Computational Thinking in Solving Arithmetic Sequences Problems for Slow Learners: Single Subject Research

Faradina Nilam Zulfa[1]*, Andriyani[1]
[1]*Mathematics Education Department, Universitas Ahmad Dahlan, Yogyakarta, Indonesia*
*Correspondence: nlmzlfa@gmail.com

Abstract

The importance of mathematical problem-solving skill shows that it is very important to develop it as an integrated part of learning mathematics process. However, some prior research results show that students' problem-solving skill is still relatively low, especially for slow learners. The students as slow learners require external stimulation or encouragement to help them to simplify complex problems into simple one. One of stimulations or encouragements is a computational thinking technique. The computational thinking technique in this research includes four principles namely decomposition, abstraction, pattern recognition, and algorithms. This research aims to determine the use of computational thinking for slow learners in solving problems related to arithmetic sequences. The method used in this research is single-subject research having two students as research subjects in one group. The data collection techniques include observation and students' test results and the data analysis techniques used are within-conditions analysis and between-conditions analysis with an A-B research design. The A-B research design is one of designs in Single Subject Research (SSR) method, with A as the baseline phase and B as the intervention phase. The results show that in the baseline phase, the students receive a final score in the range of 20 to 30 and in the intervention phase, after being given a computational thinking technique as a treatment, students' final scores increase to the range of 50 to 60. This shows that there is positive effect using computational thinking technique for slow learners in solving arithmetic sequences problems.

Keywords: Single Subject Research; Slow Learner; Computational Thinking

Abstrak

Pentingnya peran pemecahan masalah matematika menunjukkan perlunya mengembangkan kemampuan tersebut sebagai bagian integral dari pembelajaran matematika. Namun, beberapa hasil penelitian terdahulu menunjukkan bahwa kemampuan pemecahan masalah siswa masih terbilang rendah, terkhusus siswa lamban belajar. Keterbatasan siswa lamban belajar memerlukan rangsangan atau dorongan dari luar untuk membantu siswa lamban belajar menyederhanakan

permasalahan yang kompleks menjadi beberapa masalah sederhana, seperti pendekatan berpikir komputasional. Pendekatan berpikir komputasi dalam penelitian ini mencakup empat prinsip, yakni dekomposisi, abstraksi, pengenalan pola dan algoritma. Penelitian ini bertujuan untuk mengetahui peran berpikir komputasi untuk siswa lamban belajar dalam menyelesaikan permasalahan terkait barisan aritmetika. Penelitian ini menggunakan metode *Single Subject Research* dimana subyek dalam penelitian ini adalah dua siswa dalam satu kelompok. Teknik pengumpulan data meliputi observasi dan hasil tes siswa. Teknik analisis data menggunakan analisis dalam kondisi dan analisis antar kondisi dengan desain penelitian A-B. Desain penelitian A-B merupakan salah satu desain dari *Single Subject Research* (SSR) dengan A sebagai fase baseline dan B sebagai fase intervensi. Hasil penelitian menunjukkan bahwa pada fase baseline, subjek mendapatkan skor akhir pada kisaran 20 hingga 30, dan pada fase intervensi, setelah diberikan perlakuan berupa pendekatan berpikir komputasi, skor akhir siswa meningkat menjadi dalam rentang 50 sampai 60. Hal ini menunjukkan bahwa penggunaan pendekatan berpikir komputasi berpengaruh positif terhadap pemecahan masalah siswa lamban belajar terkait barisan aritmatika.

Kata Kunci: *Single-Subject Research*; Lamban Belajar; Berpikir Komputasional

Introduction

Mathematics learning is important in basic science, which is used in many aspects of daily life (Tias & Wutsqa, 2015). Mathematics is closely related to abstract patterns and has characteristics as a problem-solving skill. It is as a basis knowledge for scientific and technological studies, and it is also as a strategy for modeling real-world situations (Chambers, 2008). Through learning mathematics, students are able to develop the thinking ability logically, systematically, critically, creatively, effectively, and efficiently when solving problems (Hafriani, 2021; Mardhiyana & Sejati, 2016; Marliani, 2015; Sulistiani & Masrukan, 2017).

Mathematical problem-solving skill is one of the mathematical skills having a central position as learning mathematics goal (Napitupulu, 2008; Utami & Wutsqa, 2017). This is in line with what is stated by The National Council of Supervisors of Mathematics (Posamentier et al., 2010). They state that learning to solve problems is the main reason for learning mathematics. Furthermore, Posamentier, et al. state that problem-solving is not only the goal but also the core of learning mathematics. According to Pimta et al. (2009), the students who are trained and accustomed to solve mathematical problems are able to develop thinking and basic problem-solving skill, especially for problems in everyday life. In line with Pimta, (Posamentier et al., 2010), state that the use of everyday life problems in learning mathematics will improve students' learning abilities.

