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Maintaining the quality of problem-based learning in developing countries during the pandemic era



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ABSTRACT

The COVID-19 pandemic is referred to as an unpredictable phenomenon and a challenge that stimulates change, one of which is in the field of medical education. Online learning as the main solution in the field of education certainly offers positive and negative impacts for medical students. Therefore, learning design is a strategy that continues to be developed in improving the quality of teaching that is more effective and innovative. The purpose of writing this review is to find out more about the quality of problem-based learning in developing countries during the pandemic era. This type of study is a literature review that uses the literature study method. The sources used in this review consist of relevant journals from search engines such as Pubmed, Google Scholar, ScienceDirect, and Cochrane Library. The results of the literature search show that pandemic conditions encourage learning to be carried out using virtual methods. To implement online learning during this pandemic, various technologies have been developed, ranging from digital problem-based learning (PBL) which has been implemented at the National Taiwan University College of Medicine, web video conferencing learning (WVC) at King Abdulaziz University in Saudi Arabia which is effectively used in the case-based discussion (CBD) process, as well as various platforms that support online learning, such as Tencent Meeting, DingTalk, and Edmodo. EdTech Start-ups and SWAYAM portal in India also aims to maintain equitable distribution, access, and quality in times of pandemic. Some applications that can support live streaming based on video conferencing are Microsoft Teams, Google Meet, Lark, Zoom. Seeing the various advantages and problems faced in implementing online lectures during the pandemic, various improvement strategies need to be carried out in maintaining the quality and learning outcomes, starting from infrastructure, personnel, methods in delivering lectures, learning outcomes, institutional responses, and support from the government.

Keywords: online learning, pandemic, problem-based learning, quality

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INTRODUCTION

The coronavirus disease (COVID-19) pandemic has had an impact on various aspects of human life. The COVID-19 pandemic is referred to as an unpredictable phenomenon and a challenge that stimulates changes in the fields of education, health, economy, social and politics. Even now, when this pandemic will end is still a matter of debate. In order to prevent an increase in the number of cases and mortality rates during the pandemic, various strategies have been carried out, including lockdown

and quarantine efforts. Lockdown efforts include isolation carried out at home, minimizing travel that can increase physical contact, and prohibiting all public activities in the community.¹

Distance learning or online learning is the approach chosen by medical schools in teaching students when the lockdown and quarantine processes are intensified in this pandemic era. Online learning as the main solution in the field of education certainly offers positive and negative impacts for medical students. This is in line with the statement of Gismalla et al that the majority of medical students with

a percentage of 64% have the view that online lectures are the best solution during the COVID-19 pandemic.² The study of Stoehr et al (2021) examined the attitudes of medical students towards the online learning process using 3286 samples collected from 12 countries. The study found that 78% of medical schools were able to adapt to the online learning system quickly, the majority of students (62%) were satisfied with the quality aspect, and 67% were satisfied with the quantity of the learning process. As many as 84% of respondents said that online learning has higher flexibility and increases the

percentage of student attendance by up to 70%.³ Positive impacts of online learning have also been reported in the study of Bączek et al (2021) in Poland, including continuous access to course materials (69%), greater opportunities to stay at home (69%), comfortable study conditions (54%), and the speed of learning that are in line with the ability of each student (64%).⁴

The negative impact that can occur due to online learning during a pandemic has been described in the study of Rajab et al (2020). The study states that online learning problems are mostly related to the use of learning technology as much as 56.5%, limited interaction by 59%, followed by difficulties in giving assessments to students as much as 57.5%, stress and anxiety levels related to the pandemic as much as 48%, then as many as 35% have problems managing time, and as much as 17% have technophobia.⁵ Transfer of educational materials online or live streaming is also a major obstacle for 69.1% of students because it is related to limited coverage, quality, and internet connectivity.⁶

Learning design is a strategy that continues to be developed in improving the quality of teaching that is more effective and innovative.⁷ The quality of this learning will later lead to success and outcome management.⁸ Assessment of learning outcomes that are varied and flexible is an aspect that must be intensified to ensure student competence. Therefore, the ideal curriculum design must be student-centered by taking into account demographic conditions and profiles, such as literacy and adequate access to technology, differences in abilities, learning styles, experiences, basic knowledge, and student backgrounds.^{9,10}

