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Profile of Teacher Decision-Making in Designing Mathematical Tasks Based on Teaching Experience

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ABSTRACT

Objective: This research aims to describe the decision-making profile of mathematics teachers in designing mathematical assignments based on teaching experience. **Method:** The subjects of this study were mathematics teachers in junior high school education units with a bachelor's degree in mathematics education, including one senior teacher (ST) and one novice teacher (NT). The researcher used a task sheet for making a mathematical task design (TSMTD) and an interview guide as instruments for data collection. **Results:** The results showed that both novice and senior teachers identified problems by mentioning known information, but novice teachers tended to modify textbook assignments as materials for designing questions. In collecting information, beginner and senior teachers compared ideas from previous experiences, but senior teachers considered the context of the questions to be designed. Beginner teachers submitted problems by raising the theme of comparing values and transforming values with different resolution processes, while senior teachers considered several contexts and chose multiple alternative solutions. Both beginner and senior teachers checked all the questions designed and assessed the feasibility of the solutions generated from the task. **Novelty:** This research contributes to the understanding of the decision-making profile of mathematics teachers in designing assignments based on their teaching experience, highlighting the differences between novice and senior teachers in terms of problem identification, information collection, problem submission, and checking of designed questions.

INTRODUCTION

For constructivists, teaching is not merely an activity of transferring knowledge but an activity that allows students to construct their knowledge. Teaching means participation with students in constructing knowledge, making meaning, seeking clarity, being critical, and providing justification. Suparno (1997) reveals that teaching is a form of self-learning. So, teaching in this context is helping someone think correctly by letting him think for himself.

Based on this understanding, a teacher should know how to teach teaching material to his students. Learning, which is an effort to direct students to reach aspects of syntactical and substantive content, will only be achieved with knowledge of teaching strategies that are applied appropriately by the teacher. Teachers who want to teach mathematics effectively must know more than just about the content to be taught and some ways of teaching it (Cevikbas & Kaiser, 2020; Deng et al., 2020; Hill & Uribe-Florez, 2019; Oldknow et al., 2019; Wei et al., 2020). The teacher must also understand and be able to integrate content knowledge into knowledge about curriculum, learning, teaching, and students. This knowledge can ultimately guide teachers to tailor learning situations to the needs of individual and group students.

Initially, teacher education emphasized the teacher's knowledge of the subject matter. Over the past few decades, teacher education has begun to emphasize the effectiveness of general pedagogical methods, including the use of questions, design of assignments and curricula, and independent assessment of student performance on each subject (Borda et al., 2020; Cevikbas et al., 2022; García-Alberti et al., 2021; Kong et al., 2020; Kumar et al., 2019; So et al., 2020). Based on Permendikbud number 22 of 2016 concerning process standards, it is written that the learning process in educational units is carried out in an interactive, inspiring, fun, and challenging manner, motivating students to participate actively and providing sufficient space for initiative, creativity, and independence by talents, interests, and the physical and psychological development of students. In Permendikbud number 22 of 2016, it is also stated that the learning paradigm, among other things, the learning process changes from students being told to students finding out, from the teacher as the only source of learning to learn based on various learning sources; and utilization of information and communication technology to increase the efficiency and effectiveness of learning.

Equipping students with mathematical assignments determined by the mathematics teacher greatly influences the thinking processes in which students are involved and, in turn, will influence student learning outcomes. The International Council on Mathematics Instruction (ICMI) compiles and summarizes research relevant to task design and the difficulties encountered when designing tasks. ICMI considers the role of teaching to include "selection, modification, design, sequencing, observation, and evaluation of tasks." Teachers believe that by practicing selecting and using appropriate assignments, textbooks will be needed to complete topics by aligning with task reform. Despite attempts to divert teachers from using textbooks as the sole provider of the mathematics curriculum, textbooks continue to be a mainstay in the traditional classroom. Teachers select and refine assignments suggested in textbooks but must be able to refrain from using all of the assignments in them.

