Development of Teaching Materials Based “Activity or Resources” At Sipda Unimed to Enhance Students Learning Behavior

Muhammad Badzlan Darari and Muliawan Firdaus
Mathematics Education Department, State University of Medan, Willem Iskandar Road Pasar V Medan Estate, North Sumatera, Indonesia

e-mail: badzlan@unimed.ac.id

Abstract. State University of Medan (red-Unimed) has provided Learning Management System (LMS) for lecturers and students namely Sistem Pembelajaran Daring (Online Learning System) that is abbreviated Sipda. But before using Sipda, lecturers must prepare teaching materials and provide appropriate learning resources. Objectives of this study were to describe the effectiveness of teaching materials based "Activity or Resources” at Sipda Unimed in the mathematics education study program and also to describe changes in learning behavior of students in mathematics education study programs using teaching materials based "Activity or Resources” at Sipda Unimed. This study used Research and Development design with 4-D model. The subjects of this study were students of mathematics education at their third semester who are taking multivariable calculus course. Result of teaching materials validation scaled one to four score showed the average is 3,78. Result of response questionnaire scaled one to four score showed the average is 3,72. Result of learning behavior scaled one to four score showed the average is 3,82. Result of analysis data showed that teaching materials based on "Activity or Resources” on Sipda Unimed are effectively used and have an impact on enhance students learning behavior

1. Introduction
The Indonesian National Qualification Framework (acknowledged by KKNI) is a level of qualification for Indonesian human resources that integrates the realm of education and training to suit with requirement of the real working world. Nowadays KKNI became a reference in management of education and training throughout Indonesia. KKNI is an effort of the Indonesian to produce national human resources who are creative, productive, and able to compete in the development of high technology.

Based on Ministerial regulation of Indonesian Education and Culture Ministry that educational learning outcomes is equalized with various levels of KKNI [1]. It began from primary school to doctoral programme. There are 4 learning outcomes achievement for undergraduate programme, namely; 1) able to apply their field of expertise and utilize science, technology, and / or art in their fields in problem solving and be able to adapt to the situation at hand, 2) mastering the theoretical concepts of certain fields of knowledge in general and the theoretical concepts of special sections in the field of knowledge in depth, as well as being able to formulate procedural problem solving, 3) able to take appropriate decisions based on analysis of information and data, and able to provide guidance
in choosing alternative of the solution independently and in groups, and 4) responsible for own duty and can be given responsibility for the achievement of the work of the organization.

State University of Medan (Universitas Negeri Medan - abbreviated Unimed) as Educational Institution for Educational Staff has been completed academic curriculum of being KKNI-based curriculum. Since 2016 Unimed has used the KKNI-based curriculum and its climax in 2018 has used the KKNI-based curriculum following the demands of the Industrial Revolution 4.0. Changes in the curriculum have an impact on student learning patterns. In implementing the KKNI-based curriculum, Unimed students are required to be more agile and independent in the lecture process. Not only is required to have creativity and innovation in completing lecture assignments, but it also requires critical and rational thinking skills as well as having a strong habit of learning patterns of carrying out lectures. In general, Unimed students must have good learning behavior in conducting lectures using the KKNI-based curriculum at Unimed.

Learning Behavior can be interpreted as a mental activity of student learning. Learning is interpreted as a relatively long lasting change in behavior obtained later from experiences [2]. Learning behavior is a mental / psychological activity, which takes place in active interaction with the learning environment that results in changes in knowledge, understanding, skills, and attitude values. Learning behavior is influenced by several factors, such as; (1) physical aspects where the fitness of body can influence the enthusiasm and intensity of students in receiving lessons, (2) psychological aspects that are included are the attitudes, talents, interests, and motivation of students, (3) social environment, namely family, friends, and teachers, (4) non-social environment that includes the condition of the house, room, school, classroom, and learning strategies that used by teachers. From the description above, it can be seen that learning behavior is student capital, which is rooted in personal mentality and student habits. Strong and good behavior is indispensable in conducting lectures using the KKNI-based curriculum.

