

ANALYZING STUDENTS' MATHEMATICAL REASONING IN SOLVING PROBABILITY PROBLEMS THROUGH SPIN THE WHEEL-ASSISTED WORKSHEETS

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ABSTRACT

Mathematical reasoning ability is an essential aspect of mathematics learning because it helps students understand concepts and draw logical conclusions. However, many studies have shown that this ability remains low due to learning that is overly focused on procedures. Therefore, it is necessary to use engaging learning media that can help students connect abstract concepts with real experiences. This study aims to analyze students' mathematical reasoning ability on the topic of probability using worksheets (LKPD) assisted by Spin the Wheel media. The research employed a descriptive qualitative approach involving three eighth-grade students of SMPN 2 Waru, selected based on high, medium, and low reasoning categories. Data were collected through essay tests, observations, and interviews, and analyzed using four indicators of mathematical reasoning: (1) constructing sample spaces and determining probabilities, (2) making predictions, (3) comparing theoretical probabilities with experimental results, and (4) drawing logical conclusions. The results show that students' mathematical reasoning ability falls into the moderate category, with the main difficulty found in comparing theoretical and experimental results. The Spin the Wheel media effectively helps students understand probability concepts more concretely and increases their learning engagement. However, teacher guidance is still needed to help students connect experimental findings with theoretical concepts.

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INTRODUCTION

Mathematics learning plays a vital role in developing students' logical, critical, and systematic thinking skills. According to NCTM (2000), mathematics education should not only emphasize procedural mastery but also higher-order thinking skills such as reasoning, communication, and problem-solving. In line with the Merdeka Curriculum, reasoning ability enables students to understand concepts, make conjectures, and draw

logical conclusions Izzah & Azizah (2019). It also helps develop critical thinking in both mathematical and daily problem-solving contexts (Nuraina et al., 2022) and strengthens cognitive skills at higher levels (Afinadhita & Abadi, 2022). Thus, reasoning is a key foundation for creating meaningful mathematics learning experiences.

However, several studies reveal that Indonesian students' mathematical reasoning remains low (Kurniawati & Ramlah (2021), Zendrato et al. (2025)). Many students rely on procedural memorization without understanding underlying concepts, making it difficult to connect theory with real-life situations (Fauziyah & Sujarwo (2022)). One area that particularly requires reasoning is probability, which involves constructing sample spaces, making predictions, and comparing theoretical and experimental results (Wahyuningrum, 2020). Yet, many students still focus only on formulas and fail to explain their reasoning (Hidayat & Sariningsih (2018)).

Students' difficulties in understanding the concept of probability are not only caused by the complexity of the material but also by the lack of engaging and interactive learning media. As explained in Aliyatus's study, learning mathematics involves several factors that may hinder students' understanding of the material being taught; therefore, it is necessary to implement various effective strategies to help students comprehend the material better (Sa'adah et al., 2025). Abstract learning without the support of concrete visual aids often makes it difficult for students to understand the meaning of probability (Sari et al., 2024). Therefore, it is necessary to develop learning innovations that can bridge abstract concepts with students' real-life experiences.

According to research by Kasudarman, innovation in education requires creativity and persistence in implementation (Kasudarman et al., 2025). One such innovation is the interactive "Spin the Wheel" media, which transforms probability learning into an experimental and enjoyable experience. Research by Budi & Qohar (2021), Irham et al. (2024) and Nuraini et al. (2024) proved that Spin the Wheel increases motivation and learning outcomes, although few studies have analyzed its role in enhancing reasoning skills a gap this study aims to fill.

To optimize its use, this study integrates the Student Worksheet (SW) as structured guidance. The SW facilitates students' exploration, reasoning, and conclusion-making during learning (Rosmana et al., 2024). Combined with Spin the Wheel, it helps students link theoretical probability with experimental data more meaningfully. Experiment-based activities using Spin the Wheel encourage students to compare results, make conjectures, and draw conclusions essential aspects of reasoning (Hjelte et al., 2020). Thus, the media

not only increases engagement but also strengthens probabilistic thinking. Theoretically, this research supports the relationship between interactive media and reasoning development; practically, it serves as a reference for teachers to design participatory and higher-order-thinking-oriented lessons. Therefore, this study entitled “Analyzing Students’ Mathematical Reasoning in Solving Probability Problems through Spin the Wheel-Assisted Worksheets” is considered important to conduct.

