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MATHEMATICS TEACHERS' PEDAGOGICAL COMPETENCE FROM STUDENTS' PERCEPTIONS: A SURVEY AT SECONDARY SCHOOLS IN WEST SULAWESI

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Abstract

The results of the PISA 2022 assessment, along with preliminary studies conducted in West Sulawesi, indicate that students' proficiency in mathematics remains significantly below expectations. One of the factors contributing to students' limited proficiency in mathematics is associated with the pedagogical competence of their instructors. This study employs a quantitative research design utilizing a survey instrument to describe the level of pedagogical competence of mathematics teachers in secondary schools in West Sulawesi, based on student perceptions, and to identify the specific competencies that require development. The population of this study was all secondary school students in West Sulawesi, with a sample size of 1.051 senior secondary school students and 988 junior secondary school students. The analysis employed was descriptive statistical analysis using a stratified random sampling method. The findings indicate that a considerable proportion of mathematics teachers at both the junior high school and senior high school levels exhibit inadequate proficiency. The pedagogical competence of teachers is still lacking in several key areas, which require further development: (1) The skill to comprehend student characteristics; (2) The capability to select materials that are aligned with the learning experience and learning objectives; (3) The ability to select media and learning resources that are suitable for student needs; (4) The skill to make transactional decisions in response to situations that arise in the classroom; (5) The ability to integrate and utilize technology in learning; (6) The skill to communicate effectively; and (7) The skill to evaluate learning. The results of this study can be used as a guideline for the government, experts, and policymakers to overcome the problem of teacher competency development. In addition, the results can be used to design and determine the direction of policies and programs for developing mathematics teacher pedagogical competencies in West Sulawesi.

Keywords: Pedagogic, Mathematics, Teachers, Competence, Students

KOMPETENSI PEDAGOGIK GURU MATEMATIKA DARI PERSEPSI SISWA: SEBUAH SURVEI PADA SEKOLAH MENENGAH DI SULAWESI BARAT

Abstrak

Hasil PISA 2022 dan studi pendahuluan yang dilakukan di Sulawesi Barat menunjukkan bahwa kemampuan siswa dalam matematika masih sangat kurang. Salah satu faktor penyebab rendahnya kemampuan siswa dalam matematika adalah terkait kompetensi pedagogik guru. Penelitian ini merupakan penelitian kuantitatif yang menggunakan survei dengan tujuan untuk mendeskripsikan tingkat kompetensi pedagogik guru matematika di sekolah menengah di Sulawesi Barat dari persepsi siswa dan aspek mana saja dari kompetensi tersebut yang perlu dikembangkan. Populasi dari penelitian ini adalah seluruh siswa sekolah menengah di Sulawesi Barat dan sampelnya adalah 1.051 siswa sekolah menengah atas dan 988 siswa sekolah menengah pertama. Analisis yang digunakan adalah analisis statistika deskriptif dengan metode pengambilan sampel secara acak bertingkat. Hasil penelitian menunjukkan bahwa masih terdapat banyak guru matematika, baik di tingkat sekolah menengah pertama, maupun di sekolah menengah atas, yang kemampuannya tergolong kurang atau insufficient. Aspek dari kompetensi pedagogik guru yang kurang dan masih perlu dikembangkan adalah: (1) kemampuan untuk memahami karakteristik-karakteristik siswa; (2) kemampuan memilih materi yang sesuai dengan pengalaman belajar dan tujuan pembelajaran; (3) kemampuan memilih media dan sumber belajar yang sesuai dengan kebutuhan siswa; (4) kemampuan membuat keputusan transaksional terkait situasi yang terjadi di kelas; (5) kemampuan integrasi dan pemanfaatan teknologi dalam pembelajaran; (6) kemampuan berkomunikasi dengan efektif; dan (7) kemampuan dalam evaluasi pembelajaran. Hasil penelitian ini dapat dijadikan pedoman bagi pemerintah, ahli, dan pengambil kebijakan untuk mengatasi masalah pengembangan kompetensi guru. Selain itu, hasilnya dapat digunakan untuk merancang serta menentukan arah kebijakan dan program pengembangan kompetensi pedagogik guru matematika di Sulawesi Barat.

