

Indonesia higher education's online learning during the pandemic state

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ABSTRACT

The COVID-19 pandemic has brought significant changes in Indonesian higher education to switch the learning activities to online learning. During the online learning implementations, researchers tried to record the changes and discussed the problems they faced. This systematic review aimed to summarize the growth of online learning for Indonesian higher education during the COVID-19 and to describe the connection between trends of online learning's growth and stakeholders' interests. Ultimately, this systematic review wanted to forecast the scenario after seeing the overall progress of online learning in higher education institutions in Indonesia. The authors conducted a systematic literature review using PRISMA protocol and collected articles from Google Scholar, EBSCOHost, SAGE, Taylor & Francis, and ProQuest. A total of 1,206 studies were retrieved from all databases. The authors excluded some articles that did not come originally from Indonesia, did not involve participants from universities, and were not empirical research. A final eighty-six articles were collected for analysis. The results revealed that infrastructure, interactivity, and readiness were the three main discussions for all Indonesian higher education stakeholders. The authors provided four scenarios for online learning in Indonesia, and the Cyber Growth scenario was the preferred scenario for higher education in Indonesia.

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1. INTRODUCTION

The COVID-19 pandemic has brought significant changes to the people of Indonesia. One of the changes experienced in the online learning system. Before the pandemic period, the implementation of online learning in Indonesia depended on the policies of each higher education institution at a prominent public university in East Java; the online learning only reached 42%, while during the pandemic, 95% applied online learning [1]. Online learning provides obstacles for students, such as signal difficulties reaching 47.7% and internet access difficulties at 82% [2]. During the COVID-19 pandemic, the Indonesian government provided an internet quota subsidy of 50 GB for students and donors with details of the distribution of 5 GB of general quota and 45 GB of study quota [3].

The various preferred platforms for facilitating online learning during the pandemic were Google Classroom, WhatsApp, Zoom, Microsoft Teams, Edmodo, Moodle, and other supporting platforms. The Zoom application in online learning is suitable for active learning methods and direct interaction. In contrast, the Google Classroom and WhatsApp applications are suitable for learning with passive methods and little

interaction [4]. However, implementing online learning poses a big challenge for rural students. The greatest challenge is that rural areas have poor network conditions, power outages, and a lack of knowledge of online learning applications [5]. Research by Hidayati and Saputra [6] also explains that online learning has challenges such as poor networks, faulty geographic infrastructure, and the general availability of inadequate facilities. Online learning also provides classroom management and technical challenges for lecturers and students, such as limited study time [7]. In addition, high-level students complained of experiencing stress because the lecturers do not give leeway in assignments, are scolded by their parents because they are often in front of the computer, and have internet limitations [8].

There have been many systematic reviews of online learning for students during the COVID-19 pandemic. The systematic review conducted by Nasution and Batubara [9] explained that online learning through video conferences could substitute face-to-face meetings. The researcher justified using supporting applications for discussions, exams, and feedback in learning. Research by Arribathi *et al.* [10] described the percentage of anxiety levels of non-regular group students as higher during the COVID-19 pandemic than regular students, although the difference was insignificant. A systematic review of students' opinions about online learning stated that students are neutral about using e-learning. Students felt that accessing online learning materials was superior to traditional learning because of its flexibility in time and place as long as the internet network was adequate [11]. The systematic review by Darussyamsu *et al.* [12] related to the role of parents in supporting online learning, such as the willingness of parents to provide internet quota.

The systematic review referred to the learning media utilized for online learning and the responses of students and parents regarding online learning. However, the systematic review has not yet explained the future of online learning at the university. In addition, the systematic review has not led to stakeholders' participation from policy to classroom activities. For example, whether they address students, whether stakeholders are included in the learning interactivity, and whether the community is involved.

