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Mathematical Resilience: how Students Survived in Learning Mathematics Online During the Covid-19 Pandemic

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Date of publication: June 28th, 2022
Edition period: June 2022 – October 2022

To cite this article: Pulungan, D. A., Retnawati, H., & Jaedun, A. (2022). Mathematical Resilience: how Students Survived in Learning Mathematics Online During the Covid-19 Pandemic. *Qualitative Research in Education, 11*(2), 151-179. http://dx.doi.org/10.17583/qre.9805

To link this article: http://dx.doi.org/10.17583/qre.9805

Qualitative Research in Education Vol.11 No.2 June 2022 pp. 151-179

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Abstract

Mathematical resilience is a student's ability to survive and be positive when facing difficulties and anxiety in learning mathematics as indicated by the ability to work collaboratively with groups, and have language skills to communicate mathematical understanding. Learning mathematics online caused various negative conditions for students; reduced learning interactions, internet disturbances, material that was not optimally explained, even low support for studying at home. This study aims to find out about students' mathematical resilience when taking online mathematics lessons during the Covid 19 Pandemic. A qualitative phenomenological design was used, in which 20 high school students in Medan, participated. Data was collected through an open online questionnaire and interview, due to the implementation of social restrictions in Medan. Thematic analysis was used to interpret the data. The results are summed up: (1) Implementation and use of mathematics learning platforms during the Covid 19 Pandemic; (2) Adaptation of students learning mathematics; (3) Students' belief in learning mathematics; (4) students' communication skills during mathematics learning; (5) The Support for learning mathematics. This study recommends several suggestions to strengthen students' mathematical resilience in order to overcome mathematical difficulties and problem when taking online mathematics learning.

Keywords: mathematics resilience, online mathematics learning, indonesian students, covid 19 pandemic

ISSN: 2014-6418
DOI: 10.17583/qre.9805

Qualitative Research in Education Vol.11 No.2 June 2022 pp. 151-179

Resiliencia Matemática: cómo Sobrevivieron los Estudiantes al Aprender Matemáticas en Línea durante la Pandemia de Covid-19

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Resumen

La resiliencia matemática es la capacidad de un estudiante para sobrevivir y ser positivo cuando se enfrenta a las dificultades y a la ansiedad en el aprendizaje de las matemáticas, tal y como indica la capacidad de trabajar en colaboración con los grupos, y tener habilidades lingüísticas para comunicar la comprensión matemática. El aprendizaje de las matemáticas en línea provocó varias condiciones negativas para los estudiantes: reducción de las interacciones de aprendizaje, perturbaciones en Internet, material que no se explicaba de forma óptima, incluso poco apoyo para estudiar en casa. Este estudio tiene como objetivo conocer la resiliencia matemática de los estudiantes al tomar clases de matemáticas en línea durante la pandemia de Covid 19. Se utilizó un diseño fenomenológico cualitativo, en el que participaron 20 estudiantes de secundaria de Medan. Los datos se recogieron mediante un cuestionario abierto en línea y una entrevista, debido a la aplicación de restricciones sociales en Medan. Se utilizó el análisis temático para interpretar los datos. Los resultados se resumen en: (1) La implementación y el uso de plataformas de aprendizaje de matemáticas durante la pandemia de Covid 19; (2) La adaptación de los estudiantes que aprenden matemáticas; (3) La creencia de los estudiantes en el aprendizaje de las matemáticas; (4) Las habilidades de comunicación de los estudiantes durante el aprendizaje de las matemáticas; (5) El apoyo al aprendizaje de las matemáticas. Este estudio recomienda varias sugerencias para fortalecer la resiliencia matemática de los estudiantes con el fin de superar las dificultades y los problemas matemáticos al realizar el aprendizaje de las matemáticas en línea.

