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Mathematic Resilience Ability of Students in Linear Program Material with Blanded Learning in the Era of Pandemic

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ABSTRACT

Mathematical resilience is a multidimensional construct in positive psychology focusing on mental health. The education system in Indonesia changed the 2019 Novel Coronavirus (COVID-19) pandemic. This pandemic event provides an opportunity for academics to take further academic decisions in the future. Good mathematical resilience skills are needed to prepare students to carry out the Tri Dharma of Higher Education. The purpose of this study is to comprehensively examine mathematical resilience skills using a blended learning model during a pandemic. This type of research uses case study research and is descriptive. The research was conducted on fourth-semester students of the 2020-2021 academic year at a private university in Cirebon, West Java, with research subjects consisting of 37 students. The data was obtained from a mathematical resilience questionnaire in linear program lectures using a blended learning model. Collecting data using a questionnaire instrument was analyzed using the formula for the distribution of frequencies and percentages. The results showed that students' mathematical resilience skills using blended learning in the Linear Program courses during the Covid-19 pandemic were good; previous research on the Linear Program courses obtained good results of resilience abilities but in different samples. The existence of the Covid-19 pandemic does not have much effect on mathematical resilience abilities.

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A. INTRODUCTION

The Committee for Handling Covid-19 and National Economic Recovery (KCP PEN) conveyed that since the end of December 2019 the Covid-19 pandemic outbreak began to spread in the world which was thought to have originated from China (MacKenzie & Smith, 2020), in Indonesia in July 2021 there were 2,313,829 cases, with a death toll of 61,140. The spread of Covid-19 in Indonesia has had a major impact on the world of education. Higher Education Institutions are required to conduct lecture activities remotely, where lecturers carry out lecture activities, and students remain at home. This resulted in a lecturer being required to design lectures by utilizing online media. The Minister of Culture's decision

regarding Circular No. 4 of 2020 concerning the Implementation of Education Policies in the Emergency Period for the Spread of Covid-19.

One of the efforts to contain its spread is temporarily closing schools from PAUD to tertiary levels. This is in line with the Minister of Education and Culture Number 719/P/2020 concerning Guidelines for Curriculum Implementation in Education Units in Special Conditions. As a result of this decision, educational institutions facilitate the learning process to keep it going by implementing learning from home (Irfan et al., 2020).

Learning Management System (LMS) and video web conferencing as part of information technology now have a strategic role in learning and learning theory. These products are now an important element of learning during a pandemic. To be honest, lecturers' digital literacy skills have increased compared to before the pandemic during the pandemic. This can be seen from the intensity of lecturers in using LMS and video web conferencing, which has increased sharply compared to before the pandemic. However, without realizing it, the role of lecturers as a source of learning is increasingly being rivaled by the existence of social media, the internet, and television, especially during a pandemic like today. Many schools have used advanced information technology to produce effective learning experiences (Berrett et al., 2012; Inan et al., 2010). However, the use of this platform is less effective. It sometimes does not succeed in achieving the student's abilities to be achieved (Phillips, 2000) even to this day, the biggest problem that arises as a result of learning from home that is applied for more than one year is loss learning (Kasih, 2021; Subagya, 2021). Although educational technology has been considered commonplace in most schools for some time, including during this pandemic (Becker et al., 1999), for the most part, the integration of technology into learning remains limited (Delgado et al., 2015; Spector, 2001).

Based on the results of interviews with several lecturers at a private university in Cirebon City, it was stated that student participation during online lecture activities took place, where students' level of discipline and seriousness to attend lectures decreased. At the time of the evaluation, the lecturer had difficulty judging because the supervision of the exam was not carried out directly, and the level of honesty of students in completing the exam could not be ascertained. Access to information is constrained during lecture activities with internet signal interference causing delays in accessing information, resulting in students faltering when attending lectures by video conference and being late to collect assignments given by lecturers; this statement is reinforced by the results (Basar, 2021).