Kata Kunci: Pedagogik, Matematika, Guru, Kompetensi, Siswa

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INTRODUCTION

Indonesia is one of the numerous countries that have begun to enter the society 5.0 era. In this era, technology is the foundation that has become part of people's day-to-day activities (Daimah & Suparni, 2023; Kahar, Cika, Afni, & Wahyuningsih, 2021; Mursyidah & Muhammad, 2023). To compete in the society 5.0 era, high-quality and competitive human resources are needed (Daimah & Suparni, 2023). In this regard, education has a vital role in ensuring the quality of human resources to be able to adapt and overcome any challenges in responding to the ever-changing times (Kahar, Cika, Afni, & Wahyuningsih, 2021; Maullidina, Mulyani, & Atikah, 2023; Mega, 2022; Mursyidah & Muhammad, 2023; Nastiti & Abdu, 2020; Putri, Darmansyah, Nasution, Chaidir, Satya, & Fadhilah, 2023; Rahayu, 2021; Runisah, 2021; Siahaan, 2022).

One of the most essential sciences to master in confronting the society 5.0 era is mathematics. Mathematics has an important role in tackling problems that arise in the society 5.0 era (Saputra, Utami, & Purwanti, 2023). Mathematics can help students in improving the skills needed for their lives and careers (Maass & Engeln, 2019). Mathematics teaches us various skills from critical thinking to systematic thinking (Ikram, Anaguna, & Rosidah, 2023), which are the skills needed to survive in the society 5.0 era.

Despite the many benefits of mathematics, both in everyday life and its application in various sectors, a preliminary survey conducted by interviewing teachers, lecturers, undergraduate students, and students in West Sulawesi and observing students' experiences in various media shows the opposite. Many students avoid mathematics and consider it a difficult and boring subject to understand. This is supported by a previous study from (Enny & Sihotang, 2021), which shows that many students in Indonesia consider mathematics to be a tough subject to comprehend. In addition, the PISA 2022 report even showed that the average score of Indonesian students' performance in Mathematics was significantly below the OECD average score (OECD, 2023). These issues indicate that mathematics education in Indonesia, especially in mathematics learning in West Sulawesi, has problems.

Low student achievement in mathematics is the result of many factors, one of which is teacher competence. This is supported by studies (Isnawan & Wicaksono, 2020; Kaskens, Segers, Goei, Van Luit, & Verhoeven, 2020; Podkhodova, Snegurova, Stefanova, Triapitsyna, & Pisareva, 2020; Yang &

Kaiser, 2022), which state that teacher competence greatly affects student performance and achievement in mathematics. Nambira (2015) even stated that untrained mathematics teachers will negatively affect students' mathematics achievement. Additionally, teachers as the engine of the learning process determine the quality of a country's education system (Hoesny & Darmayanti, 2021; Lisnawati, 2018; Mariscal, Albarracin, Mobo, & Cutillas, 2023; Maullidina, Mulyani, & Atikah, 2023; Nento & Abdullah, 2022; Susantini, Kartowagiran, Hamdi, Hadi, Jaedun, Wesnawa, Sunendar, & Laliyo, 2022). Teachers are instrumental in designing learning that can develop students' full potential and equip them with the skills needed to face the era of society 5.0 (Ichsan, Sofianora, Desy, Suharyat, Santosa, & Supriyadi, 2023; Mamoh & Bete, 2019; Runisah, 2021). Some studies even suggest that some of the problems of education in Indonesia in the era of society 5.0 are the availability of the number of competent teachers and the problem of developing teacher competence (Aditiya & Fatonah, 2023; Amelia, 2023; Anggreini & Priyojadmiko, 2022; Astini, 2022; Otaya, Kartowagiran, & Retnawati, 2019; Riowati & Yoenanto, 2022). Therefore, the competence of mathematics teachers in West Sulawesi needs more attention and support.

One of the four teacher competencies that need to be mastered is pedagogic competence. Pedagogic competence is a competence possessed by individuals that includes a deep understanding of teaching methods, mastery of materials, and the ability to deliver knowledge efficiently to students by using various teaching approaches to meet diverse learning needs and create a pleasant learning environment (Baskara & Sutarni, 2024; Susantini, Kartowagiran, Hamdi, Hadi, Jaedun, Wesnawa, Sunendar, & Laliyo, 2022). The main concern of teachers' pedagogical competence is on the level of understanding of learners, instructional design, implementation of diagnostic learning, and learning evaluation that has an impact on improving learning performance such as mastery of material, skills in managing learning, and dedication to perform admirably (Bukit & Tarigan, 2022; Hakim, 2015).

