



## The Mathematics Reasoning Skill of X Graders based on Entrepreneurship Character on a Brain-based Learning with RME Approach

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### Abstract

This research described the mathematics reasoning skill of learners taught by brain-based learning with an RME approach based on the entrepreneurship character. This descriptive qualitative research took the research 32 subjects of X graders from BDP 2 Vocational High School Swadaya Semarang in the academic year of 2021/2022. The researchers collected the data with a questionnaire, observation, documentation, and interview. The results showed the learners' mathematics reasoning skills based on their entrepreneurship characters taught by brain-based learning with the RME approach were varied. The researchers analyzed the data by reducing, displaying, triangulating, interpreting, and verifying the data. The results showed the entrepreneurship characteristics of the learners were categorized into high and moderate. The learners' mathematics reasoning skills varied based on their entrepreneurship character.

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## INTRODUCTION

Reasoning skill is important for daily life and mathematics objective. The skill is important to manage various daily life problems. (Hartati et al., 2020; Marasabessy, 2021; Vos et al., 2021) explains that mathematical reasoning becomes the basic step to solving problems. Individuals would have excellent reasoning skills if the individuals (1) could explain with some models, facts, properties, and solutions; (2) estimate the answers and the solutions; (3) calculate mathematically based on the agreed rule; and (4) provide direct and indirect evidence (Triana et al., 2019).

The Directorate General Regulation of Primary Education, Dirjen Dikdasmen, Number 506/C/PP/2004 explains the mathematics activities or reasoning stages are: (1) presenting mathematics problems orally, in a written manner, with figures, and with diagrams; (2) proposing assumption; (3) manipulating mathematically; (4) arranging evidence and providing reasons for the solution; and (5) drawing a conclusion from the questions.

The importance of mathematics for every person, especially primary school learners and higher education students, makes those individuals must understand and master the skill. The mathematics skills of Indonesian learners are still low based on the TIMSS results. This International survey reveals the mathematics achievement values of Indonesian learners are below the average. The Indonesian learners reached the lowest percentage of 20% for their cognitive domain, specifically the reasoning skill. (Sari & Yuniati, 2018) explain that learners with low mathematics reasoning skills must receive attention.

The efforts of managing the problems require an accurate learning model for teaching mathematics to the learners. (Rahman & Kharisudin, 2019) explain that the learning model refers to a conceptual and operational framework to guide the teachers in planning and applying the learning activities. The learning model is also useful to elaborate the methodological process and to manage the learning experience to achieve specific learning objectives. One of the models to improve the learners' activeness is - brain-based learning.

The model makes human brains work maximally. An excellent education should treat learners as individuals with different and unique intelligence levels. Brain-based learning could facilitate learners with various intelligence levels to learn in a learner-centered environment based on their learning styles. (Triana et al., 2019) explain that brain-based learning refers to learning based on the brain's performance. Thus, the learning model suggests a natural mechanism for the brain's work. Therefore, a realistic mathematics education approach, RME, is suitable to support the learning model. (Taubah et al., 2018) explain Realistic Mathematics Education (RME) is useful to introduce learners to mathematics and to connect mathematics with real-world situations. RME, based on a similar philosophy of meaningful learning, perceives mathematics as an applicable subject in various contexts.

The entrepreneurial review will receive benefits from the knowledge gained and entrepreneurial skills. (Hadikusuma, 2019; Nurdin & Putriyani, 2022; Rina, 2019) explains that entrepreneurship influences various learners' psychological stimulus to innovate, seek inspiration, perform ethics, and understand important values. The realization of entrepreneurship opportunities decreases the rate of unemployment. One of the government's policies to solve the rate of unemployment is to instill entrepreneurship education in classrooms. The current curriculum covers entrepreneurship education by encouraging learners to learn more about entrepreneurship and develop their entrepreneurial spirit.

In this research, the researchers described the mathematical reasoning skills of the learners based on entrepreneurship characters taught by brain-based learning with RME.

## METHOD

The researchers conducted the research at Vocational High School Swadaya Semarang. This descriptive qualitative research took the tenth graders of X BDP 2 from Vocational High School Swadaya Semarang, in the academic year of 2021/2022, as the research subjects. The researchers collected the data with tests, questionnaires, interviews, observation, and documentation. The researchers determined the subjects based on the mathematics reasoning skills

and the assessment of the entrepreneurship character questionnaire.

The researchers obtained the problem-solving skill data from the problem-solving skill test and the self-efficacy characters from the self-efficacy questionnaire.

The data analysis of this qualitative research began at the beginning of visiting the research site, during the investigation at the research site, and after collecting the data from the research site (Sugiyono, 2015). Here is the explanation.

The pre-field analysis required the researchers to conduct a preliminary study or collect secondary data to determine the research focus and validate the research instruments.

