The effect of mathematical matriculation as the basis for calculus lectures: a case study of electrical engineering, UNISNU Jepara - Indonesia

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Abstract: Mathematics is applied in all fields, 70% stated it is difficult, scary, and the survey results concluded that mathematics is a scourge for most students of all levels: Elementary School to College. Based on the results of the initial questionnaire student matriculation displeasure in mathematics starting in grade 3 elementary school, because arithmetic problems began to be difficult, the teacher was less familiar, dominant in learning and lacking in guidance, conditions tended not to change until high school. By matriculating researchers and acting as a lecturer, making the initial matriculation material as tension therapy, student anxiety in mathematics with a change in the mathematics mindset is fun, namely by using active and meaningful learning methods for students. With a growth mindset and meaningful learning, matriculation has implications for good mastery of students' mathematical concepts.

1. Introduction
The model, the method of learning mathematics based on the results of interview survey research and new student questionnaires from year to year tends to be stagnant with the mathematics teacher’s answers tending to be serious so that students are carried away seriously. This ultimately creates an uncomfortable atmosphere in participating in the lesson.

In order to equip new student, the University has activities, one of which is the matriculation of basic subjects according to the study program, in general mathematics, because mathematics is basis of all fields of science that will gain in lectures, competence and preference in subjects and interest in the subjects they will face with meaningful learning so that lecturers face-to-face conditions of students. Many students find their studies in mathematics to be difficult and unrewarding [1].

Thinking skills as form of cognitive processing, which serves as a guide to think about how to solve difficulties, solve problems, think and reason, require extensive knowledge and deep understanding. about a specific domain and relies on knowledge of domain specific content [2,3]. It turns out that students are unable to solve problems because they do not mathematical concepts.

The role of mathematics in mayor legislation to ensure that citizens of the country develop and apply the mathematical and critical thinking skills required for various fields of science [4]. The curriculum should focus on setting learning goals and a balance between conceptual knowledge and skills development. The curriculum must be in line with the interest, needs, and real learning patterns for student.

Mathematical matriculation is the basic learning of mathematics for calculus or mathematics courses. Students must have good understanding of mathematical concepts, so that matriculation can
produce good results, because mathematics is used in all fields of science at the college.\[5\]. The mathematics curriculum focuses on quality mathematics, learning is directed at balancing student understanding of concepts, reasoning and skills. The importance of developing a conceptual understanding [6], reasoning through knowledge and experience during mathematical [2]. Mathematics is a series of ideas that are connected to each other regarding isolated collections of facts and algorithms.

In a research [3], regarding the understanding a concept among high achieving students cannot fully understand the concepts they think about, but when faced with non-routine problems, they cannot apply the knowledge they have learned so far. To be able to apply knowledge, students are required to do a much of practice with various questions.

Stated that teaching based on concept have a better effect in improving student understanding and does not sacrifice procedural skills [7]. In an attempt to connect the spiritual atmosphere of elementary school students to middle school, junior high school to high school, and high school to higher education institutions, researchers strongly recommend the need for school or campus matriculation and subject matter matriculation.

1.1. Teacher's Mindset
In matriculation, the lecturer with a new mindset develops meaningful relationships between underachieving students and material in the learning process can be easily understood. There is common misconception that only “math people” are capable of succeeding in mathematics, evidence suggest that a combination of proper teaching in mathematics and a growth mindset can produce success for every student. [8]

Our previous studies [9,10], revealed how teacher with a growth mindset rely strongly on process-focused pedagogical thinking. It has also been found that teachers play a critically notable role in supporting classroom interventions.[11]. The thinking ability of those who actualize the growth mindset in practice and who think critically participate actively in lectures means that they have long-term benefits of knowledge from the new mindset intervention[12].

Statement [13,14] show that students with a growth mindset achieve a higher levels than those with a fixed mindset and that when students changed their mindset, their performance changes. The finding that students in this study shifted toward viewing mathematics as a more creative subject, as well as developing as more growth mindset, supports an important link [15]. Scientist Proposes a new, more visionary goal for mathematics that empowers students to develop higher orientations and abilities to achieve greater success

1.2. Purpose of the Case Study
Scientist [16] proposes a new, more visionary goal for mathematics that empowers students to develop a higher orientations and abilities to achieve greater success [16]. It was reported that the low understanding of mathematical concepts, skills and knowledge is one of three reasons why engineering students at the University fail so many math or calculus exams [17]. In short, most students doing well in mathematics do well in Calculus. Review in Conceptual Knowledge and Mathematical Achievement of students focus on Mathematical Matriculation [5].