By using problem-solving skill, students learn to develop strategies that are appropriate for solving the problems the students face. This is supported by the research result of (Pimta et al., 2009), which states that problem-solving is the core of mathematics learning. According to Burchartz and Stein (in Yeliz, 2015), problem-solving is essential in mathematical creative activities, which always require problem-solving activities.

The importance of mathematical problem-solving skill shows the need to develop the skill as an integral part of learning mathematics. However, the real facts show that students' mathematics learning achievements at schools are still far from the expectations or has low criteria (Asih & Ramdhani, 2019; Sopian & Afriansyah, 2017; Tias & Wutsqa, 2015). The several research results indicate that the low students' problem-solving skill is caused by the lack of understanding of the information contained in the questions, the inability to make mathematical models, lack of thoroughness and haste in solving problems, and students' anxiety in solving problems especially uncommon mathematical problems (Suryani et al., 2020; Tias & Wutsqa, 2015; Utami & Wutsqa, 2017).

The low students' problem-solving skill is also experienced by the students at SMA Muhammadiyah 3 Yogyakarta. Students have difficulty to understand the information according to the questions given by the teacher, so it is very difficult to plan solutions to solve abstract mathematical problems, including arithmetic sequences problems. According to Permendikbud Number 37 of 2018, arithmetic sequencess is one of mathematics content areas taught in class XI SMA/MA (equivalent to High Schools) with the Basic Competence achievement of generalizing number patterns and quantities in arithmetic and geometric sequencess. The achievement of generalizing number patterns and sums in sequences is still quite difficult for students (Eryandi et al., 2016; Hardiyanti, 2016; Wulandari & Setiawan, 2021).

At the beginning of the research conducted at SMA Muhammadiyah 3 Yogyakarta,some students have difficulties in understanding the given questions' meaning and determining the steps to solve the questions. In detail, students have difficulties in understanding the first term concept and determining the formula for the nth term of the arithmetic sequences. Generally, students only substitute the value of the first term and the difference value to determine the nth term without simplifying the nth formula result. This fact shows that the number patterns generalization is felt to be too abstract for the students because not all students are able to optimize their abilities, including the slow learners at high schools.

The slow learners include students with special needs having low cognitive abilities, but the students are not people having disabilities (Fitri et al., 2019). The slow learners have slower learning abilities and less optimal performance than the peers but the slow learners can still achieve good academic results, it is not as quickly as other students (Awasthi, 2014; Painagoni, 2018; Putranto & Marsigit, 2018). Based on IQ intelligence tests, slow learners have scores in the range of 75–90 or are categorized as under the average score having low scores in almost all subjects (Freeman Suarez et al., 2017). The difference between slow learners and the peers in IQ is in problem-solving skill. The slow learners have lower IQ scores than other students (Sugiyarta & Andriyani, 2020).

According to Aziz et al. (2016), many slow learners do not succeed in problem-solving, especially in abstract mathematics. So, teachers need a special strategy to accommodate this (Lisnawati & Muthmainah, 2018). In learning, there is still a tendency for teachers to pay less attention to students' initial abilities (Suryani et al., 2020). Furthermore, Suryani reveals that teachers are still not orienting students to a real problem that is close to their daily lives. As a result, the teacher's instruction becomes less meaningful, and students develop a memorization learning pattern (Afriansyah, 2014).

The research results at SMA Muhammadiyah 3 Yogyakarta also show the limitations of students' problem-solving skill because the learning process conducted by teachers tends to emphasize the lecture system and memorizing concepts only. Teachers still have difficulties to teach slow learners having difficulties to think logically. In line with this, (Ready Lokanadha et al., 2006) state that the slow learners' limitations in solving problems are related to slow learners' characteristics having difficulties to complete relatively complex tasks and having limitations for reasoning practical situations.

The slow learners' limitations require external stimulation in order to be able to solve complex problems. External stimulation can be in the form of a learning method to minimize the obstacles and slow learners' characteristics like computational thinking method.

According to Maharani (2020), the computational thinking method involves logical reasoning in formulating and solving problems using procedures and systems that are easy to understand because the method is adapted to students' cognitive processes (Beecher, 2017; Csizmadia et al., 2015). In the computational thinking method, there are four principles namely decomposition (i.e., breaking a task into smaller, more manageable parts), pattern recognition (i.e., similarities and repetitions in things), abstraction (i.e., focusing on needed information and ignoring

unnecessary) and algorithm thinking (i.e., step-by-step parts of a task) (Bocconi et al., 2016; Bouck et al., 2021; Csizmadia et al., 2015; Grover & Pea, 2013; Yadav et al., 2016). The existence of a decomposition in computational thinking which divides complex problems into several simple problems, helps the slow learners to handle all difficulties in solving problems.

