



Senior High School Students' Knowledge of The Role of Mathematics in The Development of Science and Technology

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Abstract

Mathematics plays a significant role in developing science and technology (also known as IPTEK in Indonesian). However, students' understanding of the contribution of mathematics to the progress of IPTEK still needs to be improved. This study examines the knowledge of senior high school students (also known as SMA in Indonesian) regarding the role of mathematics in developing IPTEK. The method used is a quantitative survey, and questionnaires were distributed to SMA PGRI Cicalengka students. The data obtained were analyzed to determine the level of students' understanding of the relationship between mathematics and its applications in various fields of science, such as physics, biology, and technology. The study results showed that although most students understand mathematics is important in IPTEK, most still need to learn its specific applications in modern technology and scientific innovation. This study suggests the need for more contextual and applicable learning about the role of mathematics in the development of IPTEK so that students can better appreciate and understand the contribution of mathematics in everyday life.

Keywords: Student knowledge, mathematics, science and technology, science and technology, mathematics education.

1. Introduction

The Sustainable Development Goals (SDGs) are a global effort to address significant challenges like poverty, inequality, climate change, and environmental degradation. Amidst these global challenges, science and technology (IPTEK) are becoming increasingly important in supporting the achievement of these goals. Generation Z (born 1997 to 2012) (Riswandi, 2023; Tafonao et al., 2020) lives side by side with the development of IPTEK, so this generation has the potential to have new ideas to innovate in improving IPTEK in the future (Turner, 2015; Fridayani et al., 2022; Herawati et al., 2022).

Improvement of IPTEK cannot be separated from the role of mathematics because mathematics has an important contribution in various applications that can be applied in various fields, including technology (Judijanto et al., 2024; Baldwin et al., 2013; Pokhrel, 2023). However, not all students know the application of mathematics in real life. Many students still consider mathematics as abstract learning material. This is due to the abstractness of mathematics, which has basic objects in the form of facts, concepts, operations, and principles (Aguilar, 2021). In addition, the experience of using software involving mathematics could be more effectively integrated into their learning (Viberg et al., 2020). This experience can provide a clear picture that mathematics does not only function as a theoretical tool but also as a basis for innovation in technology, science, and engineering (Ganpatrao, 2022). Experiences like this can motivate students to see mathematics as a useful and relevant tool in everyday life and in various professional fields.

This problem can be overcome by introducing mathematical applications, including mathematics, in developing algorithms or computer programming (Yadav, 2021). With a better understanding of the role of mathematics in the development of science and technology, students can be more motivated to see mathematics as a tool relevant to theory and technological and scientific innovation. This also provides an important picture for educators to design learning that connects mathematical concepts with real-world applications in the professional and technological world.

2. Materials and Methods

2.1. Materials

The object of this study was students of Senior High School (SMA) PGRI Cicalengka, consisting of 80 students from various majors.

2.2. Methods

The method used in this study was the distribution of questionnaires designed to measure the understanding PGRI Cicalengka Senior High School students regarding the role of mathematics in the development of science and technology. The data collected from the questionnaire were then analyzed descriptively to obtain an overview of the extent of students' understanding of the relevance of mathematics in science and technology. The points of the statements contained in the questionnaire include:

- 1) To what extent do students agree with the statement: "Mathematics has an important role in the development of science and technology."
- 2) What do students know about the role of mathematics in the development of technology?
- 3) Examples of science and technology that depend on mathematics.
- 4) How significant is the contribution of mathematics to the development of science and technology?
- 5) Students' understanding of the role of mathematics in the development of innovation and technology after socialization.
- 6) To what extent does socialization influence students' views on the role of mathematics in the development of science and technology?
- 7) How interested are students in mathematics after learning about the role?
- 8) What are students' hopes for learning more about the role of mathematics?

3. Results and Discussion

Figures 1 to 8 present the questionnaire data obtained from respondents in visual form. Each figure illustrates the findings obtained after students received socialization regarding the role of mathematics in the development of science and technology (IPTEK). The statistics illustrate students' perceptions and understanding regarding the relationship between mathematics and IPTEK obtained after socialization. Analysis of the data presented will provide insight into changes in students' understanding of the importance of mathematics in supporting scientific and technological progress.