RESEARCH METHODS

This study employed a descriptive qualitative approach to explore students’ mathematical reasoning in solving probability problems using the Spin the Wheel-assisted worksheet. The qualitative design allowed for an in-depth understanding of students’ thinking processes in a natural learning setting, while the case study design enabled detailed exploration of specific phenomena rather than generalization (Fadli, 2021).

The participants were eighth-grade students of class VIII-C at SMP Negeri 2 Waru, selected based on teacher recommendations for their varied academic abilities. A reasoning test on probability was administered to identify students’ reasoning levels, after which three students representing high, medium, and low reasoning categories were selected using purposive sampling. The criteria included: (1) having studied probability, (2) demonstrating varied reasoning levels, and (3) willingness to participate actively in interviews and observations. The small number of subjects aimed to provide a deep, rather than broad, understanding of students’ reasoning variations.

Data were collected through tests, observations, documentation, and semi-structured interviews. The test, consisting of four essay questions, measured reasoning based on indicators such as calculation, conjecture, and logical conclusion. Observations captured students’ activities while using the media, documentation included their worksheets and screenshots, and interviews explored their reasoning strategies and difficulties.

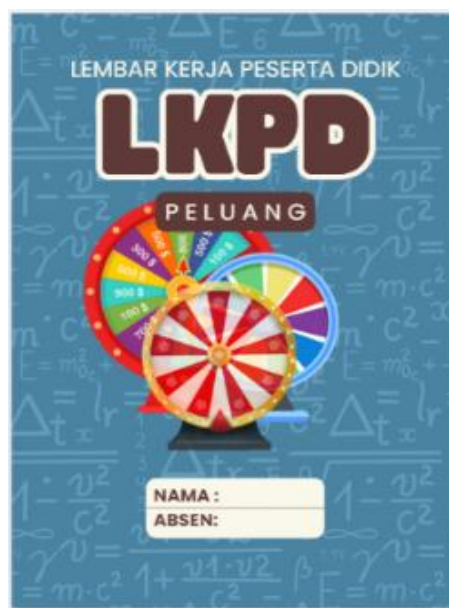
Data analysis referred to (Yusdiana & Hidayat, 2018) which outlines four indicators of mathematical reasoning: (1) Performing calculations based on applicable mathematical formulas/rules; (2) Making estimates/predictions; (3) Drawing general conclusions based on observed mathematical processes/concepts; (4) Drawing conclusions based on the similarity of observed mathematical processes/concepts. This indicator was chosen because it is operational and easily measurable through essay questions, aligns with the context of probability material, and has a strong conceptual basis by adapting

mathematical reasoning theory from previous studies, making it suitable for use. After the test results were obtained and students with high, medium, and low abilities were selected, the researcher conducted semi-structured interviews to gain more in-depth information and to verify the students' answers. In addition to interviews, the researcher also used observation and documentation as data collection techniques to strengthen the research findings.

Data validity was ensured through triangulation, comparing results from all instruments to increase reliability. Validation was also conducted through researcher discussions and participant confirmations. Data were analyzed using the Miles et al. model in Fiantika et al. (2022), involving data reduction, presentation, and conclusion drawing. Data were first simplified and categorized according to reasoning indicators, then organized into tables for clarity, and finally interpreted to describe students' mathematical reasoning comprehensively.

RESULTS AND DISCUSSION

This study shows the variations in students' mathematical reasoning abilities on probability material using worksheets assisted by the Spin the Wheel media.



Picture 1. Spin the Wheel Worksheet Instrument

The results and discussion of students' mathematical reasoning processes based on the mathematical reasoning indicators are as follows:

1. Subjects with Low Mathematical Reasoning Ability (LR)
 - a. Perform calculations based on applicable mathematical formulas/rules.

