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PROFESSIONAL COMPETENCE OF MADRASAH IBTIDAIYAH TEACHERS: A DIDACTICAL DESIGN RESEARCH STUDY

Dwi Warli[1], Didi Suryadi[1], Siti Fatimah[1], Suhendra[1]
[1]Universitas Pendidikan Indonesia, Indonesia
*Corresponding Email: didisuryadi@upi.edu.

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ABSTRACT
The professional competence of Madrasah Ibtidaiyah (MI) teachers in teaching ratio material is a vital factor in improving students' understanding of mathematics, making it important to examine MI teachers' knowledge of mathematics content. This study aims to analyze teachers' professional skills, including their understanding of the concept of ratios, their attitudes toward preparing the learning process, such as creating teaching materials aligned with the curriculum, and their understanding of students' characteristics and how they design learning. The results of this study provide an initial foundation for further research, which can help teachers develop learning methods through didactic studies. The subjects of this research are MI grade VI teachers in Bandung Regency, from six schools. The method used is a descriptive approach with a prospective analysis stage based on Didactical Design Research (DDR). Data collection involved teacher reflection sheets, exploratory interviews, observations, and document reviews. The findings indicate that teachers' professional competence in knowledge of learning content and teaching methods remains at level 2, while their understanding of students' characteristics and learning styles is at level 3. Reflection sheets and interviews reveal that teachers face difficulties beginning with defining ratios, particularly in understanding that the ratio of a to b differs from the ratio of b to a, and in solving problems involving equal proportions. Often, teachers plan their lessons with a simple sequence of materials in a journal, without considering the epistemic and systemic aspects of the content or validating their presentation and practice questions found in textbooks. MI teachers also find it challenging to select concrete teaching methods for ratios before moving to an abstract understanding, especially given the limited time. Based on these findings, there is a clear need for programs to improve teachers' competence through didactic studies, equipping them to anticipate and address potential obstacles and enabling them to design compelling learning experiences. Since teachers' professional competence in teaching ratios directly impacts students' understanding of math, exploring their content knowledge is essential. This study contributes to empowering teachers through didactic design research, a necessary approach to enhancing teacher competence.

Keywords: Didactical Design Research, Madrasah Ibtidaiyah, Professional Competence

INTRODUCTION
Professional competence includes not only mastering the subject but also the ability to design, implement, and evaluate learning effectively (Bagou, 2020). As science, technology, and education rapidly advance, teachers must constantly develop their professional skills to meet the changing demands of the education system (Mia, 2023). In this context, regulating teacher competence becomes crucial to ensure consistent and high-quality teaching practices across educational institutions. In Indonesia, teacher professionalism is governed by several laws and regulations, including Law Number 14 of 2005 concerning Teachers and Lecturers (Teachers and Lecturers Law). (1) of this Law states that teachers must possess professional competence, which includes mastery of material, structure, concepts, and scientific thought patterns within their disciplines, as well as the ability to develop effective curricula and learning experiences. (2) emphasizes that professional competence is the ability to master the core content of the subject

area and to develop this ability in line with advances in science, technology, and the arts. (3) further clarifies that professional competence includes mastery of material and skills in designing and implementing learning, the ability to evaluate and assess learning outcomes, and the ongoing development of professional expertise to enhance teaching quality (Sulastri et al., 2020).

Based on the above explanations, it is clear that the role of teachers is crucial. Every teacher must understand and believe in the truth of mathematical content, or in other words, justified true belief. Teachers who lack strong professional competence can hinder the diffusion and acquisition process, leading to learning obstacles participants experience. However, Anam & Malikkhah (2020) have noted that students encounter three types of epistemological barriers in ratio material, including a limited understanding of basic ratio concepts. Didactic barriers arise due to suboptimal teaching methods, and ontogenic barriers occur due to the cognitive readiness of students who are not yet able to understand ratios in a proportional way (Wardani et al., 2024). In fact, the ratio material is taught in Madrasah Ibtidaiyah (MI) and is a fundamental concept in the comparison material in Junior High Schools (SMP).

Additionally, in the Selection of State Civil Apparatus Candidates (CASN), there are typically 2-3 questions related to ratios and proportions. Therefore, it is essential to evaluate the professional competence of teachers in teaching ratio material at the elementary school or madrasah ibtidaiyah level to ensure that teachers have a deep understanding, that the material is relevant to students, and that it promotes an effective learning process (Salmerón Aroca et al., 2022). Mastery of ratio material by teachers not only affects students' ability to solve mathematical problems but also provides a strong foundation for understanding more complex concepts that are taught at higher levels.

