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Institute of Metallurgy and Ore Beneficiation, Satbayev University, Almaty, Kazakhstan

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**Rasmuin**

Universitas Dayanu Iksanuddin, Indonesia

E-mail: [rasmuin@unudayan.ac.id](mailto:rasmuin@unudayan.ac.id)

ORCID ID 0000-0002-9565-1900

## Difficulties in mathematics education (mapping literature of international metadata in the last 10 years)

**Abstract:** It is necessary to map the results of previous studies to conduct new research. The mapping is to obtain information about the novelty of the research to be carried out. Then, it needs a mapping of what has been done by previous researchers. This study aims to map the studies that have been carried out around the world on difficulties in learning mathematics. This research is literature review research with the type of mapping. Data consist of 1,000 research articles indexed by Google Scholar from 2013 to 2022, which were collected with Publish or Perish software using the keywords difficulties in mathematics education. Mapping analysis was carried out using VOSviewer software that images were then interpreted. Mapping is done on learning difficulties in mathematics, difficulty in learning mathematics seen from the abstract with a minimum occurrence of 15 and 10, difficulty in learning mathematics is related to mathematical learning difficulty, difficulty in learning mathematics if it is seen as a relationship if mathematics is applied in studying science, difficulty in learning mathematics is related to the application of realistic mathematics education, and difficulties in learning mathematics related to instruction. The results showed that difficulties in learning mathematics focused on mathematical concepts, applying mathematics in science, word problems, unclear instructions, limited time, and students' mathematics anxiety and ability.

**Keywords:** difficulty in learning mathematics, mapping literature review, Publish or Perish, VOSviewer.

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### Introduction

Education has an important role in the progress of a country. This is because the quality of education describes the quality of the next generation of the nation. In other words, the quality of education must be increased to create a quality generation in the future. The quality of education can significantly increase productivity in terms of the economy (Jamison et al., 2007). This means that quality education has an important role in the progress and survival of the community, especially the nation's next generation. The quality of education is also a general indicator of the development of society at a certain time and it is considered to be a feature of the progress of a country (Bakhtiyarova, 2019). Therefore, it is necessary to increase the quality of education for the next generation of a good nation.

Improving the quality of education appropriate with the development of technology. Improving the quality of education needs research. The aim is to find out which parts need and do not need to be improved to get a better quality of education. The benefit of research is for developing the education system (Basu, 2020). It agrees with the research of Weinert & De Corte (2001) that educational research can be used to develop technology in the learning process, facilitate teachers, train student learning competencies, design learning models, and other educational research.

Research of education has the aim to improve the quality of education in a better and more renewable direction. This is also appropriate with the technology development. Therefore, educational

research contains novelty and can be used to achieve a better quality of education. Educational research can be used to develop and test new ideas and methods in the learning process (Maruyama & Deno, 1992). In addition, the results of educational research are used to make new policies related to education (Bransford et al., 2009).

There is much educational research that has been done in the world and it covers various aspects of education. Therefore, it is necessary to map various aspects that have been carried out by previous research. This aims to make it easier to see aspects of education that will be improved in quality. Research mapping can be useful for determining strategic planning in certain disciplines. It is like planning leads to an increase in the quality of better education (Sedighi & Jalalimanesh, 2014). In addition, the benefits of research mapping are the basis for the latest research to improve the quality of education (Kitchenham et al., 2011).

The mapping of educational research also applies in terms of improving the quality of mathematics education. Improving the quality of mathematics education can be done by utilizing the research on mathematics education that has been done. Based on the research on mathematics education that has been carried out, it is necessary to map the students' difficulties in mathematics learning. Mapping aims to find out which aspects or parts need to be improved in quality. The factor that affects the quality of education is the need for innovation in the learning process from various aspects (Lysenko & Zharinova, 2021). Innovations and improvements in various aspects of mathematics education aim to ensure that mathematics education has good quality in terms of teaching and methodology, the quality of educators' support, and education service providers (Bakhtiyarova, 2019). One aspect of mapping mathematics education which aims to develop the quality of mathematics education is that there are difficulties in learning mathematics. Some of the students' difficulties in learning mathematics are students who feel difficult in basic material and it being carried over to higher education. Consequently, students will continue to have difficulty learning mathematics (Lima et al., 2019), students also have difficulty in formulating mathematics models in problem solving in algebra (Flores, 2018; Jupri & Drijvers, 2016), students feel difficult to do mathematical proofs (Sabri & Minggi, 2014), students do not like to read long problems solving so they feel difficult to solve them (Phonapichat et al., 2014), and students have difficulty in calculating, sorting information, understanding concepts, and complete contextual test items (Retnawati et al., 2017).

Mapping research in mathematics education is not only useful for knowing aspects that need to be updated in order to improve its quality, it is also useful for knowing what actions will be taken to increase the quality of mathematics education. Actions in mathematics education to improve the quality of education can be done by providing innovations or problem solutions to overcome students' difficulties in learning mathematics. Therefore, it is necessary to map out the difficulties in learning mathematics experienced by educators. This study aims to map the studies that have been carried out around the world on difficulties in learning mathematics.

