Realistic-science, technology, engineering, and mathematics assisted by google classroom as a learning innovation in the new normal era to improve statistical thinking skill

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Abstract. Based on government policies regarding the implementation of learning from home, it is necessary the learning innovation to continue learning in the new normal era by utilizing existing technological advances. In this digital era, statistics thinking is important because it is needed to be able to interpret and understand and make good decisions from the statistical data obtained. From these problems, one of the innovations that can be done is by implementing Realistic Mathematics Education integrated Science, Technology, Engineering, and Mathematics assisted by Google Classroom (R-STEM-GC). This paper aims to determine the effect of R-STEM-GC learning on students' statistical thinking skills. This paper uses literature review method research that identifies, assesses, and interprets all findings on a research topic to answer existing research questions. It can concluded that realistic learning was more effective in terms of students' mathematical reasoning and communication than conventional learning; learning with the application of STEM can improve students' problem solving abilities compared to conventional learning; and the use of google classrooms that can improve communication skills. From the results of this analysis, the application of R-STEM-GC learning can be an innovative solution in improving students' statistical thinking skills in new normal era.

1. Introduction

The existence of Covid-19 has an impact on all areas of life, one of which is education. All learning activities are carried out online at each student's home by taking advantage of existing technological advances or also known as distance learning. This is based on the existence of the Minister of Education and Culture Circular Number 4 of 2020 concerning the Implementation of Education in the Covid-19 Emergency Period which was strengthened by SE Secretary General Number 15 of 2020 concerning Guidelines for Implementing Learning From Home during the Covid-19 emergency. However, the existence of this distance learning raises pros and cons. It is not only students and parents who find it difficult, this also applies to teachers. Tedious learning is one of the complaints of students during distance learning. Therefore, it is necessary to have a learning innovation to make it more attractive by taking advantage of existing technological advances.

In this digital era, statistical thinking skills are important to develop because statistical thinking skills are needed to be able to interpret and understand and make good decisions from the statistical data obtained [1]. Statistical thinking is the ability to understand the statistical process as a whole, including the process of collecting data, making questionnaires, determining variables, and the ability...
to answer existing problems [2]. In the ability to think statistics, there are several competencies and indicators of achievement that need to be used as an assessment guide. The statistical competence includes (1) reasoning for data; (2) reasoning on the basic concepts of statistics and terms used in statistics; (3) reasoning on the collection and processing of data on descriptive statistics; (4) basic skills in translating data; and (5) basic skills in communicating data and research results [2]. Meanwhile, the indicators of achievement in the thinking process are statistically, namely (1) describing the data; (2) organizing data; (3) presenting data; and (4) analyzing and interpreting the data [2].

To help develop statistical thinking skills in students, we can try to use a realistic approach in learning because students can apply their understanding of statistical processes to real problems. The realistic approach is one of the mathematics learning approaches that uses everyday problems as a source of inspiration in concept formation which can then reconstruct the concept so that students have a strong understanding of mathematical concepts [3]. In addition to a realistic approach, the STEM approach will also be applied in learning. The STEM approach is problem-based learning in which there are four aspects of science, technology, engineering, and mathematics that are required simultaneously.

To help the learning process, google classroom will also be used as an application of the technology and engineering aspects of the STEM approach. The use of google classroom actually makes it easier for teachers to manage learning and convey information appropriately and accurately to students and makes students feel comfortable and active in constructing their knowledge [4].

Based on the explanation above, Realistic Mathematics Education integrated Science, Technology, Engineering, and Mathematics assisted by Google Classroom (R-STEM-GC) can be an innovative solution in improving students' statistical thinking skills in the world of education in the new normal era.

2. Methods
This type of research is literature research or literature review, which is research that is used to identify, study, evaluate, and interpret all available research with topics of interesting phenomena, with certain relevant research questions [5]. Library research is a research activity carried out by collecting information and data with the help of various kinds of materials available in libraries or sources from the internet related to the problem to be solved. Activities are carried out systematically to collect, process, and conclude data using certain methods / techniques in order to find answers to the problems faced [6].

3. Results and discussion
Based on the research of Wulansari there is an effect of problem-based learning models in statistical material on students' statistical reasoning abilities [1]. If analyzed based on the learning steps used in the research of Wulansari, et al, with the indicators of the achievement of statistical thinking, then some linkages are obtained. In the problem-based learning steps, the step presents a problem and orientation to the problem where at this step students are given problems to solve together so that students are able to achieve indicators that describe and represent data. Steps to organize students to learn and guide/facilitate individual or group investigations where at that step students are taught to study in groups, students are also required to discuss the questions on student worksheets so that students are able to achieve indicators of organizing data and applying statistical understanding to real problem. The final step in problem-based learning, namely reflection and evaluation, requires students to read the results of the data that have been presented so that students are able to achieve indicators of analyzing and representing data.

Another study by Wibowo explains that the realistic learning approach is effective on learning achievement, mathematical reasoning abilities, and student interest in learning [3]. This is in line with the competency of statistical thinking used as a guideline for this study which includes, (1) reasoning for data, (2) reasoning on basic statistical concepts and terms used in statistics, and (3) reasoning for
data collection and processing on descriptive statistics. In addition, in Lestari entitled suggests that a realistic approach can improve students' understanding of mathematical concepts [7].

