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Analysis of Students' Computational Thinking Skills on Social Arithmetic Material in Terms of Adversity Quotient

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Abstract

This research fills an urgent knowledge gap regarding the urgency of analyzing students' computational thinking skills in today's learning. In an era where technology and computing play an important role in daily life, computational thinking skills are crucial for students to face future challenges. Although there have been previous studies on students' computational thinking skills and its influencing factors, there is no adequate understanding on how AQ can affect students' computational thinking skills, especially in the context of social arithmetic learning. This research aims to fill the knowledge gap and analyze how AQ can influence students' computational thinking skills in the context of social arithmetic learning. Through a descriptive qualitative approach, involving 20 students from class VII B MTS Annuriyyah Jember as research subjects. Data were validated using triangulation techniques, namely AQ questionnaire, test and interview. Using AQ questionnaire, the results showed that there were 3 students with Climbers type (high AQ), 14 students with Campers type (medium AQ), and 3 students with Quitters type (low AQ). From each AQ type, three students were selected for further analysis related to their computational thinking ability. The results showed that students with high AQ type were able to fulfill all indicators of computational thinking ability. Students with moderate AQ type were able to identify important information and organize the solution steps, although there were some steps that were not appropriate. However, they were still able to solve the problem correctly. On the other hand, students with low AQ type were unable to record the required information and failed to organize the solution steps properly, resulting in an incorrect solution. Overall, this study showed that students' computational thinking ability in social arithmetic varied depending on their AQ type. The findings indicate a relationship between Adversity Quotient and students' computational thinking skills, which can be used to develop more effective learning strategies and motivate students in learning mathematics.

Keywords: *Computational thinking skills, Adversity Quotient, social arithmetic*

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Abstrak

Penelitian ini mengisi kesenjangan pengetahuan yang mendesak terkait urgensi menganalisis keterampilan berpikir komputasional siswa dalam pembelajaran saat ini. Dalam era dimana teknologi dan komputasi memainkan peran penting dalam kehidupan sehari-hari, kemampuan berpikir komputasional menjadi sangat penting bagi siswa untuk menghadapi tantangan masa depan. Meskipun telah ada penelitian sebelumnya mengenai keterampilan berpikir komputasional siswa dan faktor-faktor yang mempengaruhinya, belum ada pemahaman yang memadai mengenai bagaimana AQ dapat mempengaruhi kemampuan berpikir komputasional siswa, terutama dalam konteks pembelajaran aritmatika sosial. Peneitian ini bertujuan untuk mengisi celah pengetahuan tersebut dan menganalisis bagaimana AQ dapat mempengaruhi keterampilan berpikir komputasional siswa dalam konteks pembelajaran aritmatika sosial. Melalui pendekatan deskriptif kualitatif, dengan melibatkan 20 siswa dari kelas VII B MTS Annuriyyah Jember sebagai subjek penelitian. Data divalidasi menggunakan triangulasi teknik, yaitu angket AQ, tes dan wawancara. Melalui penggunaan angket AQ, didapatkan hasil bahwa terdapat 3 siswa dengan tipe Climbers (AQ tinggi), 14 siswa dengan tipe Campers (AQ sedang), dan 3 siswa dengan tipe Quitters (AQ rendah). Dari masing-masing tipe AQ tersebut, tiga siswa dipilih untuk dilakukan analisis lebih lanjut terkait kemampuan berpikir komputasional mereka. Hasil penelitian menunjukkan bahwa siswa dengan tipe AQ tinggi mampu memenuhi semua indikator kemampuan berpikir komputasional. Siswa dengan tipe AQ sedang telah mampu mengidentifikasi informasi penting dan menyusun langkah-langkah penyelesaian, meskipun terdapat beberapa langkah yang tidak sesuai. Namun, mereka masih mampu menyelesaikan permasalahan dengan benar. Di sisi lain, siswa dengan tipe AQ rendah tidak mampu mencatat informasi yang dibutuhkan dan gagal menyusun langkah-langkah penyelesaian dengan baik, sehingga menghasilkan solusi yang salah. Secara keseluruhan, penelitian ini menunjukkan bahwa kemampuan berpikir komputasional siswa dalam materi aritmatika sosial bervariasi tergantung pada tipe AQ mereka. Temuan ini mengindikasikan adanya hubungan antara Adversity Quotient dan keterampilan berpikir komputasioal siswa, dapat digunakan untuk mengembangkan strategi pembelajaran yang lebih efektif dan memotivasi siswa dalam pembelajaran matematika.