Mathematics learning at the Madrasah Ibtidaiyah (MI) level plays a crucial role in laying the foundation for students to understand mathematical concepts. It is essential to emphasize that understanding concepts is a crucial first step in learning mathematics (Yanala et al., 2021). Understanding mathematical concepts is a skill that enables individuals to explore and comprehend them. However, many students face various difficulties in mastering mathematical concepts, caused by both internal and external factors (Rahmawati & Roesdiana, 2022). Hence, an effective learning process that incorporates external factors is necessary to optimize learners' potential, such as perceptual and memorial, thereby maximizing their understanding of mathematical concepts (Firda & Juandi, 2023). Of course, this can be realized in line with adequate teacher competence (Bempah, 2023). However, the fact seven indicators show that the quality of Indonesian teachers' competence is still low, including: low understanding of learning strategies, low classroom management skills, low ability to conduct and use classroom action research, low achievement motivation, and lack of discipline, low professional commitment, low time management skills, and the low quality of teacher competence in Indonesia, this is a challenge that hinders the progress of education (Hambali & Luthfi, 2017).

It is recognized that education cannot be separated from the role of the teacher. Good teachers will produce good education, and vice versa. Therefore, teachers are the main component that determines the quality of education (Adha et al., 2019). Previous research shows that the teacher's ability influences 76% of students' quality in the teaching and learning process. Teachers must have four competencies as a professional, namely pedagogical competence, professional competence, social competence, and personality or moral competence (Hasibuan et al., 2023). One important element that significantly influences improvements in learning quality is professional competence (Wahab & Syamsussabri, 2022).

The study aims to analyze the professional competence of Madrasah Ibtidaiyah (MI) teachers in teaching ratio concepts, which is essential for improving students' mathematical understanding. Many teachers still struggle to define ratios, distinguish ratio orders, and solve proportional problems. Therefore, this research focuses on assessing their conceptual

understanding of ratios, their ability to develop curriculum-aligned teaching materials, their awareness of student characteristics, and their skills in designing effective learning strategies. Many teachers face difficulties in explaining the fundamental concept of ratios, often misinterpreting the relationship between quantities and failing to differentiate between distinct ratio orders. This misunderstanding can lead to incorrect examples and explanations in the classroom, which may confuse students and hinder their mathematical comprehension (Dirgantoro, 2018).

To achieve this, the study employs a descriptive method with a Didactical Design Research (DDR) approach, emphasizing prospective analysis. Data were collected through teacher reflection sheets, exploratory interviews, observations, and document studies. The research involved sixth-grade MI teachers from six schools in Bandung Regency. This approach helps identify the challenges teachers face in teaching ratio concepts and evaluates their professional competence in terms of content knowledge and instructional strategies (Rudi et al, 2020).

The professional competence of MI teachers in understanding and teaching ratio concepts significantly impacts the effectiveness of mathematics instruction and student learning outcomes. Teachers' struggles in transitioning from concrete to abstract teaching methods, combined with their reliance on lesson plans that lack depth and content validation, contribute to students' difficulties in grasping ratio concepts and applying them in problem-solving. These instructional gaps can hinder students' mathematical reasoning and overall academic performance. As a result, there is a pressing need for structured teacher empowerment programs through didactic studies to strengthen their conceptual understanding, improve lesson planning, and enhance their ability to implement effective instructional strategies. By addressing these challenges, such programs can ultimately lead to higher-quality mathematics education and better learning experiences for students.

The first novelty of this research is its contribution to developing a more structured approach to teacher training by integrating epistemic and systemic aspects into lesson planning, thereby ensuring a comprehensive and practical instructional framework. Second, this study goes beyond traditional content mastery by identifying specific misconceptions and instructional gaps in teaching ratio concepts, providing targeted insights for improving mathematics instruction. Third, it establishes a foundation for didactic studies in teacher competence development, offering an initial framework for future research aimed at enhancing teachers' professional skills. Ultimately, these contributions support the continuous improvement of the quality of mathematics education at the primary level.

METHOD

This research uses a descriptive qualitative method. The subject of this study is a sixth-grade MI teacher in Bandung Regency, representing six schools with six MI teachers teaching sixth grade. The selection process involved purposive sampling, specifically targeting sixth-grade MI teachers. The research incorporates methods such as teacher reflection, observation, interviews, exploratory studies, and document analysis to gather data. Data analysis was conducted in three steps: data reduction, data presentation, and verification (Miles et al., 2014)

RESULTS AND DISCUSSION

Reflection MI Teacher Self

Reflection on teaching oneself in research. This encompasses knowledge content learning, including how to teach it, its characteristics, and methods for educating study participants, as well as curriculum and teaching methods. The third aspect is the professional

teacher competence indicator based on Regulation Director General of Teachers and Education Personnel Number 2626/B/HK.04.01/2023.

Table 1 displays the indicators of professional competence, serving as a reference for evaluating an individual's ability in a specific field. These indicators include knowledge, skills, and attitudes necessary to perform tasks effectively according to established standards. By assessing these indicators, organizations and institutions can determine the level of expertise and proficiency needed for a particular role. Additionally, these indicators help identify areas that may require further improvement to boost overall competency. A clearly defined set of professional competence indicators not only ensures individuals meet industry standards but also provides guidance for ongoing professional growth. This framework allows professionals to improve their skills, adapt to changing demands, and stay competitive in their fields. Moreover, it is a valuable tool for educators and trainers to develop targeted programs that address specific competency gaps and support career progression.