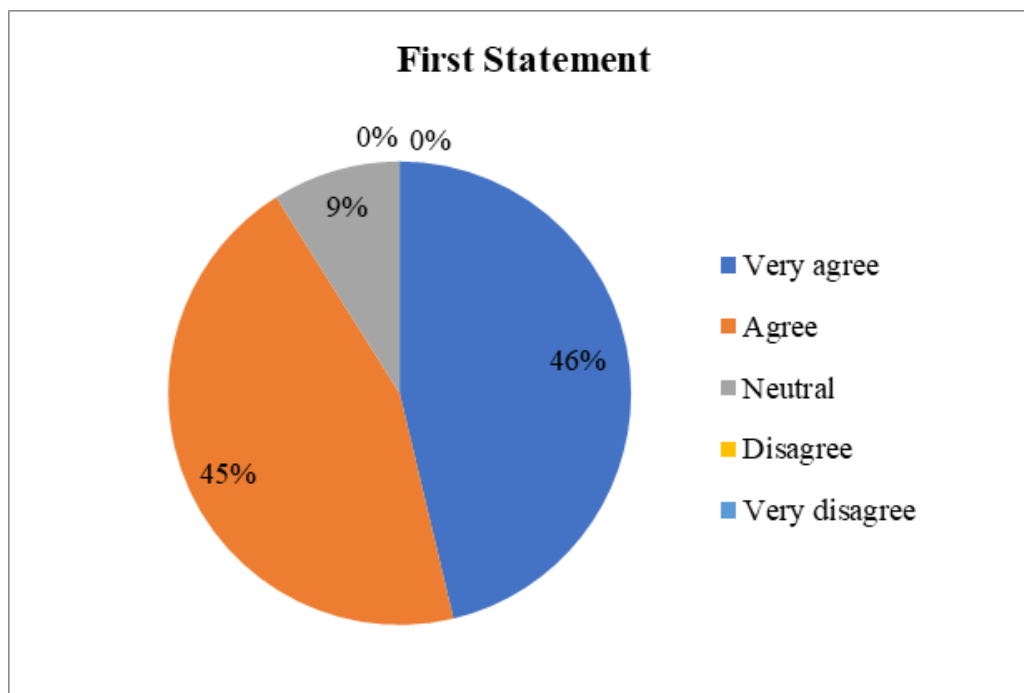


Figure 1: Diagram of the results of the first statement questionnaire

Figure 1 shows that 46% of students strongly agree that mathematics has an important role in the development of science and technology. 45% agree that mathematics is essential in this regard. Meanwhile, the other 9% are neutral.

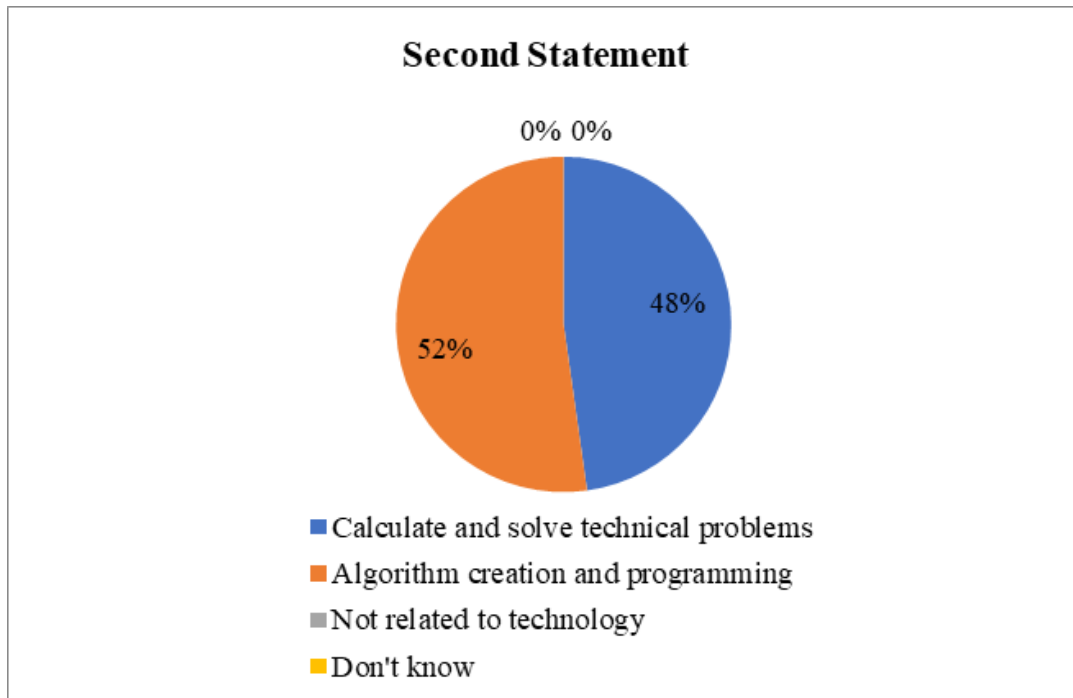


Figure 2: Diagram of the results of the second statement questionnaire

In Figure 2, 48% of students know that mathematics is used to calculate and solve technical problems. Also, 52% of students know mathematics helps create algorithms and programming.

