PROBLEM-SOLVING ANALYSIS IN SOLVING TRIGONOMETRIC PROBLEMS BASED ON BRANSFORD & STEIN STEP OF CAMPERS STUDENTS

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ABSTRAK

Penelitian ini bertujuan untuk menghasilkan vlog matematika yang valid dan praktis pada materi Penelitian ini bertujuan untuk mendeskripsikan bagaimana kemampuan pemecahan masalah siswa campers dalam menyelesaikan soal trigonometri. Penelitian ini menggunakan teori pemecahan masalah oleh Bransford & Stein yang terdiri dari lima langkah, yaitu mengidentifikasi masalah, mendefinisikan tujuan, mengeksplorasi strategi yang mungkin, mengantisipasi hasil dan bertindak, serta melihat kembali dan belajar. Teknik pengambilan subjek dalam penelitian ini menggunakan purposive sampling. Subjek penelitian adalah lima orang siswa SMK jurusan IPA. Instrumen yang digunakan adalah tes, wawancara, dan kuesioner. Hasil penelitian menunjukkan bahwa siswa berkemah dalam memecahkan masalah trigonometri cukup baik. Para siswa dapat memenuhi empat indikator pemecahan masalah Bransford & Stein: (1) mengumpulkan informasi, (2) menentukan tujuan, (3) menemukan strategi pemecahan masalah, (4) menggunakan operasi hitung yang benar, dan dapat menemukan hasilnya.

Keywords: Trigonometri, Bransford & Stein, Pemecahan masalah

ABSTRACT

This research aims to describe how the problem-solving ability of campers students in solving trigonometry problems. This study uses the problem-solving theory by Bransford & Stein that consists of five steps, namely identifying problems, defining goals, exploring possible strategies, anticipating results and acting, and looking back and learning. The technique of taking the subject in this study used purposive sampling. The research subjects were five students of IPA vocational high school. The instruments used were tests, interviews, and questionnaires. The results showed that campers students in solving trigonometry problems are pretty good. The students can fulfill four indicators of Bransford & Stein's problem-solving: (1) collect information, (2) define goals, (3) find problem-solving strategies, (4) use the correct arithmetic operations, and can find the result.

Keywords: Trigonometry, Bransford & Stein, Problem-solving

INTRODUCTION

Learning in schools is expected to be a solution that can improve problem-solving abilities, one of which is student mathematical problem-solving. Mathematical problem-solving supported by knowledge and learning experiences during class. To assess the extent to which students' mathematical problem-solving abilities can be seen from the steps of solving mathematical problems of each question done by students [4]. The process of thinking in problem-solving carried out by learners can be seen from the procedure Settlement. One of the mathematical problem-solving procedures that can be used is a procedure introduced by Bransford and Stein, i.e. IDEAL Problem-solving is an approach used in solving problems both conceptually and procedurally [3]. IDEAL stands for I-Identify problem, D-Define goal, E-Explore possible strategies, A- Anticipate outcomes and act, L-Look back and learn [9]. The indicators used by researchers in this study:

Table 1. IDEAL Problem-Solving Indicators

IDEAL *Problem Solving*	Indicators
Identification Problem	Students can identify problems by writing down what they know.
Defining Goals	Students can determine goals by writing down what they know in full
Exploring Possible Strategies	Students can find the strategies used to solve the problems.
Anticipating Results and Taking Action	Students can solve problems and use appropriate arithmetic operations.
Looking Back and Learning	Students write conclusions.
	Students see the match between the objectives to be achieved with the learning outcomes obtained.

Trigonometry is one of the materials in the high school curriculum. There are still many high school graduate students who have not mastered trigonometry [1]. He felt that while teaching Calculus 1, one of the prerequisite materials was trigonometry, many students had not mastered trigonometry well. Several interviewed students said their test scores on trigonometry material were not satisfactory [10]. Their reason is that trigonometry material is considered difficult, especially in problems related to trigonometry applications. Indicators regarding three kinds of trigonometric ratios, namely sine, cosine and tangent, are considered difficult when related to application problems. For example, the issue of determining the distance of an object with a certain height from another thing if the angle of elevation.

In solving problems, each student is different, one of which affects the ability called Adversity Quotient. Adversity Quotient is divided into three parts: quitters, campers, and climbers. The three types of AQ describe how a person's efforts turn obstacles into opportunities. Students with AQ campers strive to face the challenges and try to finish the problem encountered [6]. The effort made by campers type students is not reaching the pinnacle of success, and he is easily satisfied with the success he has achieved. They still strive to meet needs, sense of security and security, and togetherness, and can still see and feel the challenge.