Pedagogic competence is very crucial for teachers. Teachers who have high pedagogical competence can demonstrate extraordinary broad teaching abilities or performance (Afalla & Fabelico, 2020). A recent study reveals that two competencies such as pedagogic and professional are required to be developed due to the lack of mathematics teacher competencies in such aspects in West Sulawesi (Ikram, Anaguna, & Machmud, 2024). Hence, the development of pedagogic competence certainly needs special attention.

Based on the description above, developing the pedagogical competence of mathematics teachers is still very urgent. This is because teachers with greater preparation will show better pedagogical competence (Ningtiyas & Jailani, 2018; Warman, 2021). Therefore, a more efficient and effective strategy for developing the pedagogical competence of mathematics teachers is needed.

To develop a more efficient and effective competence development strategy, information is required on the parts of the pedagogic competence of mathematics teachers in West Sulawesi that need to be improved. This information can be used as a first step to address the problems of developing the pedagogical competence of mathematics teachers in West Sulawesi and formulating a policy direction or program to improve teacher competence in West Sulawesi. By knowing which aspects need to be developed, the government, policymakers, and experts can focus on designing programs devoted to developing the parts of mathematics teachers' pedagogical competence that are still lacking.

Most of the research related to the topic (developing teacher competencies and abilities) that we will discuss uses literature studies as its research method such as research by Asih, Asni, and Widana (2022); Malik, Riafadilah, Rahmi, and Puri (2021); Manik, Sihite, Sianturi, Panjaitan, and Hutauruk (2022); Ramdhani and Adawiyah (2023). There are some studies such as Aditiya and Fatonah (2023) which used interviews, phenomenological research by Mailool, Retnawati, Arifin, Kesuma, and Putranta (2020) which involved the perspectives of 15 lecturers, or research by Otaya, Kartowagiran, and Retnawati (2019) which surveyed to measure the ability of student teachers. However, this study has advantages. Firstly, this study does not only focus on one level of education but observes the perspectives of students from two levels of education, namely junior high school and high school. Second, more participants were involved (more than 2.000 so that the results obtained are more accurate and better). Finally, there is still a lack of research that discusses in detail the parts of teachers' pedagogical competence that need to be developed. Therefore, these advantages provide a broader and deeper picture of the topic to be researched.

Based on the background that has been presented, the research questions in this study are: (1) How is the level of pedagogical competence of mathematics teachers in secondary schools in West Sulawesi from the perception of students? (2) Which aspects of the pedagogical competence of

secondary school mathematics teachers in West Sulawesi are still lacking and require development?

METHODS

This study is a quantitative research conducted from July to August 2024 that aims to describe the level of pedagogical competence of mathematics teachers in secondary schools in West Sulawesi from student perceptions, especially related to which parts need to be developed. Researchers used a survey because researchers only wanted to describe a phenomenon or problem (Creswell, 2015).

The population of this study was all secondary school students in West Sulawesi and the sample consisted of 2.012 students consisting of 1.051 senior high school students and 988 junior high school students. Researchers in this case used Stratified Random Sampling by first dividing the population into two groups or clusters, which are based on the level of education, namely senior high school (SMA) and junior high school (SMP).

In the questionnaire used in the survey, students were asked to give their opinions (Strongly Disagree, Disagree, Agree, or Strongly Agree) on several statements related to the pedagogical competence of their mathematics teachers. The questionnaire is based on the Regulation of the Minister of National Education of the Republic of Indonesia No. 16/2007 on Standards for Academic Qualifications and Teacher Competencies. The initial draft questionnaire that has been prepared will then be tested to see its validity and reliability and whether there are items that must be corrected or not used. The items of the questionnaire are presented in table 1 below.

Table 1. Mathematics Teacher Pedagogical Competence Assessment Items

Item	Pedagogical Competence Indicators
1	Understand learners' characteristics related to physical, intellectual, social-emotional, moral, spiritual, and socio-cultural backgrounds.
2	Identifying learners' potential in mathematics
3	Identify learners' prior learning in mathematics
4	Identifying students' learning difficulties in mathematics
5	Apply various approaches, strategies, methods, and educational learning techniques creatively in mathematics.
6	Determine the learning objectives.
7	Determining appropriate learning experiences to achieve the learning objectives taught.

