The Computer Student Worksheet Based Mathematical Literacy for Statistics

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Abstract. The student worksheet is one of media teaching which is able to improve teaching an activity in the classroom. Indicators in mathematical literacy were included in a student worksheet is able to help the students for applying the concept in daily life. Then, the use of computers in learning can create learning with environment-friendly. This research used developmental research which was Thiagarajan (Four-D) development design. There are 4 stages in the Four-D, define, design, develop, and disseminate. However, this research was finish until the third stage, develop stage. The computer student worksheet based mathematical literacy for statistics executed good quality. This student worksheet is achieving the criteria if able to achieve three aspects, validity, practicality, and effectiveness. The subject in this research was the students at The 1st State Senior High School of Driyorejo, Gresik, grade eleven of The 5th Mathematics and Natural Sciences. The computer student worksheet products based mathematical literacy for statistics executed good quality, while it achieved the aspects for validity, practical, and effectiveness. This student worksheet achieved the validity aspects with an average of 3.79 (94.72%), and practical aspects with an average of 2.85 (71.43%). Besides, it achieved the effectiveness aspects with a percentage of the classical complete students of 94.74% and a percentage of the student positive response of 75%.

1. Introduction
As the times, problems in daily life become increasingly complex. It became important for people to improve the quality of an individual to solve the more complex. Mathematics is a branch science that can help individuals to solve problems in the daily life. Hence, the quality of learning to school mathematics must be improved.

Learning mathematics at school aims to teach students with mathematical concepts that can be used to solve the problem daily life. It is many ways for teachers to can realize a mathematics learning that actively, creative, and effective. The one of the way to make mathematics learning better is increasing mathematical literacy. Mathematical literacy is an individual capacity in formulating, implement, and interprets or evaluated the mathematical conception to solve problems in daily life.
Teachers can improve student mathematical literacy by student worksheet. The student worksheet is a learning tool that can help the teacher to teach mathematics concept. It is hoped that teacher can develop of teaching materials suitable to the character of students. Actually, the teachers are need sorting and developing the student worksheet that will presently serve by students. The criterion of the mathematical literacy is linked matter learning mathematics with daily life.

Generally, using the student worksheet in learning is needs a lot of paper. That is including one of the environmentally-unfriendly activity. The environmentally-unfriendly activity contradicts with sustainable development goals (SDGs) based on human rights to social development, economic and environmental (BAPPENAS, 2015). On the other side, most students in high school level can operate a computer well. Therefore, the application of student worksheet better also use modern technology currently by using a computer. Instead of creating an environmentally friendly, using a computer can help students work effectively and efficiently. Thus, student worksheet can be applied by using a computer.

Observation by the researcher at The 1st State Senior High School of Driyorejo shows that the most mathematics teacher only uses the worksheet provided by the school while students less motivated to learn mathematics concept from that student worksheet. In addition, just a little contextual exercise cause students only remember the concept without knowing the useful in daily life while students need contextual exercise so that students able to implement mathematics concept to solve their problem in real life. Hence, its need to develop a student worksheet that can help students reached mathematical literacy by using a computer.

Statistics is a branch of mathematics that often people use to presenting quantitative data. It is important for teachers to teach statistics to students by adopting contextual problem because the application of statistics closer to daily life. Developing a student worksheet for mathematics is one solution of teaching mathematics to students by contextual learning.

Based on the above analyse, we need to do research about, “The Computer Student Worksheet Based Mathematical Literacy for Statistics”. Then, the problem that we must solve it among. The specific research question was: How the process of developing computer student worksheet based mathematical literacy for statistics? Is the result of developing computer student worksheet based mathematical literacy for statistics with good quality? Products expected in research development was: the computer student worksheet based Mathematical Literacy for statistics good quality which fulfilled the criteria valid aspects, the practical, and an effective; the computer student worksheet based Mathematical Literacy for statistics appropriate for the purpose of learning the curriculum applied and contain matter statistics the data group.

2. Literature Review

2.1 Mathematical Literacy
Mathematics plays an important role in daily life. That can be seen when people use mathematics to solve a problem in daily life. Therefore, mathematics is very important for students so they can apply mathematics concept to solve their problem in the real life. Based on it, mathematics literacy is necessary to teach a concept to students and how to apply them.