Palabras clave: resiliencia matemática, aprendizaje en línea, estudiantes indonesios, covid 19, pandemia

ISSN: 2014-6418
DOI: 10.17583/qre.9805

Since March 2020 when the first case of Covid 19 was announced, the Indonesian government has issued various policies, including in the field of education. One of them is the online learning policy which is considered the most relevant for the purpose of preventing and suppressing the spread of the virus (Crawford et al., 2020; Pragholapati, 2020; Tyaningsih et al., 2021). Teachers and students are assigned to carry out online teaching and learning from home (Kementrian Pendidikan dan Kebudayaan, 2020). Although online learning is not new, the situation caused by the Covid 19 pandemic has a higher risk have a higher risk of decreasing mathematics learning achievement and mathematics learning loss and becomes a challenge as well as creates various anxiety for students (Haser et al., 2022; Spitzer & Musslick, 2021). Among them are how students can understand the material presented without direct face-to-face interaction and explanation at school, how to learn from home independently without a supportive learning environment, how to keep learning smoothly without internet network interference, and so on (Anggraeni et al., 2021; Arribathi et al., 2021; Budiman et al., 2021; Oktawirawan, 2020; Sari & Winingsih, 2021). The learning process can be controlled if students and teachers have the ability to survive through a positive attitude as a form of adaptation from abnormal situations.

Seen from a point of view centered on human psychology, there are many definitions of Resilience that look at subject specifics as well as various conceptual trends due to the widely accepted need to clarify and define the construct of Resilience (Davydov et al., 2010). Resilience is a person's capacity as a result of positive adaptation to challenging or threatening conditions through a dynamic process (Masten, 2014; Mir'atannisa et al., 2019) This definition is interpreted as a situation that has a high risk, but at the same time, there is behavior that adapts to the situation so that it can be separated from possible impacts or events. Student resilience in learning affects the process of changing children with adverse conditions to reduce negative effects (Wyman et al., 1999). Learning independence of school-age students is still not fully formed. Therefore, learning support is needed in the form of face-to-face interaction and communication to explain the learning material. In addition, the skills of school students and even parents to use gadgets and the internet to support learning are also still limited. Therefore, online learning from home has the risk of decreasing mathematics learning outcomes and losing

learning outcomes due to limited interaction and learning support from family.

Mathematical resilience as an important concept and can be developed in students who have "bad" experiences with mathematics that causes feelings of being "angry" and potentially "failed" (Johnston-Wilder & Lee, 2010). Mathematical resilience is part of resilience that allows students to overcome certain forms of anxiety attached to mathematics and student learning. Anxiety referred to here is a feeling of tension, anxiety, or fear that interferes with mathematical performance (Ariyanto, 2016; Ashcraft, 2002; Goodall, et.al, 2015). Mathematical resilience is shown from a positive attitude to overcome anxiety, fear in facing challenges and difficulties in learning mathematics. These positive attitudes include hard work and good language skills, self-confidence, as well as being diligent and tough in dealing with difficulties, being able to work or study collaboratively with peers, have language skills to express mathematical understanding, and master mathematics learning theory (Dilla et al., 2018; Johnston-Wilder & Brindley, 2015; Sumarmo, 2015). The ability to think logically, systematically and reflectively is needed in learning mathematics so students must have perseverance, thoroughness, and sincerity in learning it. (NRC, 2001). One of the main tasks and goals of students learning mathematics is solving problems. Therefore, in addition to intellectual abilities, students also need non-intellectual abilities (Rokhmah et al., 2019). These non-intellectual abilities are abilities that arise from students' personalities, including perseverance, never giving up, curiosity, and student confidence as well as students' ability to apply mathematics in real life (Hutauruk & Priatna, 2017).

Low positive attitude, supportive environment, and even teacher factors are some of the causes of students' vulnerability to mathematics and have an impact on mathematics learning outcomes (Ariyanto et al., 2017). Strengthening the positive adaptive attitude of mathematics in favorable and unfavorable situations and environments, can maintain students' desire to learn. This attitude is known as Mathematical Resilience (Johnston-Wilder & Lee, 2010). Mathematical resilience is closely related to mathematical problem solving skills, working in teams, understanding mathematical equations, and mastering mathematical conceptual theories. (Yeager & Dweck, 2012). A person's resilience shows his ability to survive successfully and adapt to changing situations (Ariyanto et al., 2017). Based

on that opinion, Mathematical Resilience is a positive adaptive attitude of students to respond to difficulties and anxiety in learning mathematics which is shown through problem solving skills, team work, understanding mathematical equations and mastering mathematical conceptual theory.