Item	Pedagogical Competence Indicators
8	Selecting learning materials that are related to learning experiences and learning objectives
9	Carry out educational learning in the classroom, laboratory, and field by paying attention to the required safety standards.
10	Use learning media and learning resources that are relevant to the characteristics of the learners and mathematics to achieve the learning objectives as a whole.
11	Make transactional decisions in the learning process following the developing situation.
12	Utilize information and communication technology in teaching and learning.
13	Provide a variety of learning activities to encourage learners to achieve optimal.
14	Provide various learning activities to actualize learners' potential, including their creativity.
15	Understand various strategies to communicate effectively, empathetically, and politely, orally, in writing, and/or in other forms.
16	Communicate effectively, empathetically, and politely with learners with distinctive language in the interaction of educational activities/games that build cyclically from (a) preparing learners' psychological conditions to take part in the game through persuasion and examples, (b) inviting learners to take part, (c) learners' responses to the teacher's invitation, and (d) the teacher's reaction to learners' responses, and so on.
17	Determine procedures for assessing and evaluating the learning process and outcomes.
18	Administer continuous assessment of learning processes and outcomes using various instruments.
19	Evaluate the learning process and outcomes
20	Use assessment and evaluation information to determine learning completeness.
21	Use assessment and evaluation information to design remedial and enrichment programs.
22	Utilize information from learning assessment and evaluation results to improve learning quality.
23	Reflecting on the learning that has been done
24	Utilize the results of reflection for the improvement and development of learning in the subjects taught.

The validity of the instrument was checked through two stages. First, the researcher asked two experts in mathematics education, namely lecturers with a minimum functional position of assistant professor, to check the content of the instruments used. Second, if there were no improvements and revisions from the two experts, the researcher then tested the questionnaire to see if the questionnaire used was truly valid and reliable. Researchers in this case involved 51 students in the questionnaire trial conducted.

After the test results were obtained, the data were then analyzed using SPSS, namely through correlation and calculation of Cronbach Alpha values to see the validity and reliability of the instrument. There are several decision-making criteria related to the validity and reliability of the questionnaire, namely: (1) If the correlation coefficient value is more than the r table value, then the item of the instrument is said to be valid. (2) If the Cronbach Alpha value is more than the r table value, the instrument is said to be reliable.

Invalid items in the instrument will not be used in data collection. If there is only one item that represents an indicator and the item is invalid, the validity test will be carried out again from the expert checking stage with a new item.

The data obtained from the survey will be analyzed using descriptive statistics to determine the mean and standard deviation of the data. The researcher in this case will calculate the overall mean of the mathematics teachers' pedagogical competence scores for each level of education. We will also calculate the mean of each teacher's pedagogical competence score, including for each indicator to see which aspects still need to be developed.

The level of teacher competence, in this case, is categorized into two, namely sufficient and insufficient. This categorization is based on the two-level categorization by Azwar (2013), namely a score that is more than or equal to the average is included in the sufficient category and if it is less than the average then it is included in the insufficient category.

RESULTS AND DISCUSSION

The draft questionnaire that had been prepared was given to two experts, namely a lecturer with a functional position of Assistant Professor. According to their criticism and suggestions for the suitability of indicators to the draft questionnaire, the instruments were drawn up to 40 statements which can be seen in table 2.

Table 2. Descriptions of Every Item Used in The Questionnaire

Item	Statement
1	My teacher always observes his students to know their characteristics.
2	My teacher designs lessons without considering all student characteristics.
3	My teacher always asks students about their opinions, knowledge, or skills in mathematics.
4	My teacher cannot identify students who are gifted in mathematics.
5	My teacher always asks questions related to the mathematics material to be taught before the lesson starts.
6	My teacher never gives problems before discussing mathematics material.
7	My teacher always observes the students during the teaching and learning process to find out the students' mathematics learning obstacles.
8	The teacher does not allow students to ask questions.
9	My teacher always applies creative educational mathematics learning strategies and methods.
10	My mathematics teacher's way of teaching tends to be the same and boring.
11	The teacher conveys the objectives that will be achieved in the lesson.
12	The mathematics learning activities that I participated in followed the learning objectives that had been determined at the beginning.
13	The mathematics learning materials I receive are often inconsistent with the learning objectives and learning activities I participate in.
14	My mathematics teacher always pays attention to safety standards when teaching in the laboratory or the field.
15	Not only did I gain mathematical knowledge and skills, but I also learned how to build my character and social skills.
16	My teacher uses learning media by considering the students' characteristics.
17	Teachers use learning media that are less relevant to the learning objectives.
18	My teacher can adapt and make decisions according to the current classroom conditions.
19	My teacher is not responsive to things that happen during the lesson.
20	My teacher also conducts learning through WhatsApp, Google Classroom, Zoom, or Google Meet.
21	My teacher never uses LCD or PowerPoint slides when teaching in class.