To optimize this, teachers must have the ability and skills to plan and implement learning. As stated by Richards & Lockhart (1996), the teacher is the spearhead of education. Teachers have an essential role in the success and failure of students in teaching. Therefore, teachers must be able to design learning with methods or approaches that can teach students, where students are no longer learning objects but as learning subjects. So that the effect of learning mathematics will give students the ability to understand mathematical ideas used to solve problems, encourage students to make connections between strategies, encourage students to formulate and prove conjectures and generalizations (Hartinah et al., 2019; Mainali, 2021; Rodríguez-Martínez et al., 2020; Shaumiwaty et al., 2020; Widada et al., 2019; Widyastuti et al., 2020; Yaniawati et al., 2019; Zulnaidi et al., 2020). Teachers need to focus on mathematical tasks to encourage students to formulate, prove conjectures, and generalize. This is confirmed by Brown (2009), who reveals that a person's understanding of mathematics is closely related to his ability to generate and ask questions in the form of assignments. Mathematical assignments greatly influence students in learning mathematics, but sometimes, the tasks can limit or broaden students' views on learning. Given that students have different backgrounds and abilities. So, it can be assumed that every class in the school has diversity, and teachers must be able to use tasks that can be adapted to meet diversity.

For this reason, teachers need to develop skills in designing mathematical assignments. Some literature reveals that designing assignments is an essential skill that

mathematics teachers need to develop. One way to develop teacher skills is to design mathematical assignments. However, designing or modifying assignments is an obstacle for some teachers in learning. Inadequate teacher content knowledge and experience in designing or modifying assignments will impact student development if the assignments only focus on students' math books. Jao & McDougall (2015) define that in mathematical assignments, it is necessary to pay attention to the following: 1) Is part of a real-world problem, 2) Allows having several solutions, 3) Provides opportunities for students to develop many solutions, and strategies, 4) involves various representations, 5) Students express mathematical ideas, 6) Expect students to communicate their reasoning, and 7) Do reflection as a continuous process. A teacher should pay attention to students' basic knowledge and other supporting resources when designing mathematical tasks. Therefore, in designing assignments, teachers are required to know the content of the material to be taught, the state of the students (considerations about the level of intelligence, maturity, and diversity of students), situations that include general things such as class situations and environmental situations (context).

Designing a mathematical task is closely related to the decision-making process. Therefore, learning that trains decision-making skills should encourage students to review various points of view. Every act of teaching is the result of a decision. This is because a teacher uses several different options in learning and needs to choose between these options, which option they think is most suitable for learning goals. Decision-making is choosing a preferred option or an action among a set of alternatives based on a given criteria or strategy. Furthermore, Baron & Brown (2012) argue that the decision-making process is a series of stages or sequential events such as problem identification, setting goals, making initial decisions, developing and evaluating alternatives, and selecting one of the alternatives, which are then implemented and followed up. Schoenfeld (2011) suggests that individual characteristics, knowledge, beliefs, and experience can influence a person's decision-making. Then, teachers should consider what criteria should be taught in their decision-making based on consideration of student development, context, and content (subject matter).

Several studies have researched beginner and expert teachers. Expert and novice teacher decision making revealed that in making decisions, expert teachers use many types of information, such as knowledge of the overall curriculum, subject matter, and student interests, to achieve goals for their lessons. At the same time, beginner novice teachers need a comprehensive view of knowledge to know what components of a lesson might relate to what students already know (Centeio et al., 2021; Jarodzka et al., 2021; Reiser et al., 2021) That is, expert teachers are more representative of learning objectives, and their decision-making in planning activities is different from (interactive) learning objectives. This is supported by a much more comprehensive view of classroom conditions, while novice teachers have a narrower scope where they are more fixated on learning objectives. The difference between expert and novice teachers in making decisions provides evidence and reasons to conclude that teachers at different stages of development perceive and process problems in the classroom in different ways.

Barret et al. (2002) revealed in their research that novice teachers carrying out learning activities did not carry out the learning objectives and did not believe in their mathematical abilities. Expert teachers in teaching tended to have procedural knowledge, while novice teachers tended to have declarative knowledge. Novice

teachers depend on applicable rules and guidelines set by institutions or schools, while expert teachers tend to be more comprehensive in planning lessons. Way of making decisions through their intellectual and social goals, orientation resources (beliefs, values, and choices), and other materials.

