

## META SYNTHESIS: MATHEMATICAL LITERACY REVIEWED FROM GENDER IN JUNIOR HIGH SCHOOL STUDENTS

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### Abstract

Have good mathematical literacy is important to develop because it plays an important role in solving various problems in everyday life. Meanwhile, the mathematical literacy of male and female students is different. This study aims to see and describe how mathematical literacy differences in male and female students at the junior high school level. The method used in research is meta-synthesis which is carried out by analyzing qualitative data derived from various similar studies. As a result, male students have a tendency to have better mathematical literacy than female students. Of the seven indicators of mathematical literacy, male students are able to master four to seven indicators. Meanwhile, female students can only meet three to seven indicators. Male and female students have equally fulfilled communication, mathematization, and representation skills. Both also need to improve their ability to determine problem-solving strategies and provide logical reasoning and reasoning. Furthermore, the authors suggest that similar research be carried out with a longer time span and a wider range of research areas. Furthermore, it can also conduct research on high school students so that they can be compared so that it can be understood whether there are significant differences in mathematical literacy skills at both school levels. Thus, the results obtained can be represented to be used as a basis for making decisions such as the development of more inclusive and effective learning strategies in the educational environment.

**Keywords:** mathematical literacy, gender, meta-synthesis

### Abstrak

Literasi matematis yang baik menjadi hal penting untuk dikembangkan karena memegang peranan penting dalam menyelesaikan berbagai permasalahan di kehidupan sehari-hari. Sementara itu, literasi matematis yang dimiliki siswa laki-laki dan perempuan berbeda. Penelitian ini bertujuan untuk melihat serta mendeskripsikan bagaimana perbedaan literasi matematis pada siswa laki-laki dan perempuan di jenjang SMP. Metode yang digunakan dalam penelitian adalah meta-sintesis yang dilakukan dengan menganalisis data kualitatif yang berasal dari berbagai penelitian sejenis. Hasilnya, siswa laki-laki memiliki kecenderungan literasi matematis lebih baik daripada literasi matematis siswa perempuan. Dari tujuh indikator literasi matematis, siswa laki-laki mampu menguasai empat hingga tujuh indikator. Sementara itu, siswa perempuan hanya dapat memenuhi tiga sampai tujuh indikator. Siswa laki-laki dan perempuan sudah sama-sama memenuhi kemampuan komunikasi, matematisasi, dan representasi. Keduanya juga perlu meningkatkan kemampuannya dalam menentukan strategi penyelesaian masalah serta meberikakan alasan dan penalaran yang logis. Selanjutnya penulis menyarankan untuk dilakukannya penelitian serupa dengan rentang waktu yang lebih panjang dan jangkauan wilayah penelitian yang lebih luas. Lebih lanjut juga dapat melakukan penelitian pada siswa SMA agar dapat dibandingkan sehingga dapat dipahami apakah terdapat perbedaan signifikan dalam kemampuan literasi matematis di kedua jenjang sekolah. Dengan demikian hasil yang diperoleh dapat mewakili untuk dijadikan dasar dalam mengambil keputusan seperti pengembangan strategi pembelajaran yang lebih inklusif dan efektif di lingkungan pendidikan.

**Kata kunci:** literasi matematis, gender, meta-sintesis

### INTRODUCTION

Mathematics is a universal science that underlies the development of modern technology, plays an important role in various disciplines, and the development of human

thinking (Mulyono et al., 2016). Mathematics as a scientific discipline has an important role to create change. explained that mathematics can be used as a tool to solve various problems in everyday life. Even with mathematics, humans can change the way of thinking, see different points of view, and be able to organize and analyze events Mirari and Sutarni (2022).

Based on Permendikbud No. 64 of 2013 through mathematics learning students are expected to show a logical, critical, analytical, careful and meticulous attitude, responsible, responsive, and not easily give up in solving problems. Meanwhile, the *National Council of Teachers of Mathematics* (NCTM, 2000) formulated mathematics learning objectives called *mathematical power* including: (1) learning to communicate (*mathematical communication*), (2) learning to reason (*mathematical reasoning*), (3) learning to solve problems (*mathematical problem solving*), (4) learning to associate ideas (*mathematical connection*), and (5) learn to represent (*representation*). NCTM formulated five categories of competencies that can be expressed in mathematical literacy (Tasekeb et al, 2019). *The Programme for International Student Assessment* (PISA) defines mathematical literacy as the capacity of learners to recognize and understand the role of mathematics in the world, solve mathematical problems in a variety of contexts, interpret mathematical statements, and apply mathematics rationally (OECD, 2016). There are seven basic mathematical abilities that are indicators of mathematical literacy, communication; mathematising; representation; reasoning and argument; devising strategies for solving problems; using symbolic, formal, and technical language, and operations; using mathematical tools.

