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Developing entrepreneurship ability of pre-service mathematics teachers through GSSM

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Abstract. This research aimed to describe mathematical entrepreneurship ability of 136 mathematics education students through Gerakan STKIP Siliwangi Mengajar (GSSM) that was conducted in 7 districts (of 17 villages) in West Java. GSSM was a programme that combines devotion to the society and college student internships activity at several schools within three months. The data was obtained through observation towards the activities performed by the students during GSSM. The questionnaire to measure the mathematical entrepreneurship ability of students. The results showed that 1) there were three activities that encourage the mathematical entrepreneurship ability of students; such as tutoring post, teaching practices in school and entrepreneurial activities in society, 2) through those three activities, students can develop their entrepreneurial spirit well and grow creativity, innovation and calculation take risk ability, 3) there was medium-association between student mathematical concept mastery that supports entrepreneurship with their mathematical entrepreneurship ability.

1. Introduction

For a country to be a prosperous country, there should be 2% of the citizens be an entrepreneur [1]. Therefore, the entrepreneurial spirit among the young generation should be raised remembering that the higher number of an entrepreneur in a country will gain the competitiveness of a country as well. A country with many entrepreneurs is certainly has: 1) Big income from tax sector for economic activities from the entrepreneurs 2) An independent economy (not relying on capitalist economic system) 3) Increasing Gross National Product (GNP) because with running a business, one has a chance to have higher earnings [2].

In fact, however, the number of entrepreneurs in Indonesia has only reached 0,18%. This makes a significant difference compared to Singapore that has reached 7%, Malaysia 5%, China 10%, and the United States 13% [2]. This would be a big challenge for the world of education in Indonesia to instill the knowledge and entrepreneurial spirit to the young generation so that there will be more learners that are motivated to improve their self-quality that appears to be creative, innovative, and calculated risk-taker entrepreneurs.

There are some different understandings related to the term “entrepreneur” entrepreneur refers to spirit, skills, attitude, and individual behaviour to handle a business and activities that leads to an effort to find, create, and apply the workings, technology, and new product with improving the efficiency to give a better service or obtaining the bigger profit [3]. Hence, not only referring to the business context but the term “entrepreneur” can also be used to the other field such as social, academic, governance et cetera.

STKIP Siliwangi, whose institutional vision is to generate reliable and professional teachers, has already conducted Gerakan STKIP Siliwangi Mengajar (GSSM) that combines devotion to the society and college student internships activity in several districts in West Java. One of GSSM's objectives is to set up the entrepreneurial soul of the educator, including the candidate of educators in mathematics education. This research is consequently aimed to describe the mathematical entrepreneurship ability of 136 students of mathematics education in 9 districts in West Java through GSSM.

Entrepreneurship is a realized value in behavior that becomes a resource, driving force, purpose, ethics, tips, processes, and business result [4]. In addition, entrepreneurship is also a process to apply creativity and innovation to solve a problem and looking for a chance to improve life quality. Mathematics, as the queen and servant of science, cannot be separated from the world of entrepreneurs [5]. The materials in it have the contents that support entrepreneurship; for instance, arithmetic, that contains the learning of profit and loss (P&L), taxes et cetera. Besides that, geometry also helps to calculate the shape of products' packaging. Linear Programming also teaches how to maximise the profit and reduce venture capital and cost. Accordingly, mathematical entrepreneurship in this research refers to entrepreneurial ability with applying mathematic materials within the activities process.

Gerakan STKIP Siliwangi Mengajar (GSSM) is a programme that combines devotion to the society and college student internships activity at some schools. The general ideas of this programme are (a) to prepare the SM3T Programme (*Sarjana Mengajar di daerah Terluar, Terdepan dan Tertinggal*) (b) Innovation that born from the heart/bottom-up (prioritise the and objective result) that tend to be more successful compared to innovation programme of the government (prioritise report and imaging); (c) STKIP Siliwangi, with a motto Innovative Campus: with quality and fitting cost (the innovation is based on optimism built through *istiqama*, *istikhara* and *istighfar* developing the culture of action, not discussion) [6]. The achievement targets of GSSM is to create STKIP Siliwangi students and West Java people as learners. Piaget [7] holds that the acquisition of knowledge should be obtained by action and active interaction from students towards the environment.

