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# Analysis of Disaster Mitigation in IPAS Subject of High School Phases under Merdeka Belajar Concepts

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**Abstract.**
Indonesia's geographical condition is vulnerable to geological changes and prone to natural disasters. The Indonesian Government has made various efforts to reduce disaster risk by developing disaster-safe education units. Disaster education will be effective if it is integrated into the curriculum in the school subjects such as social studies from an early age. This study aims to provide ideas for implementing disaster mitigation learning for high school students based on the concept of *Merdeka belajar* in the digital age. To better understand disaster preparedness under the concepts of *Merdeka belajar*, we thoroughly examined the relevant databases. It was carried out within the education framework put out by Ki Hadjar Dewantara (1889–1959), Johann Friedrich Herbart (1776–1841), and Jan Komensky (1592-1670). Given that Indonesia has at least 13 disaster threats whose risks vary depending on the region, it is crucial to understand the local wisdom in disaster mitigation. This content is available in high school phases' natural and social sciences subjects (*ilmu pengetahuan alam dan sosial*, IPAS). This research is crucial to successfully improve the teaching-learning quality to meet the needs of the *Pancasila* student profile.

**Keywords:** disaster mitigation, IPAS, high school, *merdeka belajar*, digital learning

## 1. Introduction

Indonesia is an archipelagic country with 17,508 islands, of which 6,000 are uninhabited. Located in Southeast Asia between the Pacific Ocean and the Indian Ocean, with a total area of 5,180,053 km$^2$, consisting of a land area of 1,922,570 km$^2$(37.1%) and an ocean area of 3,257,483 km$^2$(62.9%) with a coastline of 81,000 km. Geographically, Indonesia is located in a series of Australasia, Pacific, Eurasia, and Philippines tectonic

plates, which makes Indonesian territory vulnerable to geological changes. Indonesia's geographical conditions are also influenced by the presence of 5,590 watersheds (DAS) located between Sabang and Merauke. Indonesia's climate is strongly influenced by its location and geographical characteristics. At 6,400 km between the Pacific Ocean and the Indian Ocean, Indonesia has three basic climate patterns: monsoon 1, equator, and local climate system. This has led to dramatic differences in rainfall patterns in Indonesia. Geographical position and location in one of the most active disaster areas in the world make the Unitary State of the Republic of Indonesia a disaster-prone area. There are at least 13 disaster threats which are grouped into geological disasters (earthquakes, tsunamis, volcanoes, land movements/ landslides), hydrometeorological disasters (floods, flash floods, droughts, extreme weather, extreme waves, forest, and land fires), and anthropogenic disasters (disease epidemics, technological failures-industrial accidents, and social conflicts). Based on data from the National Agency for Disaster Management (BNPB), in the last 30 years (1982-2014), there have been 13,729 disasters, which were followed by floods and followed by landslides, strong winds, droughts, and other disasters (1).

Disasters have a significant impact on human life. International Strategy for Disaster Rection (ISDR) (2) describes disaster risk as the potential loss due to disasters on life, health status, livelihoods, assets, and services that can occur in a particular community over a certain period in the future. In the education sector, disaster occurrences are also at risk of causing injury or even death to school residents, damaging educational infrastructure, and having a long-term impact on continuing education discontinuing.

Until now, it is recorded that around 10% of schools in Indonesia have received disaster education, both facilitated and only limited to socialization. This number is minimal compared to the number of schools in Indonesia, most of which are in disaster-prone areas (3). Through disaster education, it is hoped that it can change awareness and strengthen the character of the nation's successor, who is resilient to disasters. Knowledge about disasters is essential for children and the young generation. They are part of the future of the Indonesian nation. Disasters and pandemics such as the COVID-19 pandemic have also resulted in a learning crisis in Indonesia due to learning loss. One of the transformational efforts that the Ministry of Education is trying to make is to develop a *Merdeka belajar* curriculum and a *Merdeka belajar* platform. It is interesting to discuss how to prepare community knowledge about disasters and knowledge about risks that are integrated into learning the natural and social sciences subjects (*ilmu pengetahuan alam dan sosial*, IPAS) through an independent learning policy. Furthermore, this article will discuss the implementation of disaster mitigation

materials in IPAS concerning the concept of *merdeka belajar* in the digital age**.** It is hoped that the integration of disaster education in IPAS phase E and phase F subjects in grades X and XI in Senior High School (SMA)/Vocational High School (SMK) with the *Merdeka belajar* philosophy will further encourage increased knowledge in the digital age while still prioritizing the novelty and correctness of information for students.