An alternative solution during a pandemic is to organize online learning (Basilaia & Kvavadze, 2020; Bauerlein, 2008; Laprairie & Hinson, 2006). One of online learning is blended learning, which combines material delivery methods and various technology-based media through direct education (face-face). Blended learning is good online learning, where face-to-face activities are structured and real-world. Lectures with Blended Learning are supported by infrastructure and info-structure specifically for LMS. Through LMS services, lecturers and students can carry out teaching and learning activities face-to-face (offline) and online (online). Technology and all forms of development provide flexibility in choosing the time and place to access lessons. The results showed that through blended learning, there is the potential to improve student learning outcomes and reduce the number of students who drop out of school (Scarpello, 2007). The results of this study are supported by (Fitria et al., 2016)

who reveals that information services through blended learning effectively increase student motivation. Blended learning is one of the learning methods by combining the advantages of face-to-face learning with virtual/virtual or online learning (Hermawanto et al., 2013).

Most mathematics education study program students come from various secondary schools, either general or vocational. Based on this, students' ability in one class is quite diverse, thus requiring lecturers to be more creative in delivering lecture material to facilitate student understanding. Material factors or the learning process may influence the lack of liking for mathematics. In terms of material, mathematics is an abstract science (Santoso, 2017; Szczygieł, 2021). Mathematics will feel more abstract if the material is made away from everyday life. Seventy-five percent of Americans stop studying mathematics and move away from professions related to mathematics, and the main factor is anxiety about mathematics (Akinsola, 2008; Levy et al., 2021; Scarpello, 2007; Szczygieł, 2021). Explaining arithmetic operations as far as possible begins by using real objects, pictures, or diagrams related to real-life (Leonardo & Supardi, 2010; Malik et al., 2021). Then proceed to the second stage, a model, and ends at the symbolic stage. Students who attend lectures come from almost all walks of life with diverse abilities.

Learning mathematics, which is quite abstract, strongly influences anxiety and learning outcomes, resulting in mathematical resilience abilities. Anxiety when learning mathematics has the most negative relationship with solving mathematical problems (Ramirez et al., 2016). Supported by the results of research (Putra et al., 2019), which explained that students with high cognitive capacity avoided using problem-solving strategies in mathematics when they were in high math anxiety. Students with high mathematical resilience abilities will find it easier to overcome obstacles in learning mathematics and solve difficult math problems (Zanthy, 2018).

Students can grow their confidence through mathematical resilience. Mathematics is not an obstacle; they will try to defend themselves until they succeed when there are obstacles or difficulties. Students who have high resilience abilities will help their friends according to their abilities. This aligns with (Yeager & Dweck, 2012) opinion that mathematical resilience is an emotional response to academic or social challenges useful for building positive things.

Based on observations in the field during lectures on Linear Program material for students in the 2019-2020 academic year, few students feel stressed, worried, or anxious when attending lectures with exact material content that requires them to think harder. The interviews with several students said that they felt it was quite difficult to learn explicit material during a pandemic like this. These results are in line with previous research showing that levels of psychological distress are increasing in the university population, with many studies showing the negative impact of these difficulties on the student experience of studying at the university level (Scarpello, 2007). According to a survey conducted by the American College Health Association (2018), about 30% of college students indicated experiencing depression, with an additional 50% reporting experiencing multiple events.

Students experience much anxiety, fear when attending lectures, especially lectures with explicit material. The academic ability of students during the pandemic has decreased, academic stress is the cause, the face-to-face learning process turns online quickly, some difficulties are classified as technical difficulties, adaptation difficulties, and teacher

unpreparedness (Andiarna & Kusumawati, 2020; Annur & Hermansyah, 2020). This is due to different educational backgrounds, some from social studies majors and even from vocational schools, so students' mathematical resilience abilities are still lacking. Research related to mathematical resilience abilities had been carried out before the pandemic, but after the pandemic outbreak for linear programming courses at the freshman level was carried out. The students studied previously had never been studied or analyzed regarding their resilience abilities for any subject, so the research results obtained were considered new.

In 2021 during the pandemic, several studies of mathematical resilience abilities have been carried out, (Harianto & Isweliyah, 2021) examining mathematical resilience abilities at the junior high school level. The research method used is descriptive qualitative. The results obtained are the ability of students' resilience to high mathematics during online learning. Furthermore (Tambunan, 2021) examines the effect of mathematical resilience ability on mathematics achievement at the junior high school level, this study uses the post facto method which is carried out in junior high schools. In the same year (Ifthinah & Kusdiyati, 2021) studied at the high school level using the causality method of convenience sampling technique. Respondents were high school teenagers in West Java Province, amounting to 680 people. The results showed that resilience had a positive effect on students' mathematics achievement. Several studies have been carried out at the junior and senior high school levels. Research conducted by researchers in this study involved students to measure mathematical resilience with linear programming material and no previous research had been carried out, especially during a pandemic.