## **Research Methods**

This research is literature review research with the type of mapping. Data consist of 1,000 research articles indexed by Google Scholar from 2013 to 2022, which were collected using the Publish or Perish 8 software. This software was downloaded from <https://harzing.com/resources/publish-or-perish>. Then install it on a Microsoft Windows system. The first step after installing this software is to search for articles according to the criteria. In this study, the search was carried out using the keyword "difficulties in mathematics education", which was saved in RIS format in the period 2013-2022. There are 1000 research articles.

After all, the list of articles is displayed, then proceed with analyzing the map from the VOSviewer application software. Open the application and will appear as in Figure 1.

Based on Figure 2 there are three options. Then select "create a map based on text data" and select "next". When choosing next, by using data with the type of RIS, and then choosing the field and full counting methods, the minimum occurrence of 10 and 60% of relevant topics, and an image of research trends over the last 10 years is generated. There are 2 variations of the selected field, there are the titles and abstracts of the mapped research. Based on Figure 1, the next step is to select "Create Map" it will appear as shown in Figure 2.

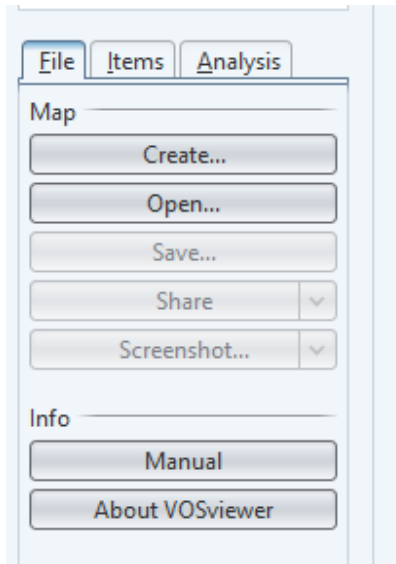


Figure 1. Appearance of the application

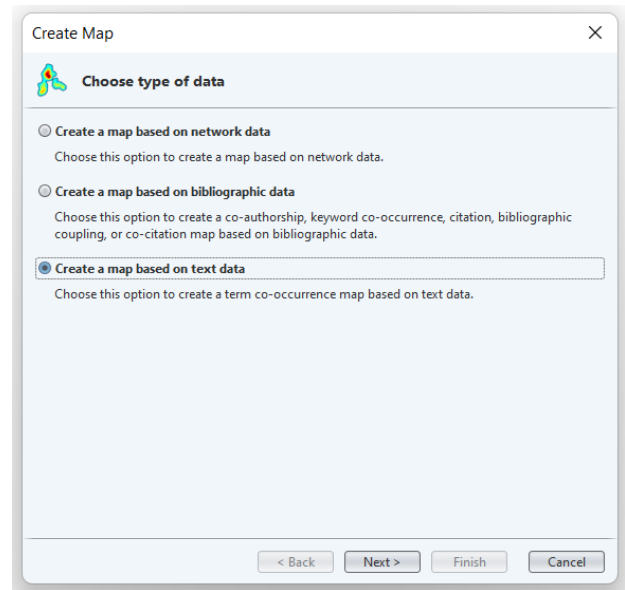


Figure 2. The appearance of Create map

### Research Results

Based on the results of the mapping difficulties in mathematics education (a mapping of the literature of international metadata in the last 10 years), the following results were obtained.

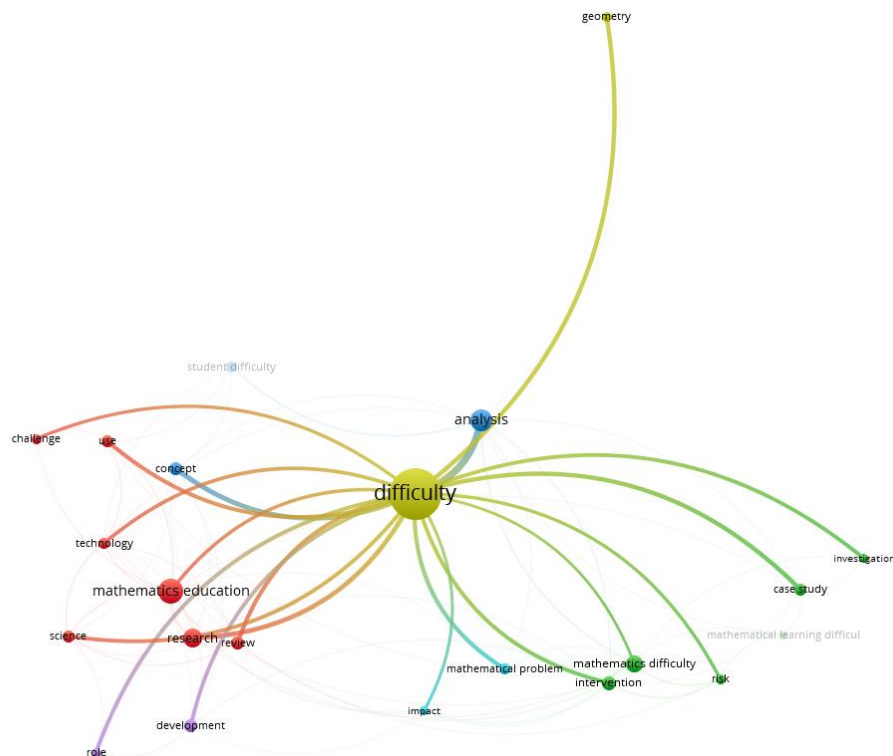


Figure 3. Mapping in research that focuses on learning difficulties in mathematics