Referring to the description that has been previously described, several reasons can be put forward why this research is vital to carry out: (1) Designing mathematical assignments is essential for teachers in selecting and adapting assigned assignments depending on the knowledge of the content of the material to be taught, students' circumstances (considerations about the level of intelligence, maturity, and diversity of students), situations that include general things such as classroom situations and environmental situations (context). (2) The teacher's ability to make a decision is a unique key in designing mathematical assignments, and the process for making these decisions is the way or steps taken by the teacher in obtaining alternatives for designing mathematical tasks. (3) The teacher's teaching experience becomes a differentiator in making decisions in designing mathematics assignments. Because of that, it is essential to research how different teachers' experiences are in making decisions, especially in designing math assignments.

RESEARCH METHOD

This research is descriptive research with a qualitative approach. The subjects of this study were math teachers at the junior high school education unit (JHS) who qualified for a bachelor's degree in mathematics education and consisted of one senior teacher (ST) and one novice teacher (NT). Selection of research subjects using purposive sampling type of maximum variation. Determination of research subjects is based on the following considerations: (1) Subjects from the group are knowledgeable about the phenomenon under study as a unique position that each has; (2) Mathematics teachers at the junior high school level have taken education specifically trained for mastery of mathematical material and to teach mathematical concepts (including the concept of comparison of value and return of value); (3) The topic of the comparison of value and value is the material taught at the seventh-grade junior high school level which is described in the curriculum. This study's data collection instruments consisted of main and auxiliary instruments. The main instrument is the researcher himself, and the auxiliary instrument consists of an assignment sheet for making a mathematical task design (TSMTD) and an interview guide. Researchers collected data through the teacher's TSMTD sheet to produce mathematical assignments designed in such a way. The TSMTD results data were followed up with interviews to reveal more in-depth about the teacher's decision-making in designing the mathematical task. Researchers used time triangulation techniques to check the validity and validity of the data obtained.

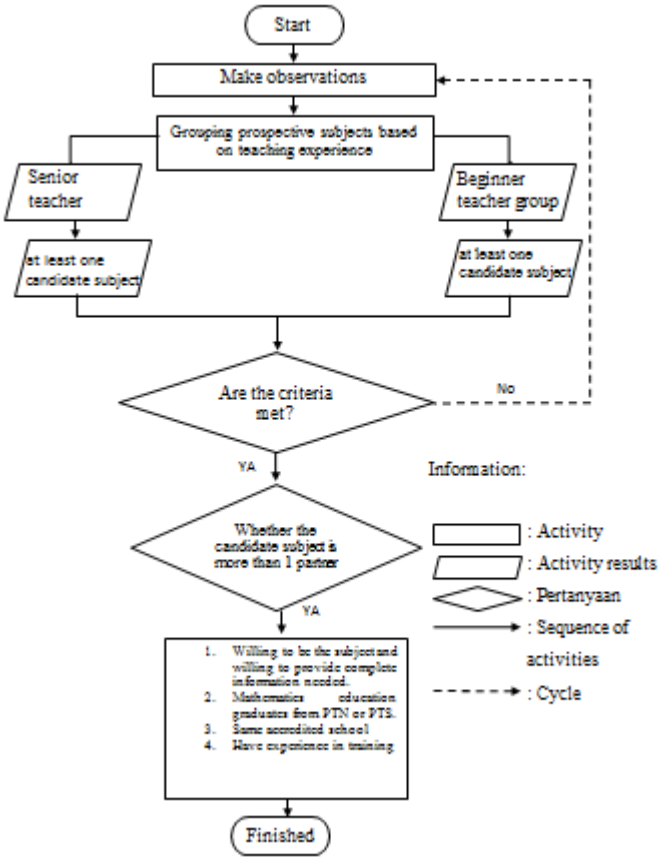

Figure 1. Research flowchart.

RESULTS AND DISCUSSION

Results

This study describes the teacher's decision-making profile in designing mathematical tasks based on teaching experience. The results of the comparative analysis of the two subjects can be seen in Table 1.

Table 1. Comparison of teacher decision-making in designing mathematical tasks.