The lack of forecasting based on the usage of online learning during pandemics in the higher education institution in Indonesia, especially in the case of interactivity in learning and policy development, encouraged us to think deeply about the matter. First, this systematic review aimed to summarize the growth of online learning for higher education during the pandemic COVID-19 in Indonesia. Secondly, this study wanted to describe the connection between trends of online learning's growth and stakeholders' interests. Ultimately, this systematic review wanted to forecast the scenario after seeing the overall progress of online learning in higher education institutions in Indonesia. This forecasting would describe from the policy to the classroom activities.

2. RESEARCH METHOD

In this paper, we reviewed the rapidly growing of online learning in Indonesia during the pandemic. Moreover, we also focused on the relationship between the growth of online learning and participants' interest in online learning. We utilized a systematic literature review methodology to answer predetermined research questions [13]. The systematic review follows the preferred reporting items for systematic reviews guidelines [14].

We collected articles using Google Scholar, EBSCOHost, SAGE, Taylor & Francis, and ProQuest from 2019 to May 2022. However, the articles were limited to published articles only (no unpublished articles in this paper). We searched for articles with keywords in English and Indonesian language. The search strings were outlined in Table 1. All potential sources were retrieved and managed using the Zotero reference manager.

Table 1. Search keyword

English keywords	Indonesian keywords
"Online learning" OR "Distance learning" OR "Remote learning"	"Pembelajaran daring" OR "Pembelajaran jarak jauh"
AND	AND
"University" OR "Higher education" OR "College"	"Universitas" OR "Perguruan tinggi"
AND	AND
"Audience curiosity" OR "Motivation"	"Partisipasi"
AND	AND
"Indonesia"	"Indonesia"

This review included all primary studies and omitted secondary studies or books. In addition, the research excluded studies that: i) did not originate from Indonesia; ii) did not involve participants from universities; and iii) were not empirical studies. Figure 1 shows the final screened articles.

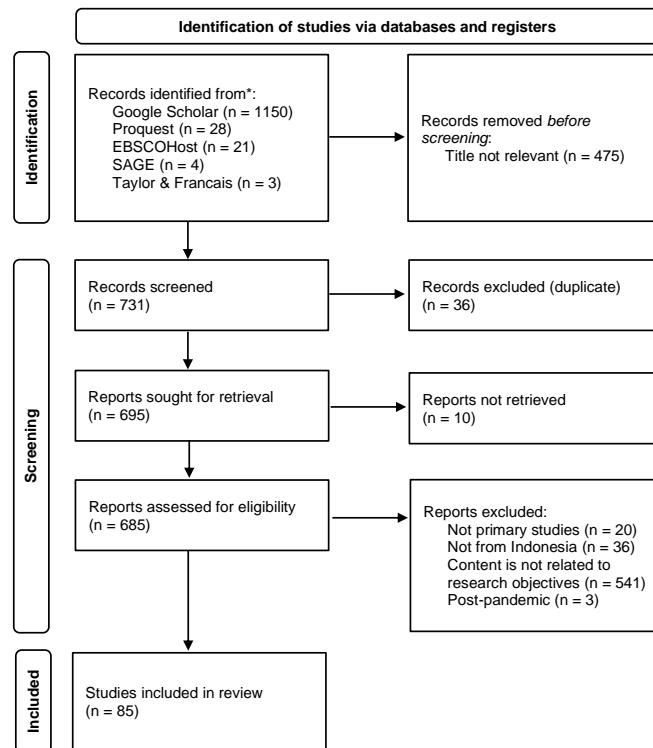


Figure 1. PRISMA diagram for systematic review

3. RESULTS AND DISCUSSION

3.1. Data resources

Online learning issues in Indonesian universities during the pandemic have received attention from education scholars. The initial search found 1,206 studies in all databases, with a publication limit from late 2019 to 2022. This number decreased by 475 after the title screening process. All potential papers were managed and screened for duplication, and deleted article duplicates to 695 papers were. We also removed ten non-access papers in this review; 685 articles remained. We read the complete reports and identified that 20 papers were not primary studies, 36 were not originally from Indonesia, 541 reports' contents did not meet the research objective, and three described post-pandemic education. The results, 85 articles included in this review. We conducted data extraction to analyze 85 potential papers. The data extraction included: i) bibliographic information (author's name, publication year, and publication status); ii) primary objectives; iii) origin of the research; iv) sample number and criteria; v) study characteristic (methodology); and vi) results.