LR was able to construct the sample space but made errors in determining probabilities. These mistakes resulted from memorizing formulas without understanding their meaning, consistent with Hidayat & Sariningsih (2018), who stated that low-ability students often rely on mechanical procedures.

hatlah roda tersebut, dan tulislah sesuai tabel ini!

Hewan	Banyak Sektor $n(A)$	Peluang $P(A)$
Singa	3	0,25
Kucing	2	$\frac{8}{2} = 4/1$
Ayam	1	$\frac{1}{8}$
Kelinci	2	0,25
	Total Sektor =	

$P(A) = \frac{n}{n}$

Lakukanlah sebuah percobaan memutar roda Spin the wheel tersebut melalui hp kamu.

- Buka link: <https://wordwall.net/resources/9863827>
- Klik Start
- Klik Spin it dan catat hewan apa yang muncul
- Klik resume dan lakukan spin lagi (jangan klik eliminate).
- Lakukan spin ini sebanyak 10 kali dan catat hasilnya pada tabel berikut dan hitung frekuensi harapan serta relatifnya.

Peluang $P(A)$	Percobaan $f(A)$	Frekuensi Harapan (fh)	Frekuensi relatif (fr)
0,25	3	$0,25 \times 10 = 2,5$	$\frac{3}{10} = 0,3$
0,25	2	$0,25 \times 10 = 2,5$	$\frac{2}{10} = 0,2$
0,125	1	$0,125 \times 10 = 1,25$	$\frac{1}{10} = 0,1$
0,125	2	$0,125 \times 10 = 1,25$	$\frac{2}{10} = 0,2$
Total Percobaan / n adalah: 10 kali		Ingat! $fh = P(A) \times n$	$fr = \frac{f}{n}$

Picture 2. LR's answer to the question on indicator 1

The following is the interview transcript:

- Researcher** : "How do you determine the probability of a specific animal appearing on this spinning wheel?"
- LR** : "I saw the number of animals and immediately wrote the fraction, but I got confused when the result was also a fraction."
- Researcher** : "Are you sure your calculation is correct?"
- LR** : "Not really sure, because I only copied the formula and guessed what to put into it."

b. Making estimates/guesses

in this section, they wrote their answers directly without spinning the wheel or observing the proportion of the sectors.

Lihatlah roda tersebut, amati dan identifikasilah hipotesisnya/jawaban sementara!

1. Singa
2. Iya selalu sama

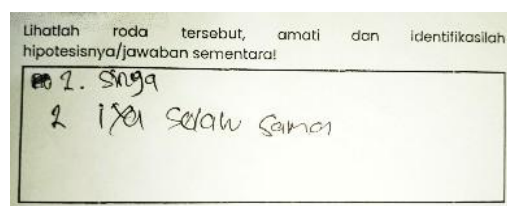
Picture 3. LR's answer to the question on indicator 2

When asked to predict which animal would appear most frequently in 10 spins, LR answered randomly without considering the size of the wheel's sectors. This shows weak probabilistic thinking, as students struggle to estimate likelihood based on proportional reasoning (Sari et al., 2024). The following is the interview transcript:

- Researcher** : "If this wheel is spun, how can you estimate which animal will appear most frequently in 10 spins?"
- LR** : "I don't know, Ma'am... maybe the outcome is random. So, I wrote it without thinking and just guessed."
- Researcher** : "If you look at the size of the sections on the wheel, do you think it could be used to make a prediction?"
- LR** : "Maybe it could, but it didn't occur to me."

c. Comparing Theory and Experiment

In this indicator, students compare theoretical probability with experimental results. SR only wrote the final answer without providing further explanation.