Indicator	Beginner teacher subject (BTS)	Senior Teacher Subject (STS)
Identification of problems	a. BTS identifies problems by mentioning known information b. BTS marks some essential ideas from a given problem situation c. BTS attempts to modify the assignments in the book as material for designing questions.	a. STS identifies problems by mentioning known information b. STS marks important ideas from problem situations by linking previous experiences' results with the student's abilities in the class.
Information Collection	a. BTS collects information by comparing the ideas it has from the results of previous experiences that are adapted to the problem situation at hand b. BTS coordinates problem situations with the results of his experience.	a. STS collects information by comparing the ideas from previous experiences adapted to the problem. b. STS coordinates the problem situation with the results of his experience and establishes the context of the problem to be designed or designed

Indicator	Beginner teacher subject (BTS)	Senior Teacher Subject (STS)
Solution Determination	a. BTS submits problems by raising the theme of the problem of comparing values and turning values with different resolution processes b. BTS chooses an alternative solution by re-describing the overall process to get an answer. c. BTS chooses alternative solutions by providing another perspective on solving the problem. d. BTS also provides reasons for selecting strategies focused on problems that students often encounter.	a. STS carries out several problem-solving activities by considering several contexts and selecting several alternative solutions accompanied by several reasons for choosing a settlement strategy for the assigned task. b. STS designed three types of questions, namely: (1) the first task related to ratio and comparison problems accompanied by pattern determination and its answers; (2) the second task is related to the concept of comparison of algebra and fractions and knowledge of linear equations of two variables; and (3) the third task is related to the concept of comparison of fractions and algebra.
Evaluation	a. BTS checks all the questions designed and assesses the feasibility of the solutions generated from these questions.	a. STS checks the designed tasks and assesses the feasibility of the tasks.

Discussion

Problem Identification

The study results show that novice and senior teachers start by mentioning the information they know and the information they are asking for. For novice teachers, problem identification is done by mentioning known information, marking some essential ideas from the problems given, and modifying the assignments in the book as a reference for designing questions. Meanwhile, senior teachers tend to coordinate the results of previous experiences with students' abilities in class. From these results, it was found that (1) novice teachers and senior teachers did a verbal analysis to understand a problem; (2) beginner teachers tend to use textbooks to design assignments, and senior teachers tend to involve the results of previous experiences and consider the abilities of students in the class to design assignments.

From the study results, novice teachers modify assignments based on available textbooks. In this case, novice teachers only change the form, develop questions, and change the numbers and context. Modifications made by novice teachers through making problems by changing or not the information provided and making problems by adding objects or information to the problems given. Meanwhile, senior teachers develop ideas by designing contextual tasks by considering the students' abilities being taught and based on experience. In a sense, contextual problems are more accessible and enable student involvement in learning. This is in line with the demands of the current curriculum, where contextual problems are one of the cores of learning mathematics. Experience-based task design aims to make it easier for students to solve problems. In a sense, the teacher considers what students must understand, making it

easier for students to work on problems. This is so that it stimulates teachers to produce new knowledge for students in learning (Gafoor & Kurukkan, 2015). Furthermore, senior teachers consider their experience in designing assignments because the teacher's thinking habits are grown through practical experience and applying the theory they gain**.** The situation experienced by the teacher influences the acquisition of the individual teacher and the further development of the general pedagogical knowledge and skills.

Information Gathering

The study results show that novice and senior teachers collect information by comparing the ideas they have from previous experiences according to the situation at hand. The experience possessed by novice and senior teachers is motivated by teaching experience and experience designing questions for comparative material. In this case, the subject's experience is caused by the habit of thinking that develops through the experience and application of the theory he has acquired**.** The teacher's experience in designing assignments is influenced by pedagogical skills where beginner teachers tend not to involve aspects of students' thinking, in contrast to senior teachers who are more concerned with considering students' thinking abilities and comparing several references. Individual experience is very close to their knowledge, thus influencing the perspective in designing or designing tasks (Döringer, 2021; Doyle et al., 2020; Puntoni et al., 2021). Furthermore, the collection of information also depends on the similarity of information between previous experience and the problems encountered, which results in obtaining the design of the task to be produced.

When viewed from the design tasks, novice teachers and senior teachers design assignments based on the context around students. Beginner teachers design assignments related to the school environment. In contrast, senior teachers design assignments by considering contextual aspects complemented by considerations of the demands of the K13 curriculum and students' thinking abilities. In a sense, novice and senior teachers lead or direct students' thinking by designing real problem situations for students. Then, selecting contextual problems allows students to more easily access and understand the problems presented to align with the demands of the 2013 curriculum, which carries a contextual approach (Huang et al., 2020; Van den Beemt et al., 2020). Therefore, the reason for using contextual problems is that the teacher tries to familiarize students so they can apply mathematical concepts to everyday life.

