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Analisis Kesulitan Guru dalam Mengembangkan Rencana Pembelajaran untuk Meningkatkan Penalaran Matematis Siswa

Analysis of Teachers' Difficulties in Developing Lesson Plan to Improve Students' Mathematical Reasoning

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Abstrak Mempersiapkan pembelajaran adalah pekerjaan yang menantang. Kualitas rencana pelajaran mempengaruhi kualitas proses belajar-mengajar. Terlebih lagi jika perencanaan bertujuan khusus untuk meningkatkan kemampuan berpikir dari peserta didik. Persiapan membutuhkan waktu lebih lama bagi guru. Salah satu keterampilan abad 21 yang dibutuhkan oleh siswa yaitu kemampun berpikir kritis. Kemampuan penalaran matematis membantu dalam pengembangan penalaran logis dan berpikir kritis dalam matematika. Oleh karena itu, tujuan penelitian ini adalah untuk mengidentifikasi kesulitan guru dalam merencanakan pembelajaran yang bertujuan untuk meningkatkan penalaran matematis siswa. Penelitian ini merupakan penelitian kualitatif deskriptif. Data dikumpulkan melalui formulir online yang dikembangkan oleh para peneliti. Peserta penelitian ini adalah sembilan puluh tiga guru matematika yang mengikuti dalam workshop daring selama tiga minggu tentang peningkatan penalaran matematika siswa. Ditemukan bahwa 73,1% guru menyatakan bahwa beban isi kurikulum merupakan hambatan utama yang dihadapi guru selama merencanakan pelajaran dalam upaya meningkatkan penalaran matematis siswa. Dan beberapa kendala yang dihadapi oleh guru selama membuat perencanaan pembelajran dibahas dalam artikel ini.

Kata Kunci Penalaran matematis, rencana pembelajaran, kesulitan guru

Abstract Lesson preparation is a challenging job. Researchers and educators worldwide generally agree that a lesson plan's quality and an efficient teaching-learning process go hand in hand. Meanwhile, mathematical reasoning aids in the development of logical reasoning and critical thinking in mathematics. Inadequate mathematical thinking abilities can affect performance not only in mathematics but also in science, economics, and other subjects. Therefore, the purpose of this study is to identify teacher difficulties regarding the preparation to improve students' mathematical reasoning through lesson plans. The study is a descriptive study, one of the qualitative research methods. The data was collected via an online form developed by the researchers and included open-ended questions. The participants of this study were ninety-three mathematics teachers who enrolled in a three-week online workshop about improving students' mathematical reasoning. Data were analyzed according to the content analysis steps, which is one of the qualitative research methods. It was found that 73,1% of teachers responded that the content load of the curriculum was a major obstacle during planning the lesson to improve students' mathematical reasoning. And several obstacles are discussed in this paper.

Keywords Mathematics reasoning, lesson plan, teachers' difficulties

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1. Introduction

Plans, implementation, and evaluation are three crucial aspects that make up learning in school. The three phases work together to provide the best learning activities. Plans activities are the first phases of learning in schools that need to be implemented by a teacher. To ensure that learning is successful, the planning phase must be as well-prepared as possible because it will serve as the benchmark for the execution and evaluation of learning(Houston, 2018; Marek & Natalie Wu, 2020). Plans, their execution, and the evaluation process all are within the scope of the education unit's curriculum.

Lesson plan is important in creating a productive learning environment, according to many researchers (X. Huang et al., 2021; Jung et al., 2019; Oliveira et al., 2021a; Russo et al., 2021; Yang et al., 2021). When organizing materials, tactics, and scheduling, teachers must create a learning environment where children can learn effectively. A lesson plan is a written description of what will occur at a specific time. Lesson planning links what is taught in the classroom to the requirements of the curriculum and textbooks.

The very first thing an educator does is develop an objective, which serves as a purpose statement for the entire lesson. An evaluation tool does answer the question of what students will be able to do by the end of the lesson. One of most crucial word to use in an assignment is a verb, because verbs indicate whether or not an accomplishment occurred (Gülten, 2013). The objective is the driving force behind the entire lesson; it is the reason the lesson exists. The objective for each day's lesson is carefully crafted because it determines the activities in which the students participate. The teacher also ensures that the lesson plan objectives are appropriate for the students' developmental level. In addition, the teacher ensures that their student achievement expectations are rational.