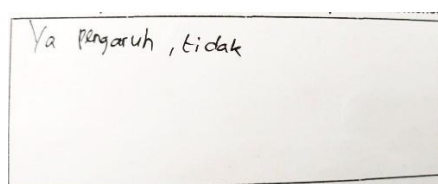
Picture 4. LR's answer to the question on indicator 3

LR had difficulty comparing theoretical probabilities with experimental results. Responses were mostly guesses without reasoning, reflecting weak inductive thinking Wahyuningrum (2020). The following is the interview transcript:

- Researcher** : "Do you think the experimental results are always the same as the theory?"
- LR** : "Probably yes, always the same, but I don't know the reason."

d. Drawing Logical Conclusions

This indicator refers to drawing conclusions with logical reasoning. In the answer sheet, LR only responded:



Picture 5. LR's answer to the question on indicator 4

LR failed to connect experimental findings to theory. Answers were descriptive and lacked logic, consistent with Yurdiana & Hidayat (2018), who noted that low-ability students often stop at superficial descriptions. The following is the interview transcript:

- Researcher** : "Does the total number of trials affect the expected frequency and the relative frequency?"
- LR** : "I think it does, Miss, but the results keep coming out differently."
- Researcher** : "If the wheel is spun more times, will the results become closer to the theoretical values?"
- LR** : "I'm not sure; I think the results will still be different each time."

2. Subject with Moderate Mathematical Reasoning Ability (MR)

a. Perform calculations based on applicable mathematical formulas/rules

MR correctly constructed the sample space and followed calculation rules, though minor arithmetic errors appeared due to inaccuracy (Adilah & Sari, 2025).

Hewan	Banyak Sektor n(A)	Peluang P(A)	Percobaan f(A)	Frekuensi Harapan (fh)	Frekuensi relatif (fr)
Singa	3	$\frac{3}{8} = \frac{3}{8}$	4	$\frac{30}{8} = 3,75$	$\frac{4}{10}$
Kucing	2	$\frac{2}{8} = \frac{1}{4}$	1	$\frac{10}{4} = 2,5$	$\frac{1}{10}$
Ayam	1	$\frac{1}{8}$	3	$\frac{10}{8} = 1,25$	$\frac{3}{10}$
Kelinci	2	$\frac{2}{8} = \frac{1}{4}$	2	$\frac{10}{4} = 2,5$	$\frac{2}{10}$
Total Sektor = n(S) adalah 8			Total Percobaan / n adalah 10 kali	Ingat $f_h = P(A) \times n$ $f_r = \frac{f(A)}{n}$	

Picture 6. MR's answer to the question on indicator 1

The following is the interview transcript:

Researcher : "What did you do to determine the probability of an animal appearing on the wheel?"

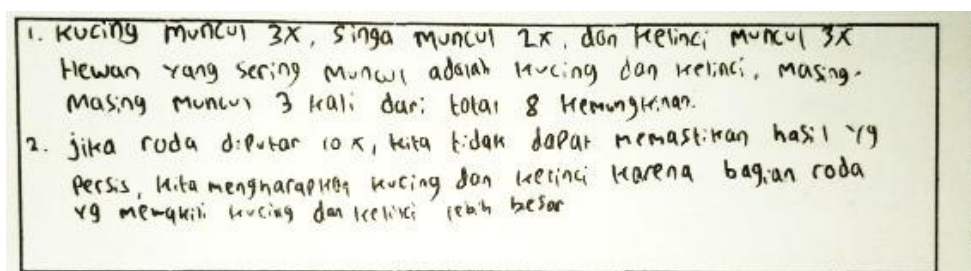
MR : "I first wrote down the sample space, then calculated it using fractions based on the number of sectors. Sometimes I made mistakes because I wasn't careful enough."

Researcher : "Where did you find the difficulty?"

MR : "In the calculations, maybe I was just not careful enough."

b. Making estimates/guesses

MR predicted outcomes using sector size, showing developing probabilistic reasoning, though predictions were not always accurate. MR was able to estimate the experimental outcome before conducting the trial, although the prediction was sometimes inaccurate.