Negative experiences with mathematics that cause anger and even trauma are the basis of why Mathematical Resilience is important for students (Johnston-Wilder & Lee, 2010). Therefore, mathematical resilience can be developed in students who have negative and unpleasant experiences with mathematics (Goodall & Johnston-Wilder, 2015). A positive attitude to overcome anxiety, fear, difficulties, including hard work, communication skills and self-confidence are attitudes that are seen as Mathematical Resilience (Ariyanto et al., 2017). The low self-confidence in learning mathematics, for example, can be seen from the reluctance of students to express opinions or ask questions during the learning process (Retnawati, 2016). This condition is certainly an obstacle in learning mathematics for both teachers and students. Students with a good level of Mathematical Resilience consider mathematics not an obstacle, even when experiencing difficulties they keep trying until they succeed. Mathematical resilience is also shown by being diligent and tough in learning collaboratively with peers (Lee & Johnston Wilder, in Sumarmo, 2018). Mathematical resilience is an important soft skill because it shows the quality of mathematics learning attitudes, including hard work, perseverance in facing difficulties, willing to discuss, reflect, and research (Dilla et al., 2018). Many studies show the occurrence of psychological symptoms, such as stress in college students which if left unchecked will have a long-term impact on their mental health and education (Isnawan et al., 2022; Lischer et al., 2021; Singh et al., 2020; Villani et al., 2021). So this condition is also possible for school students, especially children who have to learn independently from home without direct help and support from friends or teachers. Individual and environmental factors are protective factors to suppress traumatic experiences that interfere with student psychology in learning (Frieze, 2015). Mathematics learning has been considered difficult before, coupled with a disrupted learning environment due to online learning during the Covid 19 pandemic, allegedly affecting students' Mathematics Resilience. Disruption of students' mathematical resilience, can hinder the process and results of learning mathematics.

The information explained through this research is about the condition of students' mathematical resilience when carrying out online mathematics learning during the Covid 19 Pandemic. This research was conducted by understanding and analyzing the experiences of students learning mathematics online. The results of this study can be used for the sake of improving the process and learning outcomes of students' mathematics, as well as being a consideration for teachers, schools, local education offices, students, and even parents in shaping students' Mathematics Resilience during learning.

Research Question

The Covid 19 pandemic caused major changes in the education system, including Indonesia. This requires teachers to find the right way to deliver learning materials online to students, and this is something new for Indonesian teachers. In particular, learning mathematics, which before the implementation of online learning was considered a difficult subject, now has new challenges because it must be done online. Teachers must still pay attention to the condition of students' mathematical resilience. Therefore, the following questions arise:

- How have students survived and behaved towards learning math online from home as a result of the COVID-19 pandemic?
- How is the learning support felt by students in facing online math learning from home during the Covid 19 Pandemic?

Objectives of the Study

To answer the research questions above, the objectives of this study are as follows:

- This study examines how the online mathematics learning process is carried out by students and teachers during the Covid 19 Pandemic.
- This study also investigates students' Mathematical Resilience, seen from students' adaptability, confidence, and communication when taking online mathematics lessons from home during the Covid 19 Pandemic.

- This study also investigates how supportive the student environment is when learning math online from home during the Covid 19 Pandemic.

Methodology

Research Paradigm and Design

This research is qualitative research with a phenomenological approach. The phenomenological approach is used because it can reveal individual experiences in everyday life that focus on people's perceptions of the world or perceptions of things that arise within them (Creswell, 2013; Sloan & Bowe, 2014). Phenomenological research seeks answers to research questions descriptively through interviews or observations that are closest to the phenomenon (Davison, 2014). Therefore, a phenomenological approach is used to reveal and understand the meaning of the experience of adapting, surviving, and student behavior when learning mathematics online from home during the Covid 19 Pandemic. The focus of this research are: What students experience when learning mathematics online from home during the Covid 19 Pandemic.