Furthermore, Jeannette demonstrates (in (Ismi et al., 2020) that these four principles can assist students in formulating problems and finding effective solutions. Therefore, the computational thinking method trains students' mental skill so that the students are able to apply fundamental concepts and reasoning abilities as well as modern digital computer thinking (Khine, 2018). Several prior researches have already shown that the computational thinking method has a significant effect on individuals' abilities (Aminah et al., 2022, 2023; Liao et al., 2022; Molina-Ayuso et al., 2022), but there is no research related to the effect of computational thinking method on slow learners' problem-solving skill yet.

Based on the description of the problem above, the researcher intends to know the effect of applying the computational thinking method on slow learners' skill in solving arithmetic sequences problems at SMA Muhammadiyah 3 Yogyakarta. In this research, the formulation of problem is what is the role of the computational thinking method on slow learners' problem-solving skill for the material of arithmetic sequences? And the aim of this research is to know the effect of applying the computational thinking method on slow learners' skill in solving arithmetic sequences problems.

Method

The method used in this research is Single Subject Research (SSR) or research with a single subject. The research with a single subject is an experimental research method conducted to know the number of treatments or to determine the effect of the treatments given to the subjects repeatedly within a certain timeframe (Tawney and Gast in (Sunanto et al., 2006). Furthermore, this research aims to obtain data by looking at the implementation of a computational thinking method to help slow learners in solving arithmetic sequences problems in one of high schools in Yogyakarta.

According to Sunanto et al. (2006), three single-subject research designs include the A-B design, the A-B-A design, and the A-B-A-B design. The design used in this research is an A-B design where (A) is the baseline condition and (B) is the intervention given after the baseline has reached stability. The design is chosen

because it shows the treatment continuity on the effect and it is suitable to be applied in a school setting (Siswati, 2010).
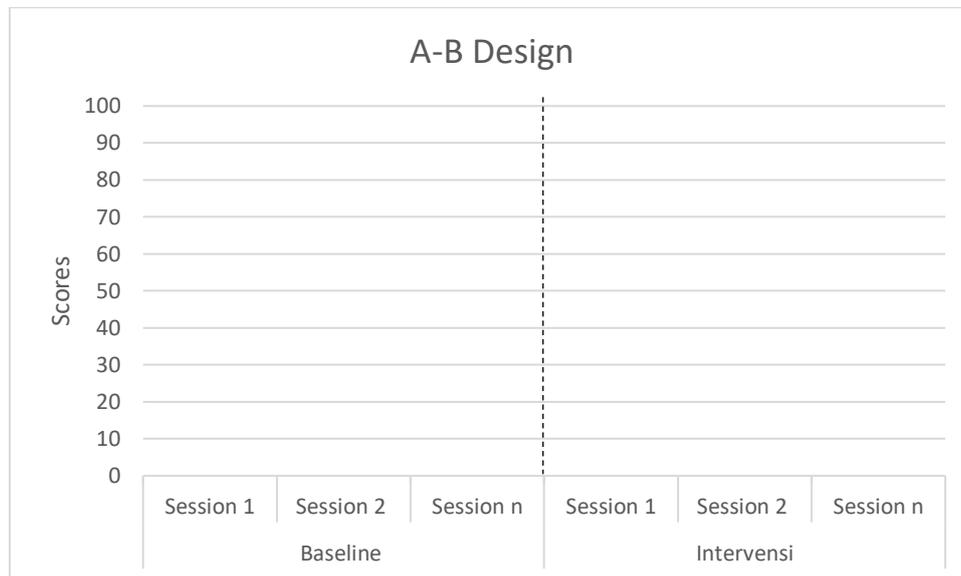
Figure 1. The A-B Design

The baseline phase is the phase before students receive computational thinking method as a treatment and the intervention phase is the phase where the students are given computational thinking method as a treatment. Sessions are carried out until the scores obtained on each subject are said to be stable and tended to be settle. The scores differences obtained from the baseline and intervention phases become the data analyzed using within-conditions and between-conditions analysis technique.

This research is conducted at SMA Muhammadiyah 3 Yogyakarta. It is located on Jl. Captain Piere Tendean No. 58, Wirobrajan, Special Region of Yogyakarta 55252. The research is conducted in second semester of 2020-2021 school year, for several days from the baseline phase until intervention phase reaches stability. The subjects in this research are taken from a group consisting two students from class XI at SMA Muhammadiyah 3 Yogyakarta.