A person's AQ can be measured using four dimensions, and each dimension has different indicators. Researchers describe the indicators for each dimension by adopting research conducted by [4]. These indicators are presented in the following table:

Table 2. Indicators of Adversity Quotient (CO2RE) Dimensions [4]

No	Indikator Dimensi *Adversity Quotient* (CO2RE)	Pengukuran
1	C- *Control*	Students self-control when they feel difficulty.
2	Or-*Original*	Recognition of the origin of the difficulty.
3	Ow-*Ownership*	Recognition of the occurrence of difficulties.
4	R-*Reach*	The student recognises the extent to which the perceived difficulty extends to other parts of life.
5	E-*Endurance*	Students' assumptions about how long the difficulty will last and how long the cause will last.

AQ can be measured using the four dimensions above to determine a person's response in facing difficulties. To know a person's AQ type, it can be determined by the sum of the scores on each dimension by compiling a questionnaire according to the indicators of each dimension called the Adversity Response Profile (ARP) questionnaire. Based on the results of the sum of the questionnaire scores on each of the AQ dimensions above, it can be grouped into three types of AQ, namely quitters (low AQ), campers (medium AQ), and climbers (high AQ) [8]. Stolz states that scores ranging from 0-59 are quitters, scores of 95-134 are campers, and scores 166-200 are climbers [8].

RESEARCH METHOD

This study uses a qualitative research method with a phenomenological approach. This research was conducted at SMA Negeri 1 Pejagoan from September 2020 to September 2021. Researchers took subjects not randomly but with specific considerations, namely based on the results of the ARP (Adversity Response Profile) questionnaire given to students. The selected students are students with a high AQ based on the questionnaire results as prospective climber subjects. The material being tested is Trigonometry, especially in the subchapter of the sum and difference of two angles. The data analysis was inductive/qualitative, and the research results emphasized meaning rather than generalization. In this study, the researcher used the snowball sampling technique as a subject-taking technique. The collection techniques used are tests, interviews, and documentation.

RESULTS AND DISCUSSION

Based on the data sources that the researchers obtained in the field, the researchers then analyzed data related to problem-solving abilities in solving trigonometry questions for climber students based on the steps of Bransford & Stein, as follows:

A. Results

1. Identification Problem

Before solving a problem, students should be able to identify the problems contained in the problems, to find out how students can use solutions to solve the problem, that is also what Sj does, which can be seen in the results of Sj work. The following are the results of Sj work:

Figure 1. The Identification problem from Sj work

Based on Figure 1, readers can see that students can understand the problems that exist by collecting information related to the problem on the worksheet when reading the questions, although not all. Thus, readers can see that students take steps to identify problems when working on questions. This is also supported by excerpts of the interview as follows:

P	: Informasi apa saja yang adek ketahui dari soal?.
S	: Nilai sin x $\frac{3}{5}$ dan nilai cos y $\frac{12}{13}$ (*)
P	: Apakah hanya itu?
S	: Sin x bersudut tumpul dan Cos y bersudut lancip(*).
P	: Kenapa tidak ditulis?
S	: heheh

2.   Defining Goals
      After identifying the problem, the student should be able to determine the goals that the student must achieve from the problem. That is also what Sj does, which can be seen in the results of Sj work. The following are the results of Sj work:

Figure 2. The defining goals from Sj work.

Based on Figure 2, readers can see that when reading the questions, students can define the objectives in the question by writing down what is asked of the question on the worksheet. Thus, readers can see that students take steps to define goals when working on questions. This is also supported by excerpts of the interview as follows:

P	: Coba adek jelaskan maksud dari soal tersebut.
S₁	: Dari nilai sin x bersudut tumpul dan cos y bersudut lancip, saya disuruh mencari nilai tan x – tan y (*)

3.   Anticipating Results and Taking Action
      Sometimes there are many ways to solve a problem and the questions used in this research. Therefore, the subject should be able to determine other possibilities in solving the problem, which is also what Sj did:
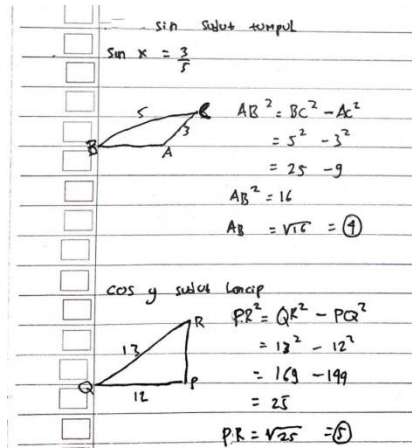
Figure 3. The Sj find ideas to solve problem

After defining the goal, students try to find ideas to solve the problem even though it is not perfect. Based on Figure 3, students assume the angles sin and cos. This conclusion means that students have tried to find possible strategies to solve the problem. This is also supported by excerpts of the interview as follows:

> P : Bagaimana cara adek menyelesaikan soal tersebut?
> S₁ : Menggunakan rumus phytagoras. Kita misalkan dengan segitiga dari sin x kita cari sisi miring segitiga sin x menggunakan rumus phytagoras untuk mendapatkan nilai tan x. Begitupula cos y untuk mendapatkan nilai tan y.