INTRODUCTION

The development of the times in the current era of globalization requires an increase in the ability or skills needed to solve global challenges. In Indonesian education, the challenge is important in creating a dynamic and strategic curriculum while following the development of technology in this 5.0 era (Danindra, 2020). The improvement of the quality of mathematics education also needs to be improved. Because mathematics is considered as one of the basic sciences that are widely used to study other fields of science (Afifah et al., 2023). One of the purposes of learning mathematics is to acquire a person's thinking and reasoning skills to enable a person to confidently and honestly form opinions and draw conclusions when facing problems (Bernard, 2015). One of the skills that can be improved in the thinking process is computational thinking skills. Computational thinking skills are basic abilities that involve various fields, including in education to solve mathematical problems and understand basic concepts in computer science (Wing, 2017).

Computational thinking skills provide benefits for humans to be able to solve problems by designing a system that we cannot do by ourselves (Nugraha et al., 2023). Therefore, applying mathematical concepts in real life is an important part of developing computational thinking skills. Rijal Kamil et al., (2021) also argue that computational thinking skills are important skills for individuals to solve their daily problems. This is in line with Christi & Rajiman, (2023) that the importance of computational thinking skills in the world of computing lies in its ability to develop individuals' critical, creative, and analytical thinking skills in solving complex problems, both in the scope of computing and in real life.

An example of the application of computational thinking skills in mathematics is when students must solve problems involving numerical calculations and mathematical operations in the context of daily life. For Example, when students are asked to calculate the total cost of purchasing several items with different prices, they need to use computational thinking skills to identify the right calculation steps and process the given data. This ability enables students to solve mathematical problems effectively and apply mathematical concepts in real-life situations.

One of the most important mathematics areas that students understand and is closely related to daily life is social arithmetic. through social arithmetic material, students can increase a deeper understanding of mathematical concepts by applying problem solving in real-life contexts. Khairunnisa & Setyaningsih, (2017) also agree that to be successful in solving social arithmetic problems, students need to have the ability to read and understand the problem and be able to determine the right steps to solve the problem.

The results of studies related to students' computational thinking skills show suboptimal results. Teachers often faced the fact that most students have difficulty in solving math problems when studying in class. In the research of Shufah & Izzah, (2022) explained that this happens because there are still many students who have difficulty working on problems that require a lot of high-level thinking skills, such as questions about how mathematics can be used in everyday life. As a result, students' interest in improving computational thinking skills is low. Therefore, it is important to improve the ability to think computationally as the low impact of this ability affects student learning outcomes (Sa'diyyah et al., 2021).

There are four operational skills in computational thinking, those are decomposition or identifying problems, pattern recognition, abstraction and algorithmic thinking (Marifaha & Kartono, 2023). By developing these four skills, students can improve their computational thinking skills as well as apply mathematical understanding in problem solving (Mubarokah et al., 2023). However, to improve students' computational thinking skills more effectively, it is also necessary to consider other factors that can influence students' learning success, including Adversity Quotient (AQ) ability. Adversity Quotient describes the extent to which a person can overcome challenges, obstacles, and hurdles in his or her life. This is because the need to consider AQ is important in improving student learning success (Chabibah et al., 2019).

Adversity Quotient is the personal intelligence in solving problems or facing challenges, and can be interpreted as an individual's fighting power (Wahyuni et al., 2022). AQ also involves intelligence and skills in changing, processing, and dealing with problems or difficulties, and turning them into challenges that can be overcome and resolved (Hidayah et al., 2016). Adversity Quotient can affect students' attitudes, motivation, and resilience in facing learning difficulties, including in solving mathematics problems involving the concept of computational thinking. This is due to the different levels of Adversity Quotient that each student has in facing problems (Abdiyani et al., 2019).