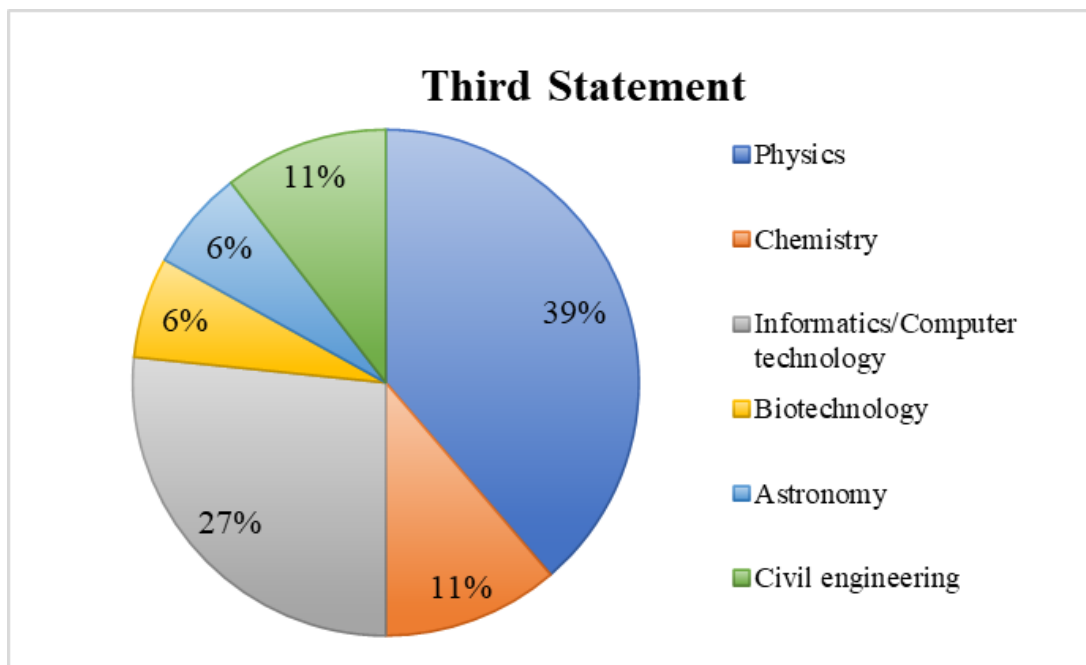


Figure 3: Diagram of the results of the third statement questionnaire

In Figure 3, it can be seen that 39% chose that science and technology depend on mathematics in the field of physics, 11% chose that science and technology depend on mathematics in the field of chemistry, 27% chose that science and technology depend on mathematics in the field of informatics/computer technology, 6% chose that science and technology depend on mathematics in the field of biotechnology, 6% chose that science and technology depend on mathematics in the field of astronomy, and 11% chose that science and technology depend on mathematics in the field of civil engineering.