4. Anticipating Results and Taking Action

After students look for strategies that can be used and find them, people who can think creatively should be able to use the strategies that have been found to solve the problem. Similarly, what Sj did, Sj used the strategies found in the previous stage to solve the problem. Here are the results of Sj work:
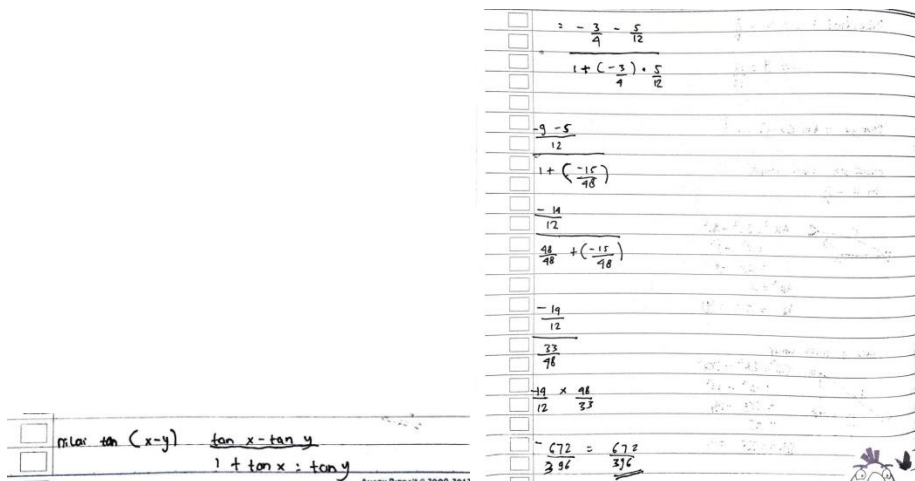

Figure 4. The strategies from Sj to solve problem.

It can be seen in Figure 4 that students can use the correct arithmetic operations and can find results using the strategies they use. This conclusion indicates that the student took steps to anticipate the outcome and act. This is also supported by excerpts of the interview as follows:

P	: Lalu bagaimana nilai tan (x-y)nya?
S₁	: Setelah itu, nilai tan x dan tan y yang di dapatkan tadi dimasukan kedalam rumus. jadi di dapatkan nilai tan (x-y)nya.

5. Looking Back and Learning

Students re-check their work results, but Sj do not write conclusions from solving problems. This statement means students do not meet all the indicators of the stages of reviewing and learning.

P	: Jadi nilai tan (x-y)nya berapa?
S₁	:- $\frac{672}{396}$

B. Discussion

Based on the data analysis and the results of the discussion that the researcher has described, the following conclusions are obtained:

In the problem-solving step, they identified the problem, which is indicated by students understanding the existing issues by collecting information related to the problem. The second problem-solving step is to define goals, which is characterised by students' ability to determine the objectives in the situation by writing down what is being asked. The third problem-solving step is exploring possible strategies, which is indicated by students trying to think of solutions that can be used and writing them down on a doodle sheet. The fourth step of student completion is anticipating the results and acting, which is indicated by students starting to solve problems according to the chosen solution and providing several alternative answers. For the last problem-solving step, which is to look back and learn, students do not write conclusions. With the description above, it can be concluded that students do not meet every research indicator. This is also following research conducted by [2], which ended that camper's students could complete the indicators of identifying problems, formulating strategies, and implementing procedures. For hands to verify the solution of the campers-type subject, it has not been able to exceed it. This statement also follows Adisti who also revealed that Camper type students solve problems until the stage of completing the plan. In understanding the problem, Camper students state things that are known and ask using their language [5]. Then Camper students prepare a plan of completion correctly. Even in executing the program, students calculate correctly. However, Camper students have not been able to re-examine the results obtained.

CONCLUSION

Based on the discussion results, it was concluded that camper's students could not fulfil every indicator of problem-solving. Campers students only meet 4 of the 5 indicators. Based on the study results and the conclusions obtained, the researcher proposes a suggestion that further researchers should examine more deeply related to the ability to think creatively in solving mathematical problems with more varied subject categories.

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