Development of data presentation instructional material based on local wisdom for preservice teachers

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Abstract. Local wisdom like Surabaya Zoo, Semanggi, and Maulud Nabi has pedagogical value because it aims to regulate behavior that is beneficial to the common interests of the community. Thus, this research aims to develop teaching materials of data presentation using local wisdom for preservice teachers. The feasibility of teaching materials was evaluated based on their validity and practicality. The design of this research was four-D-model, consist of Define, Design, Develop, and Disseminate. The data of this research was analyzed by quantitative descriptive. The results of this research were as follows: (1) The teaching materials that were developed consist of lesson plan, worksheets, power point media, and assessment; (2) The instructional materials developed were valid and practical and have scored 3.1 and 3.34 respectively. The category of validity in content, construct, language, and contain principles of local wisdom; (3) The lecturer implemented the lesson plan well, the increased of preservice teachers’ activities were indicated through investigation, investigation result analysis and presentation of final product. Based on the results of the research, the teaching materials of data presentation empowers preservice teachers’ skills in data presentation using local wisdom context.

Keywords: Development; Instructional Material; Data Presentation; Local Wisdom.

1. Introduction
Society nowadays is experiencing a crisis of identity due to a lack of application of cultural values in the world of education [1]. Education and culture are two things that cannot be separated in daily life, and it was became one ministry before. This is in line with Budiarto [2], as he stated that education and culture are two components that are complementary in a unified and complete unity. Wibowo, Agus, & Gunawan [3] illustrate education without culture is like a boat in the middle of the ocean without a captain. Culture has a role as a controller in social change through inherited noble values, and one of the parts of culture is local wisdom.

Cultural values such as local wisdom is increasingly eroded and become a complex problem in society [4]. Print media and electronic media are two factors affecting the eroding of local wisdom value. Eradication of local wisdom value makes educational leaders restless. This drives the discussion of the issue through national and international seminars. The results of the discussion offer several alternative solutions that lead to education. Education is considered a preventive alternative [5]. Through education it is expected that the quality of the younger generation will increase and can reduce the causes of national cultural problems. Based on the problem, education has many
components that can be utilized in an effort to resolve these problems. One of them is the curriculum which is the heart of Education

Law of Republic of Indonesia No. 19 Year 2005 on National Education Standards, Article 17 Paragraph 1 describes the Unit Level Curriculum Standard that the curriculum level of elementary, junior high school, high school equivalent, or other institutions units are equivalent and they are developed based on educational units, regional potential/regional characteristics, social culture of the local community, and students. Based on these regulations, the teacher can develop learning materials in accordance with the potential of the student's living area such as local wisdom. Nurrahmi [6] explains that learning materials that are tied to living conditions will be more easily understood by students. The regulation also explains that local wisdom can be used as material for developing learning materials

Hand & Nasir [7] explain that “research on race, culture, and schooling has revealed many significant factors affecting school achievement and has articulated many details of how culture and learning intersect in daily school life”. The statement said that schools play a role in integrating local wisdom within school environment. The concrete steps that can be taken are introducing innovation to learning, especially mathematics learning. This is because many students assess mathematics as a scourge in school [8]. Based on the analysis that has been carried out, the causes of students’ dislike of mathematics was because the learning process carried out was too dry, theoretical, pseudo, and less contextual. Variations in learning were very rarely done and the presentation of problems was done using formal language. As a result, mathematical cases encountered by students in everyday life are different from mathematics in schools [9]. This phenomenon requires teachers to be able to develop teaching materials in mathematics learning so that learning variations can be carried out. In this case the teaching material in question is a teaching material based on local wisdom

According to Kurniawati [10] teaching materials are components or subject matter that are arranged systematically based on learning principles. The instructional materials produced are expected to be in accordance with the potential of the local area which is the local wisdom. According to Nieveen [11] appropriate teaching instructional has three indicators: valid, practical, and effective. Thus, mathematics teaching materials are based on local wisdom but must also meet Nieveen's three indicators.

The researcher views statistical material as very important because it is essential material. This is confirmed by the opinion of Abdullah & Suhartini [12] who stated that statistics have many benefits in the fields of Economics, Health, or Education. In Indonesia, statistics is introduced to student of grade 6 elementary school until secondary level [13]. Statistical material that is always introduced to every school level is data presentation. It shows that statistical material is considered important in education [14]. Thus, university student who become a preservice teacher should have the knowledge and experience to deal with statistics. This study concern to develop teaching instructional materials with presenting data material for preservice teacher based on local wisdom.