Participants, Data Collection and Ethical Consideration

Following the phenomenological tradition, the selected participants are participants who have experienced the phenomenon under study and are willing to describe it in interviews (Eddles-Hirsch, 2013, 2015). High school students in Medan City who are still carrying out online mathematics learning from home are participants in this study. Participants came from various schools in the city of Medan, Indonesia. There were 12 stu dents from private schools and 8 from public schools. The age range of students also varies between the ages of 15-17 years. The work background of parents varies, 11 students whose parents work as traders, 5 students whose parents work as civil servants, and 4 students as freelancers. The criteria were chosen because this study was intended to explore students' perceptions in understanding their experiences and feelings carrying out online mathematics learning from home as a result of the Covid 19 Pandemic. The selection was carried out using the convenience selection

method which allows researchers to use easy and available participants for research with the assumption that all population knows this research (Lavrakas, 2008; Omodan & Ige, 2021). Participants consisted of 20 students who filled out an open online questionnaire and continued with interviews to explore the results of the completed questionnaire. The interview technique is carried out as a source of data that forms a database in a phenomenological approach (Eddles-Hirsch, 2013). An open questionnaire and online interview were used to collect data. At the beginning of data collection, all participants were asked for consent by giving them the freedom to withdraw at any time during the research process if they felt uncomfortable with the research process. Confidentiality of participants is guarded and protected so that their identities are disguised and students' names are represented by pseudonyms to protect and maintain the comfort of participants for the answers given (Omodan & Ige, 2021). Interviews were conducted later to obtain further information from the questionnaires that had been filled out by the participants. The themes collected through questionnaires and interviews were (1) how to implement online mathematics learning during the Covid 19 pandemic; (2) how students adapt to changes in mathematics learning due to the covid 19 pandemic; (3) how students' beliefs about the success of learning mathematics; (4) how are students' communication skills when learning mathematics online; and (5) how are students' perceptions of mathematics both online and offline. The questions designed for this research are semi-structured to provide opportunities for participants to express opinions and experiences freely and fairly but remain focused and not broad so that credible data can be obtained.

Data Analysis

The interview data were then analyzed in 4 stages, namely: (1) the data was tabulated based on the source, (2) the data was reduced and eliminated through grouping and determining sub-themes in relatively small groups which were then searched for themes between sub-themes (Eddles-Hirsch, 2013; Retnawati, 2016), (3) determine the relationship between themes (Bogdan & Biklen, 1982; Retnawati, 2016), (4) conclude the results of the relationship between themes so that an understanding of students'

mathematical resilience is obtained in Medan during the Covid 19 pandemic

Results

Mathematical resilience has been a research theme for a long time (Goodall & Johnston-Wilder, 2015; Kooken et al., 2013). This is because the difficulties faced by students do not only come from outside learning, but mathematics as a field of study also provides difficulties for students. Online mathematics learning that must be done due to the Covid-19 pandemic requires students to adapt to take part in mathematics learning. Table 1 shows how the implementation of online mathematics learning by students from home during the Covid 19 Pandemic.

Table 1.
Implementation of Online Mathematics Learning During the Covid 19 Pandemic

Reduction	Theme	Link Between Theme
Students learn math from home and communicate with teachers via WhatsApp Groups, Google Classroom.	Students learn math using a combination of online meeting and chat platforms	Students learn mathematics using various platforms and independently look for other learning resources because they do not get help deepening the material when studying independently at home.
Students have no experience using zoom, google meet to study.		
Students use Zoom and Google Meet with teacher guidance		
Students get material in the form of a PDF file containing written explanations and sample questions through WA Groups and Google Classroom		
Students look for independent learning resources from Youtube.	Students use learning resources such as youtube and private tutors at home	
Students take paid online courses to learn extra math and help with assignments		
Some students get private tutor facilities to help with assignments.		
Some students don't get help support such as private tutors or relatives who can help understand math from home.		