Mathematics literacy is seen by NCTM (1989) as an individual ability to explore, predict, logical reasoning, and use numerous mathematical methods effectively to solve the problem. Understanding mathematics literacy that was triggered by NCTM shows that there are four main components in mathematics literacy used to solve the problem, among other explore, predict, using logical reasoning, and apply mathematical methods.

Mathematical literacy is an individual’s capacity to identify and understand the role that mathematics plays in the world, to make well-founded judgments and to use and engage with mathematics in ways that meet the needs of that individual’s life as a constructive, concerned and reflective citizen (OECD, 2003).
In addition, Stecey and Turner (2015) equate literacy in the context of mathematics is the ability to use mathematical reasoning in problem-solving in daily life to be ready challenges life. Mathematics reasoning has included mindset problem solving, thinking logically, communicate and explains. The mindset developed based on the concept, procedures, and the mathematics relevant to the problems facing.

Definition mathematical literacy explained more specifically by OECD (2013) that mathematical literacy is an individual’s capacity to formulate, employ, and interpret mathematics in a variety of contexts. It includes reasoning mathematically and using mathematical concepts, procedures, facts and tools to describe, explain and predict phenomena. Through mathematical literacy, individuals can recognize the role of mathematics in daily life and use it in making the right decisions as building human, care and think (OECD, 2013, 2016).

The definition of above basically has the same sense in defining literacy mathematics. All three have in common, that is using mathematics in solving the problem in the real world. The whole point of using mathematics covering, the ability of an individual in formulating, apply, and interpreting mathematics to various method and devices to solve the problem in the real world. So, can be concluded that mathematical literacy is the ability of an individual to formulate, apply, and interpret the mathematics concept by using mathematics tools to solve the problem in daily life. Definition mathematical literacy above shows that literacy mathematics consists of two components, the process of mathematics and around the basics of mathematics.

2.2 The Student worksheet
In the world educated at a school, in addition to text books, also introduced the instructional a sheet of various, one of them is a student worksheet. The material used to support the process learn it called as teaching material. The student worksheet is one of the tools of learning ordinarily made by educator or observers education and also used as teaching materials when learning. The student worksheet defined by P2M PGSD FKIP UNS team (2002) as the guidelines for students to undertake work planning as a means of knowledge and skills needed students.
Prastowo (2011) outlines that student worksheet is a material composed of sheets containing matter, summary, and question exercises to be undertaken by students referring to basic competence to achieve. Based on it, the content of student worksheet can be matter, summary, question exercise to guide students in doing learning activities. The purpose of making a student worksheet namely to cultivate and developing cognitive aspects (knowledge) and affective aspects (attitude) students referring to basic competence to be achieved.

Based on three definition student worksheet above it can be concluded that student worksheet is teaching materials as a guideline for students to do activity which can develop their knowledge and skill referring to the purpose of learning. The steps at the preparation of student worksheet according to main by National Education Department (2008) is as follows:

- Curriculum Analysis. Steps curriculum analysis intended to determine which materials that require teaching materials student worksheet. Usually, in determining matter analysed by ways of seeing subject matter and learning to an experience of the matter would be taught, then competence supposed to be possessed by students.
- Composing list student worksheet needs. Sequence student worksheet it was needed to determine priorities writing. Started by curriculum analysis and analysis of learning.
- Determine sections of the student worksheet. Determine sections of the student worksheet based on basic competence of a curriculum, main material, and learn to experience.

3. Method
This research used developmental research which was Thiagarajan (Four-D) development design. There are 4 stages in the Four-D, define, design, develop, and disseminate. However, this research was finish until the third stage that is developing stage because it just produces a student worksheet. The subject of this research is students at the second grade in 1st State High School of Driyorejo. Then, the object of this research is computer student worksheet based mathematical literacy for statistics. Types of data on want to obtain and the data collection instrument will use is as follows.

| Data Type | Data Collection Instrument |
|-----------|---------------------------|
| Validity  | Validity sheet            |
| Practicality | Paper questionnaire about practical |
| Effectively | Test; Student Questionnaire. |

3.1 Stage I: Define
The purpose of this stage is to stipulate and define instructional requirements. The initial phase is mainly analytical. Through analysis, we describe objectives and constraints for the instructional materials. The five steps of the stage are front-end analysis, learner analysis, task analysis, concept analysis, specifying instructional objectives.

