

# Relational Thinking in Problem Solving Mathematics based on Adversity Quotient and Visual Learning Style

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## ABSTRACT

The purpose of this study is to describe the relational thinking profile of students of Quitter-Visual, Camper-Visual and Climber-Visual type in solving mathematical problems based on Polya rules. To support the research, we use qualitative descriptive method involving 30 students of grade V SDN Sawahan I Surabaya. The data were collected using math skill test and interview. The results show that, Climber-Visual type students are able to apply all polya steps properly and correctly and Camper-Visual type students are only able to understand the problem and implement it while the Quitter-Visual type students are less able to understand the problem and abandon it. The result is caused by students' endurance in facing difficulties. The findings of this study can be used to map effective and efficient learning methods.

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## 1. INTRODUCTION

Relational thinking is important in mathematics because there are many basic ideas in mathematics containing relationships among different representations from numbers and operation among numbers and among other mathematical objects (Molina et al.,2005) .This thinking is highly important in mathematics as "many fundamental mathematical ideas include relations between different representations of numbers and of operations between them" (Carpenter et al., 2003; Riadi, 2019) and between other mathematical objects. Because establishing relations among mathematical ideas or concepts is considered at the heart of understanding (Hiebert et al.,1992). Relational thinking has the potential to help students to develop a deep understanding of Arithmetic upon which future abstractions in Algebra can be based (Molina et al.,2005, Koehler et al., 2004, Carpenter et al.,2003). In solving mathematical problems, students who have the ability to think relational easier to solve difficult problems. A mathematical problem solver (student) not only required cognitive abilities to understand and represent a problem situation, to create algorithms to the problem,to process different types of information,and to execute the computation, but also had to be able to identify andmanage a set of appropriate (techniques, shortcuts, etc) to solve the problem ( Zhu, 2007; Hayati, 2019).

There are four steps used in problem solving, that is understanding the problem, devising a plan, carrying out the plan, and looking back (Polya, 1973). In the step of understanding the problem or understanding the problem, the student must be able to understand the existing problem by way of determining and looking for what is known and what is asked in the problem. In the devising a plan step or preparing a plan of completion, the student should be

able to draw up a resolution plan of the existing problem based on what has been known and asked the problem according to the first step. In carrying out the plan or solving the problem according to planning, students must be able to solve existing problems in accordance with the planning that has been made in the second step. In the step of looking back or re-examining the results that have been obtained, the student must be able to check back the results that have been obtained, whether the answer is correct and in accordance with what is asked on the issue or not (Widyastuti, 2015; Hasan, 2019).

In study Widyastuti (2015) states that students who have the ability to think relational in solving math problems can not be separated from the ability to face challenges and obstacles, this ability is called adversity quotient. Adversity quotient begins its first by cognitive development. Teenagers will learn how to response to thequestions to some problems. These experience of children have been developed with them since they were born which can be improved or developed, therefore, the parents propose a good care so that they will grow up with efficiency (Pangma et al.,2009) There are three types of adversity quotient: climber, camper, and quitter. Climber is a group of people who always strive to reach the pinnacle of success, ready to face the obstacles that exist, and always awaken himself to success. Camper is a group of people there is still a desire to respond to the challenges that exist, but does not reach the peak of success and easily satisfied with what has been achieved, Quitters is a group of people who prefer to dodge and reject opportunities that exist, easy to despair, easily give up, tend to passive , and are not eager to reach the pinnacle of success (Stoltz, 2000) And then, in solving

math problems students must know the tendency of learning styles used daily.

The learning style chosen in this study is the visual learning style with the consideration that the senses of the eye is the most sensitive tool to capture every symptom or learning stimulus. The characteristics of students with visual learning styles are: (1) neatly organized (2) speaking rapidly (3) usually not disturbed by commotion (4) remembering what is seen from what in hear (5) prefer to read from (7) often know what to say but are not good at picking up words (8) since visual associations (9) have problems remembering verbal instructions unless they are written, and often asking people for help to repeat (10) thoroughly to detail the problem (De Porter & Hernacki, 2004). Visual learning style is a learning style that uses more vision. People with visual learning styles will see or imagine what is being said. In addition, he has a strong sensitivity to color, in addition to having a sufficient understanding of the artistic problem. It's just that he has the obstacle to dialogue directly because it is too reactive to the sound, so it is difficult to follow the advice orally and often misinterpret the word or speech (Hamzah, 2008). Based on the above facts, finally researchers interested to describe the relational thinking of students in solving mathematical problems based on adversity quotient and visual learning style.