The data collection techniques and instruments in this research are observation and test. The observation is used to observe every aspect based on the computational thinking principles which is as the research target on the subject itself. The topic delivered in this research is solving arithmetic sequences problems. It aims to reveal whether the research subjects are able to solve the problems or not, both during the baseline and the intervention phase. The results from the test show

the research subjects' condition before the intervention phase and the research subjects' condition during the intervention phase.

The graphs are used to present the research data on this single subject. More specifically, in this research, line graphs are commonly used. The data analysis is conducted on condition changes. According to Sunanto et al. (2006) The condition changes include length of conditions, directional tendency, stability tendency, data trace, stability level and range, and level change. The length of the condition serves to indicate the number of phases in the condition. The way is to determine the interval's length first and then the length of the condition. Directional tendency serves to provide an overview on the behavior of the subject in the research. To determine the trend of direction, the split-middle method is used. It is the halving method based on the median data point value of the ordinate. The trend of stability shows how big the range of certain data groups is by using the percentage deviation from the mean (5, 10, 12, and 15). The same way is implemented to search for data trace. The level of stability indicates that the data groups range size in each phase, and the data are obtained based on the calculating results on the trend of stability. Level changes are made by calculating the difference between large and small data.

Meanwhile, (Sunanto et al., 2006) states that data analysis performed on between-conditions changes reveals that the changes are on number of variables, direction and effects, stability, level, and data overlap. The number of variables change is the number of variables given to the students. By obtaining data from the trend analysis in each condition both in the baseline and intervention phases, the changes on trend direction and the effects can be determined. Stability changes are determined by focusing on the stability trend of each condition so that the changes in stability trends can be determined, while level changes are obtained by determining the data scores for each condition in the form of the final stage for the baseline phase and the initial stage for the intervention phase and then finding the difference. For data overlap, it is determined by several steps namely (1) in baseline conditions, looking back at the lower and upper limits; (2) in the intervention phase that is in the baseline phase range, the number of data points is counted; and (3) the results in step (2) are divided by the number of data points in the intervention phase, then multiplied by 100. The better intervention effect on the target behavior, the smaller overlap percentage.

Results

The research results obtained through the accumulated score of students' arithmetic sequences problem solving during the baseline and intervention phases are shown in Table 1 and Figure 2:

Table 1. Accumulated Score

	Baseline			Intervention		
	Session 1	Session 2	Session 3	Session 1	Session 2	Session 3
Student A	25	30	30	55	50	57
Student B	25	23	25	60	60	62

Table 1 shows the scores of students' work in solving arithmetic sequences problems on the baseline phase before the computational thinking method as a treatment is given and the intervention phase when the computational thinking method as a treatment is given. On the baseline phase, student A's scores are 25, 30, and 30, and student B's scores are 25, 23, and 25. Both student A's and B's scores tend to settle down, and the data can be stated as stable data. Furthermore, on the intervention phase when the computational thinking method as a treatment is given, student A gets scores of 55, 50, 57, and student B gets scores of 60, 60, 62. The results for the intervention phase increase compared to the baseline phase.
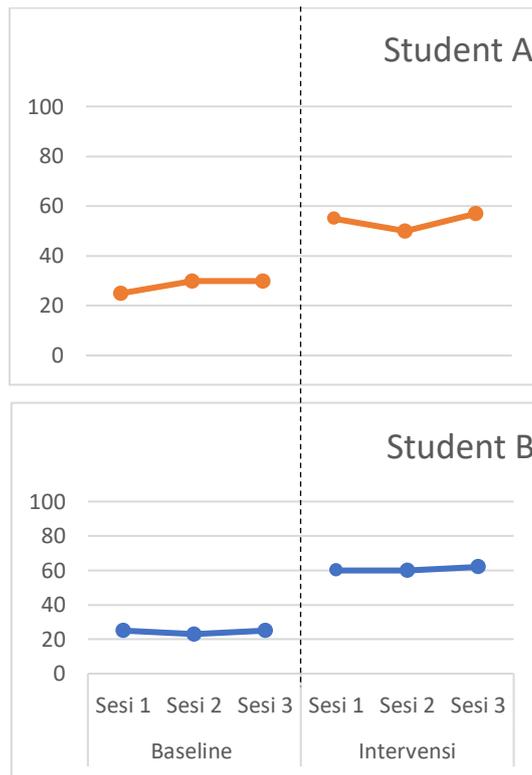
Figure 2. Score Chart