Some students in understanding lessons rely on initial abilities that provide memory for students to find the information they need and when they need it (Caillies et al., 2002). Students in understanding the subject matter are influenced by their initial abilities (Kendeou & van den Broek, 2007). Initial ability is considered an accumulation of intelligence possessed at the beginning of lecture material that can be used where and when appropriate. Initial ability is students' ability to master further knowledge (van Blankenstein et al., 2013). Individual initial ability becomes an important prerequisite for constructing individual abilities. Learning outcomes and activation of early abilities can increase learning tasks related to previous initial abilities (Wetzels et al., 2011). This is in line with the opinion that it is important to detect initial abilities as supporting data for formulating policies that benefit all students (Thompson & Zamboanga, 2004). Lack of some basic level of relevant prior knowledge may be detrimental to future learning, as the current results show (van Blankenstein et al., 2013).

Students who have high resilience when experiencing difficult conditions have high motivation to achieve their academic achievements. In contrast, students who have low resilience consider that the difficulties they face are a burden on their lives so that the burden is considered a threat and quickly gets frustrated (Zanthy, 2018). Resilience educates students to use mathematics and fiction mathematically. Students need to develop a positive adaptive attitude towards mathematics that will enable them to continue to learn and pose obstacles. A positive adaptive attitude towards mathematics is mathematical resilience (Johnston-Wilder & Lee, 2008).

The final UAS score for the Linear Program courses for the previous batch of students obtained low learning outcomes in the courses. This course is one of the subjects mostly presented in a constructive form of abstraction. To facilitate student understanding, it is necessary to present innovative lecture materials for students as prospective teachers. The use of blended learning is expected to be a solution to improve mathematical resilience abilities during a pandemic. The purpose of this study was to comprehensively examine students' mathematical resilience skills using a blended learning model during a pandemic.

1. Mathematical Resilience

Mathematical resilience is a persistent or persistent attitude in facing difficulties, working or studying collaboratively with peers, having language skills to express mathematical understanding, and mastering mathematical learning theory (Yeager & Dweck, 2012) Mathematical resilience is defined as a quality attitude in learning mathematics that includes confidence in success through hard work, perseverance in facing difficulties, willingness to discuss, reflect, and research (Johnston-Wilder & Lee, 2008). So that mathematical resilience allows students to overcome obstacles and difficulties in learning. Mathematics adapts to unfavorable and uncomfortable environments, even to less favorable ones.

Resilience reduces the risk of psychological stress, helps manage academic demands, improves academic outcomes while facilitating effective coping strategies when dealing with academic stress (Abbott et al., 2009). The statement lacks resilience; the stress faced by students can be negative, resulting in affecting their mental health, increasing psychological stress, and producing greater adjustment problems (Edwards et al., 2001). From several expert opinions, it can be concluded that resilience is an individual's ability to overcome difficulties and successfully adapt to their environment, which includes a series of dynamic traits, outcomes, or processes involving exposure to stress or adversity, followed by successful adaptation.

2. Blended Learning

There are many challenges with implementing and implementing blended learning. Implementation of various reasons in higher education such as responding to the need for more flexible and personalized curricula (Jonker et al., 2018), responding to diversity by using teaching (Boelens et al., 2018), or increasing engagement and activeness (Mestan, 2019; Vanslambrouck et al., 2018).

Various factors that influence implementing blended learning have been investigated in previous studies. Institutional transition to the implementation of blended learning has been studied (Caillies et al., 2002), while (Graham et al., 2013) examined how organizational policies and strategies, structural problems of blended learning. Much research has focused on studying blended learning design (Owston & York, 2018; Tsankov & Damyanov, 2017) or on students' perspectives and contexts (Vanslambrouck et al., 2018). However, teachers have a significant influence (Guskey, 2002).

