

## The Analysis of Problem-Solving Flow Rate Materials during the Pandemic Era in Elementary Schools from the Teacher's Perspective

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**Abstract:** Learning mathematics during the pandemic at the elementary school level reaped various kinds of problems. This study, therefore, aimed to analyze the teacher's obstacles and types of student errors often made in solving problems with flow rate material during the pandemic from the teacher's point of view. The respondents were 16 elementary school teachers for fifth grade in all Cipeucang Sub-district, Pandeglang Regency, Banten Province. Through a quantitative approach with a survey method, data were collected in the form of a questionnaire via google form. The indicators of teacher obstacles were viewed from learning tools, including methods, media, teaching materials, classroom management, and learning assessment. The data were then processed with the Microsoft Excel application and analyzed by descriptive statistics. The results showed that determining the learning method was an obstacle teacher experienced, and students often made mistakes when making plans, implementing plans, and reviewing answers. These results could be taken into consideration by other researchers to find methods, models, or learning strategies that could minimize the elementary school students' errors in working on problem-solving on flow rate material.

**Keywords:** Problem-solving, Flow rate, Elementary school, Pandemic era

**Abstrak:** Pembelajaran matematika pada masa pandemi di jenjang sekolah dasar menuai berbagai macam problema. Penelitian ini bertujuan untuk menganalisis kendala guru dan jenis kesalahan siswa pada soal pemecahan masalah materi debit di masa pandemi dari sudut pandang guru. Responden berjumlah 16 guru SD kelas V di seluruh Kecamatan Cipeucang Kabupaten Pandeglang Provinsi Banten. Melalui pendekatan kuantitatif dengan metode survei data dikumpulkan dalam bentuk (angket) via google form. Indikator pada instrumen meliputi 2 aspek yakni kendala guru dan kesalahan siswa menurut perspektif guru. Data diolah dengan aplikasi ms. Excel dan dianalisis secara statistik deskriptif. Hasil penelitian menunjukkan bahwa menentukan metode pembelajaran adalah kendala yang dialami guru dan siswa paling sering melakukan kesalahan pada tahap menyusun rencana, melaksanakan rencana dan meninjau kembali jawaban. Hasil ini diharapkan dapat dijadikan pertimbangan oleh peneliti lain untuk mencari metode, model, atau strategi pembelajaran yang dapat meminimalisir kesalahan siswa SD dalam mengerjakan soal pemecahan masalah pada materi debit.

**Kata Kunci:** Pemecahan masalah, Sekolah dasar, Masa pandemi

Submitted: July 2022

Reviewed: August 2022

Accepted: September 2022

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## INTRODUCTION

The pandemic has had an impact on various fields, including education. Following up, the Ministry of Education and Culture launched Circular Letter Number 15 of 2020 concerning Guidelines for the Implementation of Home Learning (BDR) in the Emergency Period for the Spread of Corona Virus Disease (COVID-19). Then, it was followed up again with the issuance of the Joint Decree (SKB) of the Four Ministers of the Republic of Indonesia No. 03/KB/2021, No. 384 of 2021, No. HK.01.08/MENKES/4242/2021, and No. 440-717 of 2021 concerning Guidelines for the Implementation of Learning in the Time of the COVID-19 Pandemic. The guide stated that learning could be done with limited face-to-face and distance learning. In a pandemic situation, Wiryanto (2020) in his research stated that the COVID-19 pandemic had a positive impact in the form of technology literacy by recognizing various face-to-face applications. In addition, learning can be done anywhere. However, the negative consequences were in the form of children's lack of deep understanding, students being late in collecting assignments due to a lack of communication tools, increased need for internet quotas, and the learning process being very dependent on signals.

Learning during a pandemic also requires educators to teach online. Online learning is a form of distance learning that takes place online or through digital media, which has two mediums (Joosten, 2017): synchronous and asynchronous. Synchronous learning occurs in real time. Chaeruman (2013) said that in this context, learning occurs simultaneously but in different spaces/places. Meanwhile, asynchronous learning gives students flexibility in where and when they study. In implementing online learning, there are various obstacles, as expressed by Fauzi & Khusuma (2020). On the one hand, teachers already understand the context of online learning. On the other hand, there are multiple problems in practice, such as 1) provision of facilities, 2) use of the internet, 3) planning, implementation, and evaluation of learning, and 4) cooperation with parents.