Based on Figure 2, the conditions at the baseline stage for both students A and B are stable. Entering the intervention phase, a gradual increase occurs in the graph. This shows that student A and B's scores in solving arithmetic sequences

problems increase. The students' scores increasement shows that the computational thinking method is able to improve the slow learners' problem solving skill on arithmetic sequences. The within-conditions analysis technique results are shown in Table 2:

Table 2. Summary of The Within-Conditions Analysis

Student A's Condition	Baseline	Intervention
1. Length of Conditions	3	3
2. Directional Tendency	(+)	(+)
3. Stability Tendency	Variable	Stable
4. Data Trace	(+) /	(+) /
5. Stability Level and Range	Variable	Stable
6. Level Change	25 – 30 = +5 (increase)	55 – 57 = +2 (increase)

Student B's Condition	Baseline	intervention
1. Length of Conditions	3	3
2. Directional Tendency	(=)	(+)
3. Stability Tendency	stable	stable
4. Data Trace	(=) -	(+) /
5. Stability Level and Range	stable	stable
6. Level Change	25 – 25 = 0 (no change)	62 – 60 = +2 (increase)

The within-condition changes analysis is to analyze data changes in one condition, for example the baseline or intervention conditions. The explanation in Table 2 is as follows: For student A, the length of the condition shows 3 in the baseline and intervention conditions. It means that the analysis for each phase has been conducted for 3 times and has reached stability. The trend towards the baseline and intervention phases increase. Using the stability criterion of 15% (because the data obtained are clustered at the bottom), the stability trend in the baseline phase is unstable, but in the intervention phase it is stable. The data trail left in both phases increase. The stability level data are taken from the stability trend calculation results so student A in the baseline phase is stated to have variable data

in the range of 25–30, and in the intervention phase, it is stated to be stable in the range of 50–57. The difference in level change for the baseline phase is +5, and for the intervention phase the difference is +2, so that student A has improvement in all phases.

For student B, the length of the condition obtained is 3. It is the same as student A because during those 3 sessions, student B has reached the stability. The directional tendency occuring on student B is different for each phase. Student B has a trend toward a flat direction for the baseline phase that increases during the intervention phase. The trend of stability occuring is equally stable for both phases. The data trail left by student B is parallel in the baseline phase and increases in the intervention phase. The student B's stability level data are stable for both phases, in a range of 23–25 in the baseline phase and in a range of 60–62 in the intervention phase. The level change occurring in student B is 0 for the baseline phase and +2 for the intervention phase. It indicates that student B does not have level change during the baseline phase while during the intervention phase, it improves. The between-condition analysis results are shown in Table 3.

Table 3. Analysis of the Condition

Condition	Student A B/A	Student B B/A
1. Number of Variables Changed	1	1
2. Changes in Direction and Effects	/ / increase increase	= / Stable increase
3. Stability Change	Not stable to stable	No change
4. Level Change	+25	+35
5. Data Overlap	0%	0%

The between-conditions analysis is conducted by comparing phases for each research subject. Before analyzing, the researcher provides code A for the code of the baseline phase and code B for the code of the intervention phase. Table 3 shows the number of the changed variable is 1 because each student has one treatment only, the computational thinking method. The trend towards student A both in the baseline phase and intervention phase condition analysis increases (/). So that the change in trend direction between-conditions increases. It indicates that student A's condition is getting better. The trend towards student B in the baseline phase is flat (=) and in the intervention phase increases (/). So that the change in the trend direction between-conditions is stable to increasing. It indicates that student B's condition is getting better.

The change on the student A's stability trend increases, from unstable to stable. The change on student B's stability trend, both in the baseline and intervention phases is stable, so student B does not have any changes in stability. Student A's level change improves from 30 in the baseline phase to 55 in the intervention phase having difference of +25, and student B's level change improves from 25 in the baseline phase to 60 in the intervention phase having difference of +35. Both student A and student B get an overlap percentage of 0%, where the smaller overlap percentage, the better effect of the intervention given. So that the computational thinking method has an effect on students A and B's problem solving skill.

Discussion

From the discussion above, the arithmetic sequences learning materials application using computational thinking method for slow learners is running smoothly. It can be seen from the findings that the researcher has previously described, including visual analysis; within-conditions analysis (Table 2) and between-conditions analysis (Table 3). So, the arithmetic sequences learning materials application using computational thinking method for slow learners is well accepted. The researcher discusses more clearly for each phase.

Baseline Phase

The baseline data are obtained by looking at the observation results made by researcher on the process used by slow learners in solving arithmetic sequences problems before the computational thinking method as treatment is given. The baseline phase is conducted in 3 sessions, and in each session, students are given one question related to social arithmetic. The arithmetic sequences questions given in the second and third sessions are one level easier than the question given in the first session. This is because the first session questions are considered more difficult by the students and researchers. So, the researcher lowers the questions difficulty level in the second and third sessions. However, from the three sessions in the baseline phase, the results obtained from two students in solving arithmetic sequences problems are still low. The results can be seen in Table 4.