Until now, various kinds of learning designs and models are still in the process of continuous development. However, lately, digital problem-based learning (PBL) is getting more attention in the world of health education compared to other learning curriculum models.¹¹ Interactive learning models such as PBL are more relevant in increasing the effectiveness of teaching and learning activities and have greater potential in increasing student participation. The

three phases of the PBL model include (1) initial analysis and problem presentation, (2) self-oriented learning process, and (3) report preparation or result synthesis.¹² However, this pandemic era is a challenge for medical students to be actively involved in face-to-face discussions and lectures.¹¹ Therefore, the application of digital PBL by utilizing technology during a pandemic is an important solution to implement.

Based on these problems, the purpose of writing this review is to find out more about the quality of problem-based learning in developing countries during the pandemic era so that it is expected to be the basis for improving the quality of online learning during the pandemic.

METHODS

Type of review

This type of study is a literature review that uses the literature study method. The literature search was carried out for 3 months, from November 2021 to January 2022.

Literature Search

The sources used in this review consist of relevant journals from search engines such as Pubmed, Google Scholar, ScienceDirect, and Cochrane Library. Journal searches were performed using Boolean terms (AND, OR, NOT). The author uses journals that only focus on keywords, namely online learning, pandemic, problem-based learning, and quality, taking into account titles and abstracts that are appropriate to the topic of the review.

Inclusion and Exclusion Criteria

The inclusion criteria in this review are all studies that discuss online learning, pandemics, problem-based learning, and the quality of learning, and the references used must not exceed the last ten years, unless there is no recent research related to these references. The exclusion criteria in this review are journals that are paid or not free and do not contain information that is relevant to the topic of the review. Ninety-five journals were reviewed, 73 of which were found to meet the criteria as references for this review.

RESULTS AND DISCUSSION

ONLINE LEARNING DURING PANDEMIC

The existence of a pandemic encourages learning to be carried out using virtual methods. This online learning method provides opportunities for students to access educational materials more easily.¹³ Various alternative learning methods continue to be developed in developing countries, especially for students who do not have the opportunity to access materials.¹⁴ In an effort to implement online learning during this pandemic, various technologies have been modified to support the learning model.

Digital problem-based learning (PBL) is a digital learning model that has actually been introduced as a strategy to increase flexibility and encourage student participation. However, the implementation of PBL is a must during the pandemic to facilitate the delivery of lecture materials in medical schools.¹¹ This digital PBL model has been applied at the National Taiwan University College of Medicine with the optimal duration of digital PBL sessions of 1-2 hours. PBL activities with a shorter duration are not recommended because they reduce the effectiveness of interactions and minimize the possibility of technical problems during online activities. On the other hand, the long duration of digital PBL is also avoided because it can reduce students' ability to concentrate, encourage negative perceptions, and trigger a decrease in student satisfaction.¹⁵ PBL involves students and teachers who have gone through workshops and training.¹⁶ In order to maintain the effectiveness of the digital PBL process, a student evaluation procedure, and learning design are needed to ensure that every component of learning has been achieved.¹⁷

Learning at King Abdulaziz University located in Saudi Arabia applies a new approach to support the distance education process for students, namely web video conferencing (WVC).¹⁸ Four challenges that must be faced by teaching staff in implementing online learning methods are being able to provide good pedagogical skills, establishing good interactions between teachers and

students, overcoming various teacher managerial contributions, and seeking technical support for online classes.^{19,20} Online classroom teachers through WVC must also be effective facilitators in the case-based discussion (CBD) process so that the quality of education is well maintained and students have a greater level of satisfaction.¹⁸

CBD has a relationship with PBL which is a focused and interactive learning model. CBD provides real cases from students' daily lives that will be lived during the clinical phase. This encourages students to learn more from patient cases in hospitals, practice problem-solving skills, hone clinical reasoning, and think analytically about patient conditions from various perspectives.²¹ WVC is one of the ideal choices that can support the implementation of CBD because it will lead to increased social participation, focus on students, improve communication in small groups, facilitate teachers in assessing students' abilities to apply learning and experiences in the real world, train leadership, and responsibility, responsible when solving patient cases analytically.²²