Although both teachers designed contextual tasks, they found complex differences from the designed tasks. This is because (1) novice teachers in designing tasks tend to produce contextual tasks that are procedural, where to solve these problems it is enough to transfer ideas from concepts that have been studied; (2) senior teachers in designing assignments tend to consider various aspects ranging from learning objectives, curriculum demands, familiarity with problems to be faced by students, level of difficulty of questions and thinking skills resulting from the designed assignments. Each teacher's experience influences this difference in making the right choices in designing assignments (Lee, 2017). Each teacher's decision is based on memories or schemes from previous experience, pedagogical knowledge, content knowledge, and teacher beliefs. Furthermore, senior teachers designing assignments accustom students to solving problems requiring high-level thinking, while novice teachers only focus on procedural aspects. Therefore, this experience underlies the teacher's decision-making at the information-gathering stage.

From the research results, novice teachers and senior teachers in designing assignments coordinate between the results of previous experience and the problem at hand. In addition, in gathering information, the senior teacher first sets the context of the task to be designed. Coordinating the results of previous experience with the problem situation will produce an underlying idea in designing tasks (Longchamp, 2017). Furthermore, the teacher's decision-making is influenced by the results of previous experience, which is poured into the problem situation as a reference for building ideas from the task to be designed. The determinants of the results of task design are based on previous experience, which is the teacher's control in designing tasks (Fishbein et al., 2016) and teacher perceptions based on prior knowledge (Altan & Ercan, 2016; Sainuddin et al., 2022). Therefore, decision-making at the information-gathering stage depends on the experience possessed by the teacher when designing assignments.

Determination of Solutions

The study's results found significant differences between novice and senior teachers. Beginner teachers design assignments to produce a variety of solutions. In this case, novice teachers design assignments to produce various solutions to open-ended problems (Hannula, 2019). At the same time, senior teachers pose problems by considering several things and choosing alternative solutions accompanied by reasons for selecting strategies for the assignments given. This shows that teachers make decisions by considering various things to build ideas from the tasks to be designed (Haghverdi & Wiest, 2016). Furthermore, senior teachers try to build students' mathematical knowledge by considering the context and assumptions that will arise when students solve problems (Umisuzimah et al., 2017). This shows that senior teachers already have the anticipation of the tasks designed compared to novice teachers.

In designing assignments, novice teachers choose alternative solutions by providing another perspective on solving the problem. In contrast, senior teachers choose alternatives based on the questions' context by adding some mathematical ideas from the task to be designed (for example, involving pattern determination, linear equations, and comparisons of fractions). This shows that assignments designed by novice teachers produce multiple solutions to the problems designed. Meanwhile, senior teachers produce non-routine problems that allow students to develop their thinking skills. Furthermore, tasks designed by senior teachers influence students' thinking processes, which impact mathematical ideas and ideas generated from these assignments. In contrast, decisions taken by novice teachers are only based on the diversity of solutions generated by students (Sullivan et al., 2013). When viewed from tasks designed by novice and senior teachers, novice teachers tend to encourage students to involve creative thinking in completing assignments, while senior teachers try to encourage students to carry out an in-depth analysis of the tasks designed (Carey et al., 2015). Therefore, the tasks designed by the two teachers are essentially aimed at building students' thinking skills, reasoning, and using mathematical ideas related to the tasks given. In addition, novice teachers focus on designing assignments often encountered by students so that the impact of the results research is that students only need to involve procedural aspects in solving the problem, accompanied by looking for other alternatives in completing the task. Unlike the senior teacher in designing assignments, he seeks to involve mathematical ideas from the task designed. This

shows that novice teachers, in determining solutions, focused on procedural aspects while senior teachers focused on analytical aspects and anticipating conjectures that arose when students were solving problems.

Evaluation

The study results found similarities between novice and senior teachers, where both carried out overall checks on the tasks that had been designed and assessed the feasibility of the solutions resulting from these tasks. From the research results, several things were found when the teacher carried out the evaluation, namely: (1) The teacher paid attention to the difficulty level of the questions, completion time, problem context, and students' mental activity in translating the problem; (2) The teacher re-checks the problem-solving alternatives that are designed with a focus on contextual problems; and (3) The teacher considers the impact of assignments that are designed to be familiar to students on the problems given. In this case, the evaluation carried out by the teacher is based on facts from the results of the resulting task designs (Murtafiah et al., 2020). Furthermore, the evaluation is carried out holistically, where both teachers must ensure the reasonableness of the tasks designed and will be used by students to solve problems. This aims to measure the effectiveness of the resulting task design, making it easier for students to solve problems (Longchamp, 2017). This evaluation can help the teacher assess the reasonableness, practicality, and complexity of the problems correlating with the teacher's knowledge. This evaluation will also increase the teacher's confidence in accessing students' mental activities in solving problems.

