	Very good

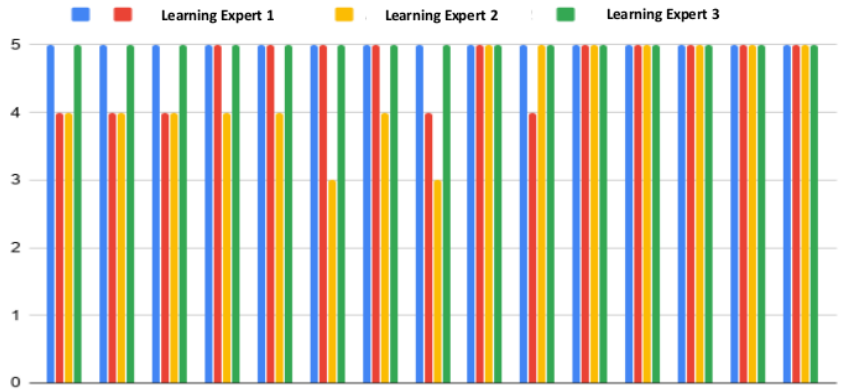


Figure 7. Learning Expert Validation

The validation results by the statistics module learning expert were 93.33, and this is very good in helping students in the learning process both at school and studying at home. The statistical module made is also classified as valid according to the learning expert with a validation score of 3.6. In this case, it is considered very good to explain, making it easier for students to understand the definitions and concepts of statistics in general and specifically.

Learning experts also commented on the aspects or aspects of language. The language used is not too high and easy for students to understand. It can be seen from the example questions that always link it into everyday life. It can be seen from Figure 6. Based on the researcher's instruments, learning experts two and three provide an assessment of the statistics module categorized as very good and suitable for grade 8 students. Similarly, teaching experts 1 gives good responses in the statistics module that has been made.

The module that was made was indeed excellent from the assessment of the three learning experts. However, the learning experts still responded in completing the module into effective, efficient, and productive modules for use on a large scale.

1. A constructive-based statistics module should show group discussion questions in general and specifically at the end of the material;
2. Using language that is easy to understand and standardized;
3. The module that is made must be tested on a large scale;
4. Adjusting to the development of the existing curriculum;
5. Pouring the module content into internet media, such as making videos;
6. Modules to be considered in trials in the experiment on a reasonably large scale;
7. The level of difficulty of the questions is expected to be considered.

Fourth Phase of Feasibility Trial, the Effectiveness of the Statistics Module

1. Small-Group Trial / Feasibility Test of Statistics Module

   This module can meet students' needs and according to the students' fundamental abilities after being revised based on the validation of material experts, learning experts, and mathematics teachers. The information expected is about the module's quality and the module being used as a tool or primary source in activities in the classroom's learning process.

Table 7. Small-Group Trial / Feasibility Test for Statistics Module

Small Scale	Percentage	Category
The aspect of effectiveness	85,71	Very good

The statistics module's assessment is classified as very good, with an assessment score of the response being 85.71. The statistics module is ready to be tested on a larger scale from the student's answer by giving an outstanding response. It is categorized as very suitable to be used in improving learning outcomes.

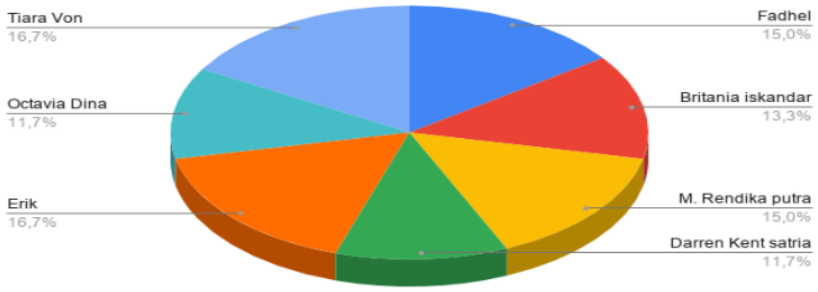


Figure 8. Small Scale Student Value Pie Chart

The small group trial results showed that the average percentage of the overall assessment aspects was 85.71. Problems given by researchers to small group students can also be answered well by students. Researchers continue to analyze data and see the distribution of students' results; it is clear from Figure 8, the pie chart, that students' abilities are evenly distributed in obtaining learning outcomes. From the respondents only, it can be seen that two students cannot answer the two questions with a score of 11.7% from a maximum of 16.7%.