3.2 Stage II: Design
The purpose of this stage is to design prototype instructional material. This phase can begin after the set of behavioral objectives for the instructional material has been established selection of media and formats for the material and the production of an initial version constitutes the major aspects of the design stage. The four steps in this stage are constituting criteria on referenced tests, media selection, format selection, and initial design.

3.3 Stage III: Develop
The purpose of Stage III is to modify the prototype instructional material. Although much has been produced at the define stage, the results must be considered an initial version of the instructional material which must be modified before it can become an effective final version. In the development
stage, feedback is received through formative evaluation and the materials are suitably revised. The two steps in this stage are an expert appraisal and developmental testing.

4. Result
There are two kinds of research, among other results the process of development computer student worksheet and the result of developing computer student worksheet. The results of the process of developing computer student worksheet are starting to define stage, design stage until develop stage while the result of developing is considered as validity of student worksheet, practicality student worksheet, and effectively of student worksheet. The analysis of the research results as follows.

The Result of Process of Computer Student worksheet Development
At define stage, front-end analysis is undertaken by identifying problems and analyse curriculum. The problems identified are worksheet students only having a little exercise about daily life context. Based on 2013 curriculum used in The 1st State Senior High School of Driyorejo grade the second class of a high school of the major Mathematics and Natural Science, statistics of the material taught in the even semester and exercise matter statistics on the student worksheet are at least. Beside of that, student has got statistics material at the time ago. So, student worksheet composed to apply students cognitive about statistics. Then, the concept analysis determines statistics sub-material what would be contained in student worksheet. Task analysis is formulates the structure of contents and mathematical literacy indicator of the student worksheet. The indicators of mathematical literacy as follows.

Table 2. Indicators of Mathematical Literacy

| Mathematical Process | Indicators of Mathematical Literacy |
|----------------------|------------------------------------|
| The First: formulating situations mathematically. | Identify the underlying mathematical variables and structures in the real world problem, and make assumptions so that they can be used |
| | Use an understanding of the context to guide or expedite the mathematical solving process, e.g. working to a context-appropriate level of accuracy |
| The Second: employing mathematical concepts, facts, procedures and reasoning. | Activate effective and sustained control mechanisms across a multi-step procedure leading to a mathematical solution, conclusion or generalisation. |
| | Explain, defend or provide a justification for the processes and procedures used to determine a mathematical result or solution |
| | Connect pieces of information to arrive at a mathematical solution, make generalisations or create a multi-step argument. |
| | Understand and utilise formal constructs based on definitions, rules and formal systems as well as employing algorithms |
| | Know about and be able to make appropriate use of various tools that may assist in implementing processes and procedures for determining mathematical solutions |
| | Make sense of, relate and use a variety of representations when interacting with a problem |
| | Interpret mathematical outcomes in a variety of formats in relation to a situation or use; compare or evaluate two or more representations in relation to a situation |
Table 2. Indicators of Mathematical Literacy

| Mathematical Process | Indicators of Mathematical Literacy |
|----------------------|-------------------------------------|
| Articulate a solution, show the work involved in reaching a solution and/or summarise and present intermediate mathematical results |
| The Third: interpreting, applying and evaluating mathematical outcomes. |
| Interpreted mathematical outcomes in a variety of formats in relation to a situation or use; compare or evaluate two or more representations in relation to a situation |
| Construct and communicate explanations and arguments in the context of the problem |

Formulating the purpose of learning contains the lesson plan.

At stage II (design stage), researchers composing student worksheet with formulated students activity in accordance with indicators mathematical literacy. As for students activity that will show at student worksheet as follows.

Table 3. Students Activities at Student worksheet

| Indicators of Mathematical Literacy | Students Activities |
|-------------------------------------|---------------------|
| Identify the underlying mathematical variables and structures in the real world problem, and make assumptions so that they can be used |
| Given the exchange rate buy, students can find the middle rate (variable) |
| Use an understanding of the context to guide or expedite the mathematical solving process, e.g. working to a context-appropriate level of accuracy |
| Students apply the concept of mean of single data to determine middle rate. |
| Activate effective and sustained control mechanisms across a multi-step procedure leading to a mathematical solution, conclusion or generalisation. |
| Students explain procedures to distribute a single data became group data and make the frequency table. |
| Explain, defend or provide a justification for the processes and procedures used to determine a mathematical result or solution |
| Students explain the purpose of sorts the smallest until the largest data and explain why in determining interval using the division concept. |
| Connect pieces of information to arrive at a mathematical solution, make generalisations or create a multi-step argument. |
| Students distribute single data according to stage exactly. |
| Understand and utilise formal constructs based on definitions, rules and formal systems as well as employing algorithms |
| Students can operate Microsoft Excel to solve problem of the student worksheet. |
| Know about and be able to make appropriate use of various tools that may assist in implementing processes and procedures for determining mathematical solutions |
| Students used diagram’s histogram to explain the exchange rate USD-IDR years 2016. |