On the other side, mathematical reasoning aids in the development of logical reasoning and critical thinking in mathematics. Inadequate mathematical thinking abilities can affect performance not only in mathematics but also in science, economics and other subjects (Russo et al., 2021). For students to comprehend mathematics, reasoning is crucial. It prevents students from grasping mathematical instructions without justification. Mathematical reasoning requires innovation, exploration, and communication. The secret to enabling pupils to learn original and rational mental leaps is communication. Teachers must establish connections and alter their thinking in order to help pupils improve mathematical reasoning (Al-Zoubi & Suleiman, 2021; Romero Ariza et al., 2021). As with other mental habits, mathematical reasoning must be consistent throughout a wide range of situations. The ability to reason mathematically is a mental habit that must be formed via frequent application in a variety of situations. Continuous training and application are required for learning that fosters thinking, whether it is in a mathematical environment or another one.

The focus of reasoning is on logical thought, which aids in determining whether or not solutions make sense or can be accepted and understood by others (Hou et al., 2021;

Mirzaxolmatovna & Fozilov, 2021; Ramírez-Montoya et al., 2022). Therefore, it is important for students to get into the habit of including a justification with each response. The secret to teaching mathematical reasoning is teaching other areas of mathematical proficiency, specifically by giving students assignments and getting them actively involved, as well as through encouraging student-teacher interaction (Goldenberg et al., 2021; He et al., 2021; Iwuanyanwu, 2021). Through exploration learning, students learn to view specific components of a scenario from a broad perspective and make inferences about other aspects of the scenario using logic and common sense.

Table 1. Previous studies

Author; year	Title	Result
Maryumah Hejji Alanazi; 2019	A Study of the Pre-Service Trainee Teachers Problems in Designing Lesson Plans	Examine the issues with grouping and arranging the data relevant to the lesson or subject. The research's findings showed that although the pre-service trainee teachers were aware of lesson preparation and its significance, they encountered some difficulties when doing it .
Ayşegül Zıngır Gülten; 2013	Am I Planning well? Teacher Trainees' Voices on Lesson Planning	The findings highlight the difficulties that teacher trainees face when planning, such as formulating objectives and selecting appropriate activities for different stages. The main challenges include teacher trainees' skepticism about the process, timing issues, difficulties in sequencing and selecting activities, providing effective transitions, and locating sources (Gülten, 2013).
Toshiakira Fujii; 2019	Designing and Adapting Tasks in Lesson Planning: A Critical Process of Lesson Study	The cooperative work among educators that goes into developing that lesson plan is largely underappreciated by non-Japanese Lesson Study adopters, possibly because the effort involved is invisible to outsiders .

The former studies cited above regarding lesson planning and mathematical reasoning explain the importance of lesson planning and hurdles in preparing lesson plans encountered by the teachers. What were the teachers' obstacles to design lesson plans in improving students' mathematical reasoning? Previous research focused on lesson plan as general. This research is more specific in mathematical reasoning. Mathematical reasoning-related tasks lead to greater realizations. Tasks involving mathematical reasoning encourage students to produce as many examples as they can. But, it is challenging for teachers to prepare the lesson especially if teachers want to improve particular students' skill. All the obstacles that teachers face during preparation are discussed in this paper.

2. Method

The study is a descriptive study, one of the qualitative research methods. The data was collected via an online form developed by the researchers and included open-ended questions. Data were collected from 93 mathematics teachers. The online form was integrated as an attendance list for all online workshop participants. The online form was filled out by participants on 1-30 July, 2022. Three prominent speakers were invited to the online workshop and 251 participants enrolled in the workshop. Ninety-three mathematics teachers made it to the first meeting and had a chance to fill out the online form.

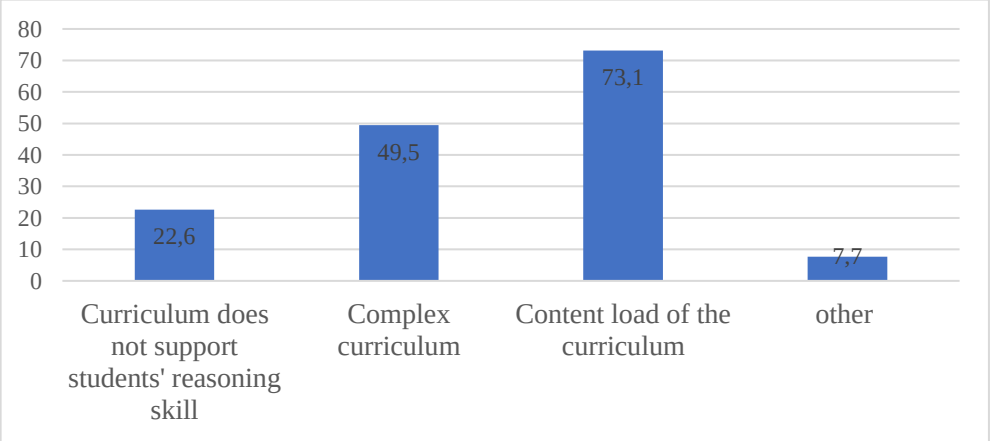
The research instrument was the questionnaire on teachers' difficulties in compiling lesson plans. The questionnaire consists of open questions and closed questions. Data were collected through questionnaires. Questionnaires were distributed online for participants in the mathematical reasoning workshop. The data were in the form of personal statement data from research subjects related to open questions given in questionnaires.