## 2. RESEARCH METHOD

### 2.1 Subjects

To determine three types of students: visual climber, visual and quitter-visual camper, the researcher provided a questionnaire of Adversity Response Profile used to group students according to their own adversity quotient ability and a learning style questionnaire adapted from the VAK learning Styles Self-Assessment used to determine the type of visual-style student. The questionnaire was given together to 30 students of grade V SDN Sawahan I Surabaya. Both questionnaires are questions that must be answered honestly by students. Criteria of student groups according to adversity response profile are as follows:

- Students who received an adversity response profile score of  $ARP \leq 59$  were classified as quitter students. Students of this type have low adversity quotient skills.
- Students who received an adversity response profile score of  $95 \leq ARP \leq 134$  were classified as camper students. Students of this type have a moderate adversity quotient.
- Students who received an adversity response profile score of  $166 \leq ARP \leq 200$  were classified as climber students. This student has high adversity quotient ability.

### 2.2 Instruments

The main instrument in this study is the researchers themselves and supporting instruments is questionnaire Adversity Response Profile, questionnaire learning style, tasks of mathematic problem solving, and interviews.

### 2.3 Data Research

The data in this study is qualitative data. The data obtained from the work on mathematical problem solving tasks done by three types of students is climber-visual, camper-visual and quitter-visual. Students work results are assessed on the basis of Polya's problem-solving steps. The data in this study also obtained from the interviews that aims to find out in detail chronological workmanship

of students on the second and fourth rare that is devising the plan and looking back. And then to assure the obtained data credibility, the researcher made observations continuously/consistently and perseverantly (to improve perseverance), time triangulation and member check. Data analysis performed after data collection process and data validation process. Based on the credible data, an analysis with three-flow model of activities were made simultaneously: data reduction, data presentation and conclusion drawing (Miles & Hubberman, 1992., Moleong, 2011).

## 3. RESULTS AND DISCUSSION

### 3.1 Climber-Visual type

The result of relational thinking from Quitter-Visual type students in solving math problems based on Polya's steps can be seen in the following table :

**Tabel 1.** Summary of the work climber-visual type

Polya's Steps	Case				
	Measurement	Integer Operation	Wide wake up flat	Proportion	Volume of cubes and block
Understanding Problem	√	√	√	√	√
Devising a plan	√	√	√	√	√
Carrying out the plan	√	√	√	√	√
Looking back	√	√	√	√	√

The result of Climber-Visual type student interview for the second and fourth step can be as follows:

Interviews 1 :

- R : What do you do after understanding the problem?  
 CV : I am trying to find the best plan by linking the various concepts that first then eliminate the steps that are not in accordance with the problem.
- R : After your work is over, will you evaluate your reply process again?  
 CV : Yes, I will do.
- R : How did you do that ?  
 CV : I will check each step of the answer, then link the answer with a similar problem.

(Note : R= Research ; CV = Climber-Visual; √ = doing well × = not doing well )

Table 1 and interview 1 show that Climber-Visual students can solve all the cases given and explain the answers to the second and complete steps, this is related to Climber-Visual students are the types of students who have good mental control support (control), responsible responsibility (origin and own property) and high endurance in the face of difficulties experienced. This is made clear by the statement of Navjout & Shivinder (2012) which says that the perceived control is more important because it is a symbol of determination in people's minds to control adverse situations. On the other hand, people with higher original scores try to assess their role in unfavorable situations. The 'Ownership' dimension tells how

someone takes ownership in an adverse situation regardless of the cause. Besides Climber-Visual students in aligning the four types of cases given with media images and body language for example in the case of cube and beam volumes, this is related to visual learners who are more dominant using the sense of sight than others, according to Pourhoussein's recommendations (2011) who say that visual students think in pictures and learn best in visual images. They rely on nonverbal cues from instructors or facilitators such as body language to help understand. From the facts of the research results that can be announced by the Climber-Visual students in solving problems that are supported by Polya properly and correctly.