Table 1. Indicators of Professional Competence

Indicator Competence	Competency Level				
	Level 1	Level 2	Level 3	Level 4	Level 5
Knowledge of learning content and how to teach it	Understanding learning content and how to teach it	Use learning content and how to teach it	Evaluating learning content and how to teach it	Collaborate with colleagues on knowledge of learning content and how to teach it.	Guiding colleagues in improving learning content and how to teach it
Characteristics and learning methods of students	Understanding knowledge about characteristics that will influence how students learn	Using knowledge about characteristics that will influence how students learn	Evaluate knowledge in determining characteristics that will influence students' learning methods.	Collaborate with colleagues regarding knowledge of characteristics that will influence how students learn.	Guiding colleagues in increasing knowledge about the characteristics that will influence how students learn.
Curriculum and how to use it	Understanding curriculum components and how to use them to design learning designs	Using knowledge of curriculum components and	Evaluate knowledge of curriculum components and how to use them to design	Collaborate with colleagues on knowledge of curriculum components and how to use them to	Mentoring colleagues in increasing knowledge of curriculum

Indicator Competence	Competency Level				
	Level 1	Level 2	Level 3	Level 4	Level 5
		how to use them to design learning designs	learning designs.	design learning designs.	components and how to use them to design learning designs.

In the Table 1 field of education, professional competence indicators play a vital role in assessing teachers' ability to deliver high-quality instruction and foster student learning. These indicators provide a structured framework for evaluating teachers' mastery of subject matter, pedagogical skills, and capacity to create an engaging and effective learning environment. By systematically analyzing these aspects, educational institutions can ensure that teachers possess the necessary qualifications to meet curriculum standards and address diverse student needs. Furthermore, professional competence indicators enable the identification of gaps in instructional practices, allowing for targeted training programs that enhance teaching effectiveness. As education continues to evolve alongside technological advancements and pedagogical innovations, these indicators serve as essential benchmarks for continuous professional development, ultimately contributing to the overall improvement of the education system.

Table 2 presents a set of reflective questions related to professional competence, designed to assess teachers' self-reflection on their skills, knowledge, and attitudes in their profession. These questions serve as a tool to help educators evaluate their strengths and identify areas for improvement in their professional practice. The total number of questions included in the reflection sheet is 10, derived from three key indicators of teachers' professional competence. The questions in the reflection sheet are carefully structured to encourage teachers to critically analyze their teaching methods, classroom management skills, subject mastery, and their ability to adapt to different learning environments. By answering these questions, educators can gain deeper insights into their professional growth and understand how their competencies align with educational standards.

Table 2. Reflection Sheet Questions Teacher Self

Indicator Competence Professional	Identification Teacher Obstacles	Question Reflection Teacher Self
A. Knowledge of learning content and how to teach it	• **Epistemological**: Lack of in-depth understanding of mathematical material, especially the concept of ratio. • **Didactics**: Difficulty translating content/material into an effective teaching process. • **Ontogenic**: Lack of confidence in mastering the material	1. To what extent do I understand the mathematics material that I have been teaching so far? 2. Especially in the ratio material, to what extent do I understand the concept of ratio? 3. How do I teach the concept of ratio to students? 4. How can I know that students understand the ratio concepts I teach?

Indicator Competence Professional	Identification Teacher Obstacles	Question Reflection Teacher Self
B. Characteristics and learning methods of students	• **Epistemological**: Lack of understanding of learning theory and child development. • **Didactics**: Less able to adapt/develop learning strategies to the individual needs of students. • **Ontogenic**: Less sensitive to optimizing student potential.	1. How well do I understand the individual learning needs of each student? 2. Do I adjust my teaching methods to optimize the potential of students, such as their ability to utilize the five senses in the learning process, or their ability to remember (memorize)? 3. How do I facilitate learning for students with special needs?
C. Curriculum and how to use it	• **Epistemological**: Lack of understanding of the structure and objectives of the curriculum. • **Didactics**: Difficulty designing lesson plans/teaching modules/syllabuses that are in accordance with the curriculum. • **Ontogenic: less flexible in** adapting the curriculum to classroom conditions.	1. Do I fully understand the content and objectives of the curriculum I use? 2. How do I integrate the curriculum with students' learning needs? 3. To what extent can I innovate in designing learning that aligns with the curriculum?

Table 2 illustrates that the reflection process enables teachers to recognize the challenges they face in the classroom and develop strategies to enhance their effectiveness in delivering quality education. It also serves as a valuable self-assessment tool that can guide teachers in setting professional development goals and seeking relevant training opportunities. Through this structured reflection, educators can continually improve their teaching practices and contribute positively to their students' learning experiences.

