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Conjecturing Via Analogical Reasoning to Trigger Divergent and Convergent Thinking

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This study aims to reveal divergent and convergent thinking due to conjecture via analogical reasoning. Revealing divergent and convergent thinking was carried out through the exploration of 67 eighth grade students in Tasikmalaya through open questions about the analogy of the problem. The research method used the think aloud method, equipped with unstructured interviews and obtained verbal data related to divergent thinking and convergent thinking. Students with divergent thinking are able to produce new ideas that are often associated with creativity, while people with types of convergent thinking are able to analyse ideas that are associated with their ability to solve problems.

Key words: *Conjecturing via analogical reasoning, divergent thinking, convergent thinking.*

Introduction

The ability to think at a high level in the form of creative thinking is the hope of learning outcomes. Even Coil (2014) and Piirto (2011) say that creativity is a twentieth century skill. Likewise, as stated by Beghetto and Kaufman (2013) Beghetto et al. (2014) Beghetto and Sriraman (2017), creativity is recognised as a staple for individual and social success, despite the fact that there are still teachers who are not ready to serve the needs of students in learning both as a use of learning models (Supratman, Ryane, and Rustina, 2016; Leikin et al. 2013; Lev-Zamir and Leikin 2011), as well as in problem solving procedures (Rejiden and Ahman M , 2015). Even teachers feel burdened when asked to apply creativity education in class or apply it simply, even though they are sympathetic to the idea (Craft 2005; Maisuria 2005; Zawojewski and Mc Carthy 2007). In addition, teachers' inadequately teaching creativity proved to be related to conflicts between teaching creativity and teaching skills (Torrance 1987; Coil 2014; Supratman, Ryane, and Rustina, 2016), and the paradoxes manifested in teacher goals versus their actions in class (Beghetto and Sriraman 2017).

Therefore, it is important for the teacher to gain knowledge in the design of assignments to build students' creativity. Conjecturing through analogy reasoning is one of the lessons relating

to utilising creative thinking (Ahman M, 2013). Besides, conjecturing via analogical reasoning can construct ordinary students into gifted students (Supratman, Ratnaningsih, and Ryane, 2018), despite the fact there are still students who make mistakes when solving problems through analogical reasoning (Supratman, 2018). This is because conjecture via analogical reasoning plays a role in problem solving (Supratman, S. 21019). In addition, conjecturing via analogy reasoning can be directed to construct new knowledge, because learning must construct new knowledge based on previously owned knowledge (Anthony, 1996). But the reality of the teachers in general in learning, is still to teach the procedure of solving problems periodically. This method does not explain why, that is, by solving the problem using the procedure (Reiden and Ahman M, 2015). There are still some teachers who are not yet proficient in stimulating learning that leads to creative thinking (Supratman, Ryane and Rustina, 2016).

For that reason, conjecturing via analogy reasoning is needed in learning, because the mastery of concepts will run systematically and logically based on student knowledge. The problem is, learning in Indonesia prioritises curriculum targets that must be pursued, not mastery of concepts / new knowledge construction as learning outcomes. Thus, in measuring the success of student learning, there are still tests that use multiple choice. So, learning does not consider the thought process, but only the final result. In fact, if students are asked to solve problems, we will find several different results according to the students' level of thinking (Ahman M, 2013)

The question is: Is conjecturing via Analogy Reasoning Encouraging Divergent and Convergent Thinking (CT)?

Literature Review

Employee Technology

Divergent Thinking and Convergent Thinking

A person focuses on conjecturing to find a solution to a problem so he is thinking convergently (Guilford, 1956). CT refers to the ability to produce optimal problem solving for a particular problem (Reitman, 1965). An important aspect of CT is that the most appropriate answer must be obtained without ambiguity, with all answers dichotomised as true or false (Cropley, 2006). CT assignments include critical thinking (Watson & Glaser, 1994), reasoning (Cheng, Holyoak, Nisbett, & Oliver, 1986), grammar transformation from logical propositions (Chamorro-Premuzic & Reichenbacher, 2008), and making anagrams (Walker, Liston , Hobson, & Stickgold, 2002). If someone with CT is given a problem like $4 \times 8 =?$ they will only argue $4 \times 8 = 8 + 8 + 8 + 8 = 32$.

In contrast to CT, if someone is looking for some conjecturing of solution it means he is using divergent thinking (DT) (Guilford, 1956). Guilford (1967) states that DT implies that one person can propose multiple or unique solutions to a problem or task. An example is the

Guilford Alternative Use Test, where students must make as many uses for simple objects as they can think of. Test results are evaluated according to indicators of fluency (that is, the ability to generate many ideas), originality (that is, the ability to generate new ideas), and flexibility (that is, the ability to generate ideas for several conceptual categories). Suppose someone thinks divergently when given a problem like 4 × 8 =? They will argue 4 × 8 = 8 + 8 + 8 + 8 = 32 otherwise it will hold 4 × 8 = 4 + 4 + 4 + 4 + 4 + 4 + 4 + 4 = 32, because 4 × 8 = 8 × 4 as commutative law.