Based on the preliminary survey that the researchers conducted, fifty-three out of seventy-two elementary school teachers (SD) stated that mathematics was a complex subject to teach during a pandemic. Twenty out of thirty-four fifth-grade teachers also indicated that flow rate was quite difficult material to teach online. In addition, the interviews revealed that indicators with low scores were problem-solving around flow rate. As research (Lestari, Saputro, & Sukanto, 2020) reported, the frequency of errors in fifth-grade elementary school students in solving the problem around flow rate uncovered an error in writing answers by 80%, calculation process errors by 24%, errors in understanding the problem by 20%, and errors in transformation by 16%.

Various studies have been performed related to solving mathematical problems. Riastini & Mustika (2017) tested Pólya's principles, including understanding the problem, making plans, implementing plans, and reviewing answers, and mentioned that the stages of Pólya's model could train students in mathematical problem-solving. In addition, Rambe & Afri (2020) said that the problem-solving abilities of students at the stage of understanding the problem, making plans, and implementing plans were quite good, but on the indicators of reviewing answers, some students were unable to do so. Meanwhile, Harisuddin's (2021) research stated that almost fifty percent of students were independent in learning mathematics by distance learning via WhatsApp groups. It implied that junior high school (SMP) students' mathematical problem-solving abilities did not significantly differ. Besides, Apriadi, Eliandri, & Harahap (2021) examined the problem-solving skills of high school students, which decreased before and after online learning, especially at the stage of understanding the problem, planning, and reviewing answers. The two previous studies were discussed from the student's point of view and at the junior and senior high school levels. Therefore, the researchers want to know it at the elementary level and from the teacher's point of view.

Specifically, the flow rate is one of the mathematics materials taught in the fifth grade of elementary school. The flow rate material is also included in the material tested in the sixth-grade school examination. Therefore, this material needs to be mastered by students. Referring to this, this study aims to analyze teacher obstacles and student errors in solving problems of flow rate material during the pandemic at the elementary school level from the teacher's perspective. The results of this study are expected to be considered by other researchers to find methods, models, or learning strategies that can minimize elementary school students' mistakes in working on problem-solving on flow rate material.

## METHOD

The researchers used a quantitative approach with a survey method (Borg, Gall & Gall, 2014). The survey method quantitatively described the obstacles and types of errors made by elementary students in solving problems on flow rate according to the teacher's point of view (Cresswell, 2019). Respondents were 16 people who were elementary school teachers for fifth grade in all sub-districts of Cipeucang, Pandeglang Regency, Banten Province. The data were collected using a questionnaire instrument totaling eight questions. Three questions described the teaching of flow rate material. Meanwhile, five questions represented errors often made by students based on the stages of George Pólya's model: understanding the problem, making plans, implementing plans, and reviewing answers (Long, DeTempe, & Milman, 2015). The instrument had been validated by an expert (Elementary School Teacher Education Lecturer) and was declared feasible to be used in research.

In addition, the scale employed was an interval scale, which showed the same distance and weight. In this study, two intervals were used, namely 1-3 and 1-5. Also, the type of scale utilized the Likert scale to measure a person's attitudes, opinions, and perceptions of social events (Sudaryono, 2017). Besides, the questionnaire was distributed through Google forms. The data collected were analyzed descriptively on how often the indicator occurred (O'Reilly, Ronzoni, & Dogra, 2018). Then, the data were processed utilizing the Microsoft Excel application and presented in the form of charts and tables. The data presented in the form of charts and tables were then analyzed based on two indicators measured: teacher obstacles and types of student errors in the four stages of the George Pólya method.

## RESULTS AND DISCUSSION

### *Teacher's Obstacles*

Before discussing the obstacles experienced by the teachers, this study examined the level of difficulty in studying flow rate material during the pandemic at the elementary school level from the teacher's point of view. Here are the data.

**Table 1.** Difficulty Level of Teaching Flow Rate Material during the Pandemic

Criteria	Frequency	Score
Very easy	0	0
Easy	2	4
Moderate	10	30
Difficult	4	16
Very difficult	0	0