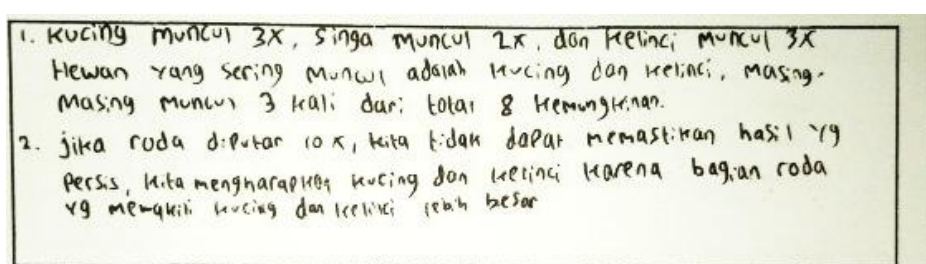
Picture 7. MR's answer to the question on indicator 2

During the interview, MR stated, 'To predict which animal appears most frequently, we need to look at the size and number of sectors in each part of the spinning wheel.' This indicates that MR has begun to develop probabilistic thinking, although it is still limited compared to LR, who did not make any predictions at all. The following is the interview transcript:

- Researcher** : "If this wheel is spun, how can you predict which animal will appear most frequently in ten spins?"
- MR** : "I look at the size of the sectors. The larger ones might appear more often."
- Researcher** : "Is your prediction always accurate?"
- MR** : "Not always; sometimes it differs from the actual results, but it's usually close."

c. Comparing Theory and Experiment

MR recognized differences between theoretical and experimental outcomes but explained them descriptively Budi & Qohar (2021), students at this stage have begun to recognize the differences between theory and practice, but they still need guidance to explain these differences mathematically.



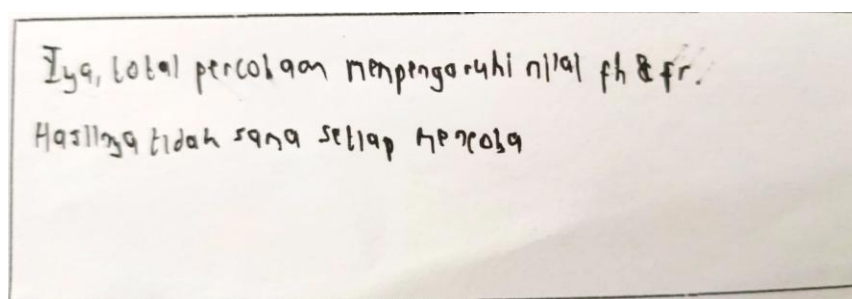
Picture 8. MR's answer to the question on indicator 3

The following is the interview transcript:

- Researcher** : "What is the difference between the experimental results and the theoretical values?"
- MR** : "Sometimes the spin results are not the same as the calculations, Miss. So, the outcomes can differ. But if the wheel is spun many times, the results might get closer to the calculations. Earlier, when I spun it eight times, it appeared about three times on average."
- Researcher** : "Why do you think that happens?"
- MR** : "Maybe because the experiment was limited. I also tried spinning it ten times, and basically, the results cannot be determined exactly."

d. Drawing Logical Conclusions

MR attempted to relate the theoretical results to the experimental ones. MR wrote:



Picture 9. MR's answer to the question on indicator 4

During the interview, MR explained that the results differed because "the experiment might not be the same as the calculation, and the total number of

trials affects the expected and relative frequencies." Although the reasoning was not yet mathematical, it showed an effort to connect theory with practice. Compared to LR, MR had already developed an initial understanding that the number of trials influences how closely the experimental results align with the theoretical values. The following is the interview transcript:

- Researcher** : "In your opinion, does the number of trials affect the results?"
MR : "Yes, the more trials we do, the closer the results get to the calculated probability. But the experiment might still differ from the calculation."
Researcher : "Why do you think that happens?"
MR : "The more trials we conduct, the more balanced the results become."

3. Subject with High Mathematical Reasoning Ability (HR)

a. Perform calculations based on applicable mathematical formulas/rules

HR demonstrated accurate calculation, consistent with conceptual understanding of probability.

