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An Increase In Literate Statistics, (Statistical Reasoning And Statistical Thinking Through The Development Of Teaching Materials And Assessments Based E-Learning

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Abstract. Issues on literacy statistics (Statistical Literacy), reasoning statistics (statistical reasoning) and thinking statistics (statistical thinking) for students are not extensively studied in Indonesia. Instead, it needs a more serious attention for policy-makers in education and needs improvement so that statistics learning are more meaningful. A teaching learning process must integrate science with technology such as through E-learning. E-learning has the advantage of not being limited to a particular classroom (accessible from anywhere), is not limited to a specific time (can be accessed at any time) and is not limited to a specific platform (accessible from any operating system). The purpose of this research is to develop instructional materials and assessments based on E-Learning for students of Business Administration department, Bali State Polytechnic to improve the literacy of Statistics (Statistical Literacy), Reasoning Statistics (Statistical Reasoning) and Think Statistics (Statistical Thinking). We are adopted a development model developed by Thiagarajan (Four-D). This model consists of four stages of development; Define, Design, Develop and Disseminate or adapted into a 4-D model, namely the definition, design, development, and deployment. This research is a second year reserach, the first year focuses on the design of learning modules and online learning tools

What the researchers do in the second year is to focus on the development of teaching materials in accordance with the given riviwer. Some improvements were made to perfect the teaching materials of the statistics lecture. The next process is to disseminate learning materials using online media. Appropriate students will take learning materials, study according to the time they set independently. As the material of online learning evaluation also conduct evaluation by conducting quiz and test for. The results of online learning will be compared with traditional learning outcomes with face-to-face in the classroom. Until now the evaluation is still done continuously. The expected result after the completion of this research process is, providing material and instructional media online statistics.

Keywords: statistic, elearning, edmodo, statistical thinking, statistical reasoning, thinking statistical

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1. Introduction.

Studies development statistika as and in line with developments in science, technology, and information system. The main advantage of web-based education is its flexibility, allowing students to access content from diverse locations, at a convenient time[1][2][3]. It encourages learning self-management, with the ability to exchange links to related information In the first year research has suggested that well organized online classrooms[7]. Statisticians have long used scientists, engineers, and others to use statistical functions to improve their work. It is time for experts to practice and utilize what they know about behavioral science and how people learn to improve the content and delivery of education Statistics (Snee 1993: 1)[1,19 Based on the results of the preliminary tests (pre test) and observation in the academic year 2014/2015 for the course of the Department of Business Administration, Bali State Polytechnic (not Department of Statistics), obtained about 74%, 5 students get an range C; the remaining 24% get a B grade and only 2% (Students from high school graduates concentrate physics class or "IPA class") get an A. Based on the paradigm it shows that the students are still lacking in the matter of Statistical Literacy, Statistical Reasoning, and Statistical Thinking (theory of thinking) which leads to the low achievement of statistical learning. One of the causes is the conventional learning media using Module, basic statistical learning, because it is not innovative (Waciko, 2011), students are not accustomed to accessing up to date data or data in large or large capacity data (Waciko, 2006)[23].

Learning which is dominated by the role of educator (the era of teacher) has long been transformed into a learning dominated by the role of educator and book (the era of teacher and book), but nowadays the trend has changed with the entry of technology (the era of theacher, book and technology) (Yaniawati, 2014)[12]. To improve these three factors is required an innovative learning that is e-learning based learning. Linde (2004) said that e-learning is a learning, both formally and informally conducted through electronic media, such as internet, intranet, CDROM, video tape, DVD, TV, mobile phone, PDA, and others[4][5]. Expected products are teaching materials and e-learning based assessment system that leads to the development of its content to be more interesting, animative, and communicative tailored to the curriculum, the characteristics of Vocational Education and the needs of the students of Bali State Polytechnic.