## 2. Method

This research is qualitative with conceptual analysis through a review of related theories using data sources such as reference books, study results, and scientific journals. Referring to Creswell (4), qualitative methods rely on text and image data, have unique steps in data analysis, and use diverse designs. This research series relates to collecting library data, reading and taking notes, then processing the appropriate and necessary information to answer the problems studied. Conceptual analysis is then carried out to examine research problems based on educational theories. According to McMillan (5), conceptual analysis studies educational concepts such as cooperative learning, grouping ability, and leadership to illustrate the different meanings and appropriate use of concepts. This article will discuss the relevance of educational theory echoed by Ki Hadjar Dewantara, Johann Friedrich Herbart (1776–1841), and Jan Komensky (1592-1670).

## 3. Results and Discussion

### 3.1. Disaster Management Education in Indonesia

Management is a systematic process of administrative decisions, organization, operational skills, and capacity to implement strategies and policies to mitigate the impact of hazards and the possibility of disasters occurring. Disaster risk management aims to avoid (prevent), reduce or divert the adverse effects of hazards through prevention, mitigation, and preparedness activities and measures (2). Disaster mitigation is an action or series of efforts to reduce disaster risk, both physical development and awareness and capacity building to deal with disasters as stipulated in the Law of the Republic of Indonesia number 24 of 2007 concerning disaster management (6). Mitigation is any form of structural (physical) or non-structural measures (e.g., land use planning, public education) implemented to minimize the adverse impacts of potential natural hazard events (7).

In Indonesia, there are 497,576 education units in 34 provinces, of which around 70% or 250 thousand schools are located in disaster-prone locations (3). Since 2006 Indonesia has had a disaster preparedness school concept, but the documentation of learning and good practice of disaster education programs for children has not been well documented. Furthermore, disaster education is coordinated in a platform known as the SPAB National Secretariat (8)**.** Until 2018, 25,920 schools, or 10 percent of the total number of schools located in disaster-prone areas in Indonesia, have implemented disaster education by various actors. One of the things done in disaster education is the establishment of a Disaster Safe Education Unit (SPAB). BNPB implemented disaster education in SPAB starting in 2015 (3).

## 3.2. Reflection on Disaster Education in the 2013 Curriculum and the Merdeka Belajar Curriculum

In the 2013 curriculum, there are several competencies in various subjects that encourage (facilitate) and provide excellent opportunities for the realization of a learning process that integrates disaster education at the junior high school (*SMP*) level, such as science subjects for class VIII, there is competence in understanding the structure of the earth to explain earthquakes. Earth and volcanic phenomena and their relationships (9). In addition, Purnamasari (10) also explained that for social studies subjects, disaster materials could be included in the teaching materials of SMP class VII social studies subjects on the concept of space and connectivity, which could then be linked to potential disaster threats and the level of disaster risk in an area.

In 2018, differences of opinion regarding integrating the disaster curriculum into school subjects still occurred between the Ministry of Education and Culture (Kemendikbud) and the National Disaster Management Agency. At that time, the Minister of Education and Culture, Muhadjir Effendy, said he would incorporate the disaster curriculum into the Character Education Strengthening Program. Meanwhile, the Head of the BNPB Data, Information, and Public Relations Center, Sutopo Purwo Nugroho, disagreed with the plan. According to Sutopo, if disaster education is included in the subject of character education, the results will not focus because character education has too much content (11).

Currently, Indonesia has developed the *Merdeka belajar* curriculum, where disaster mitigation materials are given in the subjects of IPAS phase E and phase F (class X and class XI) of SMA and SMK in the form of project-based learning. The Ministry of Education, Culture, Research, and Technology stated the reasons for developing

a *Merdeka belajar* curriculum in Indonesia, among others, because of the learning crisis in Indonesia that has lasted for a long time and has not improved from year to year. National and international studies, including Programme for International Student Assessment (PISA), show that many students cannot understand simple reading or apply basic mathematical concepts. PISA scores have not increased significantly in the last 10 to 15 years. Around 70% of 15-year-olds are below the minimum reading and math competencies. The study shows significant disparities between regions and socioeconomic groups in terms of the quality of learning. After the pandemic, this learning crisis has only gotten worse. These conditions can be seen in Figure 1.