Platforms that support online learning have also been managed by the government and the private sector which function in managing and delivering materials, as well as supporting the interaction process.²³ An example of this supporting platform is Tencent Meeting, which is widely adopted by schools in China. Tencent Meeting is a platform that acts as a live-chat media to support online learning activities during the pandemic. A similar platform to Tencent Meeting is DingTalk which can also be used internationally.²³ In addition, another learning platform that can be applied is Edmodo, where teachers can organize learning activities and conduct online classes. This platform consists of several contents that help teachers, students, and parents, ranging from notes on the agenda of activities, examinations, or polls to attend classes, assignment instructions, to quizzes to evaluate the results of teaching and learning activities.²⁴

During the pandemic, EdTech Start-ups are known to be very helpful for universities that are in a state of lockdown due to deteriorating incidence

and mortality rates.²⁵ Edtech involves the contributions and roles of teachers and students. Teachers should try to increase student participation, maintain consistency of their attention, evaluate students with various techniques. In addition, the State of India has a SWAYAM portal which was established to realize the three essential goals of the educational process, namely equitable distribution, access, and quality. The SWAYAM portal has a vital goal of providing free lectures, reducing the digital divide, and facilitating the virtual learning process.²⁶

Online learning does not fully provide optimal opportunities for teachers to match the content and objectives to be achieved from learning. Educators who have adequate digital devices and stable connections to internet services are more dominant in using live streaming sessions so that they can provide lecture materials flexibly and minimize monotonous activities. Some free applications that can support video conferencing-based live streaming are Microsoft Teams, Google Meet, Lark, Zoom.²³ This use provides a space for teachers and students to participate and communicate with each other in social learning activities.²⁷ In this regard, teachers must always cooperate with students and provide constructive suggestions. This condition is relevant to the use of applications based on video conferencing systems in virtual learning methods.^{28,29}

PROBLEM WITH THE QUALITY OF ONLINE LEARNING

Infrastructure

The COVID-19 pandemic has led UNESCO to require school closures in more than 100 countries.³⁰ As of March 29, 2020, nearly 90% of students worldwide were affected by school closures, so UNESCO recommends the use of online teaching-learning (OTL) platforms that can be used by schools and teachers to teach students remotely and limit educational disruptions.³¹ This resulted in a rapid transition from conventional to OTL learning methods in May 2020 for most educational institutions worldwide, regardless of whether or not teachers were ready to use OTL.³² Distance learning is a solution

to continuing the education system, but it is difficult in developing countries because many parents themselves are not yet in school and the lack of Information and Communication Technology (ICT) infrastructure, computers, and mobile phones to provide distance learning. Access to a computer and the internet are basic keys to successful distance teaching, but they are not guaranteed for all students in developing countries.³³

The government advises students to study through radio and television, which can be accessed at home. Radio and television lessons may be successful for some children and students in urban areas, but most parents in rural areas have not yet accessed lessons via radio or television. A study in Ethiopia showed that more than 80% of the population lives in rural areas with limited or no access to electricity, making it difficult for students in rural areas to learn from radio and television lessons.³⁴ Another study also showed the same thing, that students in rural areas and from low-income families do not have access to technology, internet access, and educational resources.³⁵ Urban schools teach students remotely by uploading assignments, books, and reading materials via Google Classroom, email, social media, and other apps. However, some schools in urban areas are also experiencing problems due to the lack of monitoring strategies in OTL, so some students do not use the application to study.³⁶

Another study explains that before the COVID-19 pandemic, there were already inequalities in access to quality education between students in urban and rural areas and between students from families with higher and lower socioeconomic status. The Covid-19 pandemic and school closures have increased inequality between students. Schools in developing countries, especially disadvantaged rural areas, due to the unavailability of suitable digital infrastructure, students do not have equal access to receive educational materials.³⁷

Personnel (teacher and student)

The COVID-19 pandemic has an impact on educational institutions and has an impact on students, teachers, and parents. The COVID-19 crisis has increased

social inequality in schools, as students with luckier parents will go to school with a complete digital infrastructure with teachers with higher levels of digital technology skills. On the other hand, underprivileged students will study in educational institutions that lack technological infrastructure and the skill level of teachers is also lower.³⁵ During the COVID-19 pandemic, many students were able to stay in school by adopting online learning, but not all teachers could use online applications well.