The three steps of the data analysis models used in this study's. Data analysis methodologies are data reduction, data presentation, and conclusion formulation and verification. Researchers collected data about respondents through questionnaires and observation during the data reduction process. By putting observations and data from questionnaires into categories, data were presented. While the final stage was the conclusions.

3. Results and Discussion

Result

The following picture shows percentages of respondents mentioned obstacles that teachers encountered in planning the lesson to improve students' mathematical reasoning



Picture 1. Obstacles that teachers encountered in planning the lesson

Data from open ended question

Table 2. Other obstacles in lesson planning

Obstacles	Number of responses	Percentages of responses
Limited time	28	30%
Different students' reasoning ability	26	28%
Don't understand the prerequisite material	14	15%
Students have low motivation in learning	5	5%
Teachers have difficulty determining method, approach, media, and context in teaching.	16	17%
Lack of learning resources in improving students' mathematical reasoning	4	4%

Discussion

What were the teachers' obstacles to designing lesson plans in improving students' mathematical reasoning?

A curriculum is a formal declaration of the knowledge and skills that students are expected to acquire (Salomaa & Mertala, 2022; Widjaja et al., 2020). It demonstrates that the curriculum was created specifically to prepare students for what they would study in class or for the knowledge they will need to succeed in today's society, as determined by the Ministry of Education. The curriculum, which was created by a team or the government, outlines the skills that children should learn, according to the teacher. To help students think and learn in the context of their classroom, teachers must be knowledgeable in both topic and methodology (Arias Velásquez & Mejía Lara, 2021; Lachner et al., 2021). Teaching is a complex activity that requires this. In this instance, the overloaded curriculum has an impact on the teaching methods used in instruction. The issue of an overloaded curriculum has some effects on the responsibilities that teachers play in teaching.

Additionally, due to the problem of an overloaded curriculum, teachers themselves encountered difficulties that occasionally impaired their ability to perform their jobs (Wijaya et al., 2019). Because there isn't enough time to cover all the material, for example, teachers may experience stress. Teachers should also exercise caution when managing their time because, time management is the main challenge in the problem of an overloaded curriculum. To get around the problem, teachers must properly prepare their lessons and classroom activities to teach the material and deliver the curriculum. As a result, the teacher can create a well-planned scheme of work or annual plan that includes the lesson, and the activity, and also takes into account any potential interruptions during the school day, such as school-related activities, vacations, appointments, exams, and so on. Once a teacher has determined the components of their subject that will be evaluated, they must meaningfully connect those components to the topic in general.

The requirements of the curriculum and textbooks are connected with what is taught in the classroom through lesson planning. Both students and teachers have a limited amount of time, and both groups frequently feel that the curriculum is too full or cluttered (Perera & John, 2020). Teachers who believe their subject's curriculum covers too many topics may feel under pressure to go into great detail on the material. This viewpoint might cause students to learn imperfectly rather than deeply.

Perceptions about content overload are also driven by a sense of assessment overload (Conrad et al., 2022; Nurlaily et al., 2019). Students are most inclined to perceive or experience exams and evaluations as the most obvious learning goals since they do not comprehend the academic objectives in the written curriculum document itself. Students frequently solely think of the curriculum as the tests they take. What students believe to be important to learn and what is ultimately maintained in a curriculum across rebuilding cycles are driven by assessments (Niemi & Kousa, 2020). While the curriculum may promote the development of more comprehensive skills along with topic knowledge, tests that place a high priority on content mastery is likely to lead pupils toward the material that will be examined at the expense of other crucial growth areas. When something is "taught to the test," what may be mastered may be compromised in favor of what will be tested. Although it can be noticed in the early grades, this phenomenon is more frequently recognized at the high school level as students prepare to transfer to colleges(Niemi & Kousa, 2020).

The different assessment types also matter. Even in primary school, relying heavily on tests, especially those with high stakes for graduation or college admission, can be quite stressful. Additionally, exam anxiety lowers academic performance (Gougis, 2020; Hyseni Duraku & Hoxha, 2018; Pascoe et al., 2019; von der Embse et al., 2018). Additionally, learning depth and retention could not be as high as what is attained through participation in learning activities or other types of assessments. Students' well-being may suffer when curricula solely rely on tests(Bergold & Steinmayr, 2018), particularly when those exams serve as a stereotyping or the only form of assessment. Aligning curriculum standards and assessment is the last requirement. Students have difficulties learning if the curriculum lacks a clear progression and reinforcement (S. Huang & Yin, 2018; Neuwirth et al., 2021). In an overloaded curriculum, finding the time and opportunities to learn could become even more difficult.