Based on the results of Indonesia's participation in PISA held on Based on the results of Indonesia's participation in PISA held in 2022, the mathematical ability of Indonesian students obtained a score of 366 which is in position 68 out of 81 countries (OECD, 2023). Meanwhile, based on the results of Indonesia's participation in PISA in 2018, the mathematical ability of Indonesian students received a score of 379 with a position of 73 out of 79 countries. The low mathematical literacy of Indonesian students can also be seen from Click or tap here to enter text. (OECD, 2019) TIMSS survey results (*Trends in Mathematics and Science Study*) hosted by *International Association for the Evaluation of Educational Achievement* (IEA) in 2015, Indonesia was ranked 44 out of 47 countries with an average student score of 397.

In relation to the understanding of mathematical literacy, there is a difference in understanding the ability that concerns between male and female (Awalyah et al., 2022). Such gender differences can affect the level of mathematical literacy of learners (Isnaniah et al., 2021; Kamila, 2018; Laksari et al., 2023; Setiawan et al., 2019). Click or tap here to enter text.. Risyavandha & Khabiba (2018) Explaining gender differences causes physiological and psychological differences in learning so that male and female learners have differences in learning mathematics. Ulfa (2022) suggests that female students have better literacy than male students, especially in content *space and shape*. This is because female students are more thorough and able to explain well the steps in solving mathematical literacy problems both in writing and verbally. On the other hand, Research conducted by Isnaniah et al., (2021) shows that the mathematical literacy of male students is superior to female students.

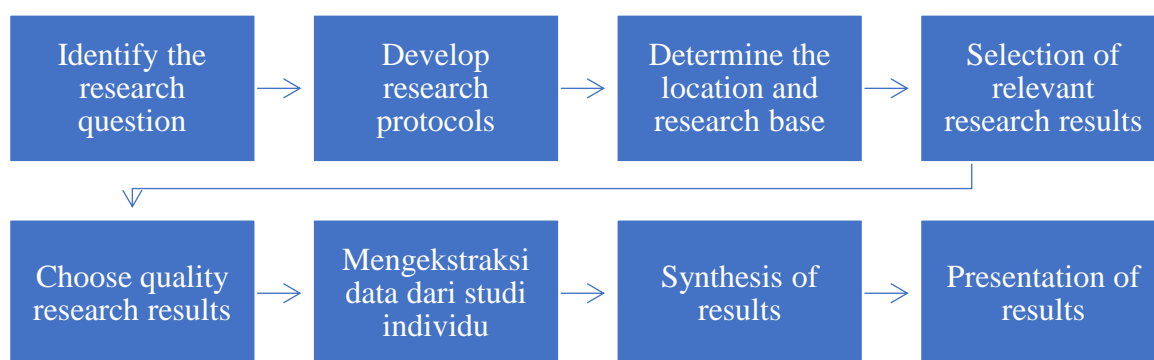
The focus of this research is to analyze various primary studies on similar topics to get a conclusion. The purpose of this study is to see and describe how mathematical literacy differences between male and female students. This explanation shows the importance of conducting a comprehensive meta-synthesis of mathematical literacy in terms of gender differences in junior high school students from 2019 to 2024. This is used to see the characteristics of students' mathematical literacy in terms of gender differences in junior high school students as a whole clearly and deeply.

## METHODS

This study uses a meta-synthesis study (*Systematic review*) which aims to answer research questions by summarizing various research results that have been carried out and recognized their validity (Walsh et al., 2005). Meta-synthesis is a relatively new technique for analyzing qualitative data derived from various individual studies with the aim of reanalyzing the results of these studies or can be interpreted to summarize various studies. Krisnawati et al., (2022) assuming that meta-synthesis can be an attempt to understand various advances in research that are growing rapidly.