There are 3 levels of adversity quotient, namely quitters, campers, and climbers (Maini & Izzati, 2019; Nuraini et al., 2018). Students who belong to the quitters type tend to tend to give up easily, be passive, and lack motivation in solving problems. They may tend to give up quickly when facing difficulties. Students who belong to the campers type, on the

other hand, endeavour to overcome the problems they face. However, they may not achieve the maximum level of success and tend to feel satisfied with what they have achieved. Students who belong to the climbers type always endeavour to achieve full success. They have strong motivation and are highly committed in solving the problems they face. They do not give up easily and keep trying to achieve better and higher results (Shufah & Izzah, 2022). Stoltz also explained that individuals with high AQ will continue to try to complete the tasks given despite facing difficulties (Wahyuni et al., 2022). In improving students' computational thinking skills, keep in mind that motivation and a positive mental attitude are very important. Students need to be encouraged to have a persistent attitude, dare to face challenges, and have high motivation in solving computational problems. With the grouping of adversity quotients, it is possible to predict how a person responds to mathematical problems (Mafulah & Amin, 2020).

Based on the previous explanation, each student has a different level of Adversity Quotient which can affect their skills in computational thinking. This information can be used to improve the mathematics learning process. Therefore, the purpose of this study is to further investigate the computational thinking skills of students at MTS Annuriyah on social arithmetic material in terms of Adversity Quotient.

METHOD

This research used a qualitative descriptive method. In this study, researchers had provided a description of students' computational thinking skills on social arithmetic material in terms of Adversity Quotient. The research subjects consisted of 20 students of class VII B MTS Annuriyah Jember. They were selected based on their AQ type. There are 3 subjects from class VII B who have high AQ, medium AQ, and low AQ categories, there is one student at each level. The data collection techniques used were questionnaire of Adversity Quotient, computational thinking skills test, and interview. Data from the AQ questionnaire was used to categorise students into Adversity Quotient types. The computational thinking skills test was conducted to determine the level of students' computational thinking skills. And the interview was conducted once when students finished doing the test with the aim of describing the test results that had been done and strengthening the test results.

In analysing the data, the researcher used the Miles and Huberman (2013) model including 3 stages: (1) data reduction, (2) data display, and (3) inference. In the data reduction stage, the data that had been collected from the AQ questionnaire and computational thinking skills test were reduced and arranged to enable researchers to understand the relevant information. Furthermore, the data display stage, the data that has been reduced is then arranged in a certain way, namely through tables or interview quotes, the purpose of data display is to provide a clear picture of the research findings. The last stage is the Inference stage, where Inference is done to interpret the data and make conclusions based on the analysis that had been done, in this case the researcher would describe the types of AQ and the level of computational thinking skills of class VII B students at MTS Annuriyah Jember based on the data that had been analysed. The research instrument used was a 20-item AQ questionnaire adopted from the thesis of PUTRA, (2021) which had been tested and vali-

dated and 2 items of story problems designed according to the indicators of computational thinking skills. These indicators could be seen in table 1. In addition, by triangulating to validate the data, namely by triangulating sources and methods.

Table 1: Indicators of computational thinking skills

Indicators of computational thinking	Indicators of competence
Decomposition	Students can identify and describe information related to the given problem
Pattern recognition	Students can find similar or different patterns used in solving problems.
Abstraction	Students can eliminate irrelevant elements in the problem solving plan to reach a conclusion.
Algorithmic thinking	Students can explain logical and systematic steps to find solutions to the problems given.

RESULTS AND DISCUSSION

Research Result

Student AQ questionnaire test results

The results of the classification of students in each AQ type can be seen in Table 2.

Table 2. AQ questionnaire results

Category	The number of students
High	3
medium	14
Low	3

In Table 2, from the 20 students who became research subjects, there were 3 students who were in the high AQ category, 14 students were in the medium AQ category, and 3 students were in the low AQ category. Research subjects were selected based on the AQ questionnaire scores obtained. The difference in the number of students in each category can be influenced by various factors. The tendency for more students in the moderate AQ category is due to a more even distribution of social sensitivity and emotional responses to mathematics problems among most students. This suggests that most students have a rather balanced response to the mathematics tasks given by the teacher, and they feel challenged to complete them. Meanwhile, the high and low AQ categories with fewer students may reflect more unique traits in terms of students' emotional responses and motivation levels towards mathematics. Students with high AQ showed very high levels of confidence and interest in mathematics, while students with low AQ showed challenges in dealing with mathematical difficulties and needed additional support. In this study, 1 student for high AQ, 1 student for medium AQ, and 1 student for low AQ were selected. The selection of one student from each category in this study aims to understand more deeply the differences in characteristics and behaviour that may occur between these AQ categories.