Table 4. Students' answers

Session	Student A	Student B
Session 1		
Session 2		
Session 3		

Intervention Phase

The intervention phase is conducted in three sessions. Each session takes longer time all sessions in the baseline phase. It is because in this phase a computational thinking method is given for the first time. It is followed by students to solve social arithmetic problems. The process where all students to solve social arithmetic problems for each session in the intervention phase can be seen in Table 5.

Table 5. Students' answers

Session	Student A	Student B
Session 1		
Session 2		
Session 3		

The intervention phase is conducted having the aim to explain the arithmetic sequencess concept using a computational thinking method including three principles namely algorithms, abstraction, and pattern recognition.

The use of the computational thinking method in this research is proven to have an effect on slow learners' arithmetic sequences problem solving skill. The results obtained from computational thinking method use show that there is a significant change at the baseline and intervention phases. It is signed by the increasement at solving arithmetic sequences problems final score. So, the hypothesis that there are significant differences in arithmetic sequences learning outcomes before and after the application of computational thinking method for slow learners is accepted.

The statement above is in line with several previous research results stated that the computational thinking method is able to have a significant effect on the individuals' ability (Aminah et al. 2022, 2023; Liao et al. 2022; Molina-Ayuso et al.

2022). The computational thinking method can also help students having special conditions; in this research, the students are slow learners.

Conclusion

Based on the research results and discussion, it can be concluded that the computational thinking method use has significant effect on slow learners' arithmetic sequences problem solving skill in class XI at SMA Muhammadiyah 3 Yogyakarta. The application of the computational thinking method for slow learners includes four principles namely decomposition, abstraction, pattern recognition, and algorithms. It is shown that there is an increasement on solving arithmetic sequences problems final score given by researcher. In the baseline phase test, the research subjects' final scores are in the range of 20 to 30, and in the intervention phase test, after computational thinking method is implemented, the research subjects' final scores increase to the range of 50 to 60. These results indicate that the computational thinking method use has a significant effect on slow learners' arithmetic sequences problem solving skill in class XI at SMA Muhammadiyah 3 Yogyakarta.

The small number of research subjects and the single-subject research method are limitations reducing the generalization of the research results. Therefore, the researcher suggests that the computational thinking method can be implemented in the classroom by taking more samples randomly with larger population so that the results can be generalized. On the other hand, the researcher suggests that other researchers can implement the computational thinking method to other materials beside arithmetic sequences or even beside mathematics.

References

Afriansyah, E. A. (2014). What Students' Thinking about Contextual Problems is. In *International Seminar on Innovation in Mathematics and Mathematics Education. Innovation and Technology for Mathematic* (pp. 279–288).

Aminah, N., Leonardus, Y., Wardono, W., & Nur, A. (2022). Computational Thinking Process of Prospective Mathematics Teacher in Solving Diophantine Linear Equation Problems. *European Journal of Educational Research*, *11*(3), 1495–1507. https://doi.org/10.12973/eu-jer.11.3.1495

Aminah, N., Sukestiyarno, Y. L., Cahyono, A. N., & Maat, S. M. (2023). Student activities in solving mathematics problems with a computational thinking using Scratch. *International Journal of Evaluation and Research in Education (IJERE)*, *12*(2), 613. https://doi.org/10.11591/ijere.v12i2.23308

Asih, N., & Ramdhani, S. (2019). Peningkatan Kemampuan Pemecahan Masalah Matematis dan Kemandirian Belajar Siswa Menggunakan Model Pembelajaran Means End Analysis. *Mosharafa: Jurnal Pendidikan Matematika*, *8*(3), 435–446. https://doi.org/10.31980/mosharafa.v8i3.534

Awasthi, D. (2014). Slow but steady can also win race: A comment on the problems of slow learners. *Asian Journal of Multi-Disciplinary Studies*, *2*(9), 53–57.

Aziz, A. N., Sugiman, S., & Prabowo, A. (2016). Analisis Proses Pembelajaran Matematika pada Anak Berkebutuhan Khusus (ABK) Slow Learner di Kelas Inklusif. *Kreano, Jurnal Matematika Kreatif-Inovatif*, *6*(2), 111. https://doi.org/10.15294/kreano.v6i2.4168

Beecher, K. (2017). *Computational Thinking: A Beginner's Guide to Problem-Solving and Programming.* Swindon, UK: BCS, The Chartered Institute for IT.