Hewan	Banyak Sektor n(A)	Peluang P(A)	Peluang P(A)	Percobaan f(A)	Frekuensi Harapan (fh)	Frekuensi relatif (fr)
Singa	3	$\frac{3}{8}$	$\frac{3}{8}$	6	$\frac{3}{8} \times 6 = \frac{15}{4}$	$\frac{6}{10} = \frac{3}{5}$
Kucing	2	$\frac{2}{8} = \frac{1}{4}$	$\frac{1}{4}$	1	$\frac{1}{4} \times 6 = \frac{3}{2}$	$\frac{1}{10}$
Ayam	1	$\frac{1}{8}$	$\frac{1}{8}$	1	$\frac{1}{8} \times 6 = \frac{3}{4}$	$\frac{1}{10}$
Kelinci	2	$\frac{2}{8} = \frac{1}{4}$	$\frac{1}{4}$	2	$\frac{1}{4} \times 6 = \frac{3}{2}$	$\frac{2}{10} = \frac{1}{5}$
Total Sektor = n(S) adalah: 8				Total Percobaan / n adalah: 10 kali	Ingat! $f_h = P(A) \times n$ $f_r = \frac{f(A)}{n}$	

Picture 10. HR's answer to the question on indicator 1

The following is the interview transcript:

- Researcher** : "How did you determine the probability of each animal on the wheel?"
HR : "I first counted the total number of sectors as the denominator, then counted how many times each animal appeared as the numerator. So, the probability is expressed as a fraction that matches the proportion of the sectors."
Researcher : "Are you confident with your answer?"
HR : "Yes, because I double-checked my work before submitting it."

b. Making estimates/guesses

HR was able to predict the experimental results quite accurately before performing the calculations.

1. Singa paling sering muncul!
 2. Jika roda diputar sebanyak 10 kali kemungkinan paling sering muncul Singa. Karena ruang sampelnya besar.

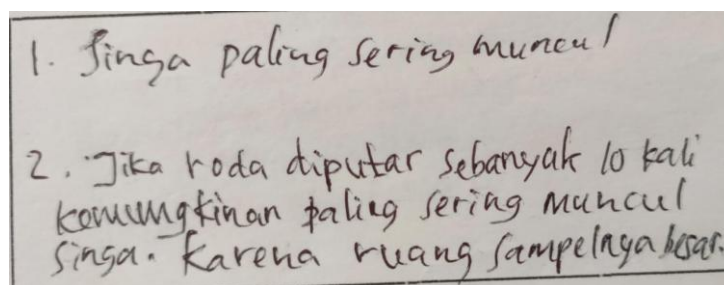
Picture 11. HR's answer to the question on indicator 2

During the interview, ST also stated that the actual results might not always match the theoretical ones due to the random nature of probability. The following is the interview transcript:

- Researcher** : "Before spinning the wheel, how did you predict which animal would appear most frequently?"
- HR** : "I first looked at the size of the sectors, Miss. If a sector is larger, the likelihood of it appearing is higher. So, I can guess the result before trying it."
- Researcher** : "Do you think the experimental results will always match your prediction?"
- HR** : "No, because probability is random in nature. But if the experiment is repeated many times, the results usually get closer to the prediction."

c. Comparing Theory and Experiment

This indicator involves comparing theoretical probability with experimental results. HR was able to provide a broader conclusion and responded:



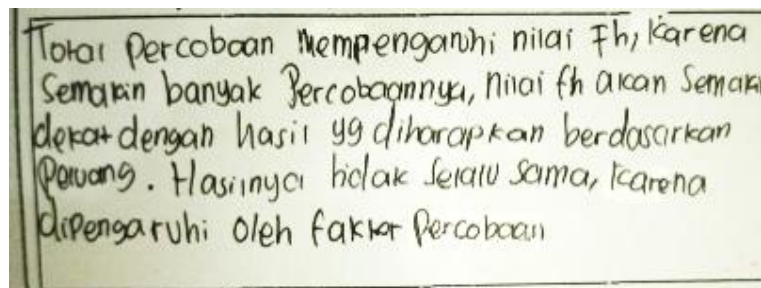
Picture 12. HR's answer to the question on indicator 3

During the interview, HR stated, "The larger the sample space, the smaller the probability of each event." This demonstrates a strong ability to generalize. The significant difference between HR and MR or LR lies in HR's ability to connect the experimental results with the theory, and even to draw general conclusions rather than merely describing the outcomes. The following is the interview transcript:

- Researcher** : "Why do you think the experimental results can differ from the theoretical ones?"
- HR** : "Because the number of trials is small, so the results can deviate. But if the number of trials increases, the results get closer to the theory."
- Researcher** : "So, in your opinion, what is the relationship between theory and experiment?"
- HR** : "Theory serves as a reference, while experimental results may vary. However, if many trials are conducted, the results will tend to approach the theoretical values."