Teacher self-reflection in this study encompasses several key aspects, including knowledge of the learning content and instructional methods, understanding of student characteristics and learning styles, and curriculum design and teaching strategies. Reflection on content knowledge and pedagogy allows teachers to assess their mastery of the subject matter and evaluate their ability to deliver lessons effectively. This aspect is crucial, as a deep understanding of ratio concepts enables teachers to explain mathematical relationships clearly, address student misconceptions, and create structured learning experiences that promote comprehension (Ilyas, 2022).

Furthermore, self-reflection on student characteristics and learning styles helps teachers tailor their instructional approaches to accommodate diverse student needs. Recognizing variations in cognitive abilities, prior knowledge, and learning preferences allows educators to implement differentiated teaching strategies that enhance student engagement and understanding. By analyzing their teaching methods, teachers can identify areas for improvement, adjust lesson pacing, and incorporate instructional techniques that foster active learning (Karsudjono, 2025).

In addition, reflection on curriculum and teaching methods ensures that educators align their lesson plans with curriculum standards while adopting effective instructional strategies. A

well-structured curriculum and appropriate teaching methods contribute to the overall quality of mathematics instruction, enabling teachers to transition students from concrete to abstract reasoning in ratio concepts. Through continuous reflection and improvement, teachers can refine their professional competence, enhance the learning experience, and ultimately improve student outcomes in mathematics education (Wulandari et al., 2025).

Sheet results: Teacher reflection on indicators, knowledge content, learning, and how to teach it

The teacher's reflection reveals that the teacher understands the draft ratio is a comparison of two numbers, as well as the development questions given to participants, which educate them on the comparison of concepts every day, and how to teach draft ratio at first by giving a picture or illustration that, according to the teacher, can help participants understand. This approach allows them to visualize concepts, such as fruits or tools, through written examples. Then use a table to determine the ratio. The teacher follows the order in the textbooks used and then develops it via PowerPoint (PPT), which is displayed in class using an LCD.

Figure 1 illustrates the observation of the learning process related to material on ratios, which is essential for understanding mathematical concepts and their applications. The observation process focuses on how students engage with ratio-related content, their level of comprehension, and the effectiveness of teaching strategies employed during the lesson. By analyzing the learning process, educators can assess student participation, identify common challenges learners face, and determine whether the instructional methods used are effective in facilitating understanding.

Figure 1. Observation of the Learning Process Material Ratio

Figure 1 shows that A firm grasp of ratio concepts is essential for educators, as ratios play a fundamental role in various mathematical topics, including proportions, percentages, and scaling. If teachers have difficulty correctly establishing equivalent ratios, it may lead to misconceptions among students and hinder their ability to apply ratios in real-world problem-solving. This issue highlights the need for targeted professional development programs that deepen teachers' conceptual understanding of ratios beyond simple pairwise comparisons. By enhancing their knowledge, educators can confidently teach ratio concepts, employ diverse problem-solving strategies, and provide students with more straightforward explanations. Furthermore, the ability to correctly determine ratios involving multiple values is crucial in fields such as physics, economics, and engineering, where proportional reasoning is frequently applied. If teachers struggle with these concepts, students may also develop an incomplete understanding, which can affect their mathematical foundation in more advanced topics. Therefore, improving teachers' understanding of ratio similarity and equivalence should be a priority in mathematics education. Through continuous training, practice, and the integration of real-world applications, educators can enhance their ability to teach ratios effectively, ensuring that students develop the skills they need to work confidently with proportional relationships.

Figure 2 shows that teachers can determine ratios and simplify them only when numbers are given in a specific order, first, then second. However, to keep the ratio of two or more numbers constant, a teacher must be able to find the correct answer. This indicates that the teacher's understanding of the related similarity ratio remains limited. Figure 2 illustrates that while teachers can identify and simplify a ratio when dealing with two numbers, specifically when dividing the first number by the second, they face difficulties when asked to maintain an equivalent ratio across multiple numbers. This suggests that their grasp of proportional reasoning and ratio similarity is still relatively weak. Correctly determining and simplifying ratios is fundamental in mathematics education because it underpins more advanced topics such as proportions, percentages, scaling, and probability. If teachers struggle with these concepts, it can impact their ability to teach effectively, resulting in gaps in students' mathematical understanding. A strong understanding of equivalent ratios is crucial for solving real-world problems that involve maintaining proportional relationships (Kusuma, 2025). For example, in fields such as engineering, physics, and economics, proportional reasoning is widely used to analyze relationships between variables. When educators struggle to understand these concepts, they may unintentionally pass on misconceptions to students, which can hinder their problem-solving skills in higher-level mathematics. This highlights the importance of targeted professional development programs designed to enhance teachers' conceptual understanding of ratios beyond simple pairwise comparisons.