Since the Covid 19 pandemic and the government imposed restrictions on interaction including education, schools, teachers, students, and parents are confused about how to prevent students from getting optimal learning from home. Especially students and teachers as the main implementers in learning. As a subject that contains abstractions and mathematical patterns, studying mathematics requires a clear and detailed explanation of

mathematical rules. So that mathematics teachers must ensure that students get the material clearly so that there is no incorrect mathematical information in understanding and solving mathematical problems. However, due to the unforeseen situation due to the pandemic with social restrictions including schools, teachers should use the easiest and most familiar learning platforms for students to stay in touch and deliver material to students. WhatsApp groups as a messenger platform are the main choice in communicating, including sending material files to students. Google Classroom as an online learning platform is also used but because students have no experience using it, WA Group is still the main platform. As a source of learning apart from teachers, students choose to use YouTube, a paid online learning program and even invite private teachers to their respective homes to help with assignments. Zoom meetings and Google meet are used by teachers and students for material that has complex mathematical abstractions/models/patterns and requires a direct explanation from the teacher.

The way of learning changed change uddenly without much preparation, and mathematics is considered a complicated subject that creates fear in students. Meanwhile, only a few students get support and assistance for deepening mathematics material at home. However, students are still required to be able to overcome the difficulties encountered during online learning from home. Table 2 shows how students adapt to the difficulties of learning mathematics online from home.

Table 2.
Students' Adaptability in Learning Mathematics Online During the Covid 19 Pandemic

Reduction	Theme	Link Between Theme
Students find math hard to learn online or offline Some students have a fear of any math subject. Students find learning mathematics online more fun because it is more flexible Understanding math online is harder	Learning math online is harder to understand although it is more flexible.	Mathematics is a difficult subject especially when learning online, but students can still try to adapt starting from how to use the platform together and do repetition to understand mathematics. But the student's initiative has not been seen and is just waiting for the teacher.
Independent students look for math explanations of material from Youtube Students have an attempt to correct the wrong math solution Students do not worry about making mistakes in mathematics, because they get the opportunity to improve Students have difficulty in mathematical modeling	Students understand the difficulty of mathematics and do not mind if they have to repeat to improve the value.	
Students form small groups to participate in online math learning together Need repetition to be good at math Students waiting for study schedule info from the group Students waiting for learning materials from the teacher	Students study together, but wait for class info from the group and do not prepare themselves with additional study materials.	

However, due to the unforeseen situation due to the pandemic by using social media including schools, teachers should be the easiest and most

familiar learning platform for students to stay in touch and deliver material to students.

The results of this study indicate that students feel mathematics is a difficult subject to understand, especially when learning online. However, students are not too difficult because during online mathematics learning students can be more flexible in learning mathematics using online learning resources. It also tries to repeat and learn math material from learning sources other than the teacher's explanation. The way students deal with it shows students' adaptability. Some students show good adaptability even though they find mathematics difficult, but try to find other learning resources besides the material presented by the teacher. For example, using Youtube as a way to understand material that has not been understood. The results of this study indicate that students feel mathematics is a difficult subject to understand, especially when learning online. However, students are not too bothered by these difficulties because during online mathematics learning students can be more flexible in learning how to learn mathematics using online learning platforms. In addition, students' also tries to repeat and learn math material from learning sources other than the teacher's explanation. The way students deal with the explanation of material that is not clear from the teacher, shows students' adaptability. Some students show good adaptability even though they find mathematics difficult because they have a way to find other learning resources besides the material presented by the teacher. For example, using Youtube as a way to understand the material that has not been understood.

When asked how students deal with material from the teacher that they don't understand, students make comments such as:

> "I watch youtube videos or seek enlightenment from social media like google" (Student 3).

Students with high adaptability even take advantage of online meeting platforms and online study rooms to discuss material they do not understand.

> "Repeat learning videos, sample questions are given by the teacher or find ways to do easy questions from learning applications" (Student 1).
>
> "Doing a small zoom with some friends" (Student 16).

Even though it is new for students to use online learning platforms, students have efforts to use them so that they can follow the learning process to completion. This was revealed from the results of student interviews when asked how they adapted to online learning platforms.

Student answers include:

> "I'm confused, especially at home no one understands, but after a while, I can."
> "Invite friends online together so that if you are confused, a friend will find out how to use it."
> "Most confusing zoom encounter, ever. Better to just use WA."