2. Field test, Constructivist-based Statistics Module Effective Test

   The statistics module received a good response from students. Before the researcher gives a constructive-based statistics module to students, the researcher first provides a test with or pre-test question to test students' knowledge of the statistics material. From the pre-test results, it can be seen that the average product is 23.13, where the ten pre-test questions that the researcher gave students could only answer questions number one

and number two. Then, the researcher gave the students a validated statistics module and asked them to study at home for one week.

It is necessary so that researchers can see the module's effectiveness on a constructive basis that has passed the validation and feasibility testing phases. In the second week, the researcher taught the material and carried out a post-test to the students. The students' mean scores' learning outcomes showed a significant increase, from the previous average of only 23.13 to an average result of 94.11. It did not stop at that stage. The researcher also provided an instrument in the form of a questionnaire to students to respond. The results were used as material for evaluating a constructive-based statistics module.

Table 8. Statistics Module Field Trials

Aspects Assessed	Score	Category
Learning	85,84	Very good
Theory	79,38	Good
Module View	80,23	Very good
Mean	81,81	Very good

The learning aspect received an outstanding response from the students, with the score of the respondents was 85.84. The content element of the material scored 79.38 and was categorized as useful. Module display aspects. The students gave an average rating of 80.23.

Confirms in ter[16] of appearance and construction that the statistics module can be used as a tool and is suitable for use in the learning process in improving the learning outcomes of Grade 8 junior high school students.

Fifth Phase Evaluation of the Practicality of the Statistics Module

Table 9. Student Score Data Before and After Using The Statistics Module

No. Student	Before Using	After Using
1	40	90
2	30	80
3	40	90
4	40	100
5	30	100
6	30	100
7	20	100
8	10	100
9	10	100
10	20	100
11	30	100
12	30	100
13	10	100
14	10	100
15	10	90
16	10	90
Mean	23,12	96,25

By looking at table 9 above, the researcher saw a significant increase in students' scores. Students can complete the test questions given by the researcher and finish them properly. This significant increase is indicated by the average value obtained by students before using the statistics module is 12.25, and the average value obtained after using the statistics module is 96.25. They saw the difference between the two averages, a significant increase in the learning process with the statistics module aids with a difference of 75.13. With such growth and achievement, it can be ascertained that it exceeds the KKM in Grade 8 Middle School in mathematics.

Discussion

This study's results indicate that the material expert validation provides an assessment of the content aspects of 79.23, which are categorized as Good, and the constructive-based statistics module is valid with a score of 3.2. Material experts think that this module's concepts are outstanding, have good structure, and are well presented. Learning experts also believed that this statistics module received an overall assessment of 93.33 aspects and was categorized as very good and valid with 3.6. Figure 7, depicted in the bar diagram, shows that the three learning experts who rated this module gave excellent responses.

After the module is said to be valid by the expert, the statistics module is tried out in small groups or on a smaller student scale to see its validity than the module before field trials are carried out. Students in the small group trial gave excellent responses with an assessment score of 85.71. From this short group trial phase, the statistics module is feasible to be tested in the field. Researchers get many positive responses from students and researchers to improve the statistics module before being tested in the area. The following are the responses given by students.