Not only perfecting the lecture curriculum, but Unimed also perfecting a learning environment that supports a high academic atmosphere. A Learning Management System (LMS) has been designed to support the Unimed blended learning lectures process, namely Unimed Online Learning System (Sistem Pembelajaran Daring abbreviated Sipda). In the beginning LMS was a learning portal that is used to document and provide online computer-based training. Nowadays LMS offers more than that, through LMS users are able to broadcast live (streaming) teaching that has been integrated with a variety of teaching materials. In addition, LMS also has the ability to produce analytical reports that can help teachers or supervisors identify indicators of teaching / training participants' performance.

LMS is a software application that is used for administration, documentation, tracking, reporting, and delivery of educational course materials, training programs, and learning development programs [3]. LMS was used in the world of higher education initially, now it is developing in employment and corporate training [4]. Sipda Unimed is a form of learning management system designed for the lecture process at Unimed was launched in early 2019. Sipda is more than just an online learning portal, but a media communication system between lecturers and students. Through Sipda lecturers can provide teaching materials, give assignments, examine assignments, and provide assessments. Through Sipda students can download lecture material, submit assignments, examine lecturer feedback, and view assessments that have been made by lecturers. All those activities are carried out online, without being limited by time and space. A condition where the hustle of the lecturers and student time constraints are no longer an obstacle in mastering science and skill. Sipda Unimed was designed as Unimed initial capital towards a world class university.

The main display on Sipda called the dashboard is divided into several lecture topics. The procedure for adding teaching material to Sipda begins with selecting the topic as the main title of the material or subject. Then select Add Activity or Resources to choose the type of communication and teaching materials that were used. Lecturers can provide various teaching materials on each lecture topic using various types of communication that are available.

Based conditions above, researchers intend to develop a teaching material based on "Activity or Resources" on the Unimed Online Learning System (Sipda) to enhance student learning behavior. The
main problems in this study are formulated as follows: (1) How is the effectiveness the use of teaching materials based on "Activity or resources" at Sipda Unimed in the Mathematics Education Study Program? (2) How does the change in students learning behavior of the Mathematics Education Study Program that were taught using teaching materials based on "Activity or resources" at Sipda Unimed? Hence, the main objectives of this study were to describe the effectiveness of teaching materials based "Activity or Resources" at Sipda Unimed in the mathematics education study program and also to describe changes in learning behavior of students in mathematics education study programs using teaching materials based "Activity or Resources" at Sipda Unimed.

2. Research Method
This study used Research and Development design with 4-D model by Thiagarajan [5]. The study produced learning material based on “Activity or Resources” at Sipda Unimed. The study conducted in Mathematics Education Study Program at Odd Semester on Year Academik 2019-2020. Research takes place in classical lectures on the classroom and online lectures using Sipda Unimed. Subjects of study were 32 students in Multivariable Calculus course. Object of study was learning material of Multivarible Calculus course based on “Activity or Resources” at Sipda Unimed.

2.1. Define stage
At this stage the researchers defined and fulfilled several requirements for the development of teaching materials. Teaching material that has been developed is expected can guide students to use Sipda Unimed in the lecture process in order to enhance student learning behavior. Subjects in this research was students in third semester at Faculty of Mathematics and Science. They are at the end of the adjustment phase of learning patterns in higher education. They always try to learn and find learning resources independently with encouragement and motivation. Those conditions are considered by researchers to emphasize blended learning in lectures rather than full on-line learning. The lectures syllabus is arranged according to the KKNI-based curriculum and pays attention to students learning outcomes, Study Program learning outcomes, and Multivariable Calculus course learning outcomes. Multivariable calculus course is a continuation of differential calculus and integral calculus course. In general, multivariable calculus course learn differential and integrals on the functions of many variables (multivariable). Result of this stage was Syllabus Lecture Document namely Semester Lesson Plan (Rencana Pembelajaran Semester abbreviated RPS). RPS contained objectives of learning, indicators, course content, learning activity for each meeting, source of learning, assignment, and evaluation. RPS is known by head of Mathematics Education Study Program and approved by head of Mathematics Department. The RPS that has been compiled includes offline and online lecture schedules that use Sipda.