After the subject was selected, the researcher analysed the students' computational thinking skills on social arithmetic material in terms of AQ. The following is a description of students' computational skills in solving problem number 1 on social arithmetic material in terms of AQ.

The questions used in this study are: At a wedding, there were 350 guests present. Of these guests, 40% are the groom's family, 30% are the bride's family, and the rest are friends of the bride and groom. If the groom's family is 140, how many guests are friends of the bride and groom?

S1 computational thinking skills with high AQ type

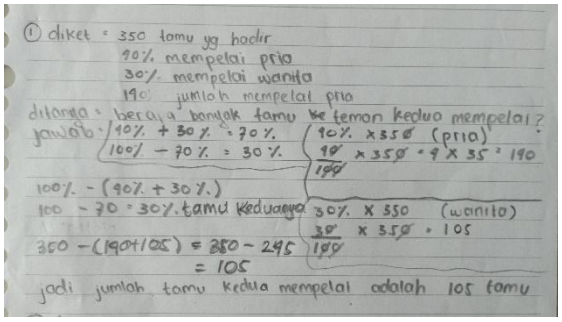

Figure 1: Answer S1 of high AQ type

Based on the data obtained from Figure 1, students are very thorough and detailed in solving the problem correctly and precisely. After analysing the students' answer sheets including identifying students' computational thinking skills in solving social arithmetic problems, it can be obtained that students are able to write the main problem and write down what facts are needed by the problem. This is supported by the results of interviews with students with high AQ types.

T : What information do you know?
S1 : 350 guests attended, 40% were the groom's family, 30% were the bride's family, the groom's family numbered 140.
T : Then what is asked in the question?
S1 : Here ma'am, how many guests are friends of the bride and groom?
T : How do you find out the information?
S1 : I read the question first ma'mm, then I know what is known in the question.
T : Then how did you calculate it?
S1 : So first calculate the percentage of male and female families. Here I use two methods. First, the percentage is 100%, right, I subtract 40% + 30%, the result is 30%. That's where I found 105 guests whose percentage is 30%. To prove it 350 - (140+105) so I found the friends of the bride and groom 105 guests.
T : After doing it, do you check the result again?
S1 : Yes ma'am, I checked the result again and calculated it again. Because to make sure the answer I wrote is correct

Through the interview excerpt above, S1 was able to perform the decomposition stage by identifying and describing information related to the problem given. S1 recognised that the relevant information included the number of guests present 350, the percentage of the groom's family 40%, the percentage of the bride's family 30%, and the number of the groom's family given 140 people. This decomposition ability helped S1 in deeply understanding the problem to be solved.

Furthermore, S1 can perform pattern recognition. S1 was able to identify similar or different patterns used in the problem solving process. In this problem, the pattern found was the use of percentages in calculating the number of groom's family and bride's family. S1 realised that this calculation was key in solving the problem.

As for the abstraction stage S1 can eliminate irrelevant elements in the problem solving plan. They focus on calculating the number of the groom's family, the number of the bride's family, and the number of friends of the bride and groom. S1 can ignore other elements such as the gender of the bride and groom or additional information that is irrelevant in finding a solution.

Finally, S1 was able to explain the logical and systematic steps to find the solution to the problem. They used structured and organised algorithmic thinking steps. First, S1 calculated the number of the groom's family by multiplying the percentage of the groom's family 40% by the number of guests present 350. Next, S1 calculated the number of the bride's family by multiplying the percentage of the bride's family 30% by the number of guests present 350. Finally, S1 reduced the total number of guests 350 by the number of the groom's family 140 and the number of the bride's family 105 to get the number of friends of the bride and groom,

namely 105 guests.

In solving this problem, S1 fulfils all indicators of computational skills. Hidayat & Sariningsih, (2018) in their research stated that students with high AQ have a good understanding of the problem, can plan the solution steps, are able to check by writing down how to verify the results and process. This shows that students with the ability of climbers can solve mathematics problems, that students are very confident that every problem can be solved, they do not give up easily and remain optimistic in facing difficulties in achieving success or finding the right answer (Yanti & Syazali, 2016).