Figure 3 shows that the results of mapping in research that focuses on learning difficulties in mathematics produce related keywords such as challenge, mathematical problem, mathematical difficulty, mathematics education, risk, use, concept, science, research, review, case study, role, impact, intervention, investigation, analysis, technology, development, and geometry. By using the words that appear, it can be interpreted that research trends related to student difficulties in learning usually use an analytical approach to problem solving difficulties, can be in the type of literature review or case study. From the difficulty

investigations carried out, the trend of difficulties and challenges in learning mathematics is related to mathematical concepts, the use/role of mathematics in science, and a topic that is often considered difficult is mathematics. To overcome these difficulties in mathematics learning, follow-up is carried out with developments to minimize the impact of these difficulties on learning success.

The next analysis is an analysis using abstract with a minimum occurrence 15 and a minimum occurrence 10. The results of the mapping with a minimum occurrence 15 are presented in Figure 4.

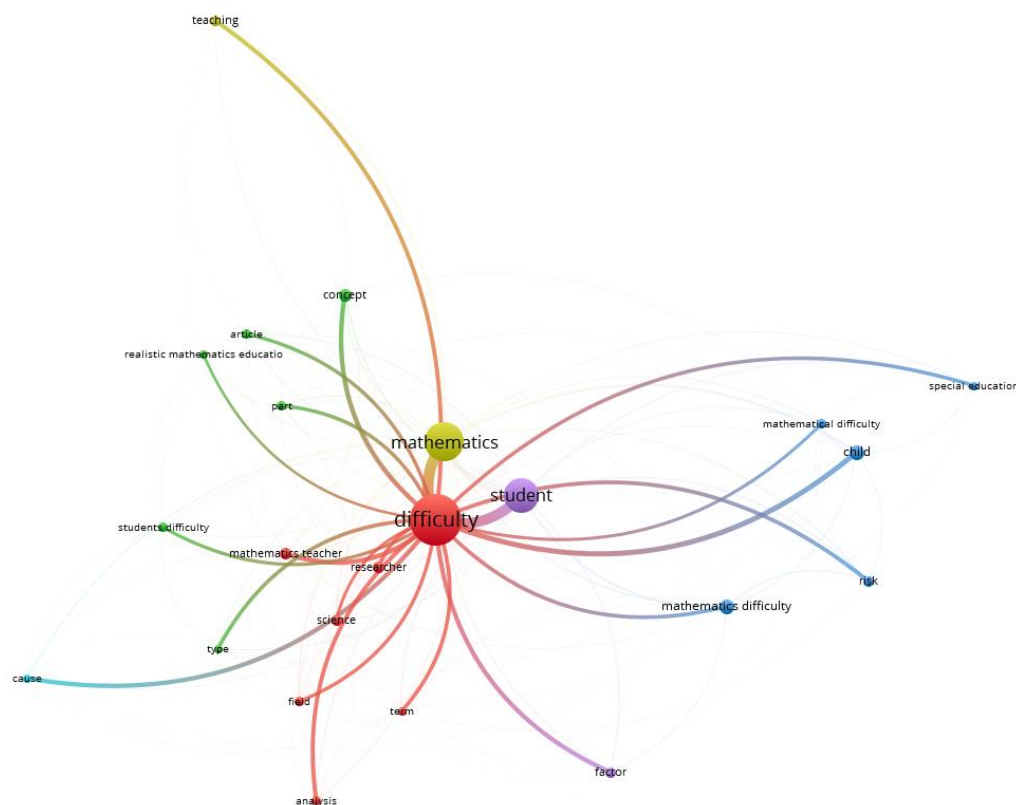


Figure 4. Mapping with a minimum occurrence 15

Figure 4 presents the mapping of difficulties in learning mathematics using research abstracts with a minimum occurrence 15. The results presented are related to mathematics, student, teaching, concept, article, realistic mathematics education, part, student difficulty, mathematics teacher, researcher, science, cause, field, analysis, factor, mathematical difficulty, risk, child, mathematical difficulty, and special education. Based on these things, the students' difficulties in learning mathematics do not only come from these students but also other factors such as mathematics teachers, the learning process, and also from mathematics which has various levels of difficulty. Therefore, it takes analysis and research on factors, causes and other related matters by researchers to get a solution. Solutions that can be used such as realistic mathematics education and special education that are appropriated with the students' difficulties in learning mathematics.

The next analysis is mapping mathematics educational research seen from the abstract with a minimum occurrence 10. The results are presented in Figure 5.