2.2. Design stage
Researcher compiled teaching materials for multivariable calculus course and compiled lecture material that would be used in Sipda Unimed at this stage. The teaching material prepared to be a module that contains multivariable calculus material and guidelines for students in used Sipda Unimed. Textbooks provides instructions for students to register and log in to a Sipda account and explain the use of "Activity or Resources" on learning topics. A draft module was printed at the beginning of the lecture for use by students in the lecture process. Before preparing online lecture material on Sipda Unimed, researchers first prepare main menu or it called the Dashboard. The dashboard contains the types of courses, lecture competencies, and lecture participants. After that the researchers adjusted the topics to be presented online through Sipda according to the RPS that had been approved by the head of the mathematics department. Not all topics are presented online because researchers carry out Blended Learning, which is a combination of online and online learning.
2.3. Develop stage
Researcher carries out two successive activities at this stage, namely: product validation by experts and product trials. The draft 1 product of teaching materials was validated by 3 mathematics lecturers with specifications, a mathematics education study program lecturer, a mathematics study program lecturer, and a computer science study program lecturer. The average validity result shows the number 3.78 from a score of 1 to 4 is equivalent to 94.45%. Thus the draft 1 multivariable calculus teaching material based on "Activity or Resources" can be declared valid. After revising teaching materials according to the validators advice, a draft 2 teaching material is obtained. Then, field trials on 32 students that taking multivariable calculus courses. The conclusions obtained from 2 meetings with students are; (1) Sipda instructions in the quiz section do not include the time limit provisions, (2) There was no troubleshooting if an internet network problem occurs and (3) The printed books which are not reciprocal make the book inefficient to use. The criticism from students becomes an evaluation of teaching materials at this stage. After being revised, the draft 2 teaching materials become the final draft teaching materials which are ready to be disseminated.

2.4. Disseminate stage
At this stage researchers distributed teaching materials to 5 other classes in the same semester of Mathematics Education Study Program. The users of this teaching material are all semester III mathematics education study program students who take Multivariable Calculus courses. The use of teaching materials in conjunction with the application of Sipda so that for the other five classes also prepared a Multivariable Calculus online course at Sipda Unimed.

3. Discussion
The effectiveness of Multivariable Calculus learning materials based "Activities or Resources" at Sipda Unimed was analyzed through the student questionnaire response instrument, while the teaching material had been declared valid by the validators previously. Student response categories in the range of scores 1 to 4 are presented in Table 1. Researchers obtained student response questionnaire score was 3.72. These results indicated a very positive student response to learning using Multivariable Calculus based learning materials "Activity or Resources" at Sipda Unimed.

| Range of Scores | Categories |
|----------------|------------|
| ≤ skor < 2,00  | Negatif response from students |
| 2,00 ≤ skor < 3,00 | Netral response from students |
| 3,00 ≤ skor ≤ 4,00 | Positif response from students |

Student activities in Multivariable Calculus courses outside of lectures can be seen through Sipda. Sipda provided information on the activities of each enrolled student in an online course. The information displayed can be in the form of bar charts or a more detailed list of log activity tables. After overall analysis, the fact was each student conducts online lectures more than two days a week. The fact of research indicate high student activity and positive student responses in online lectures. Student activities are closely related to the use of teaching materials. That is because there are a number of discussion examples of problems in teaching materials presented in the form of videos on Sipda. Thus the researchers concluded that Multivariable Calculus teaching materials based "Activity or Resources" at Sipda were very effective for used Multivariable Calculus lectures in blended learning.
Changes in learning behavior seen from the learning behavior questionnaire that had given to students at the beginning and at the end of the lecturer. Student learning behavior within the range of score 1 to 4 are presented in Table 2.

Table 2. Student Learning Behavior Category Based on Questionnaire Scores.

| Range of Scores | Categories                  |
|-----------------|-----------------------------|
| 1,00 ≤ skor < 1.75 | Bad learning behaviour      |
| 1.75 ≤ skor < 2.25 | Good enough learning behaviour |
| 2.25 ≤ skor < 3.25 | Good learning behaviour      |
| 3.25 ≤ skor ≤ 4.0 | Outstanding learning behaviour |

Furthermore, to see whether changes in student learning behavior could be said to enhance, it will be analyzed using N-gain with the formula of Hake [6]. $N \text{-} gain = \frac{\text{final score} - \text{origin score}}{\text{max score} - \text{origin score}}$. The N-gain categories are displayed in Table 3.