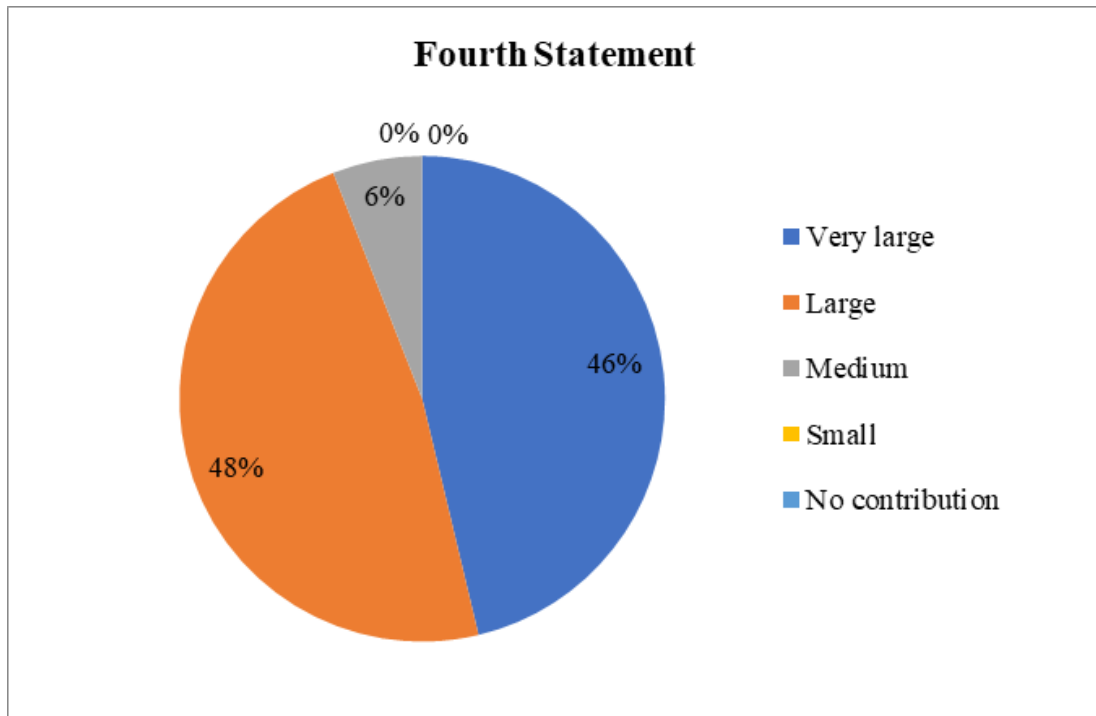


Figure 4: Diagram of the results of the fourth statement questionnaire

Figure 4 shows that 46% of respondents believe that mathematics contribution to the current field of technology is "quite large." 48% think mathematics has made a "big" contribution. Meanwhile, 6% of respondents stated that mathematics made a "sufficient" contribution.

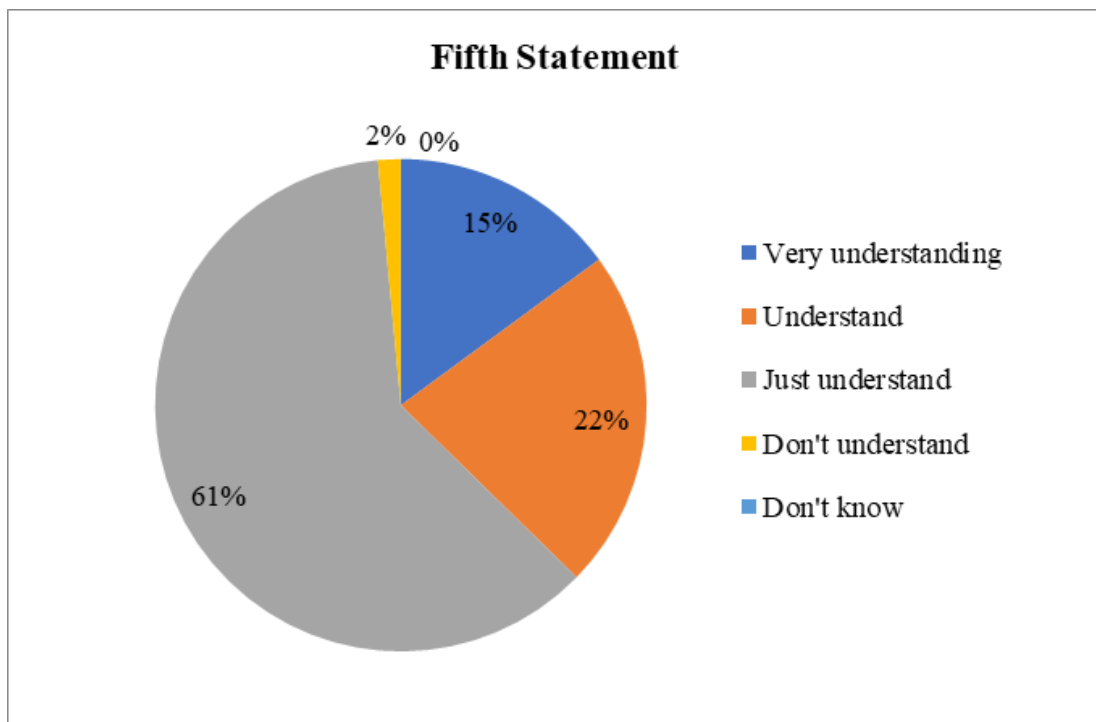


Figure 5: Diagram of the results of the fifth statement questionnaire

Figure 5 shows that 15% 'fully understand' the socialization of mathematics and its role in developing innovations in the technological world. 22% 'understand' how mathematics plays a role in developing technological innovations. 61% 'somewhat understand' how mathematics plays a role in developing technological innovations. Meanwhile, 1% would need to understand the socialization of how mathematics plays a role in developing innovations in the technological world.