Based on the background and urgency of the research, the main issues of the second year of research are:

1. How is the expert's assessment of draft teaching materials and descriptive statistics based on E-Learning?
2. What needs to be revised on the draft of the teaching materials and the descriptive Statistics based e-learning assessment and how are the guidelines for their use?
3. What are the constraints found in the results of individual trials, small group tests, and field tests of resource drafts and descriptive e-learning descriptive Statistics?

2. Research Methodology

The objective of this research is to develop teaching materials and E-Learning based assessment for students of Department of Business Administration, Bali State Polytechnic to improve Statistical Literacy, Statistical Reasoning and Statistical Thinking. The purpose of this research is to develop teaching materials and E-Learning based assessment for students of Department of Business Administration, Bali State Polytechnic to improve Statistical Literacy, Statistical Reasoning and Statistical Thinking. This research is carried out with a clear and systematic development model such as Thiagarajan (Four-D) model development[14][15][19]. This research development model consists of four stages, namely: 1) .Stage Define (activity): front end analysis, student analysis, lecture material analysis, analysis of course assignments and lecture specification analysis; 2) .Stage Design (Design) activities include selection of learning resources, a series of tests, the selection of style selingkung and wake up; 3) Development phase (Develop) activities include: expert and practitioner validation; and 4) Dissemination Stage (Desseminate) teaching materials and statistical assessment Descriptive based e-

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learning and proseding national / international seminars. Merangcang facilities and module materials module materials, EDMODO Program and test Statistics uploaded to EDMODO.

Four D development model consists of four stages[9]: define, design, development and disseminate, e-learning system development procedures in this research can be seen in the steps taken as follows:

1. Definition Step (Define)
   This stage aims to define and define lecture requirements. In determining and defining the terms of the lecture begins with the analysis of the objectives of the limitations of material to be developed teaching materials and assessment. Activities in this phase are front-end analysis, student characteristic analysis, material analysis, task analysis, and lecture objectives specification
2. Design Step (Design)
   The design step is intended to design teaching materials and e-learning assessment. Activities undertaken at this stage are resource selection, preparation of teaching materials, preparation of assessment, format selection, and design of e-learning systems.
3. Development Step (Develop)
   Development stage to produce prototype of teaching materials and assessment based on e-learning which have been revised based on result of prototype-1 analysis, expert input and practitioner as well as analysis result of lecturing activity. Activities at this stage are the assessment of experts and practitioners as well as field trials.
4. Stages of Dissemination (Desseminate)
   The dissemination stage (Desseminate) is carried out by carrying out the dissemination activities of the device. The core of activities at this stage is to socialize the products of development through the presentation of results in national / international seminars.

The subjects of the study were students of second semester of academic year 2016/2017 majoring in Business Administration Politeknik Negeri Bali in Year Programmed Descriptive Statistics as much as 184

Given the number of research population is quite limited then the sampling technique using sampling technique saturated / census which is the technique of determining the sample when all members of the population as a sample in other words all members of the population in the sample [6]. So in this study the sample amounted to 184 students

3. Result and Discussions

E-learning or online learning is a learning that its implementation is supported by electronic services such as telepone, audio, videotape, satellite or computer transmissions. Various terms used for electronic learning, among others are: on-line learning, Internet-enabled learning, virtual learning, or web-based learning. Thompson (in cute, 1999)[11][22], states that "E-learning is instructional content or learning experiences delivered or by electronic technology." Then Thompson also mentioned the advantages of e-learning can provide flexibility, interactivity, speed, visualization through the various advantages of each technology.

Kamarga (2002) suggests the benefits of e-learning in organizational learning as follows[13]:

1. Increase productivity. Through e-learning the passage of time can be reduced so that the productivity of learners and educators will not be lost due to travel activities that must be done to obtain the learning process.
2. Accelerate the process of innovation. Competence of human resources can be depreciated. Such co-competence updates can be done through e-learning so that co-opency always gives value through creativity and innovation of human resources.
3. Efficiency; the competence building process can be done in a relatively shorter time and includes a larger amount.