Creativity as collaborative thinking from convergent and divergent

Creativity is a collaboration of divergent thinking (DT) and convergent thinking (CT) (Guilford 1950; Csikszentmihalyi 1999; Cropley 2006; Tan and Sriraman 2017). DT and CT collaboration can be applied to mathematics learning. In solving problems; students begin with the next CT that has the ability to continue to DT. The role of DT according to Cropley (2006) is as follows. **First** if there is no DT, as a result there is no variability in learning mathematics, but learning only by memory that produces facts, rules, formulas, or definitions that have been studied previously (Stein et al. 1996). When learning to memorise, learners are not involved in mathematical exploration but are under the teacher's control. As a result, students are at risk of being placed in very low level thinking namely recall (Krulik, Rudnick and Milou, 2003: 89). **Second**, when learners are open to DT, but students are not well guided in the exploration of DT products, students generate new ideas but they are meaningless. Despite the lack of exploration of DT products, some students may have new effective mathematical ideas for example, finding solutions to mathematical problems with luck, as described in (Verschaffel et al. 1999). **Third,** there are occasions where students' creative mathematical ideas generated from DT are rejected by the teacher for some reason. The teacher's rejection of mathematically creative student ideas as instructional tools can lead to the loss of opportunities for students to gain insights into mathematical concepts and procedures. Shriki (2010) argues that this loss is caused by a lack of teacher knowledge about creativity. **Fourth,** there are possibilities where variability is accompanied by exploration which results in only new things that are not effective (for example, Cankoy 2014; Kirschner et al. 2006). All of these possibilities need to be considered by mathematics teachers when planning and implementing task modifications to maintain creativity.

Conjecturing via analogical reasoning of students

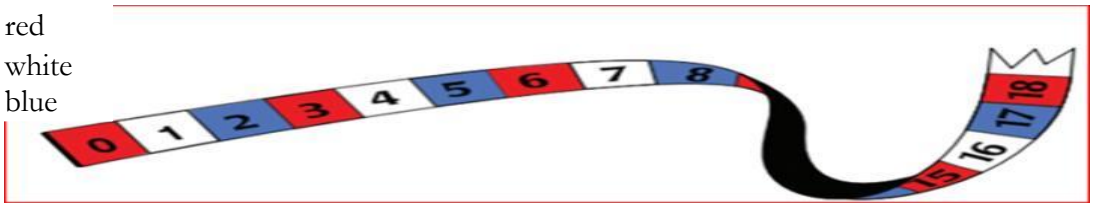
In solving problems in general students are based on conjecturing, although in reality there are still students who do problem solving through hunches and guesses (Polya, 1954). Supratman (2016, 2107 and 2019) found students solving problems and constructing new knowledge based on conjectures through analogy reasoning. Conjecturing via analogical reasoning means that students suspect through previously owned knowledge based on similarity. Example students conjecture 4 × 8 = 32 comes from previous knowledge 2 × 8 = 8 + 8 = 16, then 4 × 8 = 8 + 8 + 8 + 8 = 32 etc.

Method

Instrument research

The problem with DA was adopted from Mathematics 8th grade curriculum 2013 Ministry of Education and Culture Republic of Indonesia 2017, p.7 as follows. The following are strips of three colours (red, white and blue) as shown in Figure 1.

Figure 1. Triple color ribbon sequence



Can you name the colour of the ribbon for number 35? Next, determine the day of the ribbon number for days to 2019?

Research subject

To find the research subject, an exploration of 67 eighth grade students, in Manonjaya Subdistrict, Tasikmalaya District, who were conjecturing via analogical reasoning were encouraged to use convergent or divergent thinking in solving open analogy problems.

Research methodology

To uncover verbal data, we used the think aloud method from Van Someren, Barnard Y.F. and Barnard J.A.C. (1994) and completed unstructured interviews. Thinking aloud, that is students think hard and are expressed through writing and verbally when doing conjecturing. The interview is not structured, if there is incomplete information, the researcher asks the research subjects to explain which is written and spoken.

Data collection procedures

A total of 67 eighth grade students took turns working on the instrument test, and the results of exploration showed students' conjecturing through analogy reasoning, that there were 29 students who thought convergently, 26 students thought divergently and 12 other students thought.

Results and Discussion

Results

Subject Group Type 1 as many as 12 students

There were as many as 12 students who did not give answers thoroughly. They generally could not link the basic analogy (BA) with the analogy target (TA). They were confused about what concepts found in BA are used in TA. As revealed by Subject 1 (S1) in interviews with

researchers (R) as follows.

R : Do you understand the question?
S1 : I feel confused, sir, with the solution, but for the first time I might be able to sort from the start to number 35 on the tri-colour ribbon. But for the next one I can't, sir.

R : What are your guesses?
S1 : Eeeh (after waiting for about 3.5 minutes) Mr Blue

R : How did you find that answer?
S1 : I sorted from 0 to 35, as a three-colour ribbon

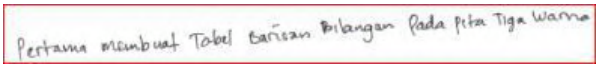
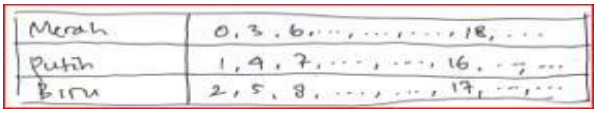
R : Can you finish the next one?
S1 : I can't, sir

This shows students did not understand the similarity of problems between problems that exist in BA with problems that exist in TA. In addition, students did not find concepts to solve problems in BA that can be used to solve problems on TA. S1 groups could not utilise analogical reasoning in solving problems / constructing new knowledge. The type 1 subject group consisted of; S8, S19, S25, S27, S28, S33, S38, S43, S45, S51, S61 and S66.