Teachers feel that e-learning can be time consuming and cause difficulties in monitoring students, thereby reducing interest in teaching compared to traditional learning systems.³⁸ Various perceptions perceived by teachers are related to unfamiliarity with e-learning media, different technological knowledge, and lack of skills, so teachers feel the need for formal training and workshops on the use of various technical methods and platforms to strengthen e-learning activities.³⁹ Another study by Hannafin et al. noted that many student observational and participatory evaluations of distance learning were difficult to evaluate. Likewise, Once & Cakir noticed that informal assessments became a challenge for online instructors due to the lack of face-to-face interaction. Another important challenge to distance learning is the reluctance and avoidance of educators to engage in new technologies and applications due to their limited knowledge or lack of proper training in these areas.⁴⁰

Based on the student's perspective, the study by Poon et al. reported that students at some local universities were not entirely comfortable with e-learning as a teaching tool. This is due to many factors such as technological challenges, difficult interactions and discussions with students, lack of adequate internet connectivity and personal learning.⁴¹ Another study showed that students have low satisfaction levels with e-learning because they feel that e-learning can only provide theoretical skills but not clinical skills.⁴² Another study shows that online learning causes students to be less responsible in participating in learning. Laziness and lack of student motivation are the main impacts caused by the transition phase of

the online learning system. Difficulties in prolonged online learning can eliminate student motivation due to the lack of direct interaction between teachers and students.^{43,44} The other research reported that during the covid-19 pandemic, students who lacked motivation were strongly influenced by external factors such as the learning environment, study time, and instrumental support which in turn, affect achievement.^{45,46}

Methods in Delivering Lectures

Problems in the online learning system come from infrastructure and can also be caused by the learning methods used by teachers. A study shows that students prefer lectures with downloadable videos to live lectures involving discussion. This will certainly reduce the opportunity for two-way interaction between teachers and students.⁴⁷ Another problem is that there are limitations in controlling learning. Through the e-learning method without online class meetings, the teacher is limited in controlling during online learning, because there is no discussion forum menu in the application used. Some students fill out the attendance list at the beginning of class, but after that, they are no longer active until learning ends, some even leave the online class to do other activities without being controlled by the teacher.⁴⁸

Learning Outcomes

Assessment and improvement of learning outcomes is a great challenge in online learning system. Previous research conducted by Pham, et al (2021) showed there are at least seven things that affect the learning outcomes of students during a pandemic with online learning systems, including ease of use of devices, perceived benefits, institutional capacity, learning content, learning design, and characteristics of students.⁴⁹ These seven things are complex things that need to be careful, one of which is through a problem-based learning approach. However, the way to observe and evaluate learning outcomes and implementation of PBL is difficult in online-based learning systems, especially in medical school.¹¹

Currently, a computer-based test is chosen to assess student learning outcomes

which are usually used as a system in the final exam. Many institutions only rely on the final score of the computer-based test on the final exam to determine the learning outcomes of students. Actually, the score of the final examination cannot determine the capability of the student comprehensively. This is because many students cannot optimize it as the study reported by Elfirdoussi, et al (2020) showed that 81.45% of students in Morocco are unable to take exams properly with an online system. The COVID-19 pandemic forces all institutions to implement online-based learning limiting lecturer observations on student development. Therefore, it will be really difficult to evaluate student attitude and process to get the score on the final exam.⁵⁰ Moreover, relying on the final exam only will also reduce the responsibility of lecturers and institutions to evaluate students' conditions. Thus, the real condition and development of the student in the learning process cannot be monitored properly.⁵¹

Institutional Responses

During online-based learning system, a lot of students still difficult to adapt to the regulations that must be applied so it will hinder the PBL process especially in developing countries. This problem should be considered by each institution. A study conducted at Oslo Metropolitan University showed that the sudden shift to the online learning system made 75% of students report that their lives and learning activities were more difficult.⁵² One of the reasons is the difficulty in accessing information and learning resources.⁵³ According to Perdana (2020), this can be caused by several problems, especially in facilities, human resources, digitalization, copyrights, and cost issues.⁵⁴ In addition, the increase in dropout rates also occurs due to the lack of evaluation of student conditions, which are still constrained by the online learning system. A previous study noted an increase of more than 65% in the dropout rate at universities in Japan during the COVID-19 pandemic in comparison with 2019, which shows the complexity of the problems for students that need to be addressed by the institution.⁵⁵