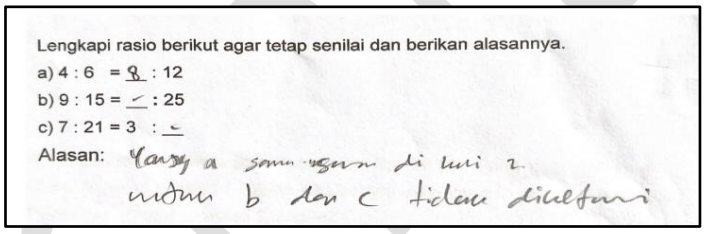
Lengkapi rasio berikut agar tetap senilai dan berikan alasannya.
a) 4 : 6 = 8 : 12
b) 9 : 15 = ✓ : 25
c) 7 : 21 = 3 : ✓
Alasan: Karena a sama dengan di kali 2.
untuk b dan c tidak dikalikan

Figure 2. Teacher's Answers to the Material Similarities Ratio

Figure 2 shows that mathematics educators should receive continuous training that incorporates hands-on learning experiences, real-world applications, and advanced problem-solving techniques. Encouraging teachers to engage in collaborative learning, workshops, and reflective teaching practices can help enhance their ability to teach ratios effectively. Additionally, integrating technology-based learning tools, such as visual simulations and interactive exercises, may provide teachers with clearer insights into the nature of ratios and their applications. By improving their conceptual knowledge and instructional strategies, teachers can foster a deeper understanding of ratios among students, ensuring they develop strong mathematical reasoning skills that benefit them across academic and professional fields. Here is the teacher's answer to the question about the similarity ratio

Figure 3 illustrates the following fact: when given a snippet image showing the quantity of basketballs and tennis balls and then asked to determine the ratio of basketballs to tennis balls, some teachers still cannot understand the meaning of the question. Here are the snippet questions given:

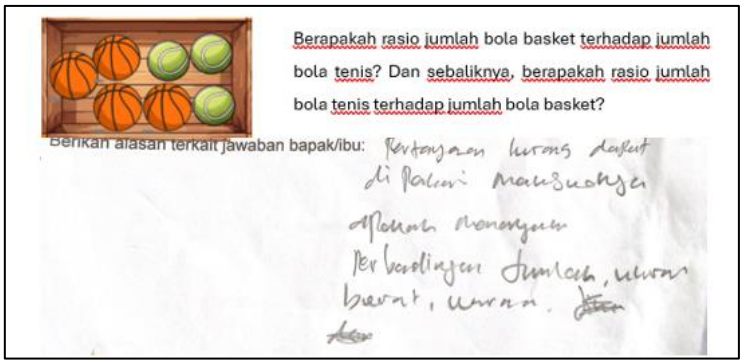

Figure 3. Questions about the ratio of a to b are not the same as the ratio of b to a

Figure 3 illustrates the specific question posed to assess the teacher's understanding of the difference between the ratio of a to b and the ratio of b to a. It was observed that the teacher momentarily confused these concepts during instruction, leading to the presentation of an incorrect example. This figure emphasizes the importance of clear conceptual comprehension when explaining ratios.

Figure 4 further reveals that this misconception was not only present in explanations but also in the examples given during lessons. If teachers themselves struggle to present ratios correctly, students may replicate these errors in their own problem-solving processes. This underscores the importance of reinforcing foundational mathematical concepts in teacher training programs to prevent such misunderstandings from being passed on to learners. Addressing this issue requires targeted interventions, including professional development workshops that emphasize the significance of order in ratio expressions, interactive exercises that allow teachers to practice with real-world ratio problems, and structured feedback mechanisms that help them refine their instructional methods.

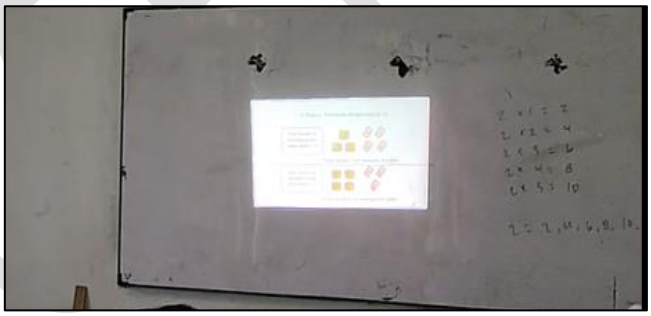

Figure 4. The teacher's understanding of the ratio of a to b and the ratio of b to a

Based on Figure 4, it is observed that the teacher currently teaches that the ratio of a to b is not the same as the ratio of b to a, which is still incorrect. The teacher conveyed that the first picture shown a ratio of bread to chocolate of 3:4. Things considered the ratio of a to b, and for the ratio of b to a is illustrated with a picture of bread and chocolate, where the ratio is 4:3. So, the ratio of a to b is not the same as the ratio of b to a.