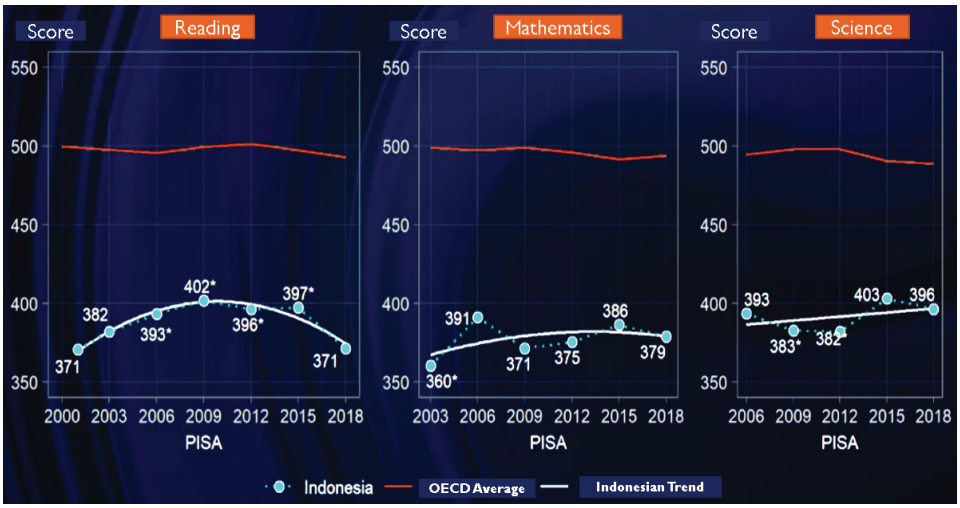


**Figure** 1: Condition of Indonesia's PISA Score (12). (Source: OECD (2018) in Kemendikbud-Ristek DIKTI 2020).

## 3.3. Implementation of Disaster Mitigation Materials in IPAS Subject Related to the Merdeka Belajar Concept in the Digital Age

Purnamasari (10) explained that one of the problems that hinder the integration of disaster education into subjects is that the majority of teachers are still confused about implementing and integrating disaster education in the subject matter content, monotonous learning activities, and the lack of teaching materials that can encourage student interest. These problems can be overcome by implementing a *Merdeka belajar* curriculum. Implement*ing the Merdeka belajar* curriculum will be supported by digital references, making it easier for teachers to get innovative learning materials.

The *Merdeka belajar* curriculum, according to the author, follows Ki Hadjar Dewantara's thinking that the perfection of human life is obtained from nature through the cleanliness of the mind on the perfection of creativity, intention, and taste. Ki Hajar Dewantara

interprets *Merdeka belajar* to form humans with a character for life's perfection (13). The *Merdeka belajar* curriculum process that provides opportunities for developing students' potential by implementing project-based learning relevant to actual social issues in their environment is in line with the thoughts of Johann Friedrich Herbart (1776–1841). Informed by psychology Herbart, teachers are advised to introduce students to more ideas and help them build connections between ideas. The application of *Merdeka belajar* will undoubtedly help develop students' interest in social science material (14). The series of processes that students undergo in the application of the *Merdeka belajar* curriculum are expected to be able to produce a profile of *Pancasila* students who have the value of global diversity, cooperation, creativity, and critical, as shown in Figure 2.