Item	Statement
22	My teacher never introduces maths-related apps in the lesson.
23	Through various mathematics learning activities provided by my teacher, my mathematics learning outcomes are maximized.
24	I can show my potential through various maths learning activities provided by my teacher.
25	My teacher communicates politely and courteously with his students through various means.
26	My mathematics teacher's communication with his students does not show that my mathematics teacher understands the position and situation of his students.
27	My teacher often gives long-winded instructions so sometimes students are confused.
28	My teacher can communicate well through persuasion and example in mentally preparing students to actively participate in learning.
29	My teacher is unable to communicate effectively, empathetically, and politely in inviting students to participate in learning.
30	My teacher always tells me the stages of the assessment that will be carried out.
31	My teacher always carries out assessments of the learning process and outcomes using various forms of assessment.
32	My teacher always conducts an evaluation, be it a test, interview, or questionnaire at the end of the semester.
33	At every meeting, my teacher always evaluates to find out about the student's learning process.
34	My teacher always informs me of my students' learning completeness based on the quiz results that have been given.
35	No additional mathematics assignments were ever given to students, either before or after the assessment.
36	After the quiz or test, my teacher never went over the material again even though there were students who still did not or did not understand it.
37	At every meeting, my teacher gave a quiz at the end of the lesson and there was an improvement in our quiz scores from before.
38	The teacher allows the students to conclude the material that has been learned and what obstacles the students experience.
39	My teacher ends the lesson as soon as the day's material is covered.
40	My classroom maths learning activities always take into account comments, criticisms, and suggestions from students at the previous meeting.

After consulting the results of improvements (see table 2) with both validators, all items were appropriate, both from the indicators and the sentences used. The researcher then conducted a pilot test of the instrument on 51 secondary school students who would give their perceptions regarding the level of pedagogical competence of their mathematics teacher. This trial was conducted to see the validity and reliability of the instrument. Referring to the value of the r table which is 0.2759 with df = 51-2 = 49. The results of the analysis using SPSS bring 5 items (number items of 6, 10, 20, 22, and 35) out to be invalid items. Hence, these items were not used so only 35 items remained from the questionnaire distributed to students. Furthermore, table 3 shows us that the value of Cronbach Alpha of 0.901 is higher than the r-table of 0.2759. Therefore, the items of the questionnaire are reliable.

Table 3. Reliability Test Results

Cronbach Alpha	r-Table	Decision
0.901	0.2759	Reliable

The results of the survey on secondary school student's perceptions of their mathematics teachers' pedagogical competence levels conducted in West Sulawesi can be seen in table 4 below.

Table 4. Survey Results

Level of Education	Mean	Standard Deviation
Senior High School	2.93	0.71
Junior High School	2.95	0.81

From the results obtained, with two-level categorization by Azwar (2013), the categorization criteria are as follows.

Table 5. Categorization of Mathematics Teachers' Pedagogical Competence

Level of Education	Category	Criteria
Senior High School	Sufficient	$x \geq 2.93$
	Insufficient	$x < 2.93$
Junior High School	Sufficient	$x \geq 2.95$
	Insufficient	$x < 2.95$

Referring to these criteria, other information was obtained regarding the number of teachers in each criterion, as follows.