CONCLUSION

Fundamental Finding: The decision-making profile of beginner teachers and senior teachers in designing mathematical assignments based on their teaching experience differs in terms of problem identification, information collection, problem submission, and checking of designed questions. Beginner teachers tend to modify assignments from textbooks and focus on the comparison of values and return values, while senior teachers consider multiple contexts and alternative solutions. **Implication:** The findings of this research highlight the importance of experience in shaping teachers' decision-making processes in designing mathematical assignments. It implies that teachers and prospective teachers need to broaden their horizons and gain as much experience as possible in mathematics education's theory and practice. **Limitation:** This research focused on comparing beginner and senior teachers' decision-making profiles in designing mathematical assignments based on their teaching experience. Further research could explore additional factors influencing teachers' decision-making, such as their beliefs, attitudes, and knowledge. **Future Research:** Future research could investigate the impact of different decision-making profiles on student learning outcomes in mathematics. Additionally, further studies could explore the effectiveness of professional development programs to enhance teachers' decision-making skills in designing mathematical assignments.

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REFERENCES

Altan, E. B., & Ercan, S. (2016). STEM education program for science teachers: perceptions and

competencies. *Journal of Turkish Science Education*, *13*, 103–117.
Baron, J., & Brown, R. V. (2012). *Teaching decision making to adolescents*. Routledge.
Borda, E., Schumacher, E., Hanley, D., Geary, E., Warren, S., Ipsen, C., & Stredicke, L. (2020). Initial implementation of active learning strategies in large, lecture STEM courses: lessons learned from a multi-institutional, interdisciplinary STEM faculty development program. *International Journal of STEM Education*, *7*(1), 1-18. https://doi.org/10.1186/s40594-020-0203-2
Brown, M. (2009). Reconceptualising outdoor adventure education: Activity in search of an appropriate theory. *Journal of Outdoor and Environmental Education*, *13*(2), 3–13. https://doi.org/10.1007/BF03400882
Carey, T., Davis, A., Ferreras, S., & Porter, D. (2015). Using open educational practices to support institutional strategic excellence in teaching, learning & scholarship. *Open Praxis*, *7*(2), 161–171. http://dx.doi.org/10.5944/openpraxis.7.2.201
Centeio, E., Mercier, K., Garn, A., Erwin, H., Marttinen, R., & Foley, J. (2021). The success and struggles of physical education teachers while teaching online during the COVID-19 pandemic. *Journal of Teaching in Physical Education*, *40*(4), 667–673. https://doi.org/10.1123/JTPE.2020-0295
Cevikbas, M., & Kaiser, G. (2020). Flipped classroom as a reform-oriented approach to teaching mathematics. *ZDM - Mathematics Education*, *52*(7), 1291–1305. https://doi.org/10.1007/s11858-020-01191-5
Cevikbas, M., Kaiser, G., & Schukajlow, S. (2022). *A systematic literature review of the current discussion on mathematical modelling competencies: State-of-the-art developments in conceptualizing, measuring, and fostering*. Springer Netherlands.
Deng, L., Wu, S., Chen, Y., & Peng, Z. (2020). Digital game-based learning in a Shanghai primary-school mathematics class: A case study. *Journal of Computer Assisted Learning*, *36*(5), 709–717. https://doi.org/10.1111/jcal.12438
Döringer, S. (2021). 'The problem-centred expert interview'. Combining qualitative interviewing approaches for investigating implicit expert knowledge. *International Journal of Social Research Methodology*, *24*(3), 265–278. https://doi.org/10.1080/13645579.2020.1766777
Doyle, L., McCabe, C., Keogh, B., Brady, A., & McCann, M. (2020). An overview of the qualitative descriptive design within nursing research. *Journal of Research in Nursing*, *25*(5), 443–455. https://doi.org/10.1177/1744987119880234
Fishbein, D. H., Domitrovich, C., Williams, J., Gitukui, S., Guthrie, C., Shapiro, D., & Greenberg, M. (2016). Short-term intervention effects of the PATHS curriculum in young low-income children: Capitalizing on plasticity. *The Journal of Primary Prevention*, *37*(6), 493–511. https://doi.org/10.1007/s10935-016-0452-5
García-Alberti, M., Suárez, F., Chiyón, I., & Feijoo, J. C. M. (2021). Challenges and experiences of online evaluation in courses of civil engineering during the lockdown learning due to the covid-19 pandemic. *Education Sciences*, *11*(2), 1–19. https://doi.org/10.3390/educsci11020059
Hartinah, S., Suherman, S., Syazali, M., Efendi, H., Junaidi, R., Jermsittiparsert, K., & Umam, R. (2019). Probing-prompting based on ethnomathematics learning model: The effect on mathematical communication skills. *Journal for the Education of Gifted Young Scientists*, *7*(4), 799–814. https://doi.org/10.17478/jegys.574275
Haghverdi, M., & Wiest, L. R. (2016). The effect of contextual and conceptual rewording on mathematical problem-solving performance. *The Mathematics Educator*, *25*(1), 56–73.
Hannula, J. (2019). Characteristics of teacher knowledge produced by pre-service mathematics teachers: The case of open-ended problem-based learning. *Lumat*, *7*(3), 55–83. https://doi.org/10.31129/LUMAT.7.3.391
Hill, J. E., & Uribe-Florez, L. (2019). Understanding secondary school teachers' TPACK and technology implementation in mathematics classrooms. *International Journal of Technology in Education*, *3*(1), 1-13. https://doi.org/10.46328/ijte.v3i1.8