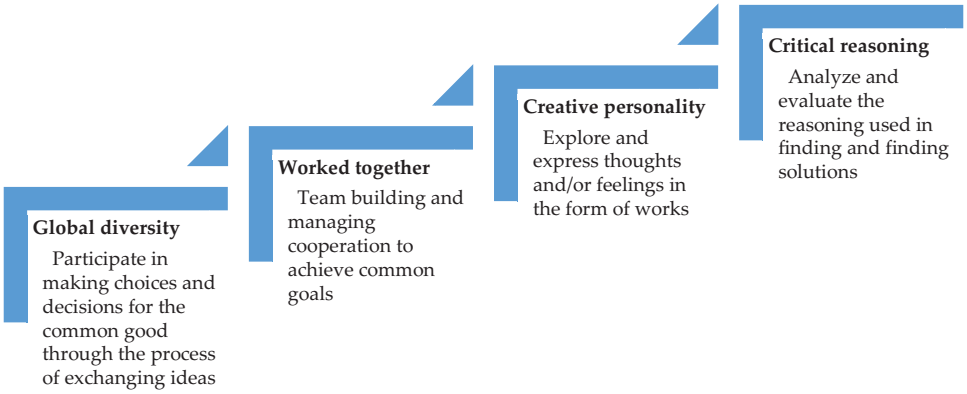


**Figure** 2: Profile of *Pancasila* Students (12).

In addition to excellence in the process, the implementation of the *Merdeka belajar* curriculum is also supported by the *Merdeka mengajar* platform. Platform as one of the learning resources developed by the Ministry of Education and Culture and Technology in the *Merdeka belajar* curriculum is an educational philosophy in line with the Pansophism thought by Jan Komensky (1592-1670), known as Comenius. The development of technology in *Merdeka belajar* will help foster universal understanding. Comenius believed that universally shared knowledge would convince people to abandon their ethnic and religious hatreds and live in harmony in the peaceful world order. The Comenian principles include (1) using objects or pictures to illustrate concepts; (2) connecting lessons with students' practical lives; (3) presenting lessons directly and straightforwardly; (4) emphasizing general principles before details; (5) emphasizing that all creatures and things are part of the whole universe; (6) presents lessons in sequence, emphasizing one thing at a time; (7) do not leave specific skills or subjects until students understand them (14).

The freedom of the *Merdeka belajar* curriculum and the presence of a *Merdeka belajar* platform should play a significant role in the development of the learning

process in the future. Teachers and students can learn from various innovative project activities sourced from the surrounding environmental conditions and the virtual world. Regarding digital data sources, it is necessary to realize that the truth of information and data sources must hold the primary key. Regarding IPAS learning, currently, social media is one part that has changed the human paradigm in the industrial revolution era. The media is not only a means of communication but is also used for many purposes, ranging from simply interacting, advertising, and conflict management, to disaster management. Moreover, social media has now become an inseparable part of the disaster management stage in the country, starting from the warning, impact, response, and recovery stages (15).

Development of disaster mitigation materials in IPAS related to the *Merdeka belajar* philosophy through the *Merdeka belajar* platform must later be integrated with digital services that can be accounted for, mainly social media owned by disaster risk reduction agencies that already exist in Indonesia. The National Disaster Management Agency (BNPB) and the Indonesian Meteorology, Climatology, and Geophysics Agency (BMKG) have developed digital services that can be accounted for as information and learning materials for disaster management in Indonesia. BNPB utilizes the highlight feature to convey critical information organized by category, namely BNPB events, infographics, dioramas, BNPB info, activities, tips, cpns bnpb, and challenging awards (16). Furthermore, in developing a *Merdeka belajar* platform and teachers in providing learning materials, the Ministry of Culture, Research, and Technology should be sourced from other digital services, especially those developed by relevant agencies. Table 1 is an example of *Merdeka belajar* planning to integrate disaster materials with digital disaster literacy resources, which may be developed further according to existing digital platforms and have reliable information truth.

Through learning with a problem-based learning model on the material of potential threats and disaster management, each student can be actively involved in developing and assessing the preparedness of their respective families, regions, and schools in facing disaster threats in their area. These activities will indirectly support resilience in dealing with disaster emergencies and encourage students to become agents of change at the family level and in their environment. The knowledge gained by students regarding disaster mitigation can then be directed to be transmitted to their respective families with family preparedness planning projects in dealing with disaster emergencies. In making this plan, each family member is involved to ensure they understand and agree to it. The things that need to be considered in making a family preparedness plan project are shown in Table 2.