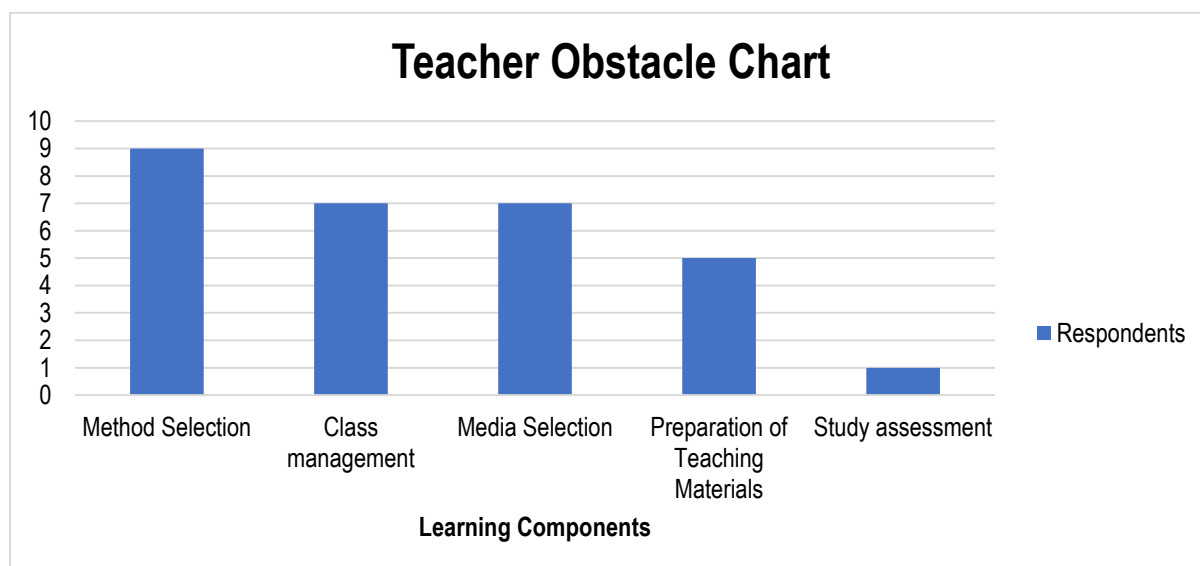
Mean	3.125
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In Table 1, most teachers (62.5%) stated that teaching flow rate material during the pandemic was in the moderate category. Overall, it fell into the difficult category. The comparison of teaching problem solving with flow rate materials before and during the pandemic is illustrated in the following table:

**Table 2.** Comparison of Flow Rate Material Teaching during and before the Pandemic

Criteria	Frequency	Score
Easier	3	3
Just the Same	8	16
Harder	5	15
Mean		2.125

In Table 2, fifty percent of respondents said that the difficulty level in teaching flow rate material during and before the pandemic was the same. However, it was more difficult if seen from the average difficulty level in teaching flow rate material during and before the pandemic. These difficulties are closely related to the obstacles experienced by teachers while teaching during the pandemic. Barriers encountered by teachers in terms of learning components included objectives, teaching materials, methods and media, evaluation, students, and educators (Curriculum and Learning MKDP Development Team, 2015). The following are the obstacles experienced by teachers in teaching flow rate material in elementary schools during the pandemic:



**Figure 1.** Chart of Teacher Obstacles in Teaching Flow Rate Material

Nine out of sixteen teachers stated that the choice of method was a constraint often experienced by teachers. Related to that, there are various learning methods in elementary schools (E. T. Lestari, 2020): lecture methods, discussions, demonstrations, recitations, experiments, assignments, game methods, and others. The learning method is one way that can help teachers in the teaching and learning process. Based on that, teachers need to choose an appropriate learning method (Faisal, Mardiana, & Japar, 2021). Another study stated that the pandemic made it difficult for teachers to perform their role as demonstrators, where teachers must make students understand and apply learning strategies (Husna, Roza, & Maemunah, 2021).

Moreover, seven out of sixteen teachers admitted that other obstacles arose in classroom management and media selection. The primary role of classroom management in learning activities is classroom conditioning. In this case, educators, as leaders in the class, act as planners and organize, foster, and carry out various activities in the classroom (Jalaludin, Arifin, & Fathurrahman, 2021). Obstacles in classroom management also occurred in the research of Sutisna & Indraswati (2020). These obstacles included the difficulty of guiding and supervising learning, the difficulty of instilling character education in students, and the difficulty of assessing objectively. Media is also integral to the learning process (Irmawati, 2020). Besides, learning media consists of equipment (hardware) and accompanying message (software) elements. Software is a message to be conveyed to students, while the hardware is a means to convey messages (Riyana, 2012). Batubara (2020) also mentioned the types of learning media, including real objects, humans, models, text, visuals, audio, and multimedia. Moreover, obstacles in selecting media corroborate Mintarsih's (2021) research, stating that the impediment to teachers during the pandemic is the lack of ability to master the media in online learning.