Data from open ended question

Limited time

Mathematical reasoning requires consistency over a wide range of contexts, just like other mental habits. Mathematical reasoning is a mental skill that must be developed via repeated practice in a variety of contexts. Whether in a mathematical context or another one, learning that promotes thinking requires ongoing practice and application. Practices take times. Teachers claimed they did not have enough time to get to know

students regarding their needs, characteristics, levels of learning, etc., and these issues influence their planning. Therefore, designing a lesson plan became very challenging.

Different students' reasoning ability

Students also face difficulty in enhancing reasoning ability because they focus on rote learning then they hardly able to perform high level of learning and reasoning ability. Students as well teachers become accustomed to receiving preserved knowledge from textbook and easily ignore or even misperceive the nature and purpose of education (Wu, 2003). The students participate in classroom discussion is mostly as a passive learners. The students are not involved directly in learning so they are deprived of the opportunities to develop their reasoning ability (Widyanto 2018).

Students don't understand the prerequisite material because students were taught during pandemic.

Traditional teaching across the globe was abruptly disrupted by the COVID-19 pandemic crisis, and learning methodologies shifted. Because the pandemic prevented effective planning, design, and development of online instructional programs, the migration process in schools and other educational institutions is now in doubt. Students believed that obstacles prevented each course from succeeding. Students report feeling demotivated, preoccupied, apprehensive, and lacking mental health (Oliveira et al., 2021b). Academic or course changes during pandemic crises may include fewer possibilities for peer interaction and discussion and an unmotivated pass/fail alternative.

Students have low motivation in learning

Teachers perception is in contrast with research founded by Tee et al. The outcomes showed that task value and critical thinking abilities were the two main predictors of students' mathematical reasoning ability. Additionally, the association between mastery goal orientation and students' capacities to complete reasoning tasks was totally mediated by critical thinking skills. When using critical thinking techniques, a tiny effect of complementary partial mediation was discovered for task value on the ability to reason. It was discovered that self-efficacy had no discernible impact on either the execution of mathematical reasoning or the application of critical thinking skills (Tee et al., 2018). These findings should be taken into account by educators and policymakers so that they can embrace the chance to encourage children to think critically and logically about mathematics.

Teachers have difficulty determining method, approach, media, and context in teaching.

Teacher use one-way lecture method and focus on students learning by memorization. Teacher asks closed ended question in the classroom which don't help to explore knowledge and reasoning ability. For this proper training should be provided to teachers to develop competencies which lead to productive reasoning ability among students. improve students reasoning ability teachers should value their creativity in the classroom as well as help and appreciate students for their creative work and ideas.

Lack of learning resources in improving students' mathematical reasoning.

Teachers have difficulty finding teaching materials that can improve students' mathematical reasoning skills. The teaching materials on the internet are not in accordance with the context in the student's school environment, so students have difficulty understanding the context of the problem. Teachers also stated that they had attended training to improve students' reasoning skills, but were confused about adopting into their respective classes.

The treatment that can be given is to provide diagnostic tests to students. Diagnostic tests are carried out so that teachers can map students based on their initial reasoning abilities, mapping based on understanding of prerequisite material. To overcome the problem of time constraints, teachers can try to give treatment, namely flipped classrooms so that the time used in class can focus on discussion. Additional possible treatment is the discussion of questions outside the classroom to improve students' reasoning. Different students' reasoning abilities can also be given differentiated learning treatment. To prepare for learning requires more time, teachers can try by collaborating with other fellow math teachers. Teacher collaboration is carried out so that teachers can discuss problems and solutions that can be given and share tasks for developing teaching materials.

4. Conclusion

The findings revealed that although teachers are aware of the importance of lesson planning, they found it difficult to develop a lesson plan. 73% teachers think that curriculum is the main reason that hinder teachers in developing lesson plan. In an overloaded curriculum, finding the time and opportunities to learn could become even more difficult. Beside curriculum, teachers encountered some other difficulties when developing lesson plan. Some of difficulties are 1) limited time, 2) different students' reasoning ability, 3) students don't understand the prerequisite material, 4) students have low motivation in learning, 5) teachers have difficulty determining method, approach, media, and context in teaching, 6) lack of learning resources in improving students' mathematical reasoning. The suggestion for future researchers is to continue research in

improving students' mathematical reasoning skills, by providing treatment. The treatment can be flipped classroom, differentiated learning or other methods.

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