To obtain the reliable mathematical entrepreneurship skill, the students are also provided with the general entrepreneurship material, planning and development service programme material of mathematics courses, economic mathematics, and financial mathematics.

2. Methods

This is research descriptively depicts mathematical entrepreneurship of 98 mathematics education students in 7 districts (17 villages) in West Java within 3 months along 2017 through Gerakan STKIP Siliwangi Mengajar (GSSM) that combines that combines devotion to the society and college student internships activity at a various level of school. Students in field practice experience are given various material beforehand. Not only the materials that are related to entrepreneurship but also a workshop to create educational devices.

The data are obtained through various students' activities during GSSM, practical teaching test to the students and filling the questionnaire to measure students' mathematical entrepreneurship ability. The data were performed using SPP and Microsoft Excel.

3. Results and Discussion

During three months of GSSM, the students conducted various activities. To measure students' mathematical entrepreneurship ability, however, the research focused on three activities. Those are tutoring at the post, teaching practices in school and students' participation in entrepreneurial activities at society.

3.1. Mathematics Tutoring Activities

Students conduct the tutoring at their post. As seen on Figure 1:



Figure 1. Tutoring at GSSM post with innovation and creativity.

Places to do the learning activities are provided by local people. Sometimes it was away from the post where students live. Students' struggle and determination are needed to reach the place, it could be district office, mosque veranda, and local people's house. Those can be seen in Figure 2 below:



Figure 2. Tutoring outside GSSM post with innovation and creativity.

Remembering that tutoring was free of charge, the participants came with high enthusiasm, even when they are far from the tutoring and the numbers of them are beyond predicted. The students are prepared with Mathematical Entrepreneurship III course to support their skill in organizing the tutoring and its curriculum. In addition, the students have already experienced to take part in teaching at free tutoring held by STKIP Siliwangi for junior to high school students. The knowledge they had were re-applied on this GSSM tutoring activities. The students faced various problems, including:

- The lack of facilities and infrastructure
- Age diversity of the participants
- Diversity of interest towards mathematics lesson
- Various level of mathematics material mastery
- Society's support towards the implementation of the tutoring

All those problems require the creativity from the students to resolve the problem that the tutoring activities can be continued connecting with their mastery of mathematics learning method and mathematics material. Based on their mastery towards those two concepts, they tried to creatively think about teaching strategy to overcome the limited facilities and infrastructures, age diversity of the participants and diversity of participants' interest towards mathematics lesson. Some learning innovations are also applied to achieve the maximum results and to show to the public about the benefit of this activity. This was done to change the viewpoint of most society that is not welcoming about this kind of activity to be fully supportive. Students' creative ways and innovation are done through accurate calculation against the risk that will be inflicted. Thus, this tutoring activity explored

the spirit of mathematical entrepreneurship well. This is in line with Rohaeti's [8] research declaring that when students were to face explorative situation, they will through three stages. The first one is educating stages, as we've done on Mathematical Entrepreneurship III lesson, where the students appeared to be unfamiliar with exploration and innovation. Then, when students took-part on free tutoring at the campus, they are in trial stage in which students create knowledge understandings and practiced. Until the GSSM held, students are accustomed to innovating and exploring several activities and calculating the risk from creativity and innovation that previously done.

3.2. The Tutoring Practices

From 17 locations of GSSM 2017, 98 undergraduate mathematics education students of STKIP Siliwangi (in their last semester) conducted teaching practices in elementary, middle-high, high (also vocational) school. The distance between the schools and their post are varied and the transportation is sometimes quite problematic.