The teacher's journey towards implementing blended learning requires more than just acquiring new skills or changing pedagogical roles (Philipsen et al., 2019). Addressing teachers' beliefs about technology and pedagogy, for example, is also important (Gerbic, 2011; Philipsen et al., 2019). In addition, transferring new learning processes into teacher practice is

inseparable from their emotions, such as feelings of lack of confidence (Howard & Mozejko, 2015).

Teachers face many challenges when using blended learning, such as teaching new and technological skills, dealing with changing pedagogical roles, or overcoming the risks associated with delivering courses in a mixed format (Vaughan, 2010). These factors influence teacher decisions and actions (Timperley, 2008), including implementing and designing blended learning. of blended learning and redesigned their courses successfully (Alammary et al., 2014). On the other hand, despite good intentions, teachers fail to adopt blended learning due to internal or external influences such as lack of time or increased instructional workload (Brown, 2016). Therefore, it is necessary to carry out in-depth research on the quality and characteristics of teachers that influence the two-way implementation process, which is very important to build a sustainable anchoring of blended learning pedagogy in schools. Learning syntax using a blended learning model adapted from (Ramsay, 2001) includes:

a. The seeking information phase. Searching for information from various sources of information available in ICT (online), books, and delivering/demonstrating empirical scientific phenomena face-to-face in class.
b. Phase: acquisition of information. Interpreting and elaborating personal and general information.
c. Phase: synthesizing of knowledge. Reconstructing knowledge through assimilation and accommodation starts from the results of analysis, discussion, and conclusions from the information obtained.

Blended learning includes several things (Graham, 2004), namely (1) combining various modalities of learning media, (2) combining various learning methods, learning theories, and pedagogical dimensions, (3) combining online learning with face-to-face (learning face to face). The more students/students practice using language, the deeper their understanding (Eggen et al., 2012). If the lecturer explains, students may or may not understand, but if students say it, they will most likely understand it. As stated (Silberman, 2014) reveals that someone will tend to forget what they hear easily, but those who teach it to others will understand it better or master it. The three main reasons why the blended learning model is chosen in universities (Graham, 2004) are the improvement of pedagogy, increased access and flexibility, and increased cost-effectiveness. Blended learning aims to combine face-to-face classroom learning experiences with online learning experiences. Overall, the blended learning model integrates so-called e-learning, task delivery tools, and techniques with traditional face-to-face teaching.

B. RESEARCH METHODS

This research uses a qualitative approach with the type of research is case study research (case studies) and is descriptive. The single case design used is a case study research that emphasizes research only on a single case unit. The data was obtained from the mathematical resilience ability questionnaire from lectures through blended learning. This research was conducted on fourth-semester students of the 2020-2021 academic year at a private

university in Cirebon, West Java. Sampling in this study used the technique of accidental sampling. The research sample consists of 37 students who were divided into three groups. The grouping of prior knowledge is seen from giving a final test in the Algebra Matrix course, which is prerequisite material for the Linear Program course. From the results, obtained values are then divided into three groups based on the level prior knowledge of student ability. Students are then given a mathematical resilience ability questionnaire using a Likert scale. The group division is as shown in the following Table 1.

Table 1. Division of Mathematics Ability Groups Based on Prior Knowledge

Group	Total
Top	10
Middle	19
Low	8

Based on Table 1. the prior knowledge group division, the upper group consisted of 10 students, the middle group 19 students, and the lower group 8 students. Most students are in the middle group. The findings were analyzed to comprehensively describe and interpret resilience and mathematical resilience through blended learning model lectures. The findings are then analyzed for a comprehensive description and interpretation of resilience capabilities. The data is analyzed through a data reduction process by summarizing, choosing the main things, focusing on the important things. Furthermore, the data is presented in narrative text, making it easier to understand what happened. The last step is drawing conclusions and verification.

C. RESULT AND DISCUSSION

The results of the analysis of mathematical resilience abilities are analyzed as a whole, based on prior knowledge and indicators, including six indicators. Each indicator is divided into several statements with positive and negative statement categories. In general, for each group prior knowladge, there is no significant difference in resilience abilities using the blended learning model in linear programming courses, this can be seen from the results of the following research.

1. Resilience capability of each indicator

In the case of resuscitation, the mathematical analysis of each indicator can be determined by the present setup indicator. As shown in Table 2.