2. Method
This study refers to the model that was presented by Thiagarajan, [15] namely the 4-D Model. Furthermore, in this study, development model is used in developing worksheets, teaching materials, learning devices, and others. The type of model for developing in this study used consists of 4 stages of development: define, design, develop and disseminate. The following is a description at each stage.

The first is define stage which aims to define learning conditions that begin with analyzing the objectives of the boundaries of the material being developed. There are 5 steps at this stage, namely front-end analysis, student analysis, task analysis, concept analysis and formulation of learning indicators. The second is design stage. The implementation of this stage aims to design a learning device prototype. There are 4 steps at design stage: test compilation (constructing criterion-referenced test), media selection, format selection and initial design. The third is develop stage which aims to produce teaching materials in 2 stages, which are the expert appraisal and developmental testing. For expert appraisal, some formula is used to analyze the validation and practicality of the instrument. The
last is the disseminate stage, consist of final packaging, diffusion, and adoption stage that is often overlooked at this stage. The disseminate stage is the most important in showing new teaching instructional materials that have been developed and can be used by anyone.

The validity analysis of the instructional teaching materials data refers to the adaptation of Widoyoko [16]. The score range 1 to 4 have 5 criteria, the highest is mean > 3.40 = highly valid, 2.80 <= valid ≤ 3.40, 2.20 < mean ≤ 2.80 = quite valid, 1.60 < mean ≤ 2.20 = less valid, mean ≤ 1.60 = invalid. The practicality conversion is similar to validity criteria. The criteria that the instructional materials created can be used for further processing (limited trial) if decided as valid through experts’ appraisal and practically which is more than 2.80.

3. Result and Discussion

3.1. Define

Front-end analysis is a fundamental activity which was conducted by studying and analyzing statistics curriculum for the students. The results of the analysis showed that curriculum used is appropriate for higher education. Some learning outcome were based on the needs of university and relates with the association of mathematics education program. Student analysis was carried out by researchers to study the characteristics of students learning that is relevant to the instructional materials developed including student competencies, teacher experience in teaching in the classroom, and general behaviors that arise during learning. Based on the results of classroom observations where the teaching material were used, it was found that lecturer often used direct, non-contextual problem that related to local wisdom. Furthermore, laptops were used to make calculation by using SPSS program. Students’ responses in learning statistics tend to be lazy, difficult and bored.

The third of defining stage is task analysis. This is done by identifying the main skills of students that must be acquired in learning the statistics method. Student should understand and can represent the data with a appropriate type of presentation to show the meaning of the data. In the fourth step, which is the concept analysis, main topics were identified and arranged in a systematic hierarchy. Through specifying instructional objectives, using task analysis and concept analysis, researchers continued on to the fifth step in the define stage, namely the formulation of learning indicators. The learning indicators were determined by the researcher. Students can explain the type of presenting the data, the characteristics type of data, and choosing the appropriate one for the various type of data.

3.2. Design

The implementation of this stage aims to design a learning device prototype. There are 4 steps at this stage. The first is constructing criterion-referenced test, preparation of tasks is the basic step used so the main abilities or skills that students must obtain in learning statistics data presentation method can be achieved systematically. The results of the preparation are the understanding the data type, understanding the frequency distribution, understanding the graph of frequency distribution, and understand the meaning of the graph of frequency distribution. The second is media selection, the media used in this study was Microsoft word 2013 to create a display design, fill material and picture. The third is format selection, the display is in book chapter format in A4 pssaper. The last is initial prototype. The initial design of instructional teaching materials using microsoft word is referred to as draft I. The steps in making teaching materials draft I are as follows, mapping competencies, finding data, representing data, constructing the material, and the assessment. Figure 1, shows the example of local wisdom context.
Figure 1. Local wisdom context of Maulud Nabi

3.3. Develop

According to Thiagarajan [15], the develop stage includes two steps of development, namely validation from experts and the implementation of limited trials. Furthermore, validation is also used by researchers so that experts provide suggestions for improvements to the instructional materials developed. The assessment in this study contained two aspects, namely validity and practicality of teaching materials. Validity assessment was carried out by two external expert lecturers and three mathematics teachers. Practical assessment is carried out by five mathematics preservice teachers.