Based on Perry & Hammond (2002), there are eight stages in conducting research using meta-synthesis. Click or tap here to enter text. First, identify the research question. This study aims to transform mathematical literature problems in terms of gender differences into a research question. Second, develop research protocols that provide guidance in conducting metasynthesis. Third, set the location *Research Results Database* as search area. In this study,

researchers provide limits on the search area for relevant research results through *Internet search of Google Scholar* from 2019-2024 . Research data obtained from the search results of scientific journals in *google Scholar* with the keywords "mathematical literacy" and "gender". Fourth, selection of relevant research results, that is, the researcher collects research results relevant to the research question. Fifth, choose quality research results. At this stage the researcher excludes and includes the research to be included based on quality. Sixth, data extraction from individual research, data mining from individual research to obtain important findings. Seventh, synthesis of results by meta-analysis methods (when possible), or narrative methods (when not possible). Eighth, the presentation of the results is to write the results of the research in a metasynthesis report document. Broadly speaking, the research flow is shown in Figure 1.



**Figure 1 Research Flow Chart**

## RESULTS AND DISCUSSION

The study began by identifying a research question, namely researchers transforming mathematical literacy problems to gender differences in junior high school students. Next, a research protocol was created to perform meta-synthesis. The placement of the research database as a search area is carried out by providing search area boundaries through Google Scholar in 2019-2024 so that several relevant research results are obtained. Research data is obtained from the search results of scientific journals on Google Scholar with the keywords "mathematical literacy" and "gender". Furthermore, eight quality studies were selected. The eight studies are listed in table 1 below.

**Table 1 List of Analyzed Articles**

No.	Title	Writer
1.	Analisis Kemampuan literasi Matematis Siswa dalam Penyelesaian Soal PISA Ditinjau dari Gender	(Setiawan et al., 2019)
2.	Analisis Kemampuan Literasi Matematis Siswa SMP Di Kabupaten Konawe Dalam Perspektif Gender	(Mahiuddin et al., 2019)
3.	<i>Mathematical Literacy Ability Viewed From Student's Learning Style Based on Gender Differences on PBL Assistance Project Assessment</i>	(Aula et al., 2019)
4.	<i>Mathematical Literacy Abilities: Study on Elementary and Junior High School Students in Lampung Tengah Regency in Term of Gender</i>	(Kadaritna et al., 2020)
5.	Analisis Kemampuan Literasi Matematis Siswa Kelas VIII SMP Ditinjau dari Perbedaan Gender	(Ulfa Sari, 2022)
6.	Kemampuan Literasi Matematis Materi Koordinat Kartesius Berdasarkan Gender di MTS Swasta Sholihin	(Mawarti & Desniarti, 2023)
7.	<i>Students' Mathematical Literacy Skill in term of Gender Differences: A Comparative Study</i>	(Suprpto et al., 2023)
8.	Analisis Kemampuan Literasi Matematika Siswa dalam Menyelesaikan Soal PISA Ditinjau dari Gender	(Rismayanti et al., 2024)

The next step is to extract research data to obtain findings related to the topic of discussion. The analysis of the eight selected articles will be described alternately according to the components to be analyzed in each article. Important factors that will be analyzed in each assessment include research objectives, research subjects, and research results obtained. Once the data is collected, it is integrated into a new result that will be described in this section. The data were processed according to the steps previously described to obtain important results from mathematical literacy research based on gender differences. Below are presented the results of his research

**Table 2 Analysis Results**

No	Title	Results
Prima: Jurnal Pendidikan Matematika		Vol. 8, No. 2, May 2024, 478 - 492

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- 1 Analisis Kemampuan literasi Matematis Siswa dalam Penyelesaian Soal PISA Ditinjau dari Gender