Government Responses

In response to the COVID-19 pandemic, the governments' role is needed in the educational system, especially on the regulation protocol. Some of the learning activities such as practicum in medical school require an offline evaluation and need to be supported. However, tight regulations from the government hinder learning activities so that the skills of students cannot develop properly, especially for students in developing countries who have low motivation to study more. When the COVID-19 pandemic spread, some countries were completely unprepared to deal with it, especially in the field of education. Poor internet connection, lack of mastery of technology by students and teachers, and the absence of a system that overshadows the learning process are major obstacles in implementing PBL and evaluating student conditions. This leads to a decrease in the quality of human resources, which has the potential to cause the country to lose its generation. This is confirmed by the increase in dropout rates that occurred in 17% of the student population at universities in India during the COVID-19 pandemic.⁵⁵ In addition, the availability of internet access is very important for the implementation of online learning activities especially in developing countries. However, research in Central Luzon, Philippines shows that more than 30% of students and 35.34% of students in Morocco do not have internet access, thus hampering online learning activities significantly.⁵⁶

STRATEGY IN MAINTAINING LEARNING QUALITY AND OUTCOMES

Infrastructure

Several strategies are used in Indonesia to increase access to digital learning for students in remote areas and other marginalized communities, namely: (1) Creating innovative financial initiatives to rent or buy computers that can be used by students and teachers, (2) using TV education programs /radio and increasing the frequency of program broadcasts, (3) collaborating with local governments to provide support for digital learning

initiatives, (4) collaborating with the Ministry of Education, Culture, Research, and Technology (Kemendikbud), forming a local task force to provide equipment subsidies through the Smart Indonesia Program (Program Indonesia Pintar) which provides cash assistance to low-income students and provides internet quota subsidies for students.⁵⁷ Another study shows that personal laptops and mobile phones are available for all students and lecturers, but internet access is still limited, so financial support from institutions is needed to support the online learning system.⁵⁸

Personnel

The attitudes shown by teachers and learning methods are also related to students' learning motivation. According to previous studies, motivation was strongly influenced by the places and tools their teachers used. In the covid-19 pandemic, teachers are challenged to make interesting learning such as making learning videos, quizzes, educational games, or others, so they don't get bored studying. Teachers can also increase student motivation by providing material while telling the cases found or giving appreciation to students who have sent assignments on time.⁵⁹ In essence, the role of the teacher cannot be replaced by technology, no matter how sophisticated it is. The use of technology in education only makes it easier for teachers to transfer knowledge, not to build student character.⁴⁸ Therefore, in providing learning during the COVID-19 pandemic, teachers should teach and provide education so that students understand the essence of each material provided.⁵⁹ Regarding evaluating learning outcomes, teachers cannot only rely on test scores. The teachers should assess the process, attitude, interaction of students with teachers and friends during online classes and their accuracy in collecting assignments.⁴⁸

Methods in delivering lectures

Several studies show that a mixed approach (traditional and e-learning) will be the most suitable medium to be applied during the COVID-19 pandemic.⁴² Given the limitations of connectivity, the concept of flexible learning emerged as

an option for online learning, especially in universities. Flexible learning will give students the freedom to choose the pace, place, and way of learning that students feel most comfortable with.⁶⁰ Based on the theory, it is stated that a key component in the success of achieving a flexible modality is to consider the modification of the curriculum to be designed, taught, implemented and assessed.⁶¹

The most commonly used method to support online lectures is providing downloadable online videos accompanied by interactive discussions.^{62,63} Virtual clinical experience with the phantom case method is another method that can be used to support the learning process for medical students who undergo clinical clerkship rotations. This will allow medical students to play the role of health professionals who interview patients, conduct examinations, propose investigations while counseling patients about their illness and determine prognosis. This method will allow students to practice critical and structured thinking in solving a case.⁶⁴