Table 2. Recapitulation of the Percentage of Mathematical Resilience Ability Questionnaire using Blended Learning Linear Program Courses

	Percentage of Questionnaire Results				
	SS	**S**	**TS**	**STS**	**Total**
1	Perseverance, confident/confident, hard-working, not easy to give up facing problems, failure to uncertainty.				
	18,52	69,17	11,48	0,83	100,00
2	Shows the desire to socialize, easy to give help, discuss with peers and adapt to their environment.				
	24,26	71,23	4,51	0,00	100,00

	Percentage of Questionnaire Results				
3	Using the experience of failure to build self-motivation				
	24,55	64,44	10,47	0,54	100,00
4	Have curiosity, reflect, research, and utilize a variety of sources.				
	10,87	57,88	26,09	5,16	100,00
5	Dare to try new ideas to solve mathematical problems				
	25,24	49,51	24,27	0,97	100,00
6	Have the ability to control yourself, aware of your feelings.				
	22,71	73,36	3,49	0,44	100,00

Results from Table 2. Recapitulation of the Percentage of Mathematical Resilience Ability Questionnaires using Blended Learning Linear Program Courses, namely Perseverance, confidence/confidence, hard working, not easily giving up facing problems, failure to uncertainty 69.17% of students agreed, showed a desire to socialize, easy to give help, discussed with their peers, and adapted to their environment 71.23% of students agreed, using the experience of failure to build self-motivation 64.44% of students agree, have curiosity, reflect, research and utilize various sources 57, 88% of students agree, dare to try new ideas to solve mathematical problems 49.51% stated agree, can control themselves, are aware of their feelings 73.36% agree. Each indicator of mathematical resilience ability is analyzed by the largest percentage of average agrees. This shows that students' mathematical resilience ability is good for each indicator. Comparison of cumulative percentage of response questionnaires students towards lectures with blended learning in linear programming courses are as follows as Shown in Table 3.

Table 3. Comparison of the Percentage of Students' Mathematical Resilience Ability in Lectures with Blended Learning

Indicator	Percentage	Interpretation
1. Diligent attitude, confident/confident, work hard and do not give up easily when facing problems, failure, or uncertainty.	73,0 %	Good
2. Shows the desire to socialize, easy to give help, discuss with peers and adapt to their environment.	78,0 %	Very Good
3. Using the experience of failure to build self-motivation	74,9 %	Good
4. Have curiosity, reflect, research, and utilize various sources.	62,2 %	Good
5. Dare to try new ideas to solve mathematical problems	69,6 %	Good
6. Have the ability to control yourself, aware of your feelings.	77,4 %	Very Good
Cumulative	72,49	Good

In Table 3. above is the result of the recapitulation of the Comparison of the Cumulative Percentage of Students' Mathematical Resilience Ability in Lectures with Blended Learning with a cumulative percentage of 72.49%. With details as much as 78% in the very good category, students have a sense of desire to socialize, are easy to assist, discuss with their peers and adapt to their environment. Having the ability to control themselves, being aware of their feelings as much as 77.40% is very good, and for other indicators it is in the good category. Based on these findings, it can be concluded that students whose lectures use blended learning models in linear programming courses during a pandemic have good overall mathematical resilience abilities. Figure 1 below explains from the findings the Comparison of the Cumulative Percentage of Students' Mathematical Resilience Ability

in Lectures with Blended Learning which is the cumulative interpretation interval of students' representation values. As shown in Figure 1.

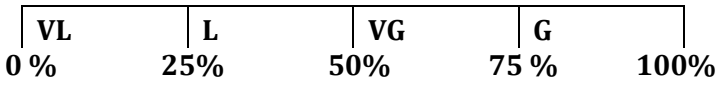

Figure 1. Interpretation Interval Graph

VL = Very Less
L = Less
VG = Good
G = Very Good

Based on the recapitulation calculation of the cumulative percentage comparison above and referring to Figure 1, it states that students' resilience with blended learning in Linear program courses during the Covid-19 pandemic has a good interpretation.

2. Overall resilience capabilities.

Recapitulation of the percentage of overall student resilience using Blended Learning in Linear Program Courses is illustrated in the following diagram as shown in Figure 2.