TABLE 1: *Merdeka belajar* is planning to integrate disaster materials with digital disaster literacy resources in IPAS subject (17,18).

| **Learning outcome (CP) phase** | **Phase E (Class X) SMA/SMK Phase F (Class XI) SMA/SMK** | |
|---|---|---|
| CP domains | **Phase E (Class X) SMA/SMK** Understanding the seven aspects of Natural and Social Sciences **Phase F (Class XI) SMA/SMK** Develop disaster mitigation based on regional characteristics and local wisdom. | |
| Learning objectives | **Phase E (Class X) SMA/SMK** Through learning with a problem-based learning model, students can explain the earth's structure, the causes of earthquakes, earthquake disaster mitigation, and design earthquake prevention efforts using tables, graphs, or others. **Phase F (Class XI) SMA/SMK** Through a problem-based learning model, students can manage the disaster risk management in Indonesia creatively, think critically, work together, and have global diversity. | |
| Keywords | **Phase E (Class X) SMA/SMK** Earth structure, Earthquake, Earthquake, Disaster Mitigation, Disaster risk, Graphic info | **Phase F (Class XI) SMA/SMK** Disaster mitigation, Local culture, Regional characteristics, Disaster risk, Disaster risk management |
| Core Question | **Phase E (Class X) SMA/SMK** Do you know how the structure of our earth? | |
| | Can you explain the relationship between the earth's structure and human life? | |
| | Why is Indonesia prone to earthquakes? | |
| | Have you ever heard the word disaster mitigation? | |
| | What do you know about earthquake disaster mitigation? | |
| | **Phase F (Class XI) SMA/SMK** Why does Indonesia have a very high disaster potential? | |
| | Why is Indonesia called a disaster laboratory? | |
| | How is disaster risk management in the territory of Indonesia? | |
| | Do all regions have local wisdom in disaster mitigation? | |
| | How is the management of disaster mitigation in your area? | |
| Competency Requirements | **Phase E (Class X) SMA/SMK** Online learning skills | |
| | Knowing the relationship between the structure of the earth and the potential for earthquake disasters | |
| | Knowing the potential threat of earthquakes in the territory of Indonesia | |
| | Able to make infographics of structural and non-structural earthquake prevention | |
| | They know earthquake disaster mitigation in everyday life. | |
| | **Phase F (Class XI) SMA/SMK** Online learning skills | |
| | Knowing Indonesia's disaster-prone potential | |
| | Understanding the types and characteristics of natural disasters | |
| | Knowing local wisdom in disaster mitigation in various regions | |
| | Knowing the components of disaster mitigation | |
| Pancasila Student Profile: | **Phase E (Class X) SMA/SMK and Phase F (Class XI) SMA/SMK** Global diversity (participating in making decisions for a good discussion), cooperation (team building and collaboration), creativity, and critical. | |
| Facilities and infrastructure: | LCD projector, Paperboard, Images of maps of Indonesia, geological maps of Indonesia, and zoning maps of natural disasters in Indonesia, LMS Google Classroom and Google Slides, Whiteboard marker, Whiteboard, Internet | |

Table 1: (Continued).