Figure 5 shows more things that related to students' difficulties in learning mathematics than using minimum occurrence 15. Mapping on minimum occurrence 10 shows that difficulty in mathematics education is related to relations, mathematical learning difficulties, mathematical difficulty, challenge, cause, chance, mathematics anxiety, mathematics education research, engineering, technology, science, mathematics problem, teaching mathematics, approach, identification, ability, word problem, fraction, probability, algebra, function, misconception, question, implication, time, challenge, instruction, task, and realistic mathematics education. Based on these results, it is illustrated that several topics in mathematics that are considered difficult by students are probability, algebra, function, and fraction. These difficulties occur due to word problems, misconceptions, time constraints, and unclear instructions. In addition, the presence of mathematics anxiety also affects students' difficulties in learning mathematics. Students'

difficulties in learning mathematics can be overcome by using mathematics education research, applying realistic mathematics education and by using technology and science that continues to develop.

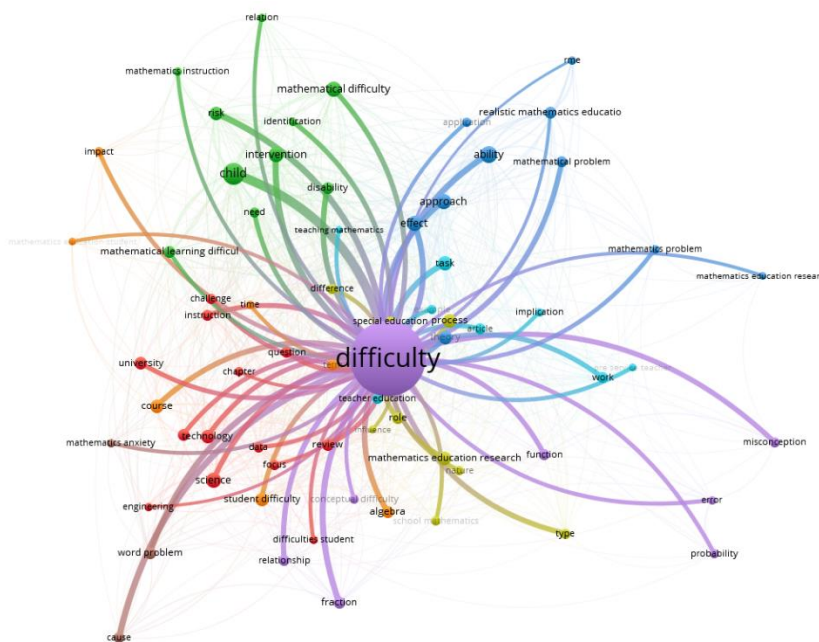


Figure 5. Mapping with a minimum occurrence 15

The next mapping focuses on the relationship in terms of mathematical learning difficulty. The result is presented as in Figure 6.

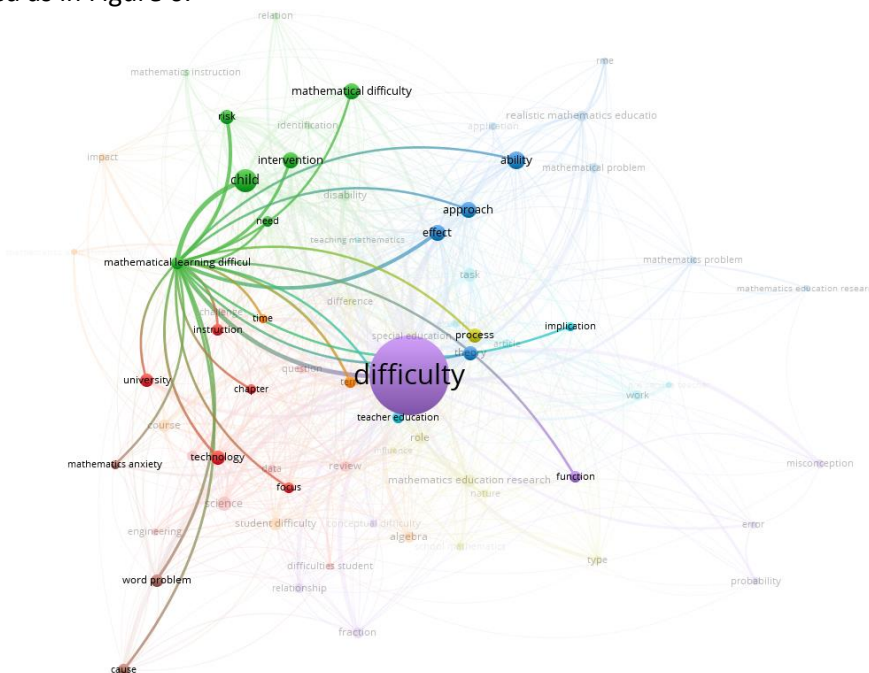


Figure 6. Mapping focuses on the relationship in terms of mathematical learning difficulty

Figure 6 shows the relationship in terms of mathematical learning difficulty. Some keywords related to this are difficulty, mathematical difficulty, intervention, child, mathematics anxiety, risk, child, instruction, chapter, university, word problem, cause, focus, technology, time, teacher education, ability, process, function, effect, approach, and implication. Based on this mapping, it is interpreted that mathematical learning difficulty is caused by several factors such as mathematical difficulty, word problems, time constraints, learning processes, and students' internal factors such as mathematics anxiety

and ability. One of the solutions offered from these problems is using technology in the development of the mathematics learning process.

Mapping of difficulty in learning mathematics when viewed in relation to mathematics being applied in studying science is presented in Figure 7.