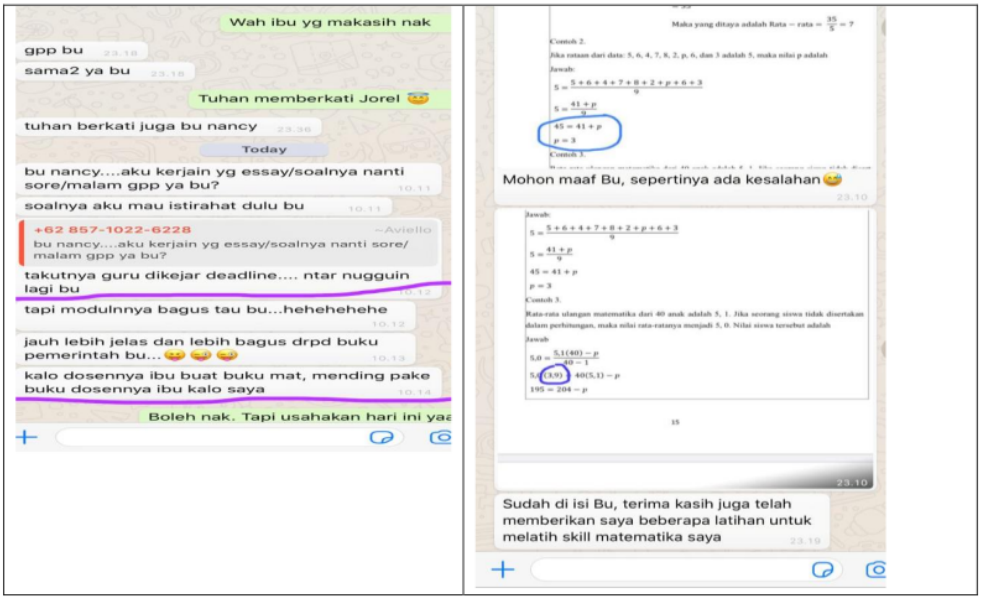


Figure 9. Student response to the statistics module

Many students gave responses in refining this module, improving basic concepts and module structure. The researcher made two revisions and consulted with experts and teachers to synchronize students' input according to their needs after revising the module from the small group's results from the little group trial results. Researchers conducted field trials, students who became the place for field trials gave an assessment with a score of 81.81 and were categorized as very good and practical.

The results of the implementation of the constructive-based statistics module field trials were declared effective, which means that the average response rate from students was categorized as high or very good. Then the researcher saw the results of the evaluation of learning outcomes before using the module and after using the statistics module. Data on student learning outcomes show a significant difference between before using the module and after using it. Before using the module, the average score of students was 23.12, and after using the module, the average score was 96.25.

It has an average difference of 73.13. In this case, the module is categorized as practical and effective in improving Class VIII junior high school students' learning outcomes.

This statistics module benefits Class VIII junior high school students in understanding the basic concepts of statistics. The teacher can also use this constructive-based statistics module as a tool in the classroom's learning process. This module not only contains ideas but is equipped with a constructive approach model. According to the compiled concept map, statistics modules that are already valid and tested will be easy to understand in stages. This constructive-based statistics module can guide students to learn independently, and students will be able to solve problems related to problem-solving. Students have skills in solving problems with the help of sample questions in the module.

Material experts have validated the following modules, learning experts and teachers have passed the trial process on a small scale and field trials: (https://drive.google.com/file/d/1bTt_gXSfoYHdB4jUcN_LiP3KqKuYNCkI/view?usp=sharing).

C. CONCLUSIONS AND SUGGESTIONS

Conclusions

Based on the results of the analysis and discussion that the researchers conducted, it can be concluded:

1. The researcher's statistics module conforms to the competency standards in K13 used by Grade 8 junior high schools.
2. The modules compiled are under the draft and module models for class VIII SMP level.
3. The statistics module prepared by constructive-based researchers has passed the Development phase process.
4. The compiled statistics module has been validated by material experts and learning experts with useful and reasonable responses.
5. The statistics module compiled has passed the validation of school teachers teaching at the junior high school level
6. Students in small groups have validated the statistics module and are categorized as feasible and with a special assessment.
7. The statistics module for grade 8 junior high school level that has been validated and tested is said to be feasible and practical to be used as a tool in the learning process both at school and at home by students.
8. The statistical module has been useful by seeing a significant increase from before using the module with an average of 23.12. After using the module with an average of 96.25, the average difference is 77.13.
9. The statistics module for Class 8 Junior High School can be used on a large enough scale, and the technology-based distance learning process is carried out.
10. The following is an online version of the constructivism-based statistics module: (https://drive.google.com/file/d/1bTt_gXSfoYHdB4jUcN_LiP3KqKuYNCkI/view?usp=sharing)