Make sense of, relate and use a variety of representations when interacting with a
Table 3. Students Activities at Student worksheet

| Indicators of Mathematical Literacy | Students Activities |
|-----------------------------------|---------------------|
| Articulate a solution, show the work involved in reaching a solution and/or summarise and present intermediate mathematical results | Students can explain diagram which the corresponding to present the data the group |
| Interpreted mathematical outcomes in a variety of formats in relation to a situation or use; compare or evaluate two or more representations in relation to a situation | Students can explain the exchange rates USD-IDR with described diagram histogram that have been made. |
| Construct and communicate explanations and arguments in the context of the problem | Learners evaluate steps solving problems that have been made citing the obstacles and solutions made. |

The student worksheet format is selecting according to described by National Education Department (2008). A device advocates selected was Microsoft Excel. Why choose Microsoft Excel? Based on a loaded student worksheet, the data displayed in large numbers so students need Microsoft Excel to make them when sort data, determine a range of the data, determining the interval data, and make a frequency table. Initial design based on analysis at a defined stage. Then, the last step from this stage is composing test.

At a develop stage, the result of initial design was validated by a lecturer of Mathematics Education in State University of Surabaya and Mathematics teacher in 1st State High School of Driyorejo. After that, researchers are revised student worksheet according to the result of validity. The results of student worksheet that have revised were tried to students (research subject). Then, teacher and students answer the practicality questionnaire, after that the students did a test and answer the students’ response questionnaire.

The Result of Development of Student worksheet
Charging questionnaire practicality by teachers and students, a student competency, and filling students response questionnaire obtained data as follows.

Table 4 The Result of Research

| Aspect        | Data Result                  | Percentage |
|---------------|------------------------------|------------|
| Validity      | Total Mean of validity       | 3.79       |
|               | (94.72%)                     |            |
| Practicality  | Total Mean of Practicality   | 2.85       |
|               | (71.43%)                     |            |
| Effectively   |                              |            |
| ✓ Test        | Class Score                  | 94.74%     |
| ✓ Students response | Positive Response of The Students | 75%       |

5. Data Analysis
There are two kinds of research, among other results the process of development student worksheet and the result of developing student worksheet. The results of the process of student worksheet development description of the research phase are starting to define stage, design stage until develop
stage while the result of developing is considered as the validity of student worksheet, the practicality student worksheet, and the effectively of student worksheet. The analysis of the research results as follows.

5.1 Analysis of Student worksheet Validity
The average of validity at the format aspect of 3.50, language aspect of 4.00, and content aspect of 3.87, shows that student worksheet have contained indicators of mathematical literacy. All of the aspect have reached validity category. The average of the lowest criteria found in completeness instructions criteria. At the student worksheet that has not revised, the instructions to distribute single data to group data by using Microsoft Excel at least. Based on validity calculation, we can get Computer Student worksheet Based Mathematical Literacy for Statistics is valid with the average of the validity of 3.79, or in the percentage of 94.72%. So, the student worksheet which developed are validated.

5.2 Analysis of Student worksheet Practicality
The student worksheet which developed is practically based on practicality aspect calculation and category of student worksheet practicality by described Riduwan. We get computer student worksheet based mathematical literacy for statistics is practical with the average of student worksheet practicality of 2.85 or in the percentage of 71.43%.

5.3 Analysis of Student worksheet Effectiveness
Competence test of students has been completed based on an effectively category by described Mulyasa. We get computer student worksheet basec mathematical literacy for statistics has been completed with classical completed very high of 94.74%. The student worksheet that developed get positive response from students. Any positive response indicated based on the determination of category elaborated by Khabibah. So, based computing student worksheet mathematical literacy for statistics a statement expressed such items positive by the acquirement of the percentage of any positive response by 75%. According to the theory on their effectiveness of student worksheet, if student competency tests had been completed and student worksheet get any a positive response from students then student worksheet developed which is effective.