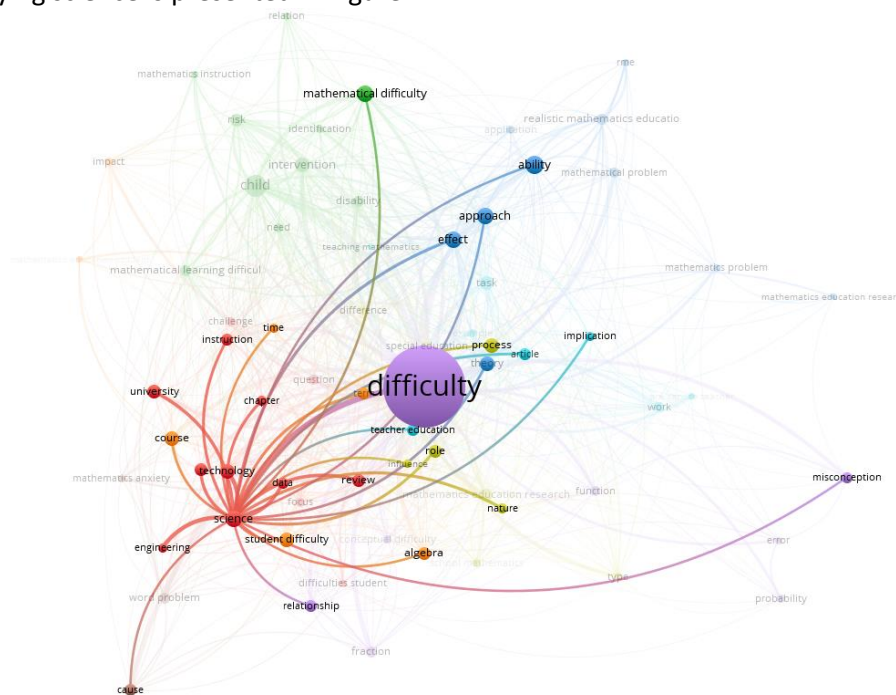


Figure 7. Mapping of difficulty in learning mathematics when viewed in relation to mathematics being applied in studying science

Figure 7 shows several things related to the difficulty of learning mathematics if mathematics is applied in studying science. There is student difficulty, difficulty, technology, data, engineering, cause, relationship, course, university, instruction, time, chapter, review, algebra, nature, role, process, implication, misconception, teacher education, approach, effect, article, ability, and mathematical difficulty. Based on the keywords, it can be interpreted that the difficulty of learning mathematics if it is applied in studying science is influenced by student difficulty, instruction, misconception, mathematical difficulty, and ability. The application of mathematics in studying science is closely related to engineering, technology, data, and algebra.

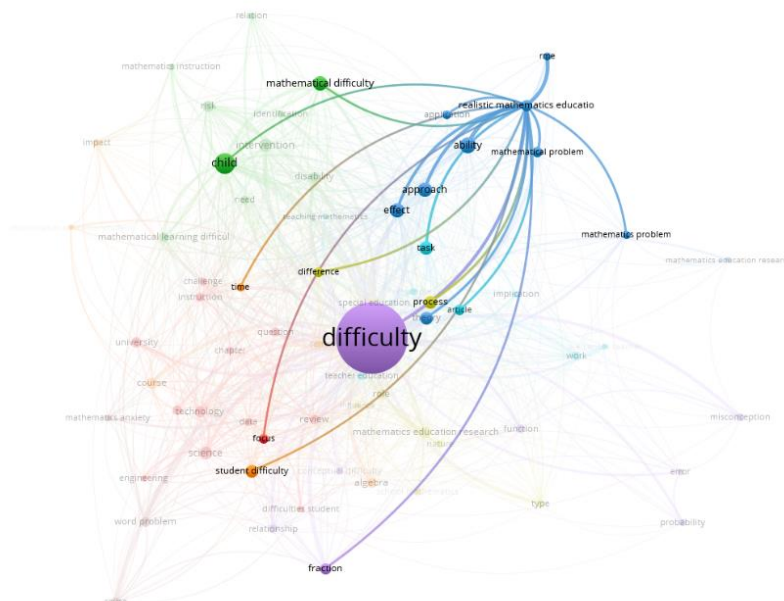


Figure 8. Mapping of learning mathematics related to the application of realistic mathematics education

Next mapping is the difficulty of learning mathematics related to the application of realistic mathematics education which is presented in Figure 8.

Figure 8 shows the difficulties of learning mathematics related to the application of realistic mathematics education. It related with mathematical problem, mathematical difficulty, ability, approach, effect, student difficulty, child, difference, process, task, RME, fraction, and focus. This can be interpreted that learning mathematics with the application of realistic mathematics education is widely applied to facilitate learning the material, especially fractions. In addition, the students’ difficulties that can be anticipated by applying realistic mathematics education such as mathematical problems, mathematical difficulties, and student difficulties. Therefore, realistic mathematics education needs precise and focused approach.