Based on the results sheet, teacher reflection, knowledge indicator content, learning, and how to teach it, it seems that the teacher's understanding of the draft ratio is limited to comparing two numbers. If we look at Definition 3 of Book V of Euclid's Elements, it says: "A ratio is a sort of relation in respect of size between two magnitudes of the same kind." The meaning of this definition is that a ratio is a type of relationship involving the comparison of two similar quantities. The meaning is that a ratio is used to compare two quantities of the same type or category, for example, length with length, width with width, or time with time. A ratio describes how much one quantity is compared to another in terms of size or quantity. In other

words, the ratio provides information about the proportional comparison between two objects or the magnitude that has similar characteristics (Madden JJ, 2018). It is necessary to emphasize that understanding the related draft similarity ratios is crucial, as there is evidence that teachers' understanding of these ratios still needs improvement. Teachers can determine a ratio and simplify it to its simplest form only when given a first number and a second number.

However, to keep the ratio of two or more numbers constant, the teacher is not yet capable of completing it correctly. This suggests that the teacher's understanding of the related similarity ratio remains low. Besides that, when given questions that show the ratio of a to b is not the same as the comparison of b to a, there are still teachers who are incapable of understanding the good meaning of the question. The error in giving the example, as shown in the image, where the ratio of a to b is not the same as the ratio of b to a, indicates an error in understanding the draft ratio. This signifies the existence of an epistemological obstacle that is discussed in philosophy education and cognitive psychology, describing an obstacle in understanding a draft because the method assumes it has already been formed previously (Sari, 2024). Obstacles usually arise when someone misunderstands or is not fully clear about a concept and finds it difficult to accept or understand a more comprehensive or in-depth perspective. Based on findings in context, understanding ratios and proportions can reveal epistemological obstacles that lead to errors. If a teacher or student understands ratio only as a comparison of two numbers without considering equality in various forms, then this becomes an epistemological obstacle. For example, the findings in the study show that the difficulty in understanding that 7 21 = 3 9 is an equivalent ratio (equivalent). Then, a misperception of the ratio a : b is the same as b : a. One of the figures who first formalized the draft ratio is Euclid (Euclid), an ancient Greek mathematician, in his work *Elements* (c. 300 BC). In Book V of Euclid's Elements, he defines ratio as: "A ratio is a sort of relation in respect of size between two magnitudes of the same kind." Euclid also developed a theory of comparison that explains why a : b ratio is not the same as b : a because the order of the numerator and denominator influences the results of the comparison (Madden JJ, 2018).

The findings suggest that some teachers may rely on visual representations to understand ratios in context, using pictures or illustrations, but struggle to apply this understanding to inform numeric or answer more abstract questions. Reliance on this approach can also become an epistemological obstacle. This finding was also supported by research that utilized software to aid in understanding teachers' concepts, indicating that teachers still rely on a particular approach for remembering information (Turmuzi et al., 2021). In educational mathematics, the concept of Didactic Design Research (DDR) can be used to identify and address epistemological obstacles in conceptual understanding. It is important that teachers not only memorize the draft ratio but also truly understand how to use it in various situations. The importance of evaluation in Didactic Design Research (DDR) lies in its role in epistemological understanding and in ascertaining that the concepts taught can be understood in depth by both teachers and students (Van den Akker, 2013).

A study previously showed that understanding draft ratio and comparison is important for teachers and prospective teachers. A strong and coherent understanding of the draft is needed so that teachers can convey material effectively and achieve the objectives established in the curriculum. A lack of understanding of the concept can be a consideration in proper design-related learning, such as draft ratio and comparison (Radiusman, 2020). Good learning design must identify a lack in teachers' understanding, so that the material delivered can be accepted by both students and achieve effective education (Rivai & Rahmat, 2023). To increase teachers' understanding of the draft ratio, can a workshop or collaborative program be developed to enhance motivation and understanding of the draft ratio and proportion? Approach: This covers interactive methods, simulations, and adventure-based projects to create

an engaging experience. This aligns with the concept of Didactic Design Research (DDR), which focuses on a needs-oriented development approach that educates participants (Budianti, 2024). Learning design that facilitates a deeper understanding of complex concepts is essential. This support is based on the principles of Didactic Design Research (DDR), which draws on experience in the mathematics learning process (Setiadi et al., 2020).

Based on findings from self-reflection, observation, interviews, and study documents, considering knowledge indicators, content learning, and how to teach it in professional competence, it is evident that MI teachers in Bandung Regency are still at Level 2, namely utilizing knowledge content and teaching it.

Results sheet, teacher reflections on characteristics, indicators, and methods, study participants, and education

Through self-reflection, the teacher revealed that they design lessons in accordance with the needs, interests, and styles of the study participants. However, the study participants do not design learning that incorporates three aspects at a time: interests, needs, and styles. This is deepened through an interview, and it is revealed that the teacher understands the characteristics of the participant students who are taught. However, more focus on the level of understanding participants are educated, so that in a way classical teachers tend to teach with the same method for all students, and are more inclined towards learning conventional, but assisted by PowerPoint (PPT), shown to participants. Then schedule special meetings or study hours in addition to participant education that result in the assessment being low. Through in-depth interviews, the teacher revealed that there is a constraint in the communication process with the participant. One of the main issues faced is when the teacher poses a question related to the lesson material. Participants sometimes give unexpected responses, such as silence or simply stating, "forget." This has become a challenge for teachers in ensuring that participants understand the material taught. The teacher also expressed that situations can influence the effectiveness of learning, because the interaction that should be in-depth and interactive becomes obstructed. When the participant cannot answer or remember material well, that is it. That indicates a difficulty in overcoming the necessary understanding through a more approachable route. The teacher sought solutions to facilitate communication with participants, enabling them to progress smoothly and understand the material effectively.