The ability of students to adapt to the difficulties and anxiety of learning mathematics, shows the ability of students to complete their mathematics learning. Students' efforts to overcome anxiety and worry in learning mathematics show the belief that even though mathematics is difficult, it can still be learned. Table 3 shows students' beliefs in learning mathematics.

The results of data collection indicate the saturation of the frequency that students still have confidence that mathematics learned online can still be followed even though it is difficult. Of the 22 students who took part, 7 students felt that they had no talent in mathematics but still believed that mathematics could be learned online and followed to completion.

> "I don't have math talent but I can still keep up with the lessons" (Student 4).
> "I don't like math so it's hard to understand but it seems like it can be learned if it's repeated often" (Student 8).
> "My dream is to become a police officer, and the entrance test is about math. Even though I didn't like it, I kept learning over and over until I could" (Student 9).

Table 3.
Students' Belief in Learning Mathematics in Online Mathematics Learning During the Covid-19 Pandemic

Reduction	Theme	Link Between Theme
Students need time to learn math Students know that mathematics can be understood by repeating and practicing. Students feel successful in mathematics because they are diligent in doing math problems at home Students need time to learn math	Math takes time to learn through repetition, especially when studying online	Students realize that mathematics is very important in life, but not all can solve mathematics. It takes time to learn math because it has to be repeated over and over again to understand it.
Students feel that not all have mathematical talent. Some students score low in math and feel more gifted in other subjects Learning math online is more relaxed and flexible even though it's still difficult to learn Students have more time, ways, and resources to study math online	Students feel that learning mathematics requires talent, but learning mathematics online is more relaxed and flexible	
Students believe mathematics is necessary for the future Students understand mathematics is needed in everyday life Students understand mathematics is always mandatory to learn to achieve their goals	Students know that mathematics is important to learn because it is needed in life and to achieve goals	

This study also reveals students' mathematical communication skills which is shown in Table 4.

Table 4.
Students' Mathematical Communication Ability in Online Mathematics Learning During the Covid 19 Pandemic

Reduction	Theme	Link Between Theme
Pictures, graphs, and math symbols are more interesting when learning math online. Students find it difficult to collect images, graphics, and symbols if they have to be in the form of word or PDF files Solving mathematics using mathematical symbols in books, captured, then sent to the WA Group or Google Classroom.	Mathematical symbols are more attractively displayed during online learning.	Learning math online, students are more open to asking questions and asking for help from teachers or friends when they encounter math difficulties.
Students seek help if they have difficulty understanding the material and solving math Students do not have the opportunity to ask questions directly because time is limited. Students do not have much time to confirm math completion with the teacher.	Students have self-disclosure to ask for and receive help.	
Students discuss with their friends material that is still not understood. Ask for explanations for difficult math problems with friends who know better. Students choose to ask friends about math assignments because no family can help Some students take the initiative to help other friends who have difficulty learning math.	Students are more open and comfortable asking friends.	

Students' mathematical communication skills are more visible when learning mathematics online. The interview data showed that students were more open to asking questions and asking for help during online mathematics learning. However, although mathematical models with symbols, graphs, and pictures are more interesting when explained online, students find it difficult to ask questions directly due to time constraints. Asking in person outside of the online study schedule also requires effort by writing it down, taking photos, and then sending it via private message to the teacher. The majority of students who are participants choose to ask friends because they are more relaxed to communicating with their peers communicate.

> "Sometimes I don't understand, but just keep quiet. Later after you finish studying, just ask your friends" (Student 4)

> "When my assignment is finished, I help teach my friend to do the assignment" (Student 1)

The results of this study also reveal the support received by students while learning mathematics online from home during the Covid 19 Pandemic. Table 5. shows the form of support received by students.