The last mapping is the difficulty of learning mathematics related to instruction. The results are shown in Figure 9

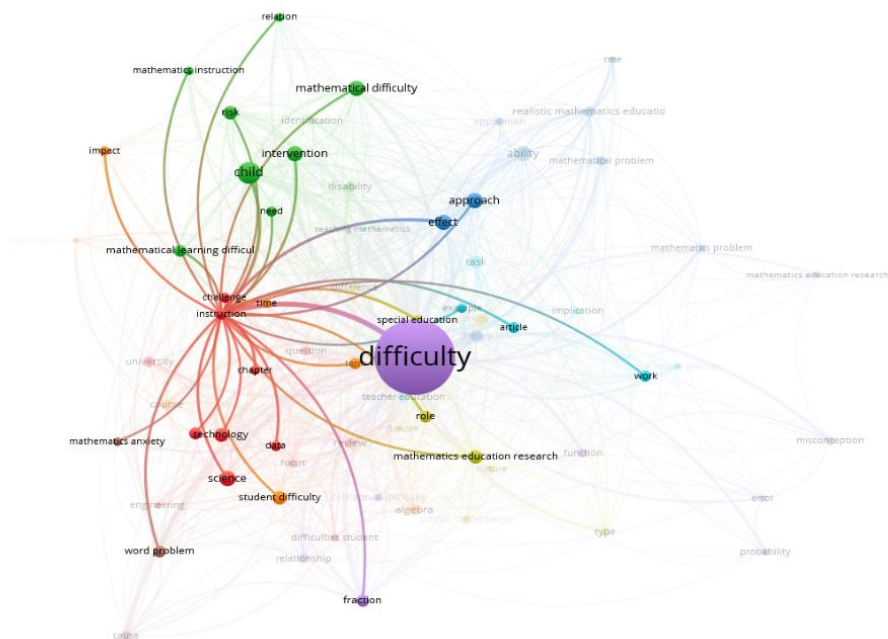


Figure 9. Mapping the difficulty of learning mathematics related to instruction

Figure 9 shows the mapping of the difficulties experienced by students related to instructions. It is related with instruction, mathematics instruction, challenge, chapter, technology, mathematics anxiety, mathematical learning difficult, word problem, mathematics anxiety, mathematics education research, special education, fraction, role, science, data, chapter, time, child, intervention, impact, risk, and relation. It illustrates that the students’ difficulties related to instruction in mathematics learning are influenced by obstacles in mathematics instruction, mathematical learning difficult, word problems, and mathematics anxiety. It needs mathematics education research and the role of technology to determine the resolution of students' difficulties in learning mathematics related to the instruction.

### Research Discussions

Mapping of educational research, especially in mathematics education research, in this study provides mapping results about learning difficulties in mathematics, difficulties in learning mathematics as seen from the abstract with a minimum occurrence 15 and 10, difficulties in learning mathematics in terms of mathematical learning difficulty, difficulties in learning mathematics when viewed in relation to mathematics applied in studying science, difficulties in learning mathematics related to the application of realistic mathematics education, and difficulties in learning mathematics related to instruction.

One of the mapping results in this study is mathematics difficulty. One of the factors that it is a disability. Differences in mathematics ability make differences in abilities in mathematics learning outcomes. Students with mathematics disabilities have low results in mathematical cognition tasks (Geary et al., 2007). This is because students have the inability to coordinate various kinds of basic mathematical

knowledge (Karagiannakis et al., 2014). It can be seen from the results of the mapping which shows that one of the difficulties experienced by students is the word problem. The students' difficulties in mathematics learning such as solving word problems and using concepts (Yulita & Ain, 2021). One of solution to this problem is the guidance or special education according to the conditions of each student. This is in accordance with the research results of Fuchs et al (2005) that mathematics difficulty can be minimized by providing guidance that is appropriated to the mathematics domain.

The mapping which presents the mapping of difficulties in learning mathematics using research abstracts with a minimum occurrence of 15 also relates the causes of difficulties in learning mathematics that is not only from student's factors but also mathematics teacher's factors. Teacher's factors in mathematics difficulty such as not directing students to ask questions, lack of skills, lack of understanding of student conditions, something wrong with teaching and learning methods, and learning tools. While the student's factors such as lack of awareness to learn, students' fear, impaired memory and reasoning, and psychological factors (Munawarah & Surya, 2017; Yulita & Ain, 2021). The psychological factor found in the mapping results of this research is math anxiety. Mathematics anxiety can become an acute disorder in the mathematics learning process and result (Baten et al., 2019). In addition, high math anxiety has an impact on low motivation to learn mathematics (Pollack et al., 2021). Indirectly, mathematics anxiety affects students' mathematics learning. There is a negative correlation between math anxiety and learning outcomes (Sherman & Wither, 2003). This means that the higher level of mathematics anxiety then the lower of the students' mathematics learning outcomes. In other words, the students will have higher level of mathematics difficulty.

Mathematics difficulty can also as a result from the application of mathematics with other subjects. Learning mathematics does not only standalone but is also related to other sciences such as science. As illustrated in the results of the mapping of this research, there are difficulties in learning mathematics if it is applied in studying science. Linking mathematics learning with science in higher education requires great effort (Matthews, 2011). This is also one of the causes of obstacles for some students so that they feel difficult in learning mathematics. In addition of its relationship with science, mathematics is also the basis and has a close interaction with modern science that supports technological developments (Vázquez, 2001). Hyslop & Lewis (1970) also stated in his research that the learning of mathematics and science involves technology in the process.