| | | |
|---|---|---|
| Student Targets: | Teachers can use teaching tools to teach regular/typical students special intelligent, gifted students (CIBI), and students with learning disabilities due to relatively slow absorption | |
| Total Students | The number of students in learning activities is 24 people (can be modified in the division of the number when the number of students is less or more than 24) | |
| Material Availability | Enrichment for CIBI students: YES | |
| | Alternative explanation/method: YES | |
| Learning Mode | Face-to-face, PJJ Online, Offline PJJ, a blend of face-to-face and PJJ (blended) | |
| Teaching materials, tools, and materials Teaching materials | **Phase E (Class X) SMA/SMK** Explain the relationship between the structure of the earth and the potential ss | |
| | Explain the potential threat of earthquakes in the territory of Indonesia | |
| | Explain structural and non-structural earthquake disaster mitigation | |
| | Explain the importance of earthquake disaster mitigation in life. | |
| | **Phase F (Class XI) SMA/SMK** Explain the types and characteristics of natural disasters in Indonesia | |
| | Explain the distribution of natural disaster-prone areas in Indonesia. | |
| | Explaining local wisdom of disaster mitigation in various regions in Indonesia. | |
| | Conduct disaster simulations based on regional characteristics. | |
| Learning Resources | **Phase E (Class X) SMA/SMK and Phase F (Class XI) SMA/SMK** Book Reference: Geography for SMA class XI specialization in social sciences, Quadra. Budi Raharjo Agung. 2016 Geography X Surakarta: Mediatama (19). | |
| | Digital Source BNPB official website for disaster news https://bnpb.go.id/berita Definition of Disaster https://bnpb.go.id/definisi-bencana Potential Disaster Threats https://bnpb.go.id/potensi-ancaman-bencana Disaster Management System https://bnpb.go.id/sistem-penanggulangan-bencana Disaster Alert https://bnpb.go.id/siaga-bencana Portal for Risk Assessment Results Using ArcGIS Server http://inarisk.bnpb.go.id/ Indonesian Disaster Information Data https://dibi.bnpb.go.id/ BNPB TV https://tv.bnpb.go.id/ Indonesia Disaster Data Geoportal https://gis.bnpb.go.id/ Indonesia's Disaster Management Policy https://bnpb.go.id/# Indonesian Disaster Management Legal Products https://bnpb.go.id/# https://youtu.be/8W2sUOkB6Ek, https://youtu.be/g5CnBIK93go https://journal.uny.ac.id/index.php/humaniora/article/view/3511 https://bpbd.bogorkab.go.id/kearifan-lokal-kultur-indonesia-dalammitigasi-bencana/ https://kumparan.com/kumparannews/4mitigasi-gempa-bumi-berbasis-kearifanlokal-di-indonesia/full | |
| Tools and materials | Laptop/computer, Projector used to make presentations/collaborations in the digital classroom example, Google classroom, zoom padlet, canva, and others A screen projector, Printer, Internet facilities, Paperboard, Ballpoint, and Colored pencils or colored markers | |
| Main learning activities | Student settings: Individual, Couple, Group (4 people) | Method Presentation, Discussion, Project, Game |
| Assessment | Assess the achievement of learning objectives: Individual assessment and Group assessment | Type of assessment Performance (presentation, publication of work) and written (objective test, essay) |
| Study preparation | **Phase E (Class X) SMA/SMK** The teacher compiles presentation materials | |

Table 1: (Continued).

| | |
|---|---|
| | The teacher prepares various reading materials and supporting media. |
| | The teacher prepares various pictures or maps in relation. |
| | Teacher prints or uploads worksheet |
| | Making technical regulations for activities Group work in the form of structural and non-structural earthquake disaster mitigation projects along with their infographics Individual work in the form of a family preparedness planning project |
| | **Phase F (Class XI) SMA/SMK** |
| | Making technical regulations for activities group work in the form of disaster planning and simulation projects based on the characteristics of a particular school area or area) Individual work in the form of a family preparedness planning project to face disaster threats based on the threat of each region. |
| | Create a discussion group |

Table 2: Materials for Family Preparedness in Disaster Education (20).

| No | Materials for Family Preparedness in Disaster Education |
|---|---|
| 1 | Knowing the threat of disaster that can occur around them |
| 2 | Knowing how to protect yourself in the event of a disaster |
| 3 | Identify parts of the house that can be used as protection |
| 4 | Avoid parts of the house that are at risk of harm |
| 5 | Knowing the agreed evacuation route |
| 6 | Knowing the agreed meeting point outside the house |
| 7 | prepare standard disaster emergency equipment for families |
| 8 | Record the phone number of each family member |
| 9 | Record significant numbers for disaster emergencies |
| 10 | Record essential phone numbers related to the activities of each family member |
| 11 | Put into practice the agreed family preparedness plan |
| 12 | Correcting deficiencies that occurred during the practice of family preparedness plans |
| 13 | Re-adjusting planning according to the latest disaster threat conditions |

## 4. Conclusion

Disaster education must become a mandatory subject matter for every student in Indonesia, which is adjusted to each level of education and the level of disaster threat faced. Disaster education is inappropriate if it is included in character education subjects because character education has too much content. Disaster mitigation materials are more appropriate to be integrated into science subjects through problem-based learning models so that students' understanding is more profound and enhances cooperation skills through the spirit of *Pancasila* students. Development of disaster mitigation materials in IPAS subject to the *Merdeka belajar* philosophy through a *Merdeka belajar* platform will have to be integrated with digital services that can be accounted for, mainly

social media owned by disaster risk reduction agencies that already exist in Indonesia. Indonesia. Government agencies related to disaster risk reduction have developed a lot of social media that can be used as a resource in *Merdeka belajar* planning to learn the integration of disaster materials with the truth of the information that can be accounted for and responsibilities.

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