Table 6. Level of Teachers' Pedagogical Competence

Education level Taught	Category	Number of Teachers
Senior High School	Sufficient	9
	Insufficient	10
Junior High School	Sufficient	11
	Insufficient	5

From table 6, it can be seen that at the senior high school level, there are many teachers with sufficient and insufficient levels of pedagogical competence, from student perceptions, almost balanced with more teachers in the insufficient category. Whereas at the junior secondary level, there are more teachers in the sufficient category. This is in line with a study by Farlina, Susilawati, Jihad, and Kariadinata (2017) involving senior high school mathematics teachers revealing that Mathematics teachers' pedagogical competence is still not optimal. The results of this study are also similar to those found by Susanto, Rozali, and Agustina (2020), but at the primary school level, where there are still many (30.43%) teachers in the Jakarta Capital Region Province whose pedagogic competence is still lacking. Similarly, in South Sulawesi, Yogyakarta, and Gorontalo, it was also reported that the teachers' pedagogical competence is still low (Bempah, Abbas, & Djakaria, 2023; Radite & Retnawati, 2023; Syahruddin, Ernawati, Ede, Rahman, Sihes, & Daud, 2013; Tandisau & Murniarti, 2021).

Furthermore, regarding teachers' pedagogic competence in more detail, the following table 7 shows which aspects of pedagogic competence still urgently need to be developed at senior secondary schools.

Table 7. Aspects of Pedagogical Competence that Needs Development

Pedagogical Skills' Indicator	Category	Number of Teachers
Understand learners' characteristics related to physical, intellectual, social-emotional, moral, spiritual, and socio-cultural backgrounds.	Sufficient	8
	Insufficient	11
Selecting learning materials that are related to learning experiences and learning objectives	Sufficient	6
	Insufficient	13
Use learning media and learning resources that are relevant to the characteristics of the learners and mathematics to achieve the learning objectives as a whole.	Sufficient	5
	Insufficient	14

Pedagogical Skills' Indicator	Category	Number of Teachers
Make transactional decisions in the learning process following the developing situation.	Sufficient	9
	Insufficient	10
Utilise information and communication technology in teaching and learning.	Sufficient	1
	Insufficient	18
Understand various strategies to communicate effectively, empathetically, and politely, orally, in writing, and/or in other forms.	Sufficient	9
	Insufficient	10
Use assessment and evaluation information to determine learning completeness.	Sufficient	9
	Insufficient	10
Use assessment and evaluation information to design remedial and enrichment programs.	Sufficient	5
	Insufficient	14
Utilise information from learning assessment and evaluation results to improve learning quality.	Sufficient	5
	Insufficient	14
Reflecting on the learning that has been done	Sufficient	3
	Insufficient	16
Utilize the results of reflection for the improvement and development of learning in the subjects taught.	Sufficient	6
	Insufficient	13

Table 7 shows us the aspects of mathematics teachers' pedagogical competence that are still lacking or insufficient, and need improvement or development. The first aspect is regarding teachers' capabilities to understand learners' characteristics related to their physical, intellectual, social-emotional, moral, spiritual, and socio-cultural backgrounds. In this skill, there are more teachers whose skills are deemed insufficient by students. On the other hand, the ability of mathematics teachers at Padang, West Sumatra to identify their students' characteristics is in the capable category which accounts for the average score of 3.88 (Irsyad & Zamil, 2023). It means that the mathematics teachers in senior secondary schools at West Sulawesi are left one step behind their counterparts.

The second one is regarding teachers' skills in selecting learning materials that are related to students' learning experiences and learning objectives. This means that so far, the mathematics materials given to students are not relevant to the learning objectives and learning experiences of these students. According to a study by Koparan (2017), there are 62 prospective mathematics teachers out of 154 in total (40.3%) agree that developing material

is difficult and time-consuming, while well-equipped suitable teaching materials can help student learning improvement. It leads to an urgency to make a betterment on this aspect at senior secondary schools, particularly around West Sulawesi.

The third skill is the use of learning media and learning resources that are relevant to the characteristics of the learners and mathematics to achieve the learning objectives as a whole. Many senior high school mathematics teachers need improvement in this skill. In this case, there are two possibilities. The teacher may have implemented and used various media, but the selection of media is not suitable for the characteristics and needs of the students. Secondly, it could be that the teacher does not use various learning media.

The next pedagogical skill relates to the teacher's ability to make transactional decisions in the learning process following the developing situation. The fact that many teachers lack this skill suggests that many teachers have not been able to adapt well to events or situations in the classroom. In this case, there are also two possibilities. Firstly, teachers continue to follow their original lesson plans without adapting to what happens in the classroom. Secondly, the teacher adapted or even predicted, but the adaptation did not follow the needs of the students.