The S2 group consisted of 29 students

In general, group subjects Type 2 assumed the problem in terms of the tri-colour ribbon number as BA. So Subject Group Type 2 started by making table 1 and the next case as TA started by making table 2 as in BA. The subject group type 2 as follows; S2, S3, S6, S15, S16, S17, S18, S21, S21, S22, S24, S32, S35, S36, S39, S40, S41, S47, S48, S49, S50, S52, S53, S54, S57, S59, S63, S64, S65 and S67. The results of conjecturing via analogy reasoning were as follows.

Table 1: Numbers on the 3 Colour ribbon

original answer	**translation**
	First: make a table of numbers on a three-color ribbon.
	Red 0, 3, 6, …, …, …, 18, … White 1, 4, 7, …, …, 16, …, … Blue 2, 5, 8, …, …, 17, …, …

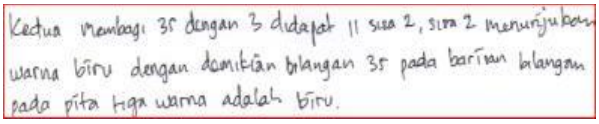
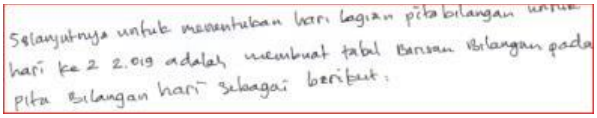
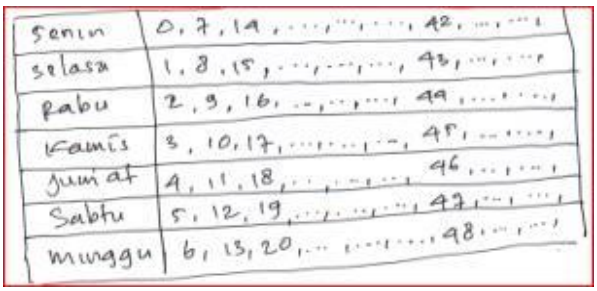
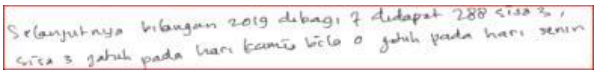
	Second: divide 35 by 3, get 11 left over 2. Left over 2 is blue. Thus, the number 35 in the row of numbers on the tricolor band is blue.
	Next: to determine day 2019 on the day number ribbon, is to make a table of day number sequences on the day number ribbon as follows.

Table 2. Numbers on the Ribbon of the Day of a Week

	Monday 0, 7, 14, ..., ..., ..., 42, ..., ..., Tuesday 1, 8, 15, ..., ..., ..., 43, ..., ..., Wednesday 2, 9, 16, ..., ..., ..., 44, ..., ..., Thursday 3, 10, 17, ..., ..., ..., 45, ..., ..., Friday 4, 11, 18, ..., ..., ..., 46, ..., ..., Saturday 5, 12, 19, ..., ..., ..., 47, ..., ..., Sunday 6, 13, 20, ..., ..., ..., 48, ..., ...,
	So, the number 2019 divided by 7 gets 288 remaining 3. The remaining 3 is Thursday.

R : Is it possible to fall on a day other than Thursday?
S2 : It's impossible, Mr.

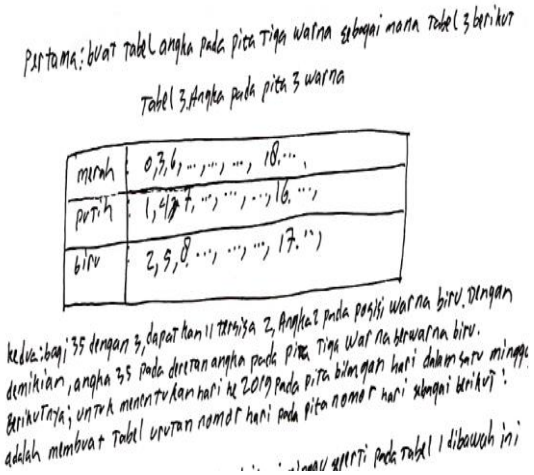
R : Why can it not? Try to explain to me!
S2 : Because indeed the rest of the division is 3. Number 3 is on Thursday.

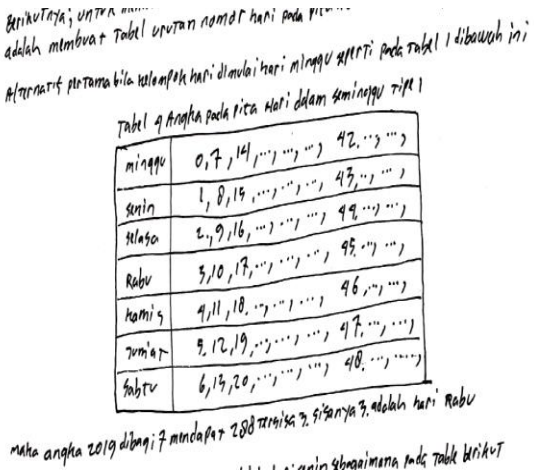
This shows that the S2 group focused on solving the correct problem no matter that there was the possibility of another way of problem solving. The S2 group were able to analyse ideas and be associated with their ability to solve problems. This is a criterion for convergent thinking as stated by Guilford (1956).