Huang, R., Ritzhaupt, A. D., Sommer, M., Zhu, J., Stephen, A., Valle, N., Hampton, J., & Li, J. (2020). The impact of gamification in educational settings on student learning outcomes: a meta-analysis. *Educational Technology Research and Development*, *68*(4), 1875–1901. https://doi.org/10.1007/s11423-020-09807-z

Jao, L., & McDougall, D. (2015). The collaborative teacher inquiry project: A purposeful professional development initiative. *Canadian Journal of Education*, *38*(1), 1–22.

Jarodzka, H., Skuballa, I., & Gruber, H. (2021). Eye-tracking in educational practice: Investigating visual perception underlying teaching and learning in the classroom. *Educational Psychology Review*, *33*(1), 1–10. https://doi.org/10.1007/s10648-020-09565-7

Kong, S. C., Lai, M., & Sun, D. (2020). Teacher development in computational thinking: Design and learning outcomes of programming concepts, practices and pedagogy. *Computers and Education*, *151*, 1-19. https://doi.org/10.1016/j.compedu.2020.10387

Kumar, S., Martin, F., Budhrani, K., & Ritzhaupt, A. (2019). Award-winning faculty online teaching practices: Elements of award-winning courses. *Online Learning Journal*, *23*(4), 160–180. https://doi.org/10.24059/olj.v23i4.2077

Lee, J. E. (2017). Preschool teachers' pedagogical content knowledge in mathematics. *International Journal of Early Childhood*, *49*(2), 229–243. https://doi.org/10.1007/s13158-017-0189-1

Longchamp, J. C. (2017). *The effect of student learning objectives on teachers and teaching as part of the teacher evaluation process: A grounded theory study*. The University of Vermont and State Agricultural College.

Mainali, B. (2021). Representation in teaching and learning mathematics. *International Journal of Education in Mathematics, Science and Technology*, *9*(1), 1–21. https://doi.org/10.46328/ijemst.1111

Murtafiah, W., Sa'dija, C., Chandra, T. D., Susiswo, S., & Zayyadi, M. (2020). Novice and experienced mathematics teachers' decision making process in designing math problem. *Journal of Physics: Conference Series*, *1464*(1), 1-9. https://doi.org/10.1088/1742-6596/1464/1/012030

Oldknow, A., Taylor, R., & Tetlow, L. (2019). Teaching mathematics using ICT. *Shanlax International Journal of Education*, *7*(4), 19–29.