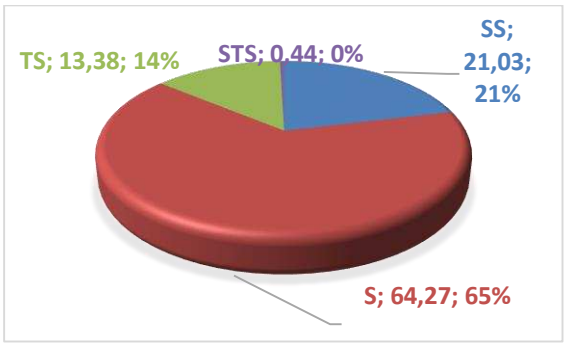

Figure 2. Percentage of Students' Mathematical Resilience Ability

Based on Figure 2. most of the students stated that the responses of students using blended learning in linear programming courses 21.03% strongly agree, 64.27% agreed, 13.38% disagree, and 0.44% strongly disagreed; Thus, most students gave a positive response, which means that overall students have good mathematical resilience skills with blended learning in Linear program courses during the Covid-19 pandemic.

3. Resilience ability based on student's initial ability.

The mathematical resilience ability data acquisition is based on the initial mathematical ability. Furthermore, the data were analyzed based on the following categories adopted from (Sugiyono, 2013). The following are the categories to represent the resilience abilities obtained by students. As shown in Table 3.

Table 3. Category of Mathematical Resilience Ability

Category	Scale
0,00 – 24.99	Very low
25,00 – 49,99	Low
50,00 – 74,99	High

75,00 – 100,00	Very High

Based on the data obtained, the average resilience ability for the upper group is 82.20, including the very high category, the middle group is 78.16, very high, and the lower group is 74.88, including the high category. This data shows that students' mathematical resilience abilities based on the initial mathematical ability grouping through blended learning in linear programming courses positively impact students. The high, middle and lower groups of students have very high and high resilience categories.

Adolescence is a transition period to experience various changes because many things happen in life that requires a lot of adaptation (Bhargava & Trivedi, 2018). Conditions when this balance will cause stress that affects the hemodynamic condition of the body (Yaribeygi et al., 2017). Several factors can affect individual resilience, including stress (Edraki & Rambod, 2018), depression, and anxiety (Shahsavarani et al., 2015).

Resilience ability can develop themselves well to deal with unpleasant conditions (Mayodromo et al., 2015), provide psychological pressure (Li & Miller, 2017), and prevent mental health disorders and improve individual bio psycho-spiritual balance in noisy conditions (Rutten et al., 2013). Through increasing mathematical resilience, students are expected to be able to overcome the problems that occur (Fletcher & Sarkar, 2013). Likewise, there will be an impact that lecturers are required to have academic qualifications, competence, lecturer certification, physically and mentally healthy, and have the ability to realize national education goals (*Undang-Undang Republik Indonesia Nomor 14*, 2005). During the pandemic period, it is a difficult experience for teachers and students, through blended learning these obstacles can be minimized, students can still develop resilience abilities (Simamora, 2020).

D. CONCLUSION AND SUGGESTIONS

The average percentage value agrees with mathematical resilience in terms of each indicator; this shows that the students' mathematical resilience ability is good for each indicator. Most of the students responded positively to the lecture, which was indicated by positive resilience abilities, meaning that the students overall had good mathematical resilience abilities. Likewise, the ability of mathematical resilience based on the initial mathematical ability of students shows a very high category for the upper and middle groups, while for the lower group, the high category.

From the three problems studied, it can be concluded that students' mathematical resilience using blended learning in Linear program courses during the Covid-19 pandemic is very high. The Covid-19 pandemic does not have much influence on students' mathematical resilience abilities. This statement can be seen from the calculation of the cumulative percentage comparison recapitulation which states that the ability to interpret resilience is good, most students give a positive response, which means that students as a whole have good mathematical resilience abilities, and based on the initial mathematical ability grouping through the use of blended learning in courses. linear programs have a positive impact on students, namely between high, middle and lower groups of students having very high and high resilience categories. The next researcher conducted further research on students' mathematical resilience abilities during the Covid-19 pandemic on other lecture materials.

Online lectures require special attention, to improve mathematical resilience skills so that lecture activities during this pandemic period run well, but also to be carried out in normal situations according to student needs.

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