Subject group type 3 were 26 students

Actually, the answers of the Type 3 Subject group were almost the same as the Subject Type 2 group but the Subject Type 3 group was able to develop guesses through analogy reasoning, so that other assumptions were obtained, as shown by students who think creatively. This is shown by the completeness in giving the argument, the extent of the argument and overcoming in every possible condition. This variation was shown by members of the S3 group, which

consisted of; S1, S7, S9, S11, S12, S14, S23, S29, S37, S46, S56 starting from Monday. While the rest were S4, S5, S10, S13, S20, S26, S30, S31, S34, S42, S44, S55, S58, S60, and S62 starting from Sunday. However, they have the same answer principle. Namely, depending on the first day taken.

Original answer	**translation**
	First: create a table of numbers on the three-color ribbon as shown in Table 3 below **Table 3. Numbers on the 3 Color ribbon** red 0, 3, 6, …, …, …, 18, … white 1, 4, 7, …, …, 16, …, blue 2, 5, 8, …, …, 17, …, Second: divide 35 by 3, get 11 remaining 2. The remaining 2 are blue. Thus, the number 35 on the row of numbers on the three-coloured ribbon is blue. Next: To determine day 2019 on the day number ribbon, is to make a day number sequence table on the day number ribbon as follows.

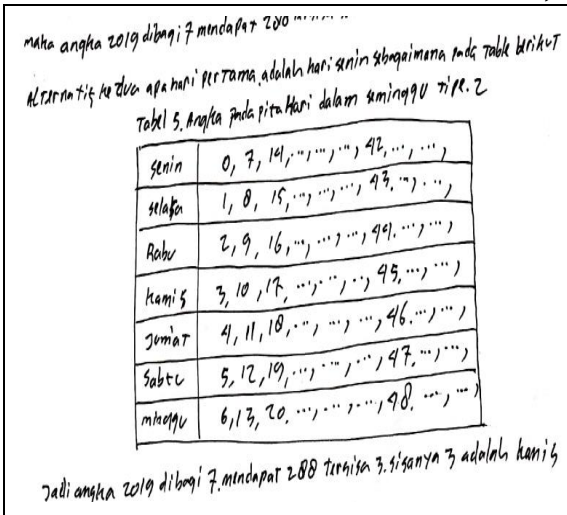


The first alternative is if the day group starts Sunday as in Table 4 below.

Table 4. Numbers on the Ribbon of the Day of a Week of Type 1

Sunday	0, 7, 14, ..., ..., ..., 42, ..., ...,
Monday	1, 8, 15, ..., ..., ..., 43, ..., ...,
Tuesday	2, 9, 16, ..., ..., ..., 44, ..., ...,
Wednesday	3, 10, 17, ..., ..., ..., 45, ..., ...,
Thursday	4, 11, 18, ..., ..., ..., 46, ..., ...,
Friday	5, 12, 19, ..., ..., ..., 47, ..., ...,
Saturday	6, 13, 20, ..., ..., ..., 48, ..., ...,

So, the number 2019 divided by 7 gets 288 remaining 3. Number 3 on Wednesday position.



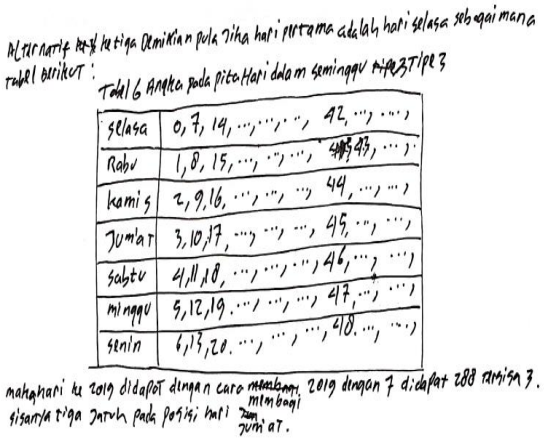
Senin	0, 7, 14, ..., ..., ..., 42, ..., ...,
Selasa	1, 8, 15, ..., ..., ..., 43, ..., ...,
Rabu	2, 9, 16, ..., ..., ..., 44, ..., ...,
Kamis	3, 10, 17, ..., ..., ..., 45, ..., ...,
Jumat	4, 11, 18, ..., ..., ..., 46, ..., ...,
Sabtu	5, 12, 19, ..., ..., ..., 47, ..., ...,
minggu	6, 13, 20, ..., ..., ..., 48, ..., ...,

The second alternative: if the first day is Monday as in the following Table 5.

Table 5. Numbers on the Ribbon of the Day of a Week of Type 2

Monday	0, 7, 14, ..., ..., ..., 42, ..., ...,
Tuesday	1, 8, 15, ..., ..., ..., 43, ..., ...,
Wednesday	2, 9, 16, ..., ..., ..., 44, ..., ...,
Thursday	3, 10, 17, ..., ..., ..., 45, ..., ...,
Friday	4, 11, 18, ..., ..., ..., 46, ..., ...,
Saturday	5, 12, 19, ..., ..., ..., 47, ..., ...,
Sunday	6, 13, 20, ..., ..., ..., 48, ..., ...,

So, the number 2019 divided by 7 obtained 288 remaining 3. Number 3 on Thursday position.