Puntoni, S., Reczek, R. W., Giesler, M., & Botti, S. (2021). Consumers and artificial intelligence: An experiential perspective. *Journal of Marketing*, *85*(1), 131–151. https://doi.org/10.1177/0022242920953847

Reiser, B. J., Novak, M., McGill, T. A. W., & Penuel, W. R. (2021). Storyline Units: An Instructional Model to Support Coherence from the Students' Perspective. *Journal of Science Teacher Education*, *32*(7), 805–829. https://doi.org/10.1080/1046560X.2021.1884784

Richards, J. C., & Lockhart, C. (1996). Interaction in the second language classroom. *Readings in Methodology*, 66-90.

Rodríguez-Martínez, J. A., González-Calero, J. A., & Sáez-López, J. M. (2020). Computational thinking and mathematics using Scratch: an experiment with sixth-grade students. *Interactive Learning Environments*, *28*(3), 316–327. https://doi.org/10.1080/10494820.2019.1612448

Sainuddin, S., Subali, B., Jailani, & Elvira, M. (2022). The development and validation prospective mathematics teachers holistic assessment tools. *Ingenierie Des Systemes d'Information*, *27*(2), 171–184. https://doi.org/10.18280/isi.270201

Schoenfeld, A. H. (2011). Toward professional development for teachers grounded in a theory of decision making. *ZDM - International Journal on Mathematics Education*, *43*(4), 457–469. https://doi.org/10.1007/s11858-011-0307-8

Shaumiwaty, S., Lubis, M. A., Lubis, T., Dardanila, D., Purba, A., Nasution, T., Ramlan, & Hasrul, S. (2020). Teacher performance toward students' mathematical literacy in teaching linear program mathematical models. *Journal of Physics: Conference Series*, *1663*(1), 1-7. https://doi.org/10.1088/1742-6596/1663/1/012066

So, H. J., Jong, M. S. Y., & Liu, C. C. (2020). Computational thinking education in the asian pacific region. *Asia-Pacific Education Researcher*, *29*(1), 1–8. https://doi.org/10.1007/s40299-019-00494-w

Sullivan, P., Clarke, D., & Clarke, B. (2013). *Teaching with tasks for effective mathematics learning (Vol. 9)*. Springer Science & Business Media.

Suparno, P. (1997). *Filsafat konstruktivisme dalam pendidikan*. Kanisius.

Umisuzimah, H., Mahanin, H., Shahrill, M., Tan, A., & Mahadi, M. A. (2017). Integrating the use of interdisciplinary learning activity task in creating students' mathematical knowledge. *International Journal of Research in Education and Science*, *3*(1), 280–298.

Van den Beemt, A., MacLeod, M., Van der Veen, J., Van de Ven, A., van Baalen, S., Klaassen, R., & Boon, M. (2020). Interdisciplinary engineering education: A review of vision, teaching, and support. *Journal of Engineering Education*, *109*(3), 508–555. https://doi.org/10.1002/jee.20347

Wei, X., Cheng, I. L., Chen, N. S., Yang, X., Liu, Y., Dong, Y., Zhai, X., & Kinshuk. (2020). Effect of the flipped classroom on the mathematics performance of middle school students. *Educational Technology Research and Development*, *68*(3), 1461–1484. https://doi.org/10.1007/s11423-020-09752-x

Widada, W., Herawaty, D., Zaid Nugroho, K. U., & Dwi Anggoro, A. F. (2019). The ability to understanding of the concept of derivative functions for inter-level students during ethnomathematics learning. *Journal of Physics: Conference Series*, *1179*(1), 1-8. https://doi.org/10.1088/1742-6596/1179/1/012056

Widyastuti, R., Suherman, S., Anggoro, B. S., Negara, H. S., Yuliani, M. D., & Utami, T. N. (2020). Understanding mathematical concept: The effect of savi learning model with probing-prompting techniques viewed from self-concept. *Journal of Physics: Conference Series*, *1467*(1), 1-7. https://doi.org/10.1088/1742-6596/1467/1/012060

Yaniawati, R. P., Indrawan, R., & Setiawan, G. (2019). Core model on improving mathematical communication and connection, analysis of students' mathematical disposition. *International Journal of Instruction*, *12*(4), 639–654. https://doi.org/10.29333/iji.2019.12441a

Zulnaidi, H., Oktavika, E., & Hidayat, R. (2020). Effect of use of GeoGebra on achievement of high school mathematics students. *Education and Information Technologies*, *25*(1), 51–72. https://doi.org/10.1007/s10639-019-09899-y

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