S2 computational thinking skills with moderate AQ type

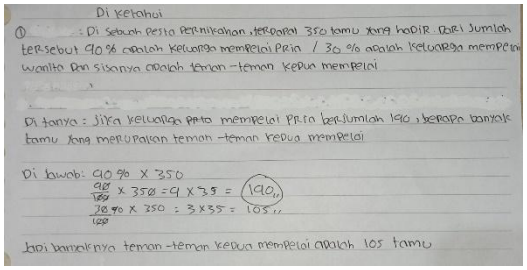

Figure 2. S2 answer of medium AQ type.

Based on the data obtained from Figure 2 and from the results of the interviews conducted with S2, it can be concluded that in understanding the problem S2 can describe the known information in the form of the number of guests present 350, the percentage of the groom's family 40%, and the percentage of the bride's family 30%. And S2 is also able to write the information asked in full, namely how much is the total number of the bride and groom. This is supported by the results of the interview with S2 who was able to provide information on the problem in detail. This shows that S2 uses a decomposition approach in his thinking process.

Next, in the second stage, namely pattern building, where S2 showed by finding a percentage calculation pattern. S2 knows that the percentage of the groom's and bride's family must be calculated first to reach an accurate solution.

Students' abstraction skills were also seen when S2 eliminated irrelevant elements in the problem solving plan. S2 focused the calculation on the groom's family, the bride's family. However, S2 did not explain the calculation to the friends of the bride and groom, where S2 immediately concluded the result of the bride and groom's guests totalling 105 people.

In explaining the logical and systematic steps to find a solution, S2 has not succeeded in showing overall algorithmic thinking skills. S2 has not been coherent in calculating the number of families of the bride and groom based on the percentage given. S2 did not reduce the total number of guests by the number of the groom's and bride's families to find the number of friends of the bride and groom but went straight to the conclusion of the result.

In solving this problem, S2 did not fulfil all indicators of computational skills. In a study conducted by Hidayat & Sariningsih, (2018) it was explained that students with AQ campers in solving problems have the ability to understand the problem, plan a solution, and implement the plan. Although the student's writing is incomplete.

S3 computational thinking skills with low AQ type

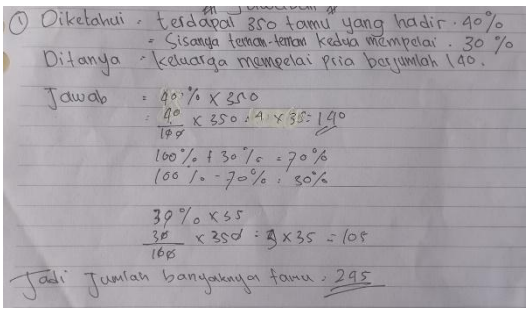

Figure 3. S3's answer of medium AQ type

Based on the data obtained from Figure 3

and the results of interviews with S3, S3 can perform the decomposition stage by showing that S3 is only able to write down the known elements, namely the number of guests present 350, although there are some elements that are less precise. The subject should have written the percentage of the groom's family 40%, the percentage of the bride's family 30% and the number of the groom's family given 140 people. And S3 was also unable to write the information asked correctly.

Next in the second stage is pattern making, where S3 shows by finding a percentage calculation pattern. S3 knows that the percentage of the groom's and bride's family must be calculated first to reach the right solution. However, S2 did not explain the calculation on the friend of the bride and groom,

The next stage in computational thinking, namely abstraction and algorithmic thinking, which has not been achieved by S3. Errors made by S3 in recognising patterns affect his ability to reach this stage. Abstraction involves the ability to identify common patterns and generalise the solutions found. However, S3 has not succeeded in achieving abstraction because he made mistakes and could not draw the right conclusions about the solution he found. In addition, the indicators of thinking algorithms have also not been fulfilled by S3. Algorithmic thinking involves logical and systematic problem solving steps. However, the steps taken by S3 were inconsistent and did not fulfil these criteria. Errors and inconsistencies in the algorithm used by S3 hindered his ability to reach the algorithm thinking stage in computational thinking.