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4. Flexible and interactive; e-learning activities can be done from any location as long as it has connections with the source of such knowledge and interactivity is possible either directly or indirectly and in full visualization (multimedia) or not.
5. E-learning can be utilized and developed in forming a new learning culture that is more modern, democratic and educational. Learning culture is a small part of the culture of society. The culture of society is defined as the integration of all objects, ideas, knowledge, institutions, ways of doing things, habits, patterns of behavior, values, and attitudes of each of its predecessor generations and is continued frequently in a form that has changed to its successor generation (Kartasasmita, 2003).

The research results obtained after going through step 4d are as follows:

1. Module teaching materials

Module of descriptive statistics course, which has been riview by statistician from Udayana University. the process of obtaining validation has gone through the steps of analysis, riview and improvement of the records provided by the expert. This teaching material has been adapted to the curriculum of statistics and descriptive courses applicable to the department of Business administration. Tthis module is covered with material-appropriate exercises in each chapter. as an evaluation material in each chapter that is discussed, this module is equipped with quis questions. it is expected that this textual learner material can strengthen students' understanding of statistical material.

2. Online learning tool

Along with the timing of expert judgments, this study also provides online learning tools. by this is done to achieve the results of research achievements in the field of dynamic learning media. Online learning media is designed using edmodo. Teachers / lecturers can also send grades, assignments and quizzes to students. Students can apply for homework and see their grades and comments teachers / lecturers may have posted about their assignments. Teachers / lecturers can also make polls and post topics for discussion among students. Teachers / lecturers can differentiate and create independent learning through the creation of subgroups in the course. After each course period is completed, the teacher / lecturer closes out the network and creates a new one for the next course. emodo has a colorful appearance, so it is expected to provide an interesting atmosphere for students. edmodo use is very easy for students, because the buttons are displayed simple and clear. The form of teaching material appearance that is displayed using edmodo looks as follows.

The first step, teacher must desain class, end the the student can interaction in the page, but prior to arranging classes, students are required to enroll on the edmodo page of statistical material. The example of upload material in the edmodo page as follow figure 1

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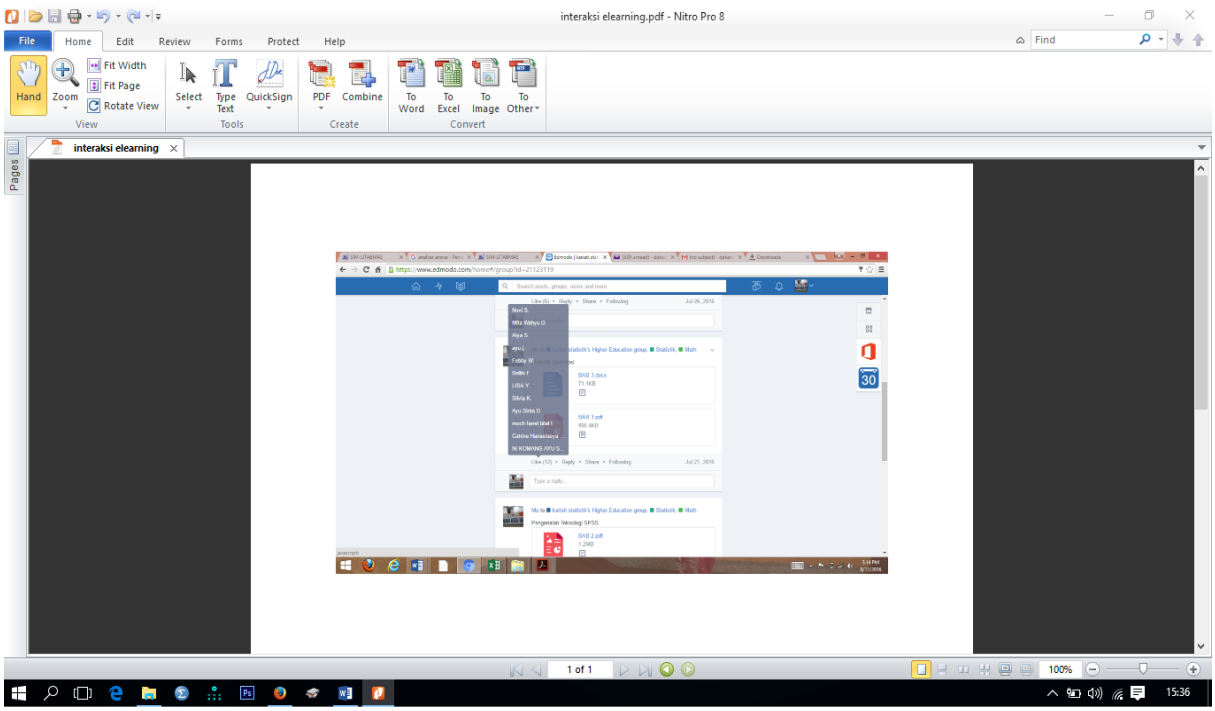