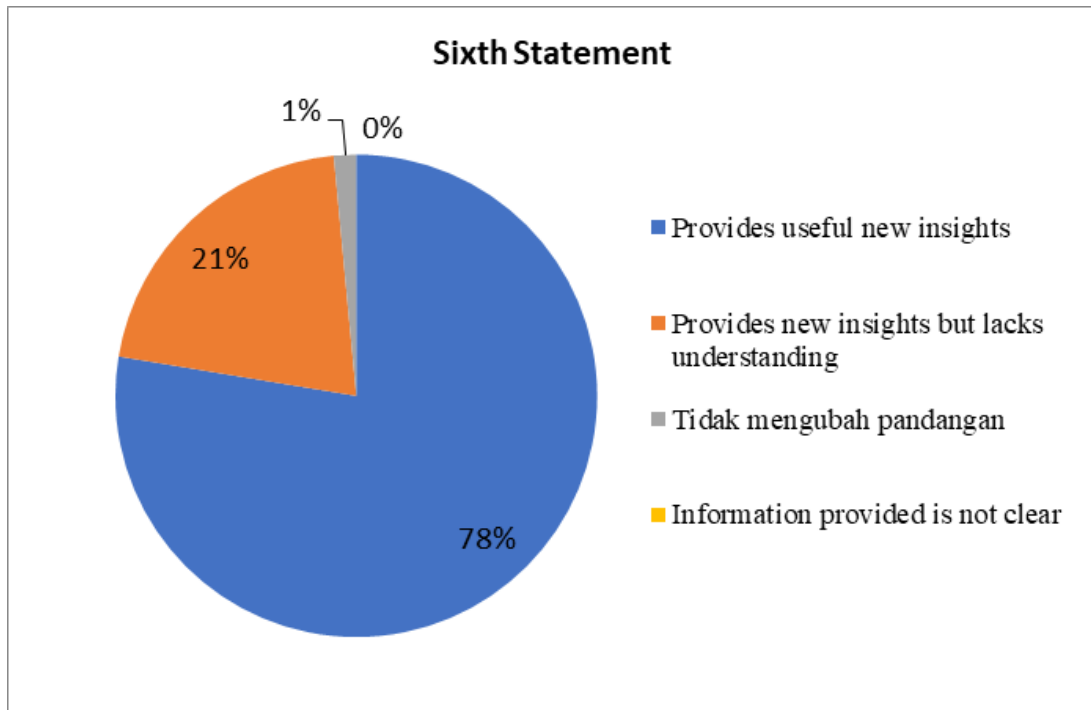


Figure 6: Diagram of the results of the sixth statement questionnaire

From Figure 6, 78% stated that socialization provided beneficial new insights. 21% indicated that socialization offered new insights, but more understanding was needed. Meanwhile, 1% indicated that socialization did not change their view of the role of mathematics in science and technology.