Research results indicate that the teacher has made an effort to design learning experiences that cater to the needs, interests, and learning styles of the study participants. However, it was found that the teacher had not optimally integrated the third aspect into the learning planning process. This emphasizes that effective learning differentiation must cover diverse needs, interests, and learning styles. Studying students in this way can maximize results (Tomo et al., 2025). Even though the teacher understands the characteristics of participants who educate, they focus more on the level of understanding of the student compared to other aspects. As a result, the method of teaching used is still conventional, although it is supported by the use of PowerPoint (PPT) media. This shows that approach teaching based on participant education is more effective compared to the instructional model, because it gives room for more active and diverse learning (Kurniawan et al., 2025).

One of the main challenges faced by teachers in learning is the obstacle to communication with participants who are educated. In a question-and-answer session, participants often do not give the expected response, such as being silent or answering with a "forget" statement. Many problems have been identified where students forget and are unable to solve the given problems, despite being expected to think logically, identify patterns and properties, and draw conclusions or provide explanations about mathematical ideas (Utami, 2024). The factors that contribute to the low understanding of students in mathematics at the

elementary school level are: (1) students perceive mathematics as a complex subject; (2) lack of student interest; (3) lack of student concentration; and (4) low conceptual understanding of students (Wahyuni, 2025). This phenomenon can be associated with low-involvement cognitive students in learning, which aligns with Vygotsky's (1978) development zone theory, specifically the proximal zone. A lack of optimal social interaction in class can significantly impact the understanding of concepts. Condition: This highlights the need to approach learning interactively and through two-way communication. Feedback from the teacher to the participant can increase understanding and motivation to learn (Pahmie & Ratnaningsih, 2025). Therefore, more teaching strategies are needed that are flexible and adaptive to increase effective communication between the teacher and participants (Meria, 2017).

In this context, Didactic Design Research (DDR) can become a relevant approach to designing more effective learning. DDR focuses on design-based learning, evaluating theory and practice repeatedly. In this matter, DDR can help teachers integrate the needs, interests, and styles of their students. Study participants are educated more holistically. Through an iterative process, DDR can be used to identify and address obstacles that arise in communication and engagement with students (Syarifah, 2025). As a step solution, teachers can implement learning strategies based on discussion and scaffolding to enhance two-way interaction between teachers and students, thereby increasing cognitive involvement and understanding of the material for students. DDR also encourages teachers to design more learning dynamics and contexts, based on the results of previous implementations, to create a more effective and responsive learning process that meets the needs of participants (Janawati et al., 2024). By using DDR, teachers can overcome communication challenges that occur in class and design more learning that is adaptive, flexible, and interactive. It is expected to reduce existing obstacles, increasing the involvement of cognitive students, as well as improving their understanding of the material taught (Rosali, 2024).

Based on the findings obtained through sheet reflection, self-observation, interviews, and study documents, which considered the characteristics, indicators, and methods, the study participants are educated in professional competence. Therefore, MI teachers in Bandung Regency are still at Level 3.

Sheets of results: Teacher reflection on curriculum indicators and methods used

The teacher's reflection on the curriculum and methods used in preparation and the learning process shows that the teacher is trying to apply the applicable curriculum moment. Although this is true, the challenges faced are the implementation of the Independent Curriculum, which has not been fully implemented. One of the obstacles that arises is the use of different texts from different years, namely, the external texts from 2020 and 2022, which have inconsistent material orders. As a result, there is repetitive material taught to participants, which confuses teachers when compiling the material to be taught at the phase the government has determined.

The teacher realized that different arrangements of material in the textbook can hinder smooth channel learning. This requires careful adjustments to the content being taught. It is not only repetitive but also appropriately aligned with the desired goals achieved in the relevant curriculum. However, the Master did not thoroughly review the material to ensure epistemic and systemic consistency in what was taught. In an effort to design and prepare the learning process, teachers rely on a journal that I created myself. The journal lists the order of topics to be covered, as well as the learning objectives for each session. Implementation of a curriculum based on interviews shows that teachers have already made efforts; however, they use teaching materials that lack consistency, which affects the effectiveness of the learning process. The teachers find it challenging to cover too much material in a limited time. Their goal is to facilitate

active and balanced learning programs, enabling teachers to delve more deeply and efficiently into the materials and processes. This way, participants can gain an optimal and meaningful learning experience with the existing curriculum.