Suggestion

1. Statistics modules that have been validated and have received outstanding interactions need to be developed into video or digitally.
2. The statistics module Class 8 SMP needs to have been experimented on a larger scale to be used at the regional level or widely.
3. It is necessary to do other modules for other materials considered difficult and require tools in the form of modules that can support the smooth learning process and become a learning aid for students at home.
4. The statistics module for Class 8 SMP needs to be adapted to individual schools' learning model.

REFERENCES

Anas Sudijono. 2003. *Pengantar Statistik Pendidikan*. Bandung: PT Raja Grapindo Persada.

Arikunto & Suharsimi. 2006. *Prosedur Penelitian Suatu Pendekatan Praktik*. Jakarta

Arsyad, Azhar. 2013. *Media mata pelajaran edisi revisi*. Jakarta: Raja grafindo Persada.

Branch Robert Maribe. 2009. Instructional Design: The ADDIE Approach. New York: Springer Science & Business Media, LLC

Dewey, John. 1964. Democracy and Education. New York: The Macmillan Compan

Habibi, Muhamad. 2014. *Pengembangan Modul Pecahan Berbasis Konstruktivisme dengan Sisipan*.

Heruman. 2007. *Model Pembelajaran Matematika*. Bandung: PT Remaja Rosdakarya.

Ika Lestari. 2013. *Pengembangan Bahan Ajar Berbasis Kompetensi*.

Johnson dan Rising. 1972. Math on Call: A Mathematics Handbook, Great Source Education Group, Inc./Houghton Mifflin Co

Kalikatur Untuk Kelas IV Sekolah Dasar. Proceedings of the National Seminar on Mathematics Education. P. 27-48 UNINUS. Bandung. ISBN: 978-602-7648-05-0.

Ministry of Education. 2008. *Penulisan Modul*. Jakarta: Ministry of Education.

Ministry of Education. 2006. *Kurikulum Tingkat satuan Pendidikan* (KTSP) for Elementary School / MI. Jakarta: Terbitan Depdiknas.

Nadeak, Bernadetha. 2019. *Manajemen Pelatihan dan Pengembangan*. Jakarta: UKI Press.

OECD. 2019. Indonesia PISA 2018 Results. Paris: OECD Publishing.

Pannen. (1995). *Mengajar di Perguruan Tinggi, buku empat, bagian "Pengembangan Bahan Ajar"*. Jakarta: PAU-PPAI, Universitas Terbuka

Republik Indonesia. 2003. Law Number 20 of 2003 Concerning the National Education System. Jakarta: State Secretariat of the Republic of Indonesia.

Seels, B.B. dan Glasgow, Z. (1990). Exercises in Instructionals Design. Columbus: Merril Publishing Company

Seels, B.B. & Richey, R.C. (1994). Instructional technology: the definition and domains of the field. (Terjemahan Yusuf Hadi Miarso, Dewi S Prawiradilaga & Raphael Rahardjo. IPTPI, Unit Percetakan UNJ).

Selviani. 2017. *Pengembangan Bahan Ajar Matematika Berbasis Masalah Pada Pokok Bahasan Statistika Kelas VIII MTsN Model Makassar*. (Essay). UIN Alauddin Makasar.

Sungkono. 2003. *Pengembangan dan Pemanfaatan Bahan Ajar Modul dalam Proses Mata Pelajaran*. Makalah Yogyakarta: FIP UNY

Supardi, Aizyah; Gusmania, Yesi; Amelia Fitrah. 2019. *Pengembangan Modul Mata Pelajaran Matematika Berbasis Pendekatan Konstruktivisme pada Materi Logaritma*. Journal of Mathematics and Mathematics Education. Universitas Riau Kepulauan. ISSN 2579-7646

Sugiyono, *Metode Penelitian Kuantitatif, Kualitatif dan R&D*. Bandung: Alfabeta, 2009.