This research aims to determine students' mathematical literacy in terms of students' gender class VIII A Year Teachings 2018/2019 Muhammadiyah Middle School 8 Batu. Based on results test literacy mathematical against 37 students consisting of 21 students men and 16 students female, literacy mathematical student male and female has fulfill 7 indicator literacy mathematical. The mathematical literacy of male students can be said to be good, which can be seen from the students' accuracy in determining the steps for solving and drawing conclusions about test questions. That matter This was confirmed during the interview session, the male students were able to explain again the steps to solve the problem that had been written down confidently. The mathematical literacy of female students can also be seen from the ability of female students to determine the steps for solving and summing up test questions well and can re-explain the solution steps that were written down during the interview. However, what is different is the students Woman tends to be more or less believe self in convey the argument .
  - 2 Analisis Kemampuan Literasi Matematis Siswa SMP Di Kabupaten Konawe Dalam Perspektif Gender

The aim of this study For analyze literacy mathematical junior high school students in the district Konawe , represented by 3 schools accredited A, B, and C. School the ie SMP Negeri 1 Sampara , SMP Negeri 1 Wawotobi and SMP Negeri 1 Unaaha . Male students at SMP Negeri 1 Sampara are weak in formulating and planning strategies and are superior in communication competence, mathematization and use of symbols, formal language, techniques and use of operations, SMP 1 Wawotobi are weak in formulating and planning strategies and are superior in communication competence, and SMP Negeri 1 Unaaha is weak in the reasoning and argument section and superior in communication competence. Female students at SMP Negeri 1 Sampara are weak in formulating and planning strategy and are superior in the competency of using symbols, formal language, techniques and use of operations, SMP 1 Wawotobi are weak in formulating and planning strategy and are superior in competency in using symbols, language. formal, techniques and use of operations, and SMP Negeri 1 Unaaha is weak in formulating and planning strategies and superior in communication competence.
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- 3 Mathematical Literacy Ability Viewed From Student's Learning Style Based on Gender Differences on PBL Assistance Project Assessment Study held with the aim of knowing literacy mathematical students at SMP Negeri 6 Semarang based on gender and style learn it . Results obtained by students a Woman with a visual learning style are able to master communication, mathematics and representation indicators . Students are able to express ideas according to the problem, change from real problems into a complete mathematical form and provides information through the images created. Mathematical literacy indicators for designing problem solving strategies need to be improved because students have not made the right decisions strategy to solve the problem in a way written . Female student with learning style auditors are able to master communication and mathematics . Students in problem modeling real mathematical form that is detailed enough so that students understand the meaning of the problem and do not experience difficulty in understanding the problem. Meanwhile, the reasoning and argumentation indicators need to be improved because students do not draw conclusions on the answer sheets as to which answer is correct. For female students with a kinesthetic learning style, s students are able to master communication and conduct mathematical modeling well. In the communication aspect, students with a complete kinesthetic learning style do not experience difficulties in understanding problems and can model real problems in mathematical form, while indicators of mathematical literacy using symbolic, formal, technical language and its operation need to be improved. In the auditory learning style category male students, they are able to master communication indicators, mathematics, and reasoning and argumentation. On the answer sheet, students are able to state what information is known and asked for in solving the problem, write a mathematical model that is appropriate to the problem, and provide a complete conclusion. The representation and use of indicators using symbolic, formal, technical language and operations need to be improved because students have not used pictures to clarify problem solving, are less clear in the use of mathematical symbols and inappropriate numbers. In male students with kinesthetic learning style, an indicator of students' mathematical literacy good at communication and