The aim of this research is to know concept knowledge of students focus on matriculation and its relationship with focus on learning mathematics learning. The function of mathematics is as a medium or means for students to achieve competence. Therefore the current information age aims to increase the functional knowledge of individuals in order to survive and can be used knowledge efficiently[18]. Curriculum problems have prevailed for decades despite numerous studies that have shown how to teach mathematics well.[15,19]

Divided the research into two groups and reported that educational research on mathematical thinking has two different perspectives, namely the process of mathematics and conceptual development. According to him, researchers who handle mathematical thinking concepts within the framework of mathematical processes are more focused on how mathematical thinking is manifested.
2. Methodology

The research description briefly includes the research design, population, research instruments, and data analysis procedures.

2.1. Research Design

Experimental research is research conducted with a scientific approach using two sets of variables employed by researchers to establish the existence of a cause and effect relationship between variables in a research study [20].

2.2. Population

The study population was new students of information engineering, electrical engineering, and aquaculture. The research sample was new students of electrical engineering at UNISNU Jepara-Indonesia academic year 2017-2019 in Mathematics subject.

2.3. Research Instruments

The research instrument was the analysis of the results of the pre-test and post-test matriculation of new student mathematics courses in 2019 as a representative of the 2017-2019 period data from the initial questionnaire data which shows that the quality of new students is assumed to be of the same quality.

2.4. Data Analysis Procedures

The collected data were analysed with SPSS software.

3. Results and discussion

3.1. Test research data

From the results of the study of Electrical Engineering students at UNISNU Jepara in learning Calculus subject matriculation shows the mean pre-test = 42.24, and mean post-test = 53.76, then the Calculus subject matriculation shows a difference, to show a significant effect on this relationship. Between the pre-test and post-test results the researcher calculates the correlation coefficient of the pre-test and post-test. Table 1 clearly shows the SPSS results showing the correlation of the pre-test and post-test.

| Table 1. The result Correlation of pre-test and post-test |
|---------------------------------------------------------|
| N   | Correlation | Sig. |
| Duo | Pretest - Postest | 17  | .924 | .000 |

The results showed a positive correlation of 0.924 close to 1, meaning that the pre-test had a strong effect on the post-test score.

3.2. Hypothesis test results based on SPSS

| Table 2. The result Samples Test with 95% confidence intervals |
|---------------------------------------------------------------|
| Upper | t  | df  | Sig. (2-tailed) |
| Duo   | Pretest - Postest | 9.42432 | 11.610  | 16  | .000 |

Table 2 shows the research class scores, where these scores were taken at the beginning of the matriculation and at the end of the calculus course matriculation as pre-test and post-test scores. The results of the t test provide a value of t count 11.610, and t table, df 16, 5% standard significance is 2.119. It can be concluded that t count is higher than t table (11.610>2.119). If t count > t table, the null hypothesis (Ho) is rejected and alternative hypothesis (Ha) is accepted. This signifies that there is a significant difference, which means that the pre-test value is significantly different from the post-test.
value, so that according to the purpose of holding matriculation it can provide a refresher for new students in calculus lectures with new mindset. The calculus material presented is in accordance with the electrical engineering study program, and in general calculus/mathematics is given to all engineering study programs, because in the faculty of science and technology mathematics is a prerequisite course which is used as the basis for engineering courses.

3.3. Matriculation of understanding mathematical concepts

This low math ability is caused by several factors. One of them is the ability to understand mathematical concepts [21]. Understanding concepts is an important component in learning mathematics [22], namely the ability to understand and master a subject matter by forming knowledge and expressing it in another easy-to-understand form. [23] because mathematical concepts are interconnected and sustainable, so [24] to have good mastery of mathematical concepts, students who have mastered a concept correctly, they will be able to show all the steps in detail in a process, be able to explain why these steps appear, and able to relate the process to the related concept. With the matriculation, students then become more aware of how to solve math problems.

4. Conclusion

The conclusions in this study include:

a. Learning mathematics matriculation on understanding concepts, reasoning, student result skill.

b. An increase the average increase in the learning outcomes of the matriculation participants

With the beginning of mathematical matriculation to the end of matriculation, understanding of concepts, reasoning, and skills shows that the post-test shows improved results. The high motivated student didn’t find much difficulty when studying math. The results presented in this paper constitute a preliminary study of mathematics matriculation students. as a basis for engineering.

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