Learning Outcomes

Assessment and optimization of learning outcomes during pandemic should focus on the learning process rather than just the final exam. Assessments based on the learning process can cover all three domains of PBL, including cognitive, affective, and psychomotor domains.⁶⁵ Several learning outcome assessments by evaluating student learning processes can be carried out, one of which is task diversification and lessened percentage of final exams. The tasks given are adjusted to the PBL and learning outcomes that have been formulated by the lecturer. This strategy has been done in distance learning in Latvia and Mexico which can provide an overview of student development from task evaluation that is given gradually and more thoroughly and avoids students from cheating.⁶⁶ The integration of this process has been done in the Edomo, an application that provides a place for teachers to design learning activities, formative assessment tasks, formative and summative assessment methods so that assessment of learning outcomes can be carried out more comprehensively.²³ Implementation of this system also needs to be followed

by close monitoring of student advisors. This monitoring has been carried out at the University of Southern Denmark which evaluates the learning process from students to psychological problems in determining learning outcomes.⁶⁷

Institutional Responses

The role of institutions also needs to be maximized to improve learning quality during the pandemic. The institution must provide education that is accessible to all its students. Open on students access to literature and journal subscriptions can be done. Currently, McGill University has opened access to thousands of literature for free due to the COVID-19 pandemic to provide enough information and resources for students to learn.⁶⁸ In addition, institutions need to optimize learning platform which provides diverse sources of learning and self-assessment. During the pandemic, the University of Colorado Boulder is developing The PhET Interactive, an interactive learning platform that can be used to improve the quality of education, especially in the fields of mathematics and science.⁶⁹ Educational regulations also need to be addressed. Institutions need to provide a positive learning environment by prioritizing educative and less punitive actions to maximize the learning process.⁷⁰

Institutions also need to pay attention to the development and condition of students including the economic conditions which are a big factor influencing dropouts. Following up on this, institutions may consider cutting the tuition fees or converting the cuts into student facilities. Cutting school fees was once carried out in Sierra Leone during the Ebola outbreak which became an important factor in encouraging students to return to school. While converting the cut into student facilities will help the student to maximize the learning process. For example by providing data package for the student to join online classes.⁷¹

Government Responses

The government's role is very important in improving the quality and outcomes of the learning process. Setting the new regulation that can facilitate learning activities are needed. Hybrid learning

methods that combine online and offline learning need to be facilitated by the government in the form of regulations. This will improve the quality of education, especially in deepening the skills of students to apply the theory that has been learned and to evaluate students' attitudes and psychomotor more comprehensively. This method has been implemented and evaluated in Chinese Taipei and Costa Rica.⁷² The government also needs to pay attention to the infrastructure that supports the implementation of learning activities, one of the main things is the availability of easy internet access. One of these efforts has been carried out by the Indonesian government by optimizing the Palapa Ring Project to strengthen telecommunications and internet access in remote areas so that online learning can still be facilitated. Students and teachers are also provided free internet packages to improve the quality of the learning process and outcome.⁵⁷

Support in the form of learning platforms and improving the quality of teachers also need to be provided by the government. During the pandemic, the Chinese government supported the development of China MOOC, which is a learning platform used by most universities in China that provides free recorded and live courses from independent instructors and all top Chinese universities so that it can homogenize learning outcomes in each university.¹⁴ Improving the quality of teachers can be done by increasing incentives for teachers or increasing certification which can be achieved by providing regular workshops in teaching for lecturers to lead the learning process.⁷³

CONCLUSIONS

The online learning system has been established massively since the COVID-19 pandemic occurred. The shift from the conventional learning system to the online system raises various challenges and problems in the implementation of learning activities, especially in developing countries. Improvement of education infrastructure, personnel capabilities, learning methods, student motivation, learning outcomes, and responses from institutions and the government can be maximized as strategies to maintain the

quality of problem-based learning and enhance the outcomes of the learning process. The strategies implemented also need to be assessed, modified, and improved in response to various changes that may occur in times of crisis. The quick spread of COVID-19 limited the number of the study conducted. Therefore lack of data found in the current literature search and further research is recommended.

AUTHOR CONTRIBUTION

All authors have contributed to this research process, including conception, design, collection and assembly of data, analysis and interpretation of the data, drafting of the article, and critical revision of the article.

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CONFLICT OF INTEREST

There is no conflict of interest for this manuscript.

ETHICAL CONSIDERATION

Not applicable.

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