Bocconi, S., Chioccariello, A., Dettori, G., Ferrari, A., & Engelhardt, K. (2016). *Developing computational thinking in compulsory education-Implications for policy and practice*. Publications Office of the European Union.

Bouck, E. C., Sands, P., Long, H., & Yadav, A. (2021). Preparing Special Education Preservice Teachers to Teach Computational Thinking and Computer Science in Mathematics. *Teacher Education and Special Education: The Journal of the Teacher Education Division of the Council for Exceptional Children*, *44*(3), 221–238. https://doi.org/10.1177/0888406421992376

Chambers, P. (2008). *Teaching mathematics*. SAGE.

Csizmadia, A., Curzon, P., Dorlng, M., Humphreys, S., Ng, T., Selby, C., & Woollard, J. (2015). *Computational thinking-A guide for teachers*.

Eryandi, Y., Somakim, S., & Hartono, Y. (2016). Learning Materials Design Pattern Numbers Context Making Kemplang in Class IX. *Journal on Mathematics Education*, *7*(2), 101–108. https://doi.org/10.22342/jme.7.2.3535.101-108

Fitri, R. M., Sumaryanto, T., & Rifa€™i RC3, A. (2019). Thematic Learning Strategy of Teacher to Slow Learners in Inclusive Elementary School. *Educational Management*, *8*(1), 124–130.

Freeman Suarez, M. D. R., Ramirez Berdut, I., & Ramirez Gueton, P. M. (2017). *A challenge for teachers in class: How to cope with slow learners*.

Grover, S., & Pea, R. (2013). Computational Thinking in K–12: A Review of the State of the Field. *Educational Researcher*, *42*(1), 38–43. https://doi.org/10.3102/0013189X12463051

Hafriani, H. (2021). Mengembangkan Kemampuan Dasar Matematika Siswa Berdasarkan Nctm Melalui Tugas Terstruktur Dengan Menggunakan ICT (Developing The Basic Abilities of Mathematics Students Based on NCTM Through Structured Tasks Using ICT). *JURNAL ILMIAH DIDAKTIKA: Media Ilmiah Pendidikan dan Pengajaran*, *22*(1), 63. https://doi.org/10.22373/jid.v22i1.7974

Hardiyanti, A. (2016). *Analisis Kesulitan Siswa Kelas IX SMP Dalam Menyelesaikan Soal Pada Materi Barisan dan Deret*.

Ismi, D. P., Normawati, D., & Murinto, M. (2020). Pelatihan computational thinking bagi guru dan siswa SMA/SMK/MA Muhammadiyah di Wilayah Kota

Yogyakarta. In *Prosiding Seminar Nasional Hasil Pengabdian Kepada Masyarakat Universitas Ahmad Dahlan* (1st ed., Vol. 2, pp. 379–388).

Khine, M. S. (Ed.). (2018). *Computational Thinking in the STEM Disciplines: Foundations and Research Highlights*. Springer International Publishing. https://doi.org/10.1007/978-3-319-93566-9

Liao, C. H., Chiang, C.-T., Chen, I.-C., & Parker, K. R. (2022). Exploring the relationship between computational thinking and learning satisfaction for non-STEM college students. *International Journal of Educational Technology in Higher Education*, *19*(1), 43. https://doi.org/10.1186/S41239-022-00347-5

Lisnawati, L., & Muthmainah, M. (2018). Efektivitas Metode Sas (Struktur Analitik Sintetik) dalam Meningkatkan Keterampilan Membaca Bagi Anak Lambat Belajar (Slow Learner) Di SDN DEMANGAN. *Jurnal Psikologi Integratif*, *6*(1), 81. https://doi.org/10.14421/jpsi.v6i1.1468

Maharani, A. (2020). Computational Thinking dalam Pembelajaran Matematika Menghadapi Era Society 5.0. *Euclid*, *7*(2), 86. https://doi.org/10.33603/e.v7i2.3364

Mardhiyana, D., & Sejati, E. O. W. (2016). Mengembangkan Kemampuan Berpikir Kreatif dan Rasa Ingin Tahu Melalui Model Pembelajaran Berbasis Masalah. In *PRISMA, Prosiding Seminar Nasional Matematika: Vol. February* (pp. 672–688).