Table 3. Interpretation of N-gain results

| Range of Scores | Categories               |
|-----------------|--------------------------|
| $N \text{-} gain \leq 0,30$ | Low learning behavior change |
| $0,30 < N \text{-} gain < 0,70$ | Medium learning behavior change |
| $N \text{-} gain \geq 0,70$ | High learning behavior change |

The result of learning behavior questionnaire at the beginning of lecture was 3.02 where the results indicated the category of good learning behavior. The results of the learning behavior questionnaire at the end of the lecture was 3.82 where the results indicated the category of outstanding learning behavior. Then, N-gain was 0.81, these results indicate that an enhance in student learning behavior is high by using Multivariable Calculus based teaching materials based "Activity or Resources" at Sipda Unimed.

4. Conclusion

The conclusion obtained from this study has been produced learning materials in based “Activity or Resources” at Sipda Unimed in Multivariable calculus course which valid with a percentage of 94.45% with a very valid category. Based on the learning behavior questionnaire is obtained an N-gain was 0.81, it shows that students learning behavior enhanced using teaching materials based “Activity or Resources” at Sipda Unimed.

The researcher suggested that to researchers in education and lecturer not only innovate in its pursuit to produce more competent college graduates and professional in their field. But also, learning material and learning management system products that have been successfully developed, it can be used as a reference for everything to make it better.
References

[1] Peraturan Menteri Pendidikan dan Kebudayaan No 73 Tahun 2013. Kerangka Kualifikasi Nasional Indonesia.

[2] Davidoff, F. 2007. Teaching Quality Improvement: The Devil Is In The Details. *JAMA The Journal of The America Medical Association*. 298 (9), 1059-1061

[3] Ellis, R. K. 2009. *Analyzing Change / Gain Score*. ASTD Learning Circuits.

[4] Davis, B., Carmean, C., and Wagner, E. 2009. *The Evolution of The LMS: From Management To Learning*. Santa Rosa: The Elearning Guild.

[5] Thiagarajan, S., Semmel, D., and Semmel, M. I., 1974. *Instructional Development for Training Teachers of Exceptional Children*. Minnesota: Leadership Training Institute

[6] Hake, R. R. 1999. *Analyzing Change/Gain Scores*. AREA-D American Education Research Association’s Division. Measurement and Research Methodology

[7] Darari, M B. 2017. Penggunaan Media Adobe Flash Pada Pembelajaran Kesebangunan Dalam Meningkatkan Kemampuan Pemecahan Masalah Matematisa Siswa SMP Negeri 7 Medan. *Jurnal Handayani*. Vol 7 No 2 hal 29-37.

[8] Sudarman. 2014. Pengaruh strategi pembelajaran Blanded Learning terhadap perolehan belajar konsep dan prosedur pada mahasiswa yang memiliki Self-regulated Learning berbeda. Jurnal Pendidikan dan pembelajaran. Volume 21 Nomor 01

[9] Frisnoiry, S., Darari, M. B., dan Refisis, N. R., (2019). The Development of IT-Based Learning Media Integrated 6 Tasks of KKNI Through Blended Learning. *Journal of Physics: Conference Series*. 1188 (1), 012108

[10] Moore-Russo, D., Wilsey, J, Grabowski, J., & Bampton, T. M. (2015). Perceptions of online learning spaces and their incorporation in mathematics teacher education. Contemporary Issues in Technology and Teacher Education, 15(3), 283-317.

[11] Sari, Milya. 2014. Blended Learning, Model Pembelajaran Abad ke-21 Di Perguruan Tinggi. *Ta’dib*. Volume 17 Nomor 2

[12] George, C. 2017. Teaching With Technology Toolbox. *R Scholarly*. Mihalak

[13] Long, P.D. 2004. Learning Management Systems. *Encyclopedia of Distributed Learning*. Thousand Oak: SAGE Publications, hal 291 – 293

[14] Schoonenboom, J. 2014. Using An Adapted, Task-level Technology Acceptance Model to Explain Why Instructors In Higher Education Intend To Use Some Learning Management System Tool More Than Others. *Computers and Education*. Vol 71 hal 247 - 256