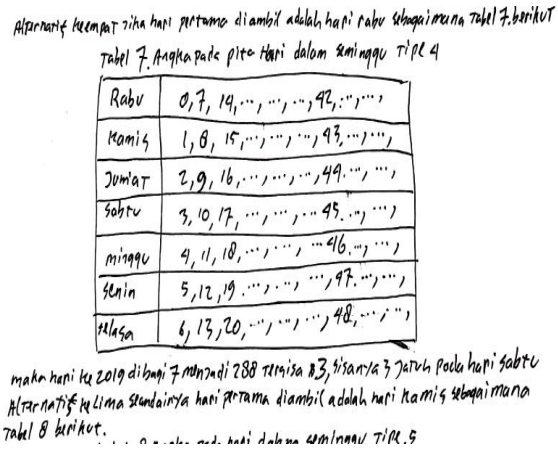


The third alternative: if the first day is Tuesday as in the following Table 6.

Table 6. Numbers on the Ribbon of the Day of a Week of Type 3

Tuesday	0, 7, 14, ..., ..., ..., 42, ..., ...,
Wednesday	1, 8, 15, ..., ..., ..., 43, ..., ...,
Thursday	2, 9, 16, ..., ..., ..., 44, ..., ...,
Friday	3, 10, 17, ..., ..., ..., 45, ..., ...,
Saturday	4, 11, 18, ..., ..., ..., 46, ..., ...,
Sunday	5, 12, 19, ..., ..., ..., 47, ..., ...,
Monday	6, 13, 20, ..., ..., ..., 48, ..., ...,

Then the number 2019 divided by 7 obtained 288 remaining 3. Number 3 on Friday position.

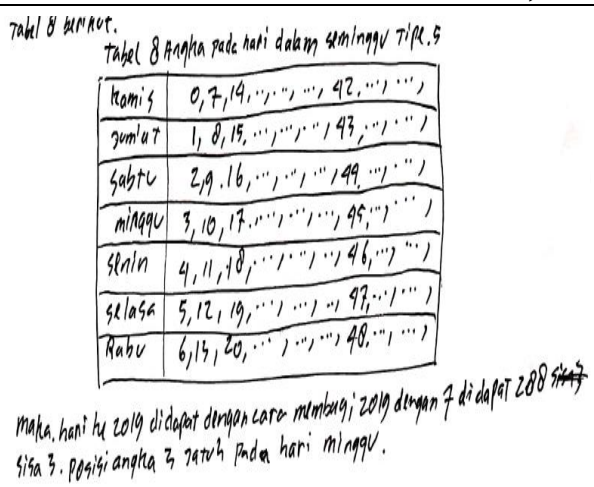


Alternative four: if the first day is Wednesday as in the following Table 7.

Table 7. Numbers on the Ribbon of the Day of a Week of Type 4

Wednesday	0, 7, 14, ..., ..., ..., 42, ..., ...,
Thursday	1, 8, 15, ..., ..., ..., 43, ..., ...,
Friday	2, 9, 16, ..., ..., ..., 44, ..., ...,
Saturday	3, 10, 17, ..., ..., ..., 45, ..., ...,
Sunday	4, 11, 18, ..., ..., ..., 46, ..., ...,
Monday	5, 12, 19, ..., ..., ..., 47, ..., ...,
Tuesday	6, 13, 20, ..., ..., ..., 48, ..., ...,

Then the number 2019 divided by 7 obtained 288 remaining 3. Number 3 on the position Saturday.



Kamis	0, 7, 14, ..., ..., ..., 42, ..., ...,
Jumlat	1, 8, 15, ..., ..., ..., 43, ..., ...,
Sabtu	2, 9, 16, ..., ..., ..., 44, ..., ...,
minggu	3, 10, 17, ..., ..., ..., 45, ..., ...,
Senin	4, 11, 18, ..., ..., ..., 46, ..., ...,
selasa	5, 12, 19, ..., ..., ..., 47, ..., ...,
Rabu	6, 13, 20, ..., ..., ..., 48, ..., ...,

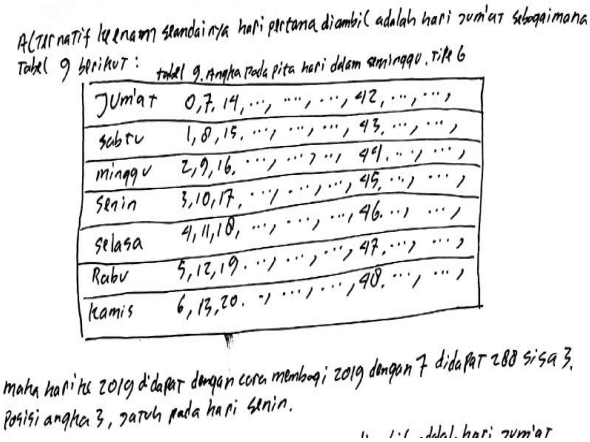
maka, hari ke 2019 didapat dengan cara membagi 2019 dengan 7 didapat 288 sisa 3. posisi angka 3 jatuh pada hari minggu.

The fifth alternative: if the first day is Thursday as in the following Table 8.