d. Drawing Logical Conclusions

HR's reasoning aligned with the law of large numbers, showing deep probabilistic understanding Hjelte et al. (2020); (Irham et al., 2024). HR's response was:



Picture 13. HR's answer to the question on indicator 4

The following is the interview transcript:

- Researcher** : "Why are the experimental results not always the same as the theoretical ones?"
- HR** : "In my opinion, it's because the number of trials is still small. If there are more trials, the results will get closer to the theory."
- Researcher** : "So, do you think the total number of trials has an effect?"
- HR** : "Yes, the more trials there are, the closer the relative frequency gets to the expected frequency."

Observations during the learning process showed that students were enthusiastic when using the Spin the Wheel media. The activity of spinning the wheel created a lively atmosphere and encouraged active participation. Students appeared motivated to predict outcomes, record experimental data, and discuss the results in groups. This indicates that the use of interactive media can foster engagement and improve students' learning motivation, consistent with Irham et al. (2024), who found that the spinning wheel media enhances students' interest in learning mathematics. However, when students were asked to explain differences between experimental results and theoretical probabilities, many still provided general or descriptive answers without solid mathematical reasoning. This suggests that their inference and argumentation skills have not yet developed optimally. Similar findings were reported by Heryani et al. (2024), who emphasized that improving reasoning and mathematical literacy requires a shift toward interactive and student-centered learning that encourages exploration and problem-solving.

When viewed by indicator, the highest achievement was found in constructing sample spaces and determining probabilities, as the media provides a clear and concrete visualization that simplifies abstract concepts. This finding supports Irham et al. (2024), who explained that spinning wheel media effectively enhances students' understanding

of simple probability. Conversely, the lowest achievement was in comparing theoretical and experimental results. Many students could identify differences but were unable to explain them using mathematical reasoning. Budi & Qohar (2021) also found that students often struggle to connect theoretical and empirical probabilities, likely due to limited experience with repeated experiments. In the logical conclusion indicator, students' answers were mostly descriptive. For instance, many only stated that "results differ because the experiment is random" without linking it to the concept of relative frequency. This shows the need for more explicit guidance in reasoning and communication training during mathematics instruction.

Across ability levels, students with low reasoning tended to rely on memorized procedures without understanding the concepts. Students with moderate reasoning began to make predictions and simple explanations, while those with high reasoning demonstrated the ability to connect theoretical concepts with experimental outcomes and provide logical arguments. These findings indicate variation in reasoning development influenced by learning experience, accuracy, and abstract thinking ability. Overall, students' reasoning ability in this study falls within the moderate category. The Spin the Wheel media successfully captured students' attention and increased participation, yet its use alone is insufficient to build higher-order reasoning without teacher scaffolding. Teachers must help students connect empirical findings with theoretical concepts and encourage them to express mathematical reasoning verbally and in writing.

This result aligns with Kusumawardani et al. (2024), which explains that students' mathematical reasoning skills can be improved through problem-based learning. The following table presents a summary of the results.:

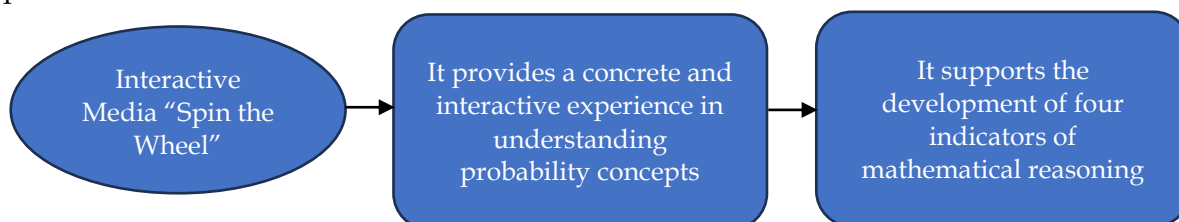
Table 1. Summary of Students' Mathematical Reasoning Abilities Based on Indicators