Discussion

Based on the analysis of the computational thinking process of the three students, it can be concluded that in solving social arithmetic story problems, students' computational thinking skills vary depending on their AQ type. Students with high AQ type, such as S1, have excellent computational thinking skills. They were able to fulfil all indicators of computational thinking, including decomposition, pattern recognition, abstraction, and algorithmic thinking. High AQ students tend to be able to identify and decompose information appropriately, including relevant elements in the problem. Their decomposition ability is very good, so they can answer the questions completely and accurately. Septianingtyas & Jusra, (2020) explained in their research, students with high AQ levels tend to have better problem solving skills, unyielding nature, and like challenges according to their AQ level. Students with moderate AQ types, such as S2, are also able to solve problems correctly. Although their decomposition and pattern recognition skills are better than those of low AQ students, they are not as clear and precise as those of high AQ students. Their abstraction and algorithmic thinking skills have also started to develop but need further development to reach a higher level. In accordance with the research of Septianingtyas & Jusra, (2020) the type transition from climber to camper (moderate AQ) shows a fairly good ability to carry out the stages of problem solving, although it is not as good as the climber stage, which means that there are indicators that are not carried out by the camper type and students are less careful in their work. Whereas students with low AQ types, such as S3, have challenges in computational thinking. Their decomposition ability still needs fur-

ther development, so relevant information from the problem is not always included appropriately in the answer. Their pattern recognition is limited to simple patterns, and they struggle to identify more complex patterns. Their abstraction and algorithmic thinking skills are also still limited, so the problem-solving steps taken are not consistent and systematic. These students did not reach the correct answer and appeared to have difficulty in applying computational thinking skills in solving social arithmetic problems. Shufah & Izzah, (2022) in their research explained that students with low AQ levels (quitters), only fulfilled 1 indicator of computational thinking skills, this is because low AQ students do not have sufficient understanding in applying the correct steps in solving problems and have difficulty in applying computational thinking skills. Overall, students' computational thinking skills in social arithmetic varied depending on their AQ type. Students with high AQ type have better skills, while students with medium and low AQ type still need further development. In line with Rosita & Rochmad, (2016) When facing difficulties in solving mathematical problems, students who belong to the camper and climber categories will continue to try to find solutions. On the other hand, students who belong to the quitter category give up more easily and have less strong motivation to try to solve the problem.

Limitation

This research is limited to analysing students' computational thinking skills in social arithmetic with a review of Adversity Quotient (AQ). Social arithmetic is the focus of this research, where students are expected to understand and apply mathematical concepts in the context of everyday life. The concept of computational thinking skills that is of concern in this study includes students' understanding in solving mathematical problems, their ability to analyse problems computationally, as well as the creativity and innovation shown in formulating mathematical solutions. This research is limited to identifying the level of computational thinking skills of seventh grade students in social arithmetic and its relationship with the types of AQ possessed by students.

Another limitation is the limited sample size of the study. The use of this relatively small sample may affect the representation of variations in students' overall computational thinking skills. As such, generalisations of the results of this study should be made with caution and only apply to student populations in the same school.

Implication

This research has a function to recognise the computational thinking skills that occur in students, when learning social arithmetic. By recognising students' computational thinking skills when learning social arithmetic, teachers can better understand students' individual needs and challenges in dealing with mathematical problems.

The results of this study provide valuable guidance for educators in developing more effective and targeted learning strategies. Teachers can identify students with high, medium, and low AQ types, so that they can accommodate the differences in student characteristics with the right approach. Learning plans that are tailored to students' computational thinking abilities will help improve students' understanding and performance in mathematics subjects, especially social arithmetic.

CONCLUSION

Based on the research and discussion that has been done, it can be concluded that the analysis of students' computational thinking skills in social arithmetic material in terms of Adversity Quotient (AQ). Of the 20 students who filled out the AQ questionnaire, there were 3 students with high AQ type, 14 students with medium AQ type, and 3 students with low AQ type. Students with high AQ type showed good skills in all indicators of computational thinking skills. They were able to fulfil all the requirements and indicators proposed. Students with moderate AQ type have been able to identify important information and develop solutions in computational thinking problems. However, there were some steps that were not in accordance with the requirements and were unable to solve the problem correctly. On the other hand, students with low AQ type could not write down the required information and organise the solution steps well. Their skills in solving computational thinking problems were still limited. Overall, students' computational thinking skills in social arithmetic varied depending on their AQ type. Students with high AQ type have better skills, while students with medium and low AQ type still need further development. therefore, it is necessary to make additional efforts to assist students with medium and low AQ type in improving their computational thinking skills in the context of social arithmetic.

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