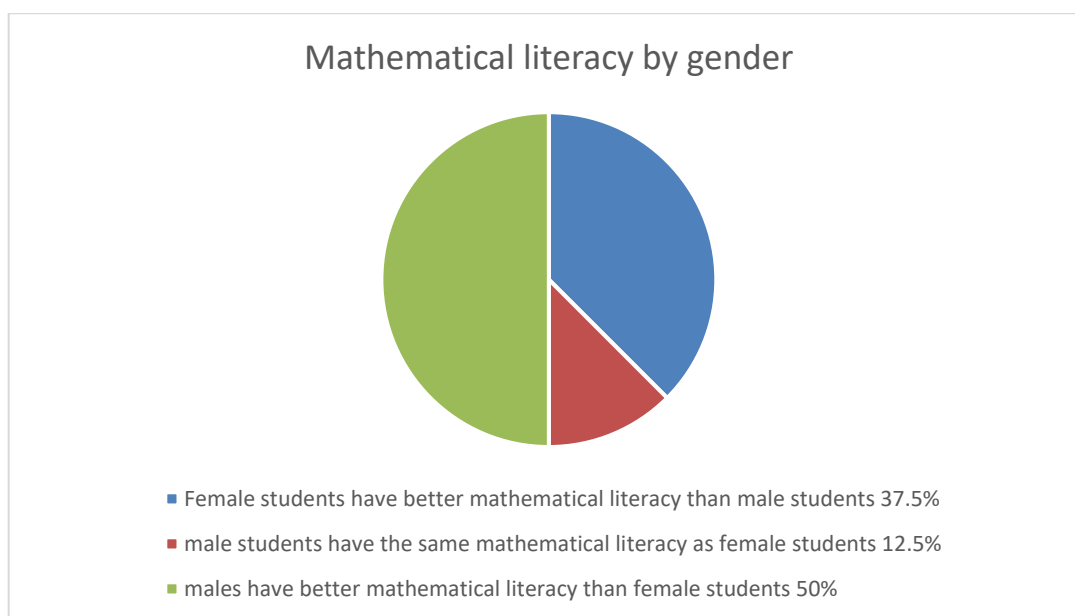
- mathematics. Learners No difficulty in modeling real problems. The representation indicator needs to be improved because it does not use images to clarify the solution to the given problem, and is not yet maximal in the use of symbols.
- 4 Mathematical Literacy Abilities: Study on Elementary and Junior High School Students in Lampung Tengah Regency in Term of Gender This research was conducted to student class IX junior high school in Central Lampung Regency to find out literacy mathematical his students If seen from gender differences. The result shows the average student men are lower compared to student Woman reviewed from total and majority aspects Skills mathematics base. Student men are superior compared student Woman in matter use Language symbolic, formal and technical operation as well as reasoning and argumentation. Highest achievement ability base mathematics in students woman and male is on aspect communication, meanwhile achievement Lowest is in reasoning and aspects argument. This means that students are better in communicate draft mathematics in various method.
- 5 Analisis Kemampuan Literasi Matematis Siswa Kelas VIII SMP Ditinjau dari Perbedaan Gender The aim of this study for analyze literacy mathematical student class VIII of SMP Negeri 2 Kendari seen from gender differences. As a result, female students with mathematical literacy in quantity content were able to go through the stages of communication, mathematization, formulating and planning strategies but were not yet able to use mathematical tools. In the Space and Shape content, students are able to go through the stages of communication, mathematization, representation, formulating and planning strategies and are able to use mathematical tools. And in the change and relationships content, students are able to go through the communication stage, but are not yet able to go through the stages of mathematization, representation, formulating and planning strategies, understanding language, using symbols and carrying out formal operations and using mathematical tools. Temporary s male students with mathematical literacy in quantity content are not yet able to go through the communication stage, but are able to go through the mathematization stage, formulate and plan strategies but are not yet able to use mathematical tools. In the Space and Shape content, students are not yet able to go through the communication stage, but are able to go through the mathematization, representation, formulating and planning strategies and are able to use mathematical



- tools. In the content of change and relationships, students are able to go through the stages of communication, mathematization, representation, formulating and planning strategies, understanding language, using symbols and carrying out formal operations and using mathematical tools.
- 6 Kemampuan Literasi Matematis Materi Koordinat Kartesius Berdasarkan Gender di MTS Swasta Sholihin Study This carried out at Private MTS Sholihin to student class VIII-1 2022/2023. Based results test, students male own literacy mathematics above student Woman with achievement literacy, that is student man find presentation by 81% and among students Woman his presentation by 71%. By whole student class VIII-1 has ability in create pattern connection from Meaning question until find A capable conclusion they responsibility answer in a way good. In visualize formulation problem, identify, plan the solution as well as use symbol There 's also existing mathematics good. The students Still own error in make conclusion their answer do it. However they Already understand How Meaning from questions and make design the solution.
- 7 Students' Mathematical Literacy Skill in term of Gender Differences: A Comparative Study This research was carried out to junior high school students in Madiun for know literacy mathematical student seen from gender. The results showed that male and female scored very high on the ability to use mathematical symbols, while male and female tended to get low scores on the skills components of modeling, mathematical communication and problem solving, as well as mathematical thinking and reasoning. However, different results were found in representational abilities where female students got very high scores, while male students got low scores on this ability component. Results Between female and male students, significant differences were found in all components of mathematical literacy abilities. Male students outperform female students in two components, namely the use of mathematical symbols and mathematical thinking and reasoning abilities, while female students outperform male students in four components, namely representation, modeling, mathematical communication, and the ability to determine . problem solving strategy . From these results it can be said that female students' mathematical literacy is much higher than male students .
- 8 Analisis Kemampuan Literasi Matematika This research was carried out at UPT SMP Negeri 1 Malangke. Based on results research, subject male