Table 5.
Student Support for Learning Mathematics Online During the Covid 19 Pandemic

Reduction	Theme	Link Between Theme
The teacher helped to explain again when asked. The teacher's explanation in the form of an explanation video and written information is sent to the WhatsApp group Students form small groups to study and do assignments together	Support for re-explanation to understand math material	Students do not get support for learning from their families at home. However, they still get support with the opportunity to ask the teacher directly when online learning takes place, even though the time is limited. Students also do not get technical support to study, for example, internet support is not optimal.
No one can help re-explain and do math homework at home Students have the opportunity to get a private tutor at home	Students do not get optimal learning support while studying online from home	
Government quota assistance can't be used because teachers use more WA groups Students have difficulty providing independent internet quota	Support to get internet quota from the government has not been maximized, while students have difficulty providing it independently.	

Research data shows that students get sufficient support to overcome the various difficulties they face when learning mathematics online during the Covid 19 Pandemic. This data shows that students have a high potential for mathematical resilience because even though they face various difficulties and anxiety, students still get support.

Discussion

Online math learning forces students to be more careful and skilled. Therefore, teachers should understand the effectiveness of digital technology used in the learning process (Putrawangsa & Hasanah, 2018). In teaching mathematics, the learning platform used must be able to accommodate the characteristics of mathematics that require a clear and detailed explanation of abstractions, symbols, images, graphics. Students learn mathematics using various platforms such as Zoom, Google meets, Google Meet, Google Classroom, and Wa Group. The Zoom Meeting and Google meet platforms are the most appropriate platforms for learning math online. However, the choice platform used by teachers and students during the Covid-19 pandemic still prioritzes the practicality and ease of use factors (Yohannes et al., 2021) . This is in line with research (Arlinwibowo et al., 2020; Yohannes et al., 2021) which revealed that the WhatsApp Group is the most widely used platform for teachers and students to learn mathematics online. This is because WhatsaApp Group is easier to use, free, unlimited time, and fast in transferring files, and hence is the most used option. This is not in line with research conducted by (Ahmad, 2021; Marhami et al., 2020) which explains that online learning assisted by video conference zoom and google meet can lead to direct interactions such as studying in regular classes, even remotely to help students better understand and master the material being taught. This is different from the findings in the research conducted (Ahmad, 2021) which explains that the use of the zoom platform has many obstacles and is not effective for high school students in South Tangerang in learning mathematics. The research explains that skills in using platforms and internet networks are a contributing factor. Research (Ahmad, 2021) explains that the lack of student experience in implementing Zoom Meetings is the reason this online learning platform is not so dominantly used by teachers and students.

When taking online math lessons during the Covid 19 pandemic, students get lessons from teachers using video conferencing such as: zoom and google meet. In addition, messaging platforms such as WhatsApp Group chat, or asynchronous platforms such as Google classroom. However, the platform is still not sufficient for students' learning needs as students get during face-to-face learning. Students still face various difficulties because the teacher did not provide detailed mathematical

explanations such as mathematical illustrations. This is because the platform that is most widely used by teachers in online learning is written material sent via WhatsApp groups that is why, other learning resources are needed. This study is in line with research conducted by who explained that parents felt that teachers did not provide explanations to students during DLM. Mathematics teachers provide almost no illustrations or analogies for students to learn and understand easily. Therefore, students meet the needs of learning resources other than teachers through learning videos from the Youtube channel and learning facilities with private teachers at home. This is in line with research (Suwarno, 2017; Esparza Puga, 2021) which explains that the Youtube channel that provides learning resources for mathematics is a type of assistance that is multifunctional, always available, personal, easy to use, and independent so that it becomes a potential source of learning mathematics to provide mathematics assistanceto students.

Students have an awareness that mathematics is a difficult subject to understand in one explanation. Especially if the teacher explains online which is often constrained by network disturbances. Therefore, YouTube is the most popular additional learning resource. In addition, mathematics is taught using an online platform. In addition, mathematics taught using an online platform adds to the difficulty of students in understanding mathematics. However, students can adapt to these changes by studying together with friends using an online mathematics learning platform. Students understand mathematical difficulties and have no problem if they have to repeat and correct wrong answers because the teacher allows students to correct them. This attitude shows the adaptability of students during online mathematics learning. Although online mathematics learning is difficult for students to understand the material, students can adapt to these changes by studying together with friends. Students have no problem if they have to repeat and correct wrong answers because the teacher allows students to re-correct. This attitude shows students' adaptability during online mathematics learning. As stated that the ability to adapt to various demands from within and the environment shows successful resilience despite not having the resources and capacity to adjust thoughts, behaviors to manage new and uncertain changes (Annur & Hermansyah, 2020; Mir'atannisa et al., 2019; Sari et al., 2020; Sercombe, 2014; Zhang et al., 2021). The adaptability of someone who has mathematical resilience can be measured through the willingness to try new strategies or start over after