The on-site research analysis included the implementation of the Miles & Huberman data analysis method, starting from data reduction, data display, and data verification. Here are the detailed explanations about the on-site research analysis.

(a) data reduction included (1) preparing the learning instrument, such as syllabus, lesson plan, worksheet, self-efficacy questionnaire, and validated problem-solving skill test by experts; (2) assessing the entrepreneurship questionnaire and mathematics reasoning skill test results, (3) determining the research subjects for further interview, and (4) noting and screening valuable findings from the research site.

(b) data display included (1) presenting the data from findings in the forms of tables, graphics, pie charts, etc; (2) presenting the data from the findings in the form of short essays, inter-category cohorts, etc; and (3) presenting the data from interview results

(d) drawing and verifying the conclusion. In this step, the researchers verified the data and conclusions from the research results.

## RESULTS AND DISCUSSIONS

The researchers described the mathematical reasoning skills of the learners based on the entrepreneurship character. In this research, the researchers used three instruments: an entrepreneurship character questionnaire, a mathematics reasoning skill test, and an interview.

Then, the researchers distributed the questionnaire to the learners to fill out. This step was useful to identify the entrepreneurship characteristics of the learners. The researchers arranged the

entrepreneurship questionnaire based on three dimensions. They were the internal locus of control, the need for achievement, and the need for independence (Ormiston et al., 2021). The researchers grouped the entrepreneur characters for the learners into three categories: high, moderate, and low potential entrepreneurship (Yusuf et al., 2019).

The researchers shared the entrepreneurship characters for the learners to fill in. After receiving the data about the learners' entrepreneurship characters, the researchers analyzed the questionnaire results. From the data, the researchers found the entrepreneurship character of the learners was categorized as high and moderate. The results showed 21 learners had high entrepreneurship characteristics while 11 learners had moderate levels.

Then, the researchers applied brain-based learning with the RME approach and shared the mathematics reasoning skill test for the learners at the end of the learning. Based on the final test results of the learners' mathematics reasoning skills, the researchers found 4 learners had extremely high mathematics reasoning skills, 25 with high mathematics reasoning skill category, and 3 learners with moderate category.

The researchers described the learners' mathematics reasoning skills based on the mathematics reasoning indicator mastery. The indicators were: (1) presenting the mathematics statement into mathematics figures, tables, and models; (2) creating strategies of assumptions on working and solving the problems; (3) manipulating mathematically; and (4) reflecting the solutions from the problems.

From the final data, the researchers interviewed the learners. The researchers conducted a close interview with the subjects based on the predetermined interview guideline. The results were useful to ensure the identified results of the learners' entrepreneurship characters and their mathematical reasoning skills.

### The Descriptions of Learners with High Entrepreneurship Character Potency

The results showed 21 learners with high entrepreneurship character and 2 learners with extremely high and high mathematics reasoning skills. Of these 21 learners, four learners had extremely high mathematics reasoning skills and 17 learners had high mathematics reasoning skills. Here

are the descriptions of the learners' mathematics reasoning skills with high entrepreneurship character.

Learners with high entrepreneurship potency and extremely high mathematics reasoning skills obtained scores of 90 and 87. On the other hand, learners with high mathematics reasoning skills obtained scores of 81, 79, 77, and 75.

### The Descriptions of Learners with Moderate Entrepreneurship Character Potency

The results showed 11 learners with moderate entrepreneurship character and 2 learners with high and moderate mathematics reasoning skills. Of these 11 learners, eight learners had high mathematics reasoning skills and 3 learners had moderate mathematics reasoning skills. Here are the descriptions of the learners' mathematics reasoning skills with moderate entrepreneurship character.

Learners with moderate entrepreneurship potency and high mathematics reasoning skills obtained scores of 75 and 71. On the other hand, learners with moderate mathematics reasoning skills obtained scores of 67, 77, and 65.

From 32 learners as the subjects, the researchers found the learners' mathematics reasoning skills based on the entrepreneurship characters were varied. The researchers found that entrepreneurship characters and mathematics reasoning skills had the same categories. However, the mathematics reasoning skill patterns were not the same.

### CONCLUSION

The X graders' mathematics reasoning skills of Vocational High School Swadaya Semarang based on the entrepreneurship character of brain-based learning with the RME approach were varied. The researchers found learners with high entrepreneurship character also had extremely high and high mathematics reasoning skill categories. The researchers also found learners with high entrepreneurship character could master the first, second, and third indicators excellently. They could also adequately master the fourth indicator. Then, learners with moderate entrepreneurship character had high and moderate mathematics reasoning skills. The learners with moderate entrepreneurship could master the first and second indicators excellently. They could adequately

master the third indicator but could not master the fourth indicator.

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