Reasoning Indicators	Low-Ability Students (LR)	Moderate-Ability Students (MR)	High-Ability Students (HR)	Critical Analysis
Constructing the Sample Space & Determining Probability.	Constructs the sample space but makes errors in probability calculation.	Constructs correctly but lacks accuracy in computation.	Constructs and calculates correctly and carefully.	LR's errors stem from memorization, MR's from carelessness, while HR shows consistency
Making Predictions/Estimates.	Unable to make predictions, only guesses randomly.	Makes predictions based on sector size, though not yet accurate.	Makes accurate predictions based on sector size.	Probabilistic thinking skills improve progressively from LR → HR.
Comparing	Unable to	Identifies	Explains	A common

Reasoning Indicators	Low-Ability Students (LR)	Moderate-Ability Students (MR)	High-Ability Students (HR)	Critical Analysis
Theory with Experiment.	explain the differences.	differences, but explanations remain descriptive.	differences using the concept of the number of trials.	weakness among students is the difficulty in connecting theory and practice.
Drawing logical conclusions.	Providing short answers without logical reasoning.	Giving simple reasons (the number of trials affects the result).	Concluding accurately by linking to the law of large numbers.	The depth of argumentation increases according to the skill category.

Thus, the use of the Spin the Wheel media proves capable of attracting attention, fostering motivation, and increasing students' participation in probability learning. However, the research results also indicate that using the media alone is insufficient to develop mathematical reasoning comprehensively. Teachers need to provide specific guidance to help students connect experimental results with theoretical concepts and to train them to present mathematical reasoning. Therefore, interactive media such as Spin the Wheel can function optimally not only as a demonstration tool but also as a means to cultivate deeper mathematical reasoning skills.

To clarify the contribution of using the Spin the Wheel media to the development of students' mathematical reasoning skills, the conceptual map of this study's findings is presented below.



From the conceptual map, it can be concluded that the **primary contribution of the Spin the Wheel media is to serve as a bridge between empirical experiences and theoretical concepts**, which gradually develops students' mathematical reasoning skills. The processes of visualization, exploration, and reflection that occur during activities using Spin the Wheel form a meaningful learning cycle aligned with the reasoning-based learning objectives in the Merdeka Curriculum.

CONCLUCIONS AND SUGGESTIONS

This study shows that students' mathematical reasoning ability in probability material, using worksheets assisted by the Spin the Wheel media, falls into the moderate category. The indicator with the highest achievement is constructing sample spaces and determining probabilities, while the lowest achievement is comparing theoretical probabilities with experimental results. This confirms that students find procedural aspects easier to master than reasoning that requires logical argumentation. Theoretically, this study contributes to enriching research on mathematical reasoning, particularly in probability material, by emphasizing that the use of concrete-interactive media can support the development of probabilistic thinking skills. The findings also highlight the importance of teacher scaffolding to guide students not only to follow procedures but also to build logical mathematical arguments.

The practical implication of this study is that teachers can use the Spin the Wheel media as an alternative for teaching probability in a more engaging and motivating way. Worksheets assisted by this media can facilitate concept exploration, recording experimental results, and drawing conclusions with logical reasoning. Thus, this media functions not only as a teaching/demonstration tool but also as a means to foster students' active involvement. The limitation of this study lies in the relatively small number of subjects and the research context, which was conducted in only one class. This makes the findings not yet generalizable on a wider scale. Furthermore, this study primarily focuses on reasoning within the context of probability material, so further research is needed on other abstract mathematical topics.

Therefore, mathematics teachers are advised to use the Spin the Wheel media as an alternative for teaching probability, as it has been proven to enhance students' engagement and understanding, particularly in constructing sample spaces and determining probabilities. However, it remains necessary to provide reinforcement and guidance in comparing theoretical results with experimental outcomes so that students can practice giving logical mathematical reasoning. Future research can explore the use of similar media in other abstract mathematical topics and involve a larger number of subjects to obtain more comprehensive results. Additionally, schools are expected to support the use of interactive learning media by providing adequate facilities, making mathematics learning more effective, meaningful, and enjoyable for students.

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