Based on mapping in this research, one solution that arises from mapping mathematics difficulty is realistic mathematics education. According to Nurfadilah et al (2021), learning using realistic mathematics education is more effective in improving students' problem-solving abilities. This is also in line with research from Cendekiawaty & Sugiman (2020) that RME can improve students' abilities, especially in fraction problem-solving. This is also in accordance with the results of the mapping of this research related to the application of realistic mathematics education that one of the materials considered difficult for students and the need for the application of realistic mathematics education is a fraction. In addition, realistic mathematics education is not only improving problem-solving abilities but also increasing students' self-efficacy (Ulandari et al., 2019).

Based on the discussion of the results of the mapping difficulties in mathematics education research, other studies are still needed related to efforts to overcome student difficulties. This is because mathematics difficulties faced by students will be more complex in the future. In addition, more specific studies are needed on the diagnosis of students' learning difficulties in mathematics and strategies for using mathematics in other fields like science. Mathematics not only has a role in science and technology but also in the development of science, both natural and social sciences with various conditions (Jazuli, 2021).

## **Conclusions**

Research mapping is an important thing as the basis for further research. Based on the results of mapping of the research that has been carried out around the world about difficulties in learning mathematics indexed by Google Scholar in 2013 to 2022, mapping is done on learning difficulties in mathematics, difficulty in learning mathematics seen from the abstract with a minimum occurrence of 15 and 10, difficulty in learning mathematics is related to mathematical learning difficulty, difficulty in learning mathematics if it is seen as a relationship if mathematics is applied in studying science, difficulty in learning



mathematics is related to the application of realistic mathematics education, and difficulties in learning mathematics related to instruction. The results showed that difficulties related to learning mathematics focused on mathematical concepts, the use/role of mathematics in science, word problems, unclear instructions, time constraints, and students' mathematics anxiety and ability.

Mapping difficulties in mathematics education are expected to be a reference for future research on mathematics education. Further research is especially useful for overcoming various kinds of difficulties in mathematics education and innovations in the mathematics learning process. It is also related to the relationship of mathematics with other fields besides science and technology.

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## References

- Bakhtiyarova, Kh. (2019). Methodological approaches on interpretation concept "quality" and "quality of education." *Visnyk Taras Shevchenko National University of Kyiv. Pedagogy*, 2(10), 8–11. <https://doi.org/10.17721/2415-3699.2019.10.02>
- Basu, M. (2020). Importance of Research in Education. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.3703560>
- Baten, E., Pixner, S., & Desoete, A. (2019). Motivational and Math Anxiety Perspective for Mathematical Learning and Learning Difficulties. In A. Fritz, V. G. Haase, & P. Räsänen (Eds.), *International Handbook of Mathematical Learning Difficulties* (pp. 457–467). Springer International Publishing. [https://doi.org/10.1007/978-3-319-97148-3\\_28](https://doi.org/10.1007/978-3-319-97148-3_28)
- Bransford, J. D., Stipek, D., Vye, N. J., Gomez, L. M., & Lam, D. (Eds.). (2009). *The role of research in educational improvement*. Cambridge MA: Harvard Education Press.
- Cendekiawaty, T., & Sugiman, S. (2020). Realistic mathematics education: An alternative to improve students' understanding of fraction concept. *Journal of Physics: Conference Series*, 1581(1), 012045. <https://doi.org/10.1088/1742-6596/1581/1/012045>
- Flores, L. A. (2018). Mathematics Difficulties among Grade 11 Students of Ramon Magsaysay Technological University. *International Journal of Scientific & Engineering Research*, 9(9), 1359–1365.
- Fuchs, L. S., Compton, D. L., Fuchs, D., Paulsen, K., Bryant, J. D., & Hamlett, C. L. (2005). The Prevention, Identification, and Cognitive Determinants of Math Difficulty. *Journal of Educational Psychology*, 97(3), 493–513. <https://doi.org/10.1037/0022-0663.97.3.493>
- Geary, D. C., Hoard, M. K., Byrd-Craven, J., Nugent, L., & Numtee, C. (2007). Cognitive Mechanisms Underlying Achievement Deficits in Children With Mathematical Learning Disability. *Child Development*, 78(4), 1343–1359. <https://doi.org/10.1111/j.1467-8624.2007.01069.x>
- Hyslop, J., & Lewis, R. (1970). Mathematical Models in Science. *International Journal of Mathematical Education in Science and Technology*, 1(4), 375–388. <https://doi.org/10.1080/0020739700010406>
- Jamison, E. A., Jamison, D. T., & Hanushek, E. A. (2007). The effects of education quality on income growth and mortality decline. *Economics of Education Review*, 26(6), 771–788. <https://doi.org/10.1016/j.econedurev.2007.07.001>
- Jazuli, A. (2021). Reviving the role of mathematics in science through STEM. *Journal of Physics: Conference Series*, 1778(1), 012031. <https://doi.org/10.1088/1742-6596/1778/1/012031>
- Jupri, A., & Drijvers, P. (2016). Student Difficulties in Mathematizing Word Problems in Algebra. *EURASIA Journal of Mathematics, Science and Technology Education*, 12(9). <https://doi.org/10.12973/eurasia.2016.1299a>
- Karagiannakis, G., Baccaglioni-Frank, A., & Papadatos, Y. (2014). Mathematical learning difficulties subtypes classification. *Frontiers in Human Neuroscience*, 8. <https://doi.org/10.3389/fnhum.2014.00057>
- Kitchenham, B. A., Budgen, D., & Pearl Brereton, O. (2011). Using mapping studies as the basis for further research – A participant-observer case study. *Information and Software Technology*, 53(6), 638–651. <https://doi.org/10.1016/j.infsof.2010.12.011>
- Lima, P. da S. N., Silva, L. das A., Felix, I. M., & Brandao, L. de O. (2019). Difficulties in Basic Concepts of Mathematics in Higher Education: A Systematic Review. *2019 IEEE Frontiers in Education Conference (FIE)*, 1–7. <https://doi.org/10.1109/FIE43999.2019.9028658>
- Lysenko, El. M., & Zharinova, Ye. N. (2021). Quality of education as an indicator of the quality of life. *SHS Web of Conferences*, 101, 03045. <https://doi.org/10.1051/shsconf/202110103045>
- Maruyama, G., & Deno, S. (1992). *Research in Educational Settings*. SAGE Publications, Inc. <https://doi.org/10.4135/9781412985680>
- Matthews, K. (2011). Mathematics in science higher education: Narrative inquiry and an analytical framework for exploring the student experience. *Proceedings of Volcanic Delta 2011: The Eighth Southern Hemisphere Conference on Teaching and Learning Undergraduate Mathematics and Statistics*, 268–277.
- Munawarah, N., & Surya, E. (2017). An Analysis of the Difficulties in Learning Mathematics by Using Scientific Approach at SMA Negeri 3 Manyak Payed. *International Journal of Sciences*, 33(3), 11.