Table 8. Numbers on the Ribbon of the Day of a Week of Type 5

Thursday	0, 7, 14, ..., ..., ..., 42, ..., ...,
Friday	1, 8, 15, ..., ..., ..., 43, ..., ...,
Saturday	2, 9, 16, ..., ..., ..., 44, ..., ...,
Sunday	3, 10, 17, ..., ..., ..., 45, ..., ...,
Monday	4, 11, 18, ..., ..., ..., 46, ..., ...,
Tuesday	5, 12, 19, ..., ..., ..., 47, ..., ...,
Wednesday	6, 13, 20, ..., ..., ..., 48, ..., ...,

Then the number 2019 divided by 7 obtained 288 remaining 3. Number 3 on the position of the Sunday



Jum'at	0, 7, 14, ..., ..., ..., 42, ..., ...,
Sabtu	1, 8, 15, ..., ..., ..., 43, ..., ...,
minggu	2, 9, 16, ..., ..., ..., 44, ..., ...,
Senin	3, 10, 17, ..., ..., ..., 45, ..., ...,
selasa	4, 11, 18, ..., ..., ..., 46, ..., ...,
Rabu	5, 12, 19, ..., ..., ..., 47, ..., ...,
kamis	6, 13, 20, ..., ..., ..., 48, ..., ...,

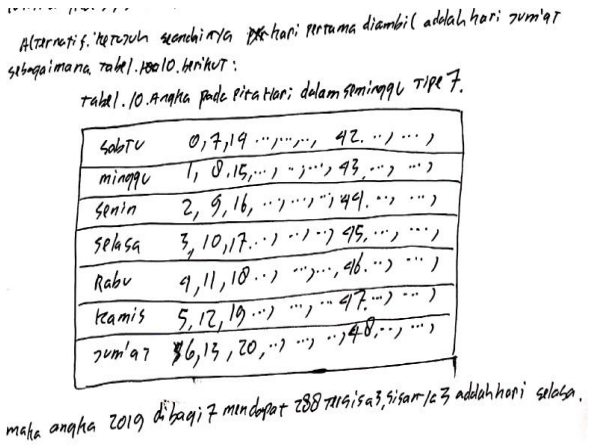
maka hari ke 2019 didapat dengan cara membagi 2019 dengan 7 didapat 288 sisa 3. posisi angka 3, jatuh pada hari Senin.

The sixth alternative: if the first day is Friday as in the following Table 9.

Table 9. Numbers on the Ribbon of the Day of a Week of Type 6

Friday	0, 7, 14, ..., ..., ..., 42, ..., ...,
Saturday	1, 8, 15, ..., ..., ..., 43, ..., ...,
Sunday	2, 9, 16, ..., ..., ..., 44, ..., ...,
Monday	3, 10, 17, ..., ..., ..., 45, ..., ...,
Tuesday	4, 11, 18, ..., ..., ..., 46, ..., ...,
Wednesday	5, 12, 19, ..., ..., ..., 47, ..., ...,
Thursday	6, 13, 20, ..., ..., ..., 48, ..., ...,

Then the number 2019 divided by 7 obtained 288 remaining 3. Number 3 on Monday position



The seventh alternative: if the first day is Saturday as in the following table.

Table 10. Numbers on the Ribbon of the Day of a Week of Type 7

Saturday	0, 7, 14, ..., ..., ..., 42, ..., ...,
Sunday	1, 8, 15, ..., ..., ..., 43, ..., ...,
Monday	2, 9, 16, ..., ..., ..., 44, ..., ...,
Tuesday	3, 10, 17, ..., ..., ..., 45, ..., ...,
Wednesday	4, 11, 18, ..., ..., ..., 46, ..., ...,
Thursday	5, 12, 19, ..., ..., ..., 47, ..., ...,
Friday	6, 13, 20, ..., ..., ..., 48, ..., ...,

then the number 2019 divided by 7 obtained 288 remaining 3. Number 3 on Tuesday position

R : Why does 2019 fall on a day other than Thursday?
S3 : (the student was silent for a while) then he said that 2019 could fall on a day other than Thursday. during point 0 other than Monday.

R : Try to explain in detail!
S3 : For example, if Tuesday is the beginning = 0, 7, 14, ..., ..., then 2019 falls on Friday. If Wednesday = 0, 7, 14, ..., ..., then 2019 is Saturday. If Thursday = 0, 7, 14, ..., ..., then 2019 is Sunday. If Friday = 0, 7, 14, ..., ..., then 2019 is Monday. If Saturday = 0, 7, 14, ..., ..., then 2019 is Tuesday. If Saturday = 0, 7, 14, ..., ..., then 2019 is Wednesday.

R : What changes on the first day results in changes on day 2019
S3 : Yes Sir, as explained above.

This mindset shows fluency, flexibility, originality, and elaboration so that it includes divergent thinking from Guilford (1956, 1967). That is divergent thinking in solving problems, if it meets the following four criteria: fluency of thinking, flexibility, originality, and elaboration. The four criteria are stated as follows:

- the fluency of a person produces many ideas;

- the flexibility of thinking is the ability of a person to produce ideas consisting of different categories, or the ability to see an object, situation or problem from various points of view;
- originality or often called unusual thinking is a form of the authenticity of thinking about something that has not been thought by others, or is not the same as the thinking of people in general;
- Elaboration is the ability to break down a main idea into smaller ideas.