Siswa dalam capable use indicator competence literacy Menyelesaikan Soal mathematics that is do modeling on competencies PISA Ditinjau dari mathematization, use language and operations formal Gender and technical symbolic, designing strategy for solve issues and representation. Subject male capable reach four competence literacy mathematics from six competence literacy mathematics used. Subject Woman capable use indicator competence literacy mathematics that is competence use language and operations formal and technical symbolic , designing strategy For solve issues and representation . Subject Woman capable reach three competence literacy mathematics from six competence literacy mathematics used.

The results of the analysis of the eight articles found that there were three conditions that occurred, namely: (a) male students have the same mathematical literacy as female students (Setiawan et al., 2019), (b) male students have better mathematical literacy than female students (Mahiuddin et al., 2019; Ulfa Sari, 2022; Mawarti & Desniarti, 2023; Rismayanti et al., 2024), (c) female students have better mathematical literacy than male students (Aula et al., 2019; Kadaritna et al., 2020; Suprpto et al., 2023). The percentage of literature study results related to mathematical literacy based on gender is presented in Figure 2.



**Figure 2 Percentage of Mathematical Literacy by Gender**

From the results of the study, it is known that the mathematical literacy of male students is better than the mathematical literacy of female students, reaching 50%, 37.5% of the results of the study concluded that female students have better mathematical literacy than male students, and as many as 12.5% showed male students have the same mathematical literacy as female students. This is in accordance with previous research conducted by Isnaniah et al., (2021), male students that the mathematical literacy of male students is superior to female students. The description of mathematical literacy based on gender differences is outlined as follows. [Click or tap here to enter text.](#)

### **Mathematical Literacy of Male Students**

Male students tend to have better mathematical literacy. Of the seven indicators of mathematical literacy, male students have been able to meet four to seven indicators. Male students have been able to perform communication skills, mathematization, representation, and use language and symbolic operations. Students are able to read and interpret statements, questions, and objects in a problem and can write down the information completely so as to communicate the results of the solution correctly. They are able to turn real problems into mathematical form or vice versa. Male students also tend to be able to write and use mathematical symbols in problem solving. In restating a problem, they tend to be able to do so. It is even accompanied by pictures to clarify the solution. In this regard, most are able to use mathematical tools. On the other hand, male students need to improve their skills in terms of determining problem-solving strategies and providing logical reasons.

### **Mathematical Literacy of Female Students**

Of the seven indicators of mathematical literacy, female students have been able to meet three to seven indicators of mathematical literacy. Female students have been able to perform communication, mathematization, and representation skills. In terms of communication skills, students are able to communicate the results of the solution correctly even though they are shy when explaining verbally. They can already do mathematical modeling, which is to turn real problems into mathematical form or vice versa. They can already present a problem in the form of pictures, diagrams, and so on to clarify the solution. This means they can use mathematical tools. Some other indicators, such as writing and using mathematical symbols in problem solving, the ability to determine problem-solving

strategies, and providing reasoning and logical reasoning are still poorly mastered by female students.

## CONCLUSION

Based on this literature study, it can be said that male students have a tendency to have better mathematical literacy than female students. Of the seven indicators of mathematical literacy, male students are able to master four to seven indicators. Meanwhile, female students can only meet three to seven indicators. Male and female students have equally fulfilled communication, mathematization, and representation skills. Both also need to improve their ability to determine problem-solving strategies and provide logical reasoning and reasoning. Furthermore, the authors suggest that similar research be carried out with a longer time span and a wider range of research areas. Furthermore, it can also conduct research on senior high school students so that they can be compared so that it can be understood whether there are significant differences in mathematical literacy skills at both school levels. Thus, the results obtained can be represented to be used as a basis for making decisions such as the development of more inclusive and effective learning strategies in the educational environment.

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