The next skill is related to the utilization of information and communication technology in teaching and learning. This is a skill where almost 95% of teachers are in the less category from students' perceptions. This shows that teachers are still not proficient in utilizing technology in learning mathematics. Teachers could also be proficient but choose not to utilize it in mathematics learning. Regarding the need to develop teacher competence in integrating technology, several studies (Farlina, Susilawati, Jihad, & Kariadinata, 2017; Lumbantoruan & Nadeak, 2022; Mailizar & Fan, 2019), described that for the most part, secondary school mathematics teachers in Indonesia experience difficulties in using technology to explain mathematical concepts to students. Baskara and Sutarni (2024) even reported similarly that in a systematic literature review conducted on the pedagogic competence of high school teachers in Indonesia, there were significant shortcomings in technology integration and the use of innovative learning methods.

The sixth aspect of mathematical teachers' pedagogical competence is the skill to understand various strategies to communicate effectively, empathetically, and politely, orally, in writing, and/or other forms. The lack of teacher skills in this aspect shows how teacher communication, including in

delivering material, has not been considered effective and good from the student's perspective. Therefore, teachers are expected to be able to develop their communication skills so that discussions and delivery of material to students can be more effective and better.

The seventh skill is the skill to use assessment and evaluation information to determine learning completeness. From the students' perceptions, they thought that their maths teachers only conducted assessments without determining whether the learning objectives had been achieved or not. In this case, it is most likely that teachers do not report or do not inform or rarely inform students regarding the results of the assessments they have carried out.

The eighth aspect is teachers' skill to use assessment and evaluation information to design remedial and enrichment programs. The lack of mathematics teachers' ability in this aspect suggests several possibilities. Firstly, remedial or enrichment programs are rarely conducted. Secondly, the remedial or enrichment programs that are conducted are not appropriate to the needs of the students. This means that teachers do not adjust the information from the assessment results to suit these programs.

The ninth skill is the skill to utilize information from learning assessment and evaluation results to improve learning quality. In this case, students consider that the mathematics learning they participate in from time to time or from meeting to meeting does not show an increasing trend in terms of quality. Therefore, teachers are expected to use information related to the results of learning assessment to better design lessons so that the quality of mathematics learning carried out in the future will increase. There is also an alternative to providing a questionnaire that can be given to students to assess and provide suggestions regarding the mathematics learning that they have participated in that day.

The tenth skill is the skill to reflect on the learning that has been done. The lack of mathematics teachers' ability in this aspect shows that from students' perceptions, reflection on learning is very rarely done. This shows that teachers rarely ask about how students feel or comment on the learning that has been carried out, what things have been learned, which aspects are lacking, and so on. Therefore, teachers are expected to start doing this reflection more often.

The last skill that needs more attention is the utilization of the results of reflection for the improvement and development of learning in mathematics.

This skill is closely related to the previous skill, the lack of reflection on the mathematics learning that has been carried out results in the absence of information related to the results of reflection that can be used in improving the quality of learning or learning development.

The most highlighted pedagogic competence is related to the ability to evaluate learning. There are still numerous aspects of this ability that need to be developed. This is in line with the opinion of Wulandari and Nurhaliza (2023) who stated that one of the challenges in the development of teachers' pedagogical competence is the difficulty of teachers in planning, implementing, and evaluating learning outcomes. The same thing was also stated by Farlina, Susilawati, Jihad, and Kariadinata, (2017); Pardimin (2018) that mathematics teachers still need to further develop their abilities in planning, implementing, and evaluating learning.

Next, the results of the analysis of each pedagogical skill indicator for junior secondary school mathematics teachers are shown in table 8 below.

Table 8. Aspects of Pedagogical Competence that Needs Development

Pedagogical Skills' Indicator	Category	Number of Teachers
Understand learners' characteristics related to physical, intellectual, social-emotional, moral, spiritual, and socio-cultural backgrounds.	Sufficient	5
	Insufficient	11
Selecting learning materials that are related to learning experiences and learning objectives	Sufficient	4
	Insufficient	12
Use learning media and learning resources that are relevant to the characteristics of the learners and mathematics to achieve the learning objectives as a whole.	Sufficient	2
	Insufficient	14
Make transactional decisions in the learning process following the developing situation.	Sufficient	6
	Insufficient	10
Utilise information and communication technology in teaching and learning.	Sufficient	0
	Insufficient	16
Understand various strategies to communicate effectively, empathetically, and politely, orally, in writing, and/or in other forms.	Sufficient	5
	Insufficient	11
Communicate effectively, empathetically, and politely with learners with distinctive language in the interaction of educational	Sufficient	6
	Insufficient	10