- Nurfadilah, I., Nindiasari, H., & Fatah, A. (2021). Using realistic mathematics education in mathematical problem-solving ability based on students' mathematical initial ability. *Prima: Jurnal Pendidikan Matematika*, 5(1), 35. <https://doi.org/10.31000/prima.v5i1.3166>
- Phonapichat, P., Wongwanich, S., & Sujiva, S. (2014). An Analysis of Elementary School Students' Difficulties in Mathematical Problem Solving. *Procedia - Social and Behavioral Sciences*, 116, 3169–3174. <https://doi.org/10.1016/j.sbspro.2014.01.728>
- Pollack, C., Wilmot, D., Centanni, T. M., Halverson, K., Frosch, I., D'Mello, A. M., Romeo, R. R., Imhof, A., Capella, J., Wade, K., Al Dahhan, N. Z., Gabrieli, J. D. E., & Christodoulou, J. A. (2021). Anxiety, Motivation, and Competence in Mathematics and Reading for Children With and Without Learning Difficulties. *Frontiers in Psychology*, 12, 704821. <https://doi.org/10.3389/fpsyg.2021.704821>
- Retnawati, H., Kartowagiran, B., Arlinwibowo, J., & Sulistyaningsih, E. (2017). Why are the mathematics national examination items difficult and what is teachers' strategy to overcome it? *International Journal of Instruction*, 10(3), 257–276. <https://doi.org/10.12973/iji.2017.10317a>
- Sabri, & Minggu, I. (2014). Students' difficulties in mathematics proofs. *Proceeding of The First International Conference on Science*, 272–280. <http://eprints.unm.ac.id/10484/1/ICOS%20-%20Sabri%20dan%20Ilham%20Minggu%20-%20Students%20Difficulties%20in%20Mathematics%20Proofs.pdf>
- Sedighi, M., & Jalalimanesh, A. (2014). Mapping research trends in the field of knowledge management. *Malaysian Journal of Library & Information Science*, 19(1), 71–85.
- Sherman, B. F., & Wither, D. P. (2003). Mathematics anxiety and mathematics achievement. *Mathematics Education Research Journal*, 15(2), 138–150. <https://doi.org/10.1007/BF03217375>
- Ulandari, L., Amry, Z., & Saragih, S. (2019). Development of Learning Materials Based on Realistic Mathematics Education Approach to Improve Students' Mathematical Problem Solving Ability and Self-Efficacy. *International Electronic Journal of Mathematics Education*, 14(2). <https://doi.org/10.29333/iejme/5721>
- Vázquez, J. L. (2001). *The importance of mathematics in the development of science and technology*. <http://verso.mat.uam.es/~juanluis.vazquez/reptmath.pdf>
- Weinert, F. E., & De Corte, E. (2001). Educational Research for Educational Practice. In *International Encyclopedia of the Social & Behavioral Sciences* (pp. 4316–4323). Elsevier. <https://doi.org/10.1016/B0-08-043076-7/02422-0>
- Yulita, & Ain, S. Q. (2021). Analysis of Students' Learning Difficulties in Learning Mathematics at Elementary Schools. *AL-ISHLAH: Jurnal Pendidikan*, 13(2), 892–899. <https://doi.org/10.35445/alishlah.v13i2.745>