### 3.2 Camper-Visual type

The result of relational thinking from Camper-visual type students in solving math problems based on Polya's steps can be seen in the following table :

**Table 2.** Summary of the work camper-visual type

Polya's Steps	Measurement	Integer Operation	Case Wide wake up flat	Proportion	Volume of cubes and block
Understanding Problem	√	√	√	√	√
Devising a plan	√	√	√	√	√
Carrying out the plan	√	√	×	√	×
Looking back	×	×	×	×	×

The result of Climber-Visual type student interview for the second and fourth step can be as follows:

Interviews 2 :

R : What do you do after understanding the problem?

CMV : I am trying to find the best plan by linking the various concepts, but I often hesitate to do it.

R : After your work is over, will you evaluate your reply process again?

CMV : Just for the case of measurement and proportion only. Besides, I'm not sure to do it.

(Note : R= Research ; CMV = Camper-Visual; √ = doing well × = not doing well )

Table 2 and interview 2 show that Camper-Visual students do not want to use all of their abilities to evaluate the answers they are doing. This can be seen from the checklist of tables and answers to the last interview. Camper-Visual students tend to look safe in the face of a difficulty, this happens because of the durability of durability and O2 (origin & ownership) possessed by students of this type is only mid. In his book Stoltz (1997) said that campers often focus their energy on material items that make them as comfortable as possible. Campers ignore the progress that these energy and resources can create. Campers are satisfied, they are satisfied with sufficient effort, rather than struggling. Although not optimal in evaluating cases, the camping-visual student is able to understand the problem well from all the cases given and is able to visualize the

problem in his mind.

### 3.3 Quitter-Visual type

The result of relational thinking from Quitter-Visual type students in solving math problems based on Polya's steps can be seen in the following table :

**Table 3.** Summary of the work Quitter-visual type

Polya's Steps	Case				
	Measurement	Integer Operation	Wide wake up flat	Proportion	Volume of cubes and block
Understanding Problem	√	×	×	×	×
Devising a plan	√	×	×	×	×
Carrying out the plan	×	×	×	×	×
Looking back	×	×	×	×	×

The result of Climber-Visual type student interview for the second and fourth step can be as follows:

Interviews 3 :

R : What do you do after understanding the problem?

QV : No, no ... I can only understand the measurement case only and try to find the best plan I can not afford to continue it. For me the cases are difficult, I can not afford anymore. I am sorry. (Note: R= Research ; QV = Climber-Visual; √ = doing well × = not doing well )

Table 3 and interview 3 show that the students of the Visual Quitter can only understand a number of cases and give up to continue the answer process, this can be seen from the checklist and answers to the interviews, students stop the question. This happens because the Quitter students have a low Adversity Quotient (Control, Endurance, Origin & Ownership) so that in facing difficulties they are easy to give up and look for reasons to leave it. In his book Stoltz (1997) said that quitters leave climbing. They reject the opportunity given by the mountain. They ignore, cover up, or leave their core human urge to rise and with that much of what life has to offer. They have abandoned their dreams and chosen the path that they think is more flat and easier. Although it was easy to give up, in the first stage and the two steps of Polya for measurement cases, the students of the Visual Quitter were still able to visualize the problem properly. In general, from the results of the tables and interviews, it can be said that the students of the Quitter have failed in all the steps in solving the Polya problem.

## 4. CONCLUSION

Based on the results of the research and discussion above, it can be concluded that the differences of the three types of subjects namely Climber-Visual, Camper-Visual, and Quitter-Visual are located in the component of the Adversity Quotient that is owned. Visual Climber students have the power to control and can survive in difficulties and try to find the best solution, Camper-Visual

students tend to find safe when in trouble and do not want to maximize their abilities while the Quitter-Visual students quickly give up and break away from responsibility in completing problem given. Although different in facing difficulties, the three types of students are generally the same in visualizing problems.

Based on the findings of this study, it is expected that school management, especially classroom teachers, can map the right strategies in the learning process so that students can improve their performance and the quality of education in general.

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