Pedagogical Skills' Indicator	Category	Number of Teachers
activities/games that build cyclically from (a) preparing learners' psychological conditions to take part in the game through persuasion and examples, (b) inviting learners to take part, (c) learners' responses to the teacher's invitation, and (d) the teacher's reaction to learners' responses, and so on.		
Use assessment and evaluation information to determine learning completeness.	Sufficient	7
	Insufficient	9
Use assessment and evaluation information to design remedial and enrichment programs.	Sufficient	2
	Insufficient	14
Reflecting on the learning that has been done	Sufficient	1
	Insufficient	15
Utilize the results of reflection for the improvement and development of learning in the subjects taught.	Sufficient	3
	Insufficient	13

Table 8 shows that the aspects of mathematics teachers' pedagogical competence that require development and attention are more or less the same between mathematics teachers at senior secondary and junior secondary school levels. The difference is that at the senior secondary school level, one aspect that is not present at the junior secondary school level is related to utilizing information from learning assessment and evaluation results to improve learning quality. As for the junior high school level, one aspect that requires special attention that is not present at the senior high school level is the ability to communicate effectively, empathetically, and politely with learners with distinctive language in the interaction of educational activities/games that build cyclically from (a) preparing learners' psychological conditions to take part in the game through persuasion and examples, (b) inviting learners to take part, (c) learners' responses to the teacher's invitation, and (d) the teacher's reaction to learners' responses, and so on. Teachers' lack of ability in this aspect shows several things. Teachers are still lacking in terms of ensuring students' readiness to learn, including in creating situations and environments where students are ready to learn. Next, teachers are also less active or even rarely actively encourage or motivate students to participate and be active in learning mathematics. Lastly, teachers may have done these activities, but their delivery or communication during

learning has not been effective. Whereas several studies Sahabuddin (2016); Sidik and Sobandi (2018) show that interpersonal communication between teachers and students has a positive influence on students' motivation and participation in learning. Thus, those findings on aspects for developing pedagogical competence should be taken by the government, stakeholders, and other parties into consideration.

CONCLUSION

Based on the results of the research that has been carried out, the conclusions are as follows, the number of senior high school mathematics teachers in West Sulawesi whose pedagogical competence is at a sufficient level and insufficient level, according to their students, are 9 (47.4%) and 10 (52.6%), respectively. On the contrary, the number of junior high school mathematics teachers in West Sulawesi whose pedagogical competence is at a sufficient level and insufficient level, according to their students, are 11 (68.7%) and 5 (31.3%), respectively.

At the junior secondary and senior secondary school levels, aspects of teachers' pedagogical competence that require further development and concern are teachers' skills to: (1) understand the characteristics of learners related to physical, intellectual, social-emotional, moral, spiritual, and socio-cultural backgrounds; (2) select learning materials related to student learning experiences and learning objectives; (3) select and use learning media and learning resources appropriate to the characteristics of learners and mathematics to achieve learning objectives as a whole; (4) make transactional decisions in the learning process according to the developing situation; (5) utilising information and communication technology in teaching and learning; (6) understanding various strategies to communicate effectively, empathetically, and politely, either orally, in writing, and/or other forms; (7) using assessment and evaluation information to determine learning completeness; (8) using assessment and evaluation information to design improvement and enhancement programmes; (9) reflecting on the learning that has been done; and (10) utilising the results of reflection to improve and develop mathematics learning.

This study discusses the level of pedagogical competence of mathematics teachers in secondary schools in West Sulawesi from students' perceptions. Other researchers may be interested in the same topic and could conduct the study in different provinces or regions. Researchers may also

consider adding the perspectives of supervisors, peers, principals, or even lecturers and parents. Researchers could also increase the methods used, namely interviews and observations to see the reasons behind the lack of teachers' pedagogical competence in certain aspects. Finally, the results of this study can be used by the government and education policymakers to formulate programs that can help mathematics teachers, especially in West Sulawesi, to further develop their pedagogical competence.

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