Warsita, Bambang. 2008. *Teknologi Mata pelajaran Landasan & Aplikasinya*. Jakarta: Rineka Cipta.

Widyoko, E. P. 2009. *Evaluasi Program Mata Pelajaran*. Yogyakarta: Pustaka Pelajar.

DEVELOPMENT OF A CONSTRUCTIVISM-BASED STATISTICS MODULE FOR CLASS VIII JUNIOR HIGH SCHOOL STUDENTS

ORIGINALITY REPORT

10%	5%	5%	4%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	Submitted to Kalasin University Student Paper	3%
2	moam.info Internet Source	2%
3	A Prabowo, R P Anggoro, D Astuti, S Fahmi. "Interactive multimedia-based teaching material for 3-dimensional geometry", Journal of Physics: Conference Series, 2017 Publication	1%
4	Mutia, K N S Effendi, Sutirna. "PISA-LIKE: Uncertainty and data content in Statistics subject with futsal context", Journal of Physics: Conference Series, 2021 Publication	<1%
5	repository.usd.ac.id Internet Source	<1%
6	Nilam Sri Anggraheni, Nurul Hidayah, Ayu Nur Shawmi. "Developing Red-White Monopoly	<1%

	Games through Integrative Thematic Learning in the Primary School", Al Ibtida: Jurnal Pendidikan Guru MI, 2019 Publication	
7	en.wikipedia.org Internet Source	<1%
8	journal.unilak.ac.id Internet Source	<1%
9	mafiadoc.com Internet Source	<1%
10	Submitted to Higher Education Commission Pakistan Student Paper	<1%
11	primary.ejournal.unri.ac.id Internet Source	<1%
12	Submitted to Texas Christian University Student Paper	<1%
13	Wahyuni Satria Dewi, Renol Afrizon. "Validity of handout development of physics education statistics course using a cooperative problem solving (CPS) model", Journal of Physics: Conference Series, 2020 Publication	<1%
14	Herminarto Sofyan, Tawarjono Us, Muhkamad Wakid, Bambang Sulistyo. "Developing Micro-	<1%

Teaching Video As Learning Media In Automotive Teacher Education", Journal of Physics: Conference Series, 2019
Publication

15	Mhmd Habibi, Dwi Lasia, Mesi Oktafia, Muhammad Ilham. "Habits of Mind Strategies for Enhancing Students' Math Problem Solving Skills", JTAM (Jurnal Teori dan Aplikasi Matematika), 2020 Publication	<1%
16	digilib.iain-palangkaraya.ac.id Internet Source	<1%
17	jurnal.unimed.ac.id Internet Source	<1%
18	Fenny Thresia -. "VIDEO TO AMPLIFY BANKING STUDENT'S WRITING PERFORMANCE", PREMISE JOURNAL:ISSN online: 2442-482x, ISSN printed: 2089-3345, 2017 Publication	<1%
19	R T Sancoko, D Nurhadiyanto. "Developing blog-based learning media for basic mechanical engineering subjects", Journal of Physics: Conference Series, 2020 Publication	<1%
20	Vira Pratiwi, Laely Farokhah, Zaenal Abidin. "A LESSON DESIGN OF ALGEBRAIC THINKING	<1%

IN ELEMENTARY SCHOOL AS AN EFFORTS TO DEVELOP MATHEMATICAL LITERATION IN INDUSTRIAL ERA 4.0", PrimaryEdu - Journal of Primary Education, 2019
Publication

21	Suwasono Suwasono, Dwi Prihanto, Irawan Dwi Wahyono, Andrew Nafalski. "Virtual Laboratory for Line Follower Robot Competition", International Journal of Electrical and Computer Engineering (IJECE), 2017 Publication	<1%
22	inba.info Internet Source	<1%

Exclude quotes	On	Exclude matches	Off
Exclude bibliography	On		