Figure 1. teacher upload materia statisc

Every student who has registered registration can be monitored by using class management. Figure 2 shows the page containing the data of students who have registered to the statistics class

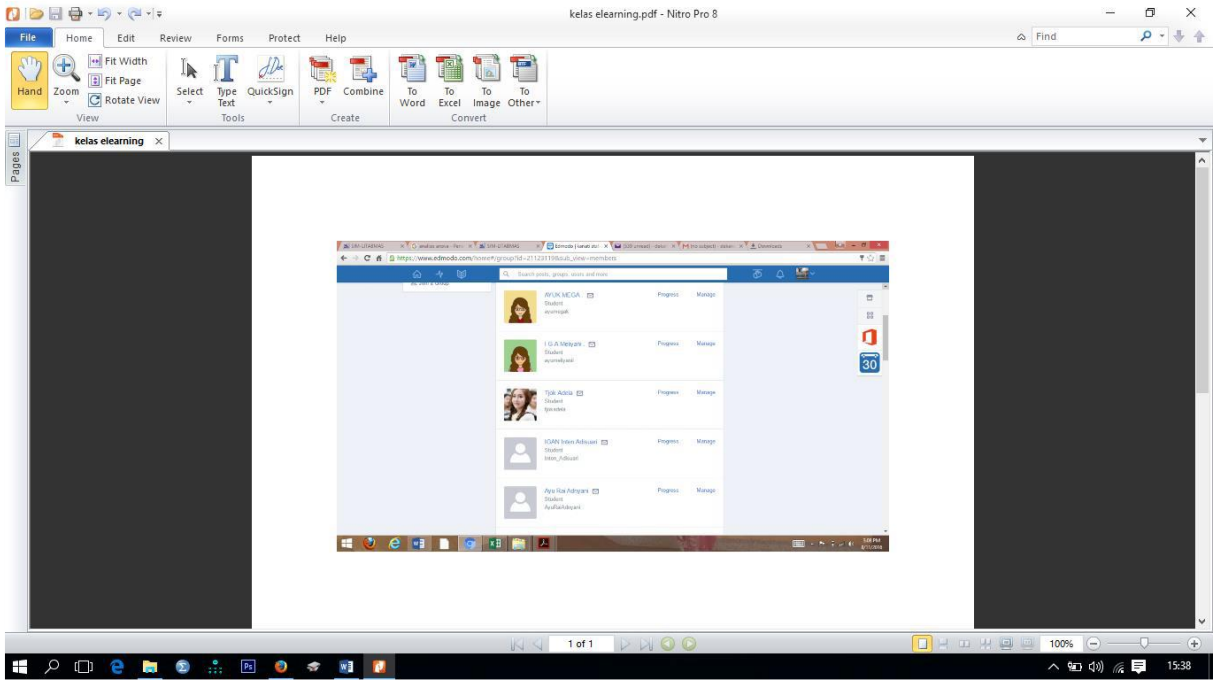

Figure 2. data of students who have registered to the statisctics class.