The results of teacher reflections regarding curriculum implementation show that although teachers try to follow the applicable curriculum, implementing the Independent Curriculum still faces various challenges. One major problem is the inconsistency in the use of books from different years of publication (2020 and 2022). The inconsistent order of the material in the books makes the taught material repetitive and confusing, which, of course, affects the smoothness of the learning process. The same issue arises in textbooks where students' interpretation of the concept of vector value and direction becomes problematic due to differences in the sources of understanding used by students during learning (Brata et al., 2024). Teachers realize that the different order of material can hinder the learning process and require careful adjustments to ensure the material remains relevant and appropriate to the goals set in the curriculum (Tomlinson, 2014). However, teachers do not conduct deep reviews of the material to ensure that what is taught, both epistemic (knowledge-based) and systemic (related to objective learning), maintains its quality. There were also problems in the praxis block, such as unclear visual data presentation and issues with the sequence of material in the logos block, with learning limited to only one context. The results reveal potential ontogenic obstacles in the praxis block and possible didactic and epistemological obstacles in the logos block. The findings indicate a need to improve textbooks (Brata et al., 2024).

One of the strategies implemented by teachers is creating a journal that contains ordered material as well as achievement learning goals that they want to accomplish in each session. However, even though there is a plan to design structured learning, the challenge faced is that the content often includes too much material congested into a limited time. This condition causes difficulty in giving deep attention to each topic, which, of course, hampers the delivery of material effectively (Dewi, 2024; Tarizha, 2024). Teachers also hope for more activities or additional programs that are suitable for field conditions, which can facilitate the learning process better. This hope includes better support in the form of more teaching materials, consistent resources, and improved planning, so that teachers can focus more on delving deeper into the material and enhancing students' learning experiences.

In the context of Didactic Design Research (DDR), the challenges faced by these teachers show that designing effective learning needs a more adaptive, evidence-based approach. DDR is a research approach that emphasizes the importance of designing instruction that focuses on theory and evaluated practice through iteration (Gravemeijer, 2012). In this matter, DDR can be used to analyze problems faced by teachers, such as mismatched order of material in textbooks and limitations of available time, and to develop solutions based on design that can help teachers create more effective learning experiences (Islamiyah & Mahmudah, 2024). Through DDR, teachers can redesign and adapt material with a more logical and consistent sequence, and recognize the constraints of limited time. DDR can also assist teachers in developing more flexible teaching materials, so that they can be used effectively despite differences in textbooks (Van den Akker et al., 2006). This approach encourages teachers to continuously develop and adapt appropriate learning strategies to meet the needs of participants, educational goals, and the applicable curriculum.

Besides that, DDR emphasized the importance of collaboration between teachers and researchers to evaluate and improve design learning sustainably. In this context, teachers can work with related parties (for example, developers of curriculum, colleagues, or educational researchers) to create more learning experiences that respond to students' needs. Research based on DDR can produce designs that are more instructionally effective in facing obstacles faced by teachers, such as limited and unavailable teaching materials. With the DDR approach,

teachers can obtain the support needed to design and implement more structured and appropriate learning that aligns with the applicable curriculum (Ardiansari et al., 2023).

Based on results obtained through self-reflection sheets, observations, interviews, and document studies, considering curriculum indicators and methods used in professional competence, MI teachers in Bandung Regency are still at Level 2.

CONCLUSION

Based on results related to teachers' professional competence, reflected in their knowledge of content learning, teaching methods, characteristics, and implementation of curriculum, it can be concluded that even though teachers have made efforts to understand and teach ratio material, their understanding remains limited. This is especially true in areas like the similarity of ratios and comparing ratios, which indicate errors in the teaching process. For example, teachers have difficulty explaining complex topics such as comparing two or more equivalent ratios and understanding that the ratio of a to b is not the same as the ratio of b to a. Although teachers use various teaching methods, such as visual images, tables, and PowerPoint, their approach tends to be conventional and not sufficiently effective in conveying a deep understanding of ratios. Furthermore, teachers face challenges in understanding the characteristics and needs of students. Even when they notice these in lesson planning, they struggle to integrate students' interests, needs, and learning styles simultaneously, resulting in uniform learning experiences that lack interaction. Communication problems also arise, such as inadequate responses during question-and-answer sessions, which reduce teaching effectiveness. Additionally, although teachers attempt to follow the Independent Curriculum, its implementation is inconsistent because of disparate sources of teaching materials, such as differences in the sequence of topics in textbooks and publication years. This leads to repetitive and confusing lessons, hampering the planned learning process. Teachers recognize the need for adjustments to make their teaching more aligned with curriculum goals. Despite their efforts to design effective learning experiences, various epistemological and practical challenges highlight the need for a greater understanding of concepts and more flexible, adaptive learning strategies. Approaches like Didactic Design Research (DDR) could serve as solutions for creating more responsive learning experiences that meet students' needs and curriculum goals, as well as addressing obstacles in communication and student engagement.

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