Expert lecturers were the selected validators to assess instructional material. The value given by media experts is 2.83 and it was calculated as valid. The conclusion given is that the instructional materials developed are worthy of being tested with revisions as suggested. Assessment carried out by expert lecturers through assessment sheet. The results of the validation of instructional teaching materials by expert lecturers can be seen in Table 1.

| Rate aspect            | Average score | Criteria       |
|------------------------|---------------|----------------|
| Content Eligibility    | 2.80          | Valid enough   |
| Presentation Eligibility| 2.83          | Valid          |
| Language eligibility   | 2.86          | Valid          |
| **Average Total**      | **2.83**      | **Valid**      |

Mathematics teachers were chosen to assess instructional teaching materials that were developed from material aspects, the ease in using instructional materials developed and displays that were in accordance with local wisdom context. The results of the validation of instructional teaching materials by teachers can be seen in Table 2.

| Rate aspect            | Average score | Criteria |
|------------------------|---------------|----------|
| Content Eligibility    | 3.28          | Valid    |
| Presentation Eligibility| 3.47          | Valid    |
| Language eligibility   | 3.40          | Valid    |
| **Average Total**      | **3.38**      | **Valid**|

Based on the average total in Table 1 and Table 2 it can be calculated that the validity of instructional material is 3.1 which is fall under valid category (Widoyoko, 2010)
Practical assessment is carried out by students that already get the material of presenting data and did not finish the statistics methodology module. They assessed instructional teaching materials that are developed in terms of the feasibility of displaying, material presentation, user interaction. The results of practicality assessment can be seen in Table 3.

| Rate aspect                    | Average score | Criteria  |
|-------------------------------|---------------|-----------|
| Feasibility of displaying     | 3.42          | Very practical |
| Feasibility of Presentation Material | 3.52        | Very practical |
| Feasibility user interaction  | 3.08          | Practical  |
| **Average Total**             | **3.34**      | Practical  |

The results of the average practicality assessment given by students amounted to 82 for display feasibility, 86 for the feasibility of presenting material, 73 for the feasibility of user interaction. Thus, the conclusion of the assessment results by students is 80.33 and when viewed from the practicality table it is equivalent to 3.34 which meets the practical criteria.

The second phase in develop stage is developmental testing. The limited trials in this study were carried out simultaneously with the taking of validity assessments and practicality assessments by mathematical experts and teachers. This limited trial is done because according to Thiagarajan [15] direct student involvement makes it easy for researchers to get comments, responses, and reactions of students in using the developed teaching material. Therefore, this limited trial was conducted, first to see the students' used and obvious think about instructional teaching material. Furthermore, it was to know the responses and suggestions of students on the developed instructional teaching materials (through practicality assessment sheets by students and interviews).

After some comment and suggestion in expert appraisal and practicality assessment, the instructional design was revised. Next, structured assignment was be to the student so that researcher can see how the students think based on students' work. Structured assignment was given to the students and they already understand about the steps to make distribution frequency and solve the problem. Like the figure 2.

**Figure 2.** Student answer in solving quartile problem
3.4. Disseminate
According to Thiagarajan [15] at the final packaging, diffusion, and adoption stages, are often ignored when this stage is the most important in showing new teaching materials that have been developed and can be used by anyone. The results of the evaluation in terms of validity and practicality were used to revise draft I to draft II. The revised results are then implemented to broader goals. The results obtained from the implementation of the development and students achieved the competency. Through the implementation phases, additional data on improvement suggestions are obtained to increase the effectiveness of the use of instructional teaching materials that have been developed. For packaging, the improvements are given by students who were the subjects at the implementation stage are used as material for revision of draft. Furthermore, the results of last draft are packaged in statistical method book chapter of for preservice teacher. Then the final draft was distributed to participants when they have copyright. The participants were consisted of teachers, lecturers, and students.

Based on the primarily problem dan result in this study, it revealed that 4 stages of development can be used to develop instructional material with local wisdom context. For expert appraisal, validity conducted in these studies underscore the validity of the content, construct, language and practically/empirical validity. Some validity of the content may be declared invalid even though it falls to the very good category by the validator. This is because the instructional teaching materials developed accordance with the material that should have been presented as similar as Widodo’s [17] research.

The score of validators on the of presentation, displaying picture and writing as well as aspects on the language and legibility aspects were due to the process of development. As expressed by Nurseto [18], Widodo [17] that in developing learning tools, developers must pay attention to the principle of "visua"s", which is visible (easily seen), interesting (attractive), simple (simple), useful (it useful or beneficial), accurate (correct and accountable), legitimate (reasonable), and structured (structured / structured).

4. Conclusion
The process of developing teaching materials has four stages: define, design, develop and disseminate. Using the four stages, several products has been develop, they were (1) The teaching materials which consist of lesson plan, book chapter, power point media, and assessment; (2) The instructional materials developed were valid and fell under good category in content, construct, language, practical and contain principles of local wisdom;(3) Based on the results of the research, the teaching materials of data presentation can empower preservice teachers’ skills in data presentation using local wisdom context. From these results, it can be suggested that the prototype of development of data presentation instructional material based on local wisdom can be used for experimental research.

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