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After the student has access rights to the online statistic class, then the student can follow the whole interaction of teaching and learning. students can take the material, then learn independently. in interactive classroom learning students can ask questions about material that can not be understood independently. here the topic of discussion can be answered in discussion by other students who already understand or lecturers who are interacting with the class. as an evaluation material in the online statistics class, lecturers upload quis materials. students will work on the quis in accordance with the length of time provided. the advantage of this test is that students can work on the quis dynamically, can access from anywhere as long as connected with internet network. they can work in their time as long as they do not exceed the lecturer's specified date limit. Figure 3, shows the appearance of the upload quiz in multiple-choice form.

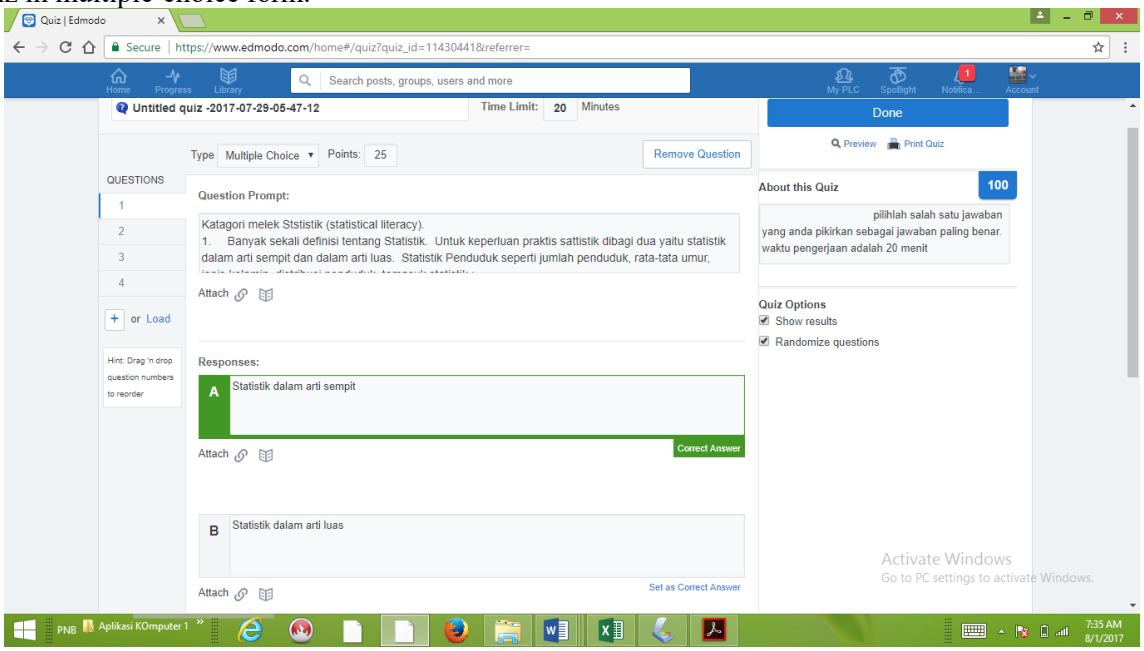

Figure 3. quis online

Figure 2 is an example of a quis scene screenshoot that the student will do. The time period given is 20min, the student can work freely during the time span required by the system. Free means is that they do not have to work simultaneously in one room, but wherever at any time within 24 hours within the intended date and within 20 minutes. From the observation of researchers there is an increase in value compared with conventional methods.

4. Conclusions and Recommendations

The conclusions in this study are

Riviwer gives a positive response, Things that need to be revised according to the reviwer notes in the brief section of the formulation of growth and in real written media required learning, Constraints that during the trial period, folded in campus environment with an u -down internet connection, There is an increasing response from students in online-based learning, Valid statement until progress is 70% valid and reliable in statistical learning

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