Discussion

Judging from the results of conjecturing via analogy reasoning in problem solving, turns out to be convergent thinking and divergent thinking. To see convergent and divergent thinking as a result of analogy reasoning shows the correspondence that occurs between BA and TA. Convergent thinking and divergent thinking are revealed through unstructured thing aloud and interviews as shown in Figure 1 and Figure 2. Before revealing convergent thinking and thinking about the agency, the coding is made as in Table 11.

Table 11: Coding

Term	**Code**	**Term**	**Code**
The problem is determining the colour of the number 35 (problem with BA)	*a*	Determine the day to 2019 (problem with TA)	*b*
Make a tri-colour ribbon table (in BA)	*c*	Make a day table of week type 1	*1c*
Define red as 0, 3, 6, ... (in BA)	*d*	Make a table of days of week type 2	*2c*
Define white as 1, 4, 7, ...	*e*	Make a day table of week type 3	*3c*
Determine blue as 2, 5, 8, ...	*f*	Make a day table of week type 4	*4c*
Divide 35 by 3	*g*	Make a day table of week type 5	*5c*
Conjecturing the quotient of 35 with 3	*h*	Make a day table of the week type 6	*6c*
Define Sundays as 0, 7, 14, ...,	*1d*	Define Monday as 0, 7, 14, ...	*2d*
The remaining projecture quotient is 35 by 3	*i*	Determine the position of the remainder of the division with colour	*j*
Define Tuesday as 0, 7, 14, ...	*3d*	Define Wednesday as 0, 7, 14, ...	*4d*

Define Thursday as 0, 7, 14, ...,	*5d*	Specifies Friday, at as 0, 7, 14, ...,	*6d*
Specify Saturday as 0, 7, 14, ...,	*7d*	Define Monday as 1, 8, 15, ...	*1e1*
Define Tuesday as 2, 9, 16, ...	*1e2*	Define Wednesday as 3, 10, 17, ...	*1e3*
Define Thursday as 4, 11, 18, ...	*1e4*	Define Friday as 5, 12, 19, ...	*1e5*
Define Tuesday as 1, 8, 15, ...	*2e1*	Define Wednesday as 2, 9, 16, ...	*2e2*
Define Thursday as 3, 10, 17, ...	*2e3*	Define Friday as 4, 11, 18, ...	*2e4*
Define Saturday as 5, 12, 19, ...	*2e5*	Define Wednesday as 1, 8, 15, ...	*3e1*
Define Thursday as 2, 9, 16, ...	*3e2*	Define Friday as 3, 10, 17, ...	*3e3*
Define Saturday as 4, 11, 18, ...	*3e4*	Define Sundays as 5, 12, 19, ...	*3e5*
Define Thursday as 1, 8, 15, ...	*4e1*	Define Friday as 2, 9, 16, ...	*4e2*
Define Saturday as 3, 10, 17, ...	*4e3*	Define Sundays as 4, 11, 18, ...	*4e4*
Define Monday as 5, 12, 19, ...	*4e5*	Define Friday as 1, 8, 15, ...	*5e1*
Define Saturday as 2, 9, 16, ...	*5e2*	Define Sundays as 3, 10, 17, ...	*5e3*
Define Monday as 4, 11, 18, ...	*5e4*	Define Tuesday as 5, 12, 19, ...	*5e5*
Define Saturday as 1, 8, 15, ...	*6e1*	Define Sundays as 2, 9, 16, ...	*6e2*
Define Monday as 3, 10, 17, ...	*6e3*	Define Tuesday as 4, 11, 18, ...	*6e4*
Define Wednesday as 5, 12, 19, ...	*6e5*	Define Sundays as 1, 8, 15, ...	*7e1*
Define Monday as 2, 9, 16, ...	*7e2*	Define Tuesday as 3, 10, 17, ...	*7e3*
Define Wednesday as 4, 11, 18, ...	*7e4*	Define Thursday as 5, 12, 19, ...	*7e5*
Define Saturday as 6, 13, 20, ...	*1f*	Define Sundays as 6, 13, 20, ...	*2f*
Define Monday as 6, 13, 20, ...	*3f*	Define Tuesday as 6, 13, 20, ...	*4f*
Define Wednesday as 6, 13, 20, ...	*5f*	Define Thursday as 6, 13, 20, ...	*6f*
Define Friday as 6, 13, 20, ...	*7f*	Divide 2019 by 7	g^7

Conjecturing the quotient for 2019 with 7	h^7	The remaining projecture quotient is 2019 with 7, which is 3	i^7
Determine the position of the remaining shares with Wednesday	*1j*	Determine the position of the remaining shares with Thursday	*2j*
Determine the position of the remaining shares with Friday	*3j*	Determine the position of the remaining shares with Saturday	*4j*
Determine the remaining position of the division by Sunday	*5j*	Determine the position of the remaining shares with Monday	*6j*
Determine the position of the remaining shares with Tuesday	*7j*		