The obligated number of lesson in school are 10 sessions. However, in fact, the total of meetings is sometimes exceeded, even more than 20 meetings. The obligatory for practicing students are to teach high school level, but again, it appeared that they teach more than merely one level of school. As found in GSSM 2016 [6], on GSSM 2017 are also found several problems:

3.2.1. Diversity of students' characteristic

There were students with harsh and rude intonation, shows no respect to the teacher(s), discipline problems, being lazy on doing the assignment, presence problems, and low mathematics skill. Passive students tend to perceive the information and following on what is being explained and exemplified by the teachers. They generally dislike mathematics.

3.2.2. Diversity of school personnel characteristics

There was a nice and friendly teacher(s). However, there are also teacher(s) that shows seniority towards others, so busy and lack in presence that the practicing students receive less guidance. Monotonous and not innovative teaching method is also felt when some of the home teacher only give a note to their students. This causes problems for their understandings towards the material. Some of the practicing students had some difficulties as the school personnel uses very polite (tend to be old-fashioned) Sundanese language in which not familiar.



Figure 3. Learning practises at the school with innovation and creativity.

Understanding of mathematical concepts gives big contributions to create a creativity and innovation in a learning. This founding is according to Muskibin [9] that hypothesized that creativity and innovation is a process to create something involving current existing elements and experiences to be processed in the brain to generates something new.

3.3. Entrepreneurial Activities in Society

There are some entrepreneurial activities in the area where the students participated in GSSM. For example, a small business of *Gurilem* crackers in Desa Taman Jaya Gunung Halu, chicken farm in Ciamis, culinary business in Desa Ciburuy and more. In this activity, the students took part in those businesses. They initially obtained the knowledge and insights of the business that has run by doing some of practices, packaging, and selling. After some time, the students applied their mathematical knowledge in that activity, such as social arithmetic, financial mathematics that they already learned in Mathematical Entrepreneurship II lesson. They give some feedback related to profit and loss, innovation to be done with calculating the risk that possibly happened. Their knowledge in geometry was used when it came to packaging the product. Information and experienced assimilated by the students during the lecture can be utilized to initiate a creativity and innovation towards business in society. The figure depicts these below:



Figure 4. Students participation in entrepreneurial activity in society with innovation and creativity

Participating in entrepreneurial activities in the society means that they directly face the social environment connecting to their entrepreneurial ability. This made the students explored the skill and potential in themselves to arise innovation and creativity, as said by Coleman and Hammen [10] that stated that the factor that supports one's creativity and innovation, besides cognitive skill, is the open nature of internal and external stimulus, independent in thinking and expressing. It also needs independence of thought, unbounded to authority and existing social convention, and most of all, believe in self-ability.

3.4. The Association between Mathematical Concept Mastery with Mathematical Entrepreneurship

The connection between students' Mathematical Concept Mastery with their Mathematical Entrepreneurship is described in the table below:

Table 1. The number of students based on the criteria of mathematical concept mastery and their mathematical entrepreneurship

		Mathematical Entrepreneurship			Total
		High	Medium	Low	
Mathematical Concept Mastery	High	15	7	0	22
	Medium	15	31	22	68
	Low	1	1	6	8
	Total	31	39	28	98

Based on calculation performed on SPSS obtained $\text{sig}=0,000 < 0,05$ meaning that H_0 is rejected so that the conclusion obtained, there is an association between mathematical concept mastery with mathematical entrepreneurship ability. Also obtained $C=0,57$ C_{max} , meaning that association is categorized as medium.

As shown in Table 1 we can see that between students' mathematical concept mastery with mathematical entrepreneurship ability has a close relationship. This is in line with the results of

Hendriana and Rohaeti's [11] research that declared that there is close relation between hard one's skill (of mathematics) and soft skill (characters). Therefore, those two abilities should be optimally developed and balanced through various of innovative learning with value and character nuances.

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4. Conclusion

Based on the results and discussion, it can be concluded that: (a) There are three activities that encourage the mathematical entrepreneurship ability of students; such as tutoring post, teaching practices in school and entrepreneurial activities in society; (b) Through those three activities, students can develop their entrepreneurial spirit well and grow creativity, innovation and calculation take risk ability; (c) There is medium-association between student mathematical concept mastery that supports entrepreneurship with their mathematical entrepreneurship ability.

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