Based on research by Yunisha and Siregar it can be concluded that the mathematical communication skills of students who learn with the PMR approach are higher than students who learn with conventional approaches [8],[9]. This research supports the competency of statistical thinking in this study, namely the basic ability to translate data, communicate data and research results. Another research by Sitorus, there is an influence of the RME learning approach on students' creative thinking processes [10]. The student's creative thinking process includes 5 stages including: orientation, preparation, incubation, illumination and incubation. From the description of each stage, it is found that the relationship between students 'creative thinking stages and students' statistical thinking competencies and indicators. Another research that supports this statistical thinking competency is by Khairani shows that learning combined with STEM elements combined with various learning strategies and methods can improve students' connection and communication skills because they can communicate ideas and concepts of STEM elements into mathematical ideas and concepts and vice versa [11]. Another study by suggests that there is much talk about the development of future innovations. in STEM. STEM education concept is introduced to communicate existing ideas in various ways to meet the needs of young mathematics gifted [12].

From the results of the analysis of several studies above, statistical thinking competencies that have been fulfilled also support the achievement indicators in the statistical thinking process which are used as guidelines in this study. Students' mathematical reasoning and communication are needed in describing data, organizing data, presenting data to analyzing and interpreting data.

The average score of students' understanding of mathematical concepts taught using the e-learning model is 80.73 and the blended learning model assisted by google classroom is 80.80, where these results are better (have a positive effect) than using conventional learning which is only 74, 43.

Based on the results of the analysis of the effectiveness of e-learning with google classroom as a learning medium in Sabran and Sabara's, it can be concluded that, (1) aspects of learning planning; (2) aspects of material design and manufacture; (3) delivery aspects or learning delivery methods; (4) aspects of the evaluation of the implementation of learning; and (5) the criteria for implementing google classroom learning as a learning medium as a whole are categorized as quite effective [4].

The R-STEM-GC model is a learning innovation that integrates STEM into the Realistic Mathematics Education model assisted by Google Classrooms. The following are the stages of the R-STEM-GC learning model.

| Stage | Teacher Activities |
|-------|--------------------|
| Asked a problem | The teacher uploads learning material which consist STEM Context on google classroom and instructs students to study the material before teaching and learning activities. The teacher explains the learning objectives, motivates students, asks about the material that has been studied, and starts learning by posing STEM Context problems related to daily activities. |
| Oriented to learning objectives | The teacher helps students in forming groups and identifying the STEM Context problems given. The teacher directs students to collect information, analyze, and interpret the information obtained. |
| Develop a mathematical model | The teacher assists students in finding appropriate problem-solving strategies |
| Realizing interactive learning | The teacher assists students in designing and preparing the results of the discussion which will then be presented by the students. The teacher helps students to evaluate and draw conclusions from the results of the discussion. The teacher instructs students to upload the results of discussions, group or individual assignments, and carry out quizzes on google classroom. |
| Find mathematical concepts | |

Tabel 1. The stages of the R-STEM-GC learning model
STEM study through activities (1) asking questions (science) and defining the problem (engineering); (2) develop and use models; (3) planning and carrying out investigations; (4) analyzing and interpreting data (mathematics); (5) using mathematics; information technology and computers; and computational thinking; (6) building explanation (science) and designing solutions (engineering); (7) engage in arguments based on evidence; (8) obtaining, evaluating, and communicating information provides a stimulus for students to develop statistical literacy [13], [14]. The STEM context study presented in this learning model also provides students the advantage of being able to represent data in various and more meaningful ways [15]. In addition, STEM is effective for improving students' 4C abilities such as critical thinking and problem solving, creativity and innovative skills, collaboration, and communication skills [16].

Realistic Mathematics Education has a good impact on improving statistical thinking skills [17]. In addition, Zakaria & Syamaun stated that realistic mathematics education approach enhanced students' mathematics achievement, but not attitudes towards mathematics [18]. The Realistic Mathematics Education Approach Encourage students to participate actively in the teaching and learning of mathematics.

It can be concluded that R-STEM-GC learning is very suitable and effective in improving students' statistical thinking skills during the Covid-19 pandemic in this new normal era. Supported by several research results according to the table which states that students' statistical thinking skills with the application of R-STEM-GC learning are better (have a positive effect) than learning outcomes using conventional learning.

4. Conclusion

Based on several research sources, it can be concluded that the application of R-STEM learning is better (has a positive effect) than conventional learning and google classroom is an effective learning medium. Therefore, R-STEM-GC can have a positive effect on students' statistical thinking skills. Based on this explanation, the application of R-STEM-GC learning can be an innovative solution in the world of education in the new normal era to improve students' statistical thinking skills.

The implementation of R-STEM-GC learning must be supported by a learning component that is made interesting, complete, and clear so that students are interested in learning and easily understand the material. In addition, the education component, starting from the Department of Culture and Education, school components, and the participation of parents are also expected to be able to work together in assisting, providing adequate learning support and facilities so that students' mathematics learning outcomes, especially students' statistical thinking skills, can continue to increase. although in this new normal era.

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