As for the illustration of divergent thinking and convergent thinking as follows

Figure 1. Illustration of Convergent Thinking

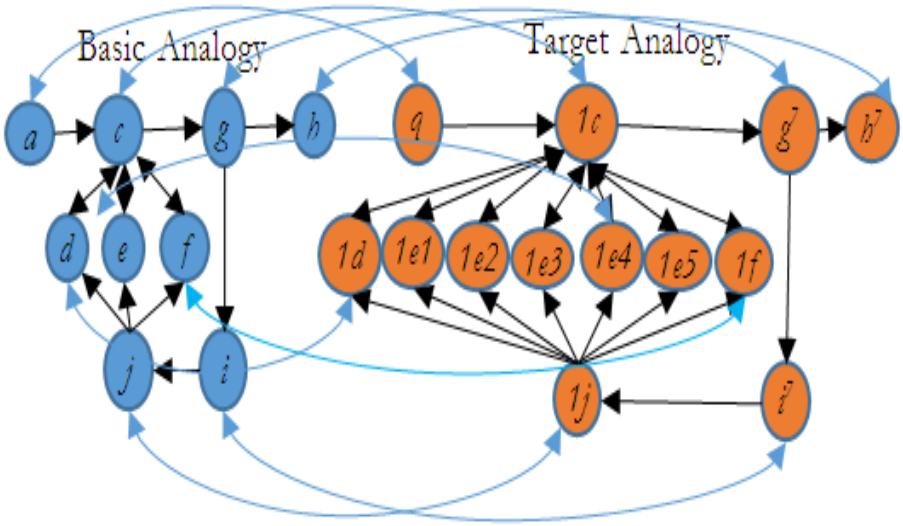
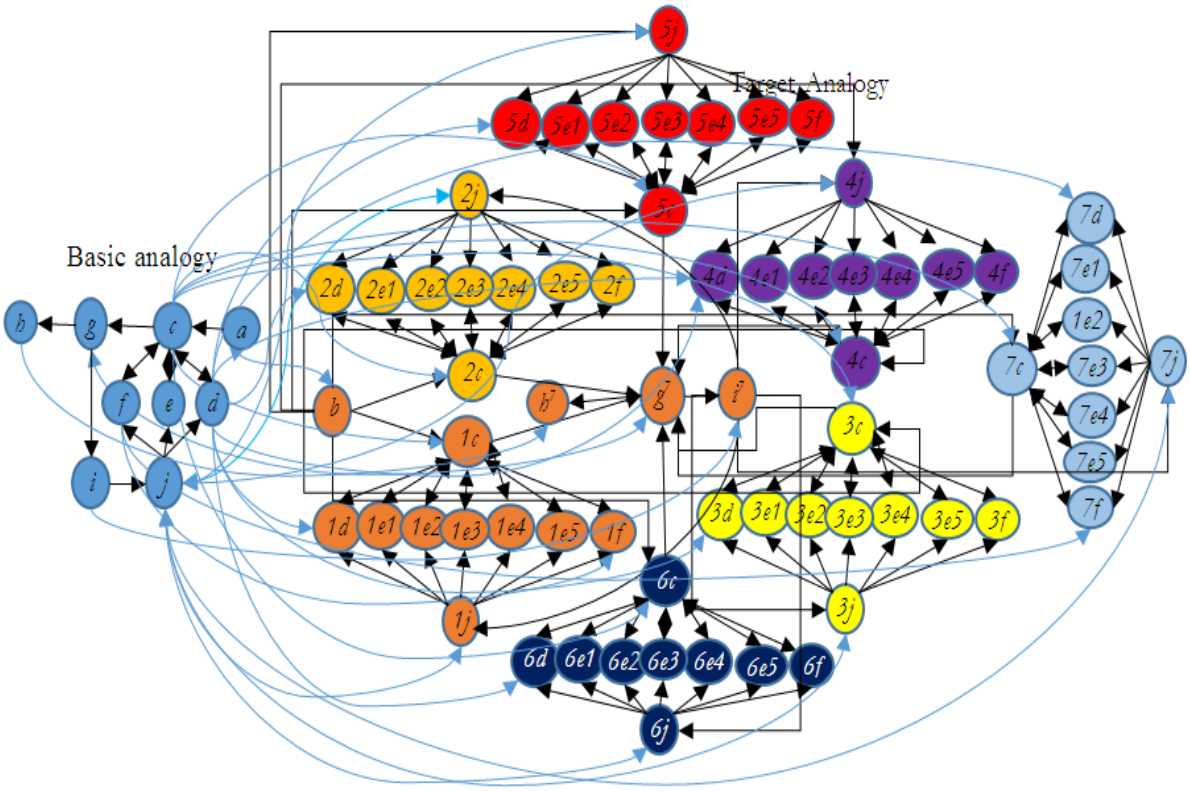


Figure 2. Illustration of Divergent Thinking



Divergent thinking is part of Guilford's Structure of Intellect (1967) model, which he described as part of problem solving. Divergent thinking refers to the process of generating many answers or ideas for a particular topic or problem such as the problem above. This is in contrast to tasks that represent convergent thinking, where only one solution is appropriate and possible, as in conventional intelligence tests.

Conclusion

From the results of problem-solving carried out by eighth-grade students based on students' conjecturing through analogical reasoning, this can trigger convergent thinking and divergent thinking. Convergent thinking requires a correct solution, but in divergent thinking the task is to produce as many diverse responses as possible (Wronska, Bujacz, Gocłowskad, Rietzschelb, & Nijstad, 2018). On the other hand, divergent thinking is equated with creativity. This is the ability to generate many ideas and be unique to a given problem (Darbor, 2010). School-age children are predicted to be successful in the future if they are accustomed to divergent thinking. In addition, children with higher divergent thinking skills have more successful careers in the arts and science later in life (Plucker, 1999; Torrance, 1988).

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