### **Student Errors in Problem-Solving on Flow Rate Material**

The types of student errors discussed referred to George Pólya's stages, including understanding the problem, making plans, implementing plans, and reviewing answers (Long, DeTempe, & Milman, 2015). At the stage of understanding the problem, students could mention the known data, and the data asked. At the planning stage, students could determine the formula to be used. When implementing the plan, students could transform and calculate it according to the data and chosen formulas. Lastly, in the review stage, students rechecked their work to ensure correct answers. Riastini & Mustika (2017) have also tested Pólya's principles, comprising understanding the problem, making plans, implementing plans, and reviewing answers, and mentioned that the stages of Pólya's model could train students to solve problems mathematically. The following is a table of student errors in solving flow rate problems based on George Pólya's stages:

**Table 3.** Student Errors in Solving Problems on Flow Rate Material

Stages	Criteria					Mean
	1	2	3	4	5	
Understanding the Problems	0	4	9	2	1	3
Making Plans	0	5	4	6	1	3.2
Implementing Plans	1	4	2	9	0	3.2
Reviewing Answers	1	3	4	8	0	3.2
					Mean	3.14

Referring to Table 3, in general, four errors in the stages of mathematical work on flow rate material were in the often category. Specifically, students often made errors in the stages of preparing plans, implementing plans, and reviewing. It aligns with Rofi'ah & Ansori's (2019) research, which concluded that misunderstanding the problem was categorized as a small error. Meanwhile, planning, completing planning, and rechecking errors fell into the fairly high category.

Moreover, in understanding the problem, students could mention what was known and what was being asked from the question. In this case, the ratio between volume and time is called flow rate (Purnomosidi et al., 2018). There are two elements in the flow rate: volume and time. Volume has units of cubes, commonly called cubic. In addition, volume is also used in liters. Information about flow rate, volume, and time with various units was known by the students and asked by the teacher.

First, the planning stage was where students determined the flow rate formula to use. The formula for finding the flow rate is to divide the volume by time. To find the time, the volume is divided by the flow rate. Meanwhile, finding the volume is multiplying the flow rate by time (Purnomosidi et al., 2018).

This formula is used as requested by the question. At this stage, according to the teacher, students often make mistakes. It is supported by research by Rofi'ah & Ansori (2019), which stated that errors in the planning step were included in the fairly high category of errors, where errors occurred with a higher frequency than the stage of understanding the problem.

Then, the stage of implementing the plan was when transforming numbers from the stage of understanding the problem to the stage of preparing a plan. Errors at this stage were usually in the form of entering incorrect data and calculating numbers. Referring to Table 3, errors in implementing the plan fell into the category of frequent occurrences. Jana's research (2018) also mentioned the same thing. Errors often occur in students in story problems using data and techniques to solve problems.

The last stage is review. This stage was also quite often done by students. At this stage, it requires precision and foresight. Similar research stated that students very rarely rewrote statement sentences as reinforcement for student answers (Rambe & Afri, 2020). In fact, the sentence is one indicator of students reviewing their answers.

Based on the explanation presented above, it can be seen that the learning method was the difficulty experienced by teachers in teaching flow rate material during the pandemic. On the other hand, students often made mistakes based on the Pólya stages: making plans, implementing plans, and reviewing answers. These two things imply that the selection of learning methods can be used as an alternative to improve student learning outcomes on flow rate material. The learning method is also one way or strategy that can help teachers in the learning process (Faisal et al., 2021). Thus, the choice of learning method can be determined by taking into account the mistakes often made by students based on the Pólya stages.

## CONCLUSION AND SUGGESTIONS

Taking the common thread from what has been described above, it can be concluded that the obstacle experienced by teachers in teaching flow rate material during the pandemic was the selection of methods. Meanwhile, students often made errors at the stage of making plans, implementing plans, and reviewing answers. Further, this study can be used as a reference source for other researchers to find out what methods are appropriate to minimize student errors in working on problem-solving problems on flow rate material. Nevertheless, the limitation of this research is that the respondents only covered the Cipeucang Sub-district, Pandeglang Regency, which could not be generalized as a whole. Still, this research can be used as a reference for further research.

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**How to cite:** Kurniasih, D., & Wahyudin. (2022). The Analysis of Problem-Solving Flow Rate Materials during the Pandemic Era in Elementary Schools from the Teacher's Perspective. *Teknodika*, 20 (2), 122-129. DOI: <https://doi.org/10.20961/teknodika.v20i2.63844>