6. Discussion
In this research, validation of student worksheet both in theoretical and empirical expressed validly. But there was a criterion on format aspect that has not according to the criteria valid or was very valid. The criteria is not valid that is the instruction completeness. At the draft-1, student worksheet only for instructions about what to do students, but do not contain a clue as to how to the way of executing the command. After validated by the validator, researchers revise student worksheet in accordance with advice from validator and particularly on the criteria which do not belong in the category of valid.

At the practical analysis, overall computer student worksheet based mathematical literacy for statistics is practical because the student worksheet is easy to use for both in students and teachers. The percentage average of practicality aspect is 71.43%. Six for eight point statement displayed on student worksheet meet the criteria practical. But it has two points survey practicality only meet the criteria practical enough. Two of these include: (1) the language used student worksheet communicative; (2) orders at student worksheet understandable.

Based on two points above, It can be seen that the use of language in giving guidance or orders at student worksheet. So, students feel difficult to understand a command. Hence, the trial needs to revise criteria the use of language in giving guidance.

On judgment test competence of students, there are two students who do not get Minimum Completed Criteria (has not been). The result of both students competence test is 62.5 and 77.5, with Minimum Completed Criteria of 78. The reason why they have not completed because they only can represent the information that they get, but they are not communicated well.
Classical completed and positive response of students shows that student worksheet is effective. Most advice from students about student worksheet that developed stated that many sentences elusive. So, it needs a revision of language aspect.

Based on a student negative response it is known that orders at student worksheet less communicative, display student worksheet less motivate students to do it. On student worksheet the only problem in daily life displayed on the main topic, thus students feel that student worksheet not present contextual problems.

The theory outlined Nieven in 1999, student worksheet developed in this research good quality because meet the criteria valid, practical, and effective details are validated, student worksheet had already been assessed validity by the validator with value of 3.79 (94.72 %); practicality, student worksheet considered practical because easy to use on the value of 2.85 (71.43 %) ; effectiveness, student worksheet is effective as it gets responded with a scale of 75 % assessment, and classical complete of students get very high criteria of 94.74 %.

There are some things that can become obstacles in this research, among others as follows. The first, the use of student worksheet that developed need some computer that has applications Microsoft Excel as many as a group of students who have been formed during learning. This causes schools that are not facilitated laboratory computer that has application Microsoft Excel experienced difficulty in using or could not even using student worksheet developed in this research. The second, the use of student worksheet that developed is using Microsoft Excel. If students who will use sheets has no competence in Microsoft Excel operates hence could impede the use of student worksheet in learning. Teachers should give the students knowledge regarding the operation of Microsoft Excel relating to the use of student worksheet and it can cause learning duration not efficient.

7. Conclusion

The process of development sheets students activity mathematical literacy based on subject matter statistics for students who meet the criteria aspects valid, practical, and effective can use the design research, Four-D (Thiagarajan), to the briefing as follows.

- At the define stage, information was obtained students on the matter, namely student worksheet students to the matter mathematics very few exercises about not contextual raised. Students who made the subject of research are students grade eleven of The 5th Mathematics and Natural Science. In addition, statistics contained in student worksheet developed of distribution single data to the data the group and size of the data.

- At the design stage, we get computer student worksheet based mathematical literacy for Statistics that according to indicators of mathematical literacy. Ten indicators mathematical literacy contain seven around the basics of mathematical literacy and three mathematical processes OECD version 2015.

- At the develop stage, performed validation student worksheet developed by two kinds of, namely lecturer mathematics education and mathematics teachers in The 1st State Senior High School of Driyorejo. After that, performed the trial student worksheet to students. Then students were tested competence to know research results after using student worksheet developed. In addition, students also fill the survey response and survey practicality, to know the practicality and effectiveness of student worksheet.

The result of this research development, namely obtained computer student worksheet based mathematical literacy for statistics executed good quality because it fulfilled three aspects are valid, student worksheet had already been assessed validity by the validator with value of 3.79 (94.72 %); practical, student worksheet considered practical because easy to use on the value of 2.85 (71.43 %); effectiveness, student worksheet is effective as it gets responded with a scale of 75 %, and classical completed of students get very high criteria of 94.74 %.
8. Suggestions
The researchers suggest are when doing similar research as follows. Indicators of mathematical literacy that will be contained in student worksheet adapted to characteristics of students and matter would be taught. Do checks on the completeness of tools that support the use of student worksheet.

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