Marliani, N. (2015). Peningkatan Kemampuan Berpikir Kreatif Matematis Siswa melalui Model Pembelajaran Missouri Mathematics Project (MMP). *Formatif: Jurnal Ilmiah Pendidikan MIPA*, *5*. http://dx.doi.org/10.30998/formatif.v5i1.166

Molina-Ayuso, Á., Adamuz-Povedano, N., Bracho-López, R., & Torralbo-Rodríguez, M. (2022). Introduction to Computational Thinking with Scratch for Teacher Training for Spanish Primary School Teachers in Mathematics. *Education Sciences*, *12*(12), 899. https://doi.org/10.3390/educsci12120899

Napitupulu, E. E. (2008). Mengembangkan Strategi dan Kemampuan Siswa Memecahkan Masalah Matematik. *Pythagoras: Jurnal Matematika dan Pendidikan Matematika*, *4*(2), 26–36. https://doi.org/10.21831/pg.v4i2.557

Painagoni, K. (2018). Role of Teachers and Parents in Honing Their Hidden Talents of Slow Learners. *Int. J. Adv. Reseach*, *5*(3), 3–6.

Pimta, S., Tayruakham, S., & Nuangchale, P. (2009). Factors Influencing Mathematic Problem-Solving Ability of Sixth Grade Students. *Journal of Social Sciences*, *5*(4), 381–385. https://doi.org/10.3844/jssp.2009.381.385

Posamentier, A. S., Smith, B. S., & Stepelman, J. S. (2010). *Teaching secondary mathematics techniques and enrichment units 8th Edition*.

Putranto, S. & Marsigit. (2018). Does Peer Tutoring with Realistic Mathematics Education Approach Effective to Develop Conceptual Understanding of Slow Learners? *Journal of Physics: Conference Series*, *1097*, 012127. https://doi.org/10.1088/1742-6596/1097/1/012127

Ready Lokanadha, G., Ramar, R., & Kusuma, A. (2006). Slow learners, Their Psychology and Instruction. *Discovery Publishing House*.

Siswati, N. (2010). Pengaruh Social Stories Terhadap Keterampilan Sosial Anak Dengan Attention-Deficit Hyperactivity Disorder (ADHD). *Jurnal Psikologi Undip*, *8*(2), 106–123.

Sopian, Y. A., & Afriansyah, E. A. (2017). Kemampuan Proses Pemecahan Masalah Matematis Siswa melalui Model Pembelajaran Creative Problem Solving dan Resource Based Learning (Studi Eksperimen pada Siswa Kelas X SMK Krija Bhakti Utama Limbangan). *Jurnal Elemen*, *3*(1), 97. https://doi.org/10.29408/jel.v3i1.317

Sugiyarta, A. W., & Andriyani. (2020). *Computational Thinking Learning to Improve Slow Learner Critical Thinking Ability in Linear Programming Materials at SMA Muhammadiyah 3 Yogyakarta*.

Sulistiani, E. & Masrukan. (2017). Pentingnya Berpikir Kritis dalam Pembelajaran Matematika untuk Menghadapi Tantangan MEA. *Prosiding Seminar Nasional Matematika*, 605–612.

Sunanto, J., Takeuchi, K., & Nakata, H. (2006). Penelitian dengan subjek tunggal. *Bandung: UPI Press*.

Suryani, M., Jufri, L. H., & Putri, T. A. (2020). Analisis Kemampuan Pemecahan Masalah Siswa Berdasarkan Kemampuan Awal Matematika. *Mosharafa: Jurnal Pendidikan Matematika*, *9*(1), 119–130. https://doi.org/10.31980/mosharafa.v9i1.605

Tias, A. A. W., & Wutsqa, D. U. (2015). Analisis Kesulitan Siswa SMA dalam Pemecahan Masalah Matematika Kelas XII IPA di Kota Yogyakarta. *Jurnal Riset Pendidikan Matematika*, *2*(1), 28. https://doi.org/10.21831/jrpm.v2i1.7148

Utami, R. W., & Wutsqa, D. U. (2017). Analisis Kemampuan Pemecahan Masalah Matematika dan Self-efficacy Siswa SMP Negeri di Kabupaten Ciamis. *Jurnal Riset Pendidikan Matematika*, *4*(2), 166. https://doi.org/10.21831/jrpm.v4i2.14897

Wulandari, M., & Setiawan, W. (2021). Analisis Kesulitan dalam Menyelesaikan Soal Materi Barisan pada Siswa SMA. *Jurnal Pembelajaran Matematika Inovatif*, *4*(3), 571–578. https://doi.org/10.22460/jpmi.v4i3.571-578

Yadav, A., Hong, H., & Stephenson, C. (2016). Computational Thinking for All: Pedagogical Approaches to Embedding 21st Century Problem Solving in K-12 Classrooms. *TechTrends*, *60*(6), 565–568. https://doi.org/10.1007/s11528-016-0087-7

Yeliz, Y. (2015). Sixth graders and non-routine problems: Which Strategies are Decisive for Success? *Educational Research and Reviews*, *10*(13), 1807–1816. https://doi.org/10.5897/ERR2015.2230

This page is intentionally left blank