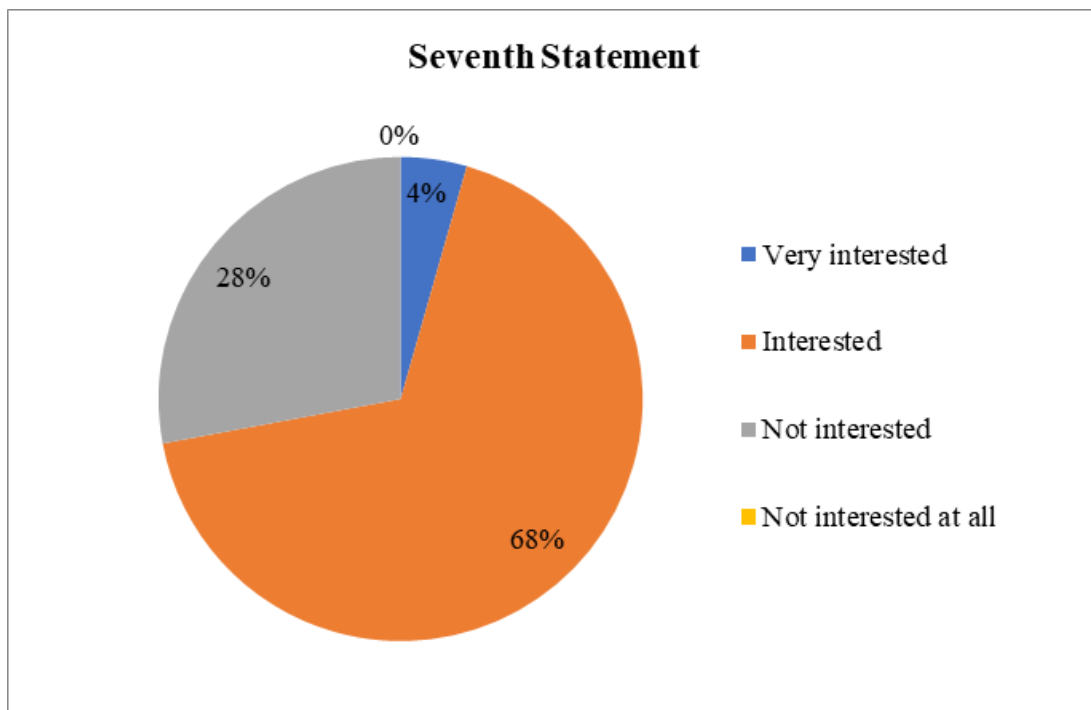


Figure 7: Diagram of the results of the seventh statement questionnaire

Figure 7 shows that 4% are "very interested" in studying mathematics after knowing its role in the development of science and technology. After knowing its role in the development of science and technology, 69% are "interested" in studying mathematics. Meanwhile, the other 28% are interested in different things besides mathematics after knowing its role in developing science and technology.

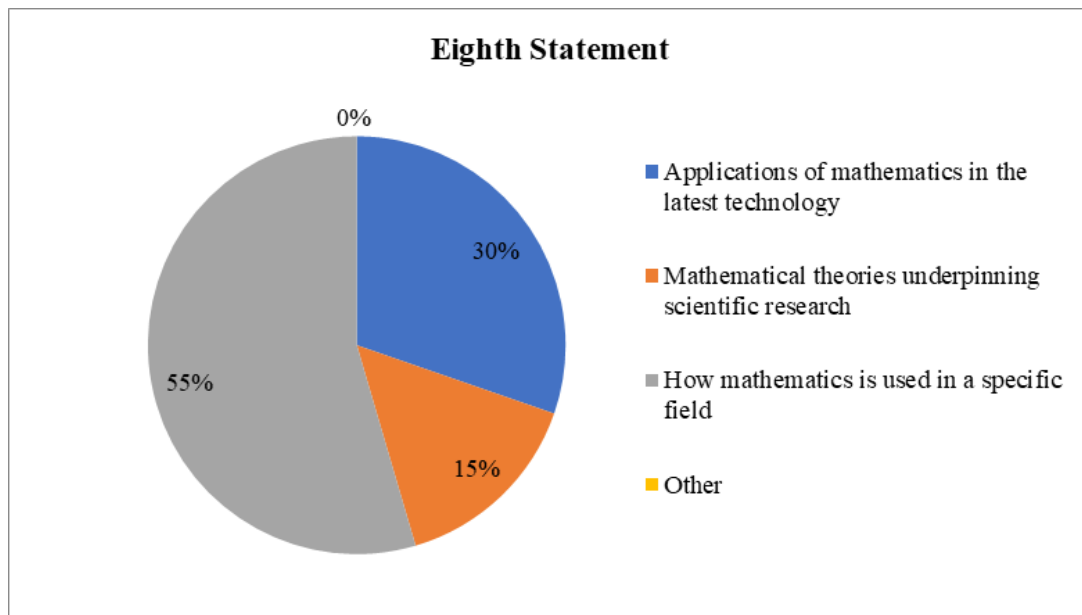


Figure 8: Diagram of the results of the eighth statement questionnaire

Figure 8 shows that 30% hope for further learning related to mathematics, science, and technology in applying mathematics to the latest technology. 15% expect further learning related to mathematics, science, and technology in the mathematical theories underlying scientific research. Meanwhile, another 54% expect further learning related to mathematics, science, and technology about how mathematics is used in specific fields.

4. Conclusion

In socializing the role of mathematics in science and technology, students strongly agree that this role is very important to help students create algorithms and programming, especially in the fields of physics and computer informatics or technology. According to the great students of mathematics contributions in the field of technology today, socialization provides new insights to students which is very useful and leads students interested in learning more about how mathematics is used in a particular field; This is known from students who quite understand the material presented during socialization.

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