experiencing various changes and failures (Hutauruk & Priatna, 2017; Peatfield, 2015; Thornton et al., 2012).

Students' Mathematical Resilience is also seen when students have confidence that mathematics can be learned (Hutauruk & Priatna, 2017; Hutauruk & Naibaho, 2020). Students with good resilience show efforts to learn mathematics even though they feel they are not gifted because they believe that even though mathematics is difficult, it can still be learned. Likewise, when mathematics is learned online, students still have confidence that they can follow mathematics learning well. The beliefs that are formed in students indicate that students have a developed mindset so that students will have various ways to overcome the difficulties and anxieties they face. Although students who have good mathematical resilience show the ability to overcome their difficulties and anxiety, external support also determines students' mathematical resilience abilities. Students will be able to overcome anxiety when students have someone to accompany them. In addition, when students know that the perceived difficulty of mathematics can be overcome by repetition, the help of friends, teacher explanations, and family who provide various learning facilities, students' anxiety in learning mathematics will be reduced.

Conclusion and Recommendations

The change in the way of learning mathematics from face-to-face to online learning due to the Covid-19 pandemic has its own challenges for teachers and students. As a subject that requires more logical reasoning, of course, mathematics has its challenges. In a new way, students are required to be able to learn to deal with it. This situation then gives rise to diverse attitudes for students. Some students can adapt well and quickly to changing ways of learning mathematics, some students have difficulty and learn mathematics all the time. Student resilience will emerge and be able to adapt when faced with obstacles. Students who have confidence that mathematical material and problems can still be followed, understood and solved even though online learning shows good mathematical resilience This study shows that with online mathematics learning, students have survived well, although some students still feel anxious. However, students believe they can still succeed at math by repeating and getting help finding other learning resources and support from teachers, peers, and family. The

results of this study still allow for further research. Further research could be conducted on the effectiveness of online learning in studying other subjects during the COVID-19 pandemic. The results of this study can be used to provide an overview of current online mathematics learning so that it can be used to evaluate the online mathematics learning process in anticipation of when situations require online learning to be implemented. Based on the conclusion, this research can be input for mathematics teachers and tutors who carry out online mathematics learning. The results of this study can be used as material for evaluating the process and results of learning mathematics during the Covid 19 Pandemic, especially in terms of what support should be given to students while participating in online mathematics learning. This is so that students do not feel that changes in the way they learn mathematics due to the COVID-19 pandemic will not have an impact on mathematical achievement. Instead, they feel that this change is something new and challenging to go through. Evaluating the process and results of learning mathematics. Especially in terms of anxiety that arises and forms of support that can support the resilience of fellow students. Mathematics teachers and tutors who carry out online learning must ensure that changes to the way they learn mathematics do not improve students. students feel challenged and excited by new ways of learning mathematics.

Limitation and Recommendation for Further Studies

This research was only conducted in the city of Medan, Indonesia, so it cannot be generalized to describe the overall Mathematics Resilience of students in Indonesia. This study also uses participants who may not represent all students. However, the decision on the number of participants is still in the principle of qualitative research. The limitations of this study open up opportunities for further research by using a larger and wider number of students using a quantitative approach to obtain quantitative statistical information. For example, conducting an analysis of what factors make students mathematically resilient during a pandemic, and reviewing their relationship to student math achievement. The limitations of this study open up opportunities to conduct further research using a larger and wider number of students using a quantitative approach to obtain statistically quantitative information.

Acknowledgment

We would like to thank all parties involved in this research. This research work was supported by the Ministry of Education of the Republic of Indonesia.

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