We found two main trends in most of the articles. First, at the beginning of the pandemic outbreaks (late 2019 to 2020), learning management systems (LMS) and the effectiveness of online learning became research trends. The second trend involved academic interaction during online learning and how to improve the online learning processes. In addition, most studies discussed the difficulties that occur during online learning.

Figure 2 shows the origin of the research involved in this review in Indonesia. Based on the screening of potential studies, we found research about online learning at the university level in 20 provinces in Indonesia. Potential articles spread from all over Indonesia, from Sumatra to Papua Island. Most of the research was found on Java Island, then Sumatra in the second place. Based on Higher Education Statistics data in 2020, Indonesia has 4,593 higher education institutions (HE) throughout Indonesia [15]. As many as 48% of the total HEs are in Java, with details of 395 HE in Special Capital Region Jakarta Province, 597 HE in West Java province, 168 HE in Banten province, 367 HE in Central Java province, 135 HE in the province Special Region of Yogyakarta, and 558 HE is in the province of East Java [15]. In addition, as many as 60% of Indonesian students study at universities on the island of Java. This fact answers the problem of the distribution of articles found on Java [15]. Likewise, access to internet infrastructure is better on the island of Java. Based on data from the Central Statistics Agency (BPS), 40% of all Base Transceiver Station (BTS) towers in Indonesia are located on the island of Java [16]. This fact provides an excellent opportunity for students in Java to conduct research.



Figure 2. Locations of the original research

This systematic review's primary articles came from international and national peer-reviewed journals as presented in Figure 3. The balance between both types of publications showed that research toward online learning in Indonesian higher education became an exciting topic for national and international journals. This situation implied that Indonesian researchers also collaborate with other researchers in an international setting. For example, writers came from a consortium or a professional association that showed an interest in investigating the impact of pandemic states on higher education among countries [17], [18].

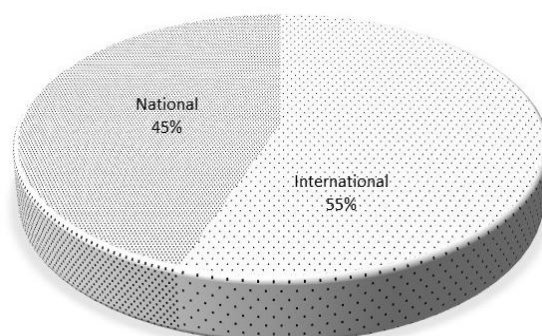


Figure 3. The published articles included in the systematic review

From the publications, we classified the articles into journals' accreditation. We utilized the classification for the national journals administered by the Ministry of Education, Culture, and Research and Technology Republic Indonesia, which fall into six categories: Sinta 1 to Sinta 6 (highest to lowest). For international journals, according to Scimago JR, we classified it into Q1 to Q4. Figure 4 shows that most publications were unclassified (48%). The Q1 articles discuss lecturers' and students' perceptions of online learning [19], [20]. Surendran *et al.* [18] discussed bioscience teaching and learning in several countries and several international writers in a consortium. The three articles are included in the Q1 category because the discussion on teaching and learning focuses on specific goals with rigorous qualitative methods. Therefore, the three articles have varied data and sharp analyses. Meanwhile, the unclassified articles (48%) have several shortcomings, such as the analysis is not sharp, the research objectives and methods are not specific, and the data is minimal. Figure 4 shows the reputation of the published articles in this systematic review.

Since most of the articles (62%) found that the internet connection was problematic in Indonesia, we searched through the Ministry of Telecommunication and Information to check the internet availability [16]. Figure 5 shows the results of internet availability in each area where the researchers performed their research on online learning in higher education. Therefore, it can be implied that data from the government showed the internet availability of adequate services. However, the fact that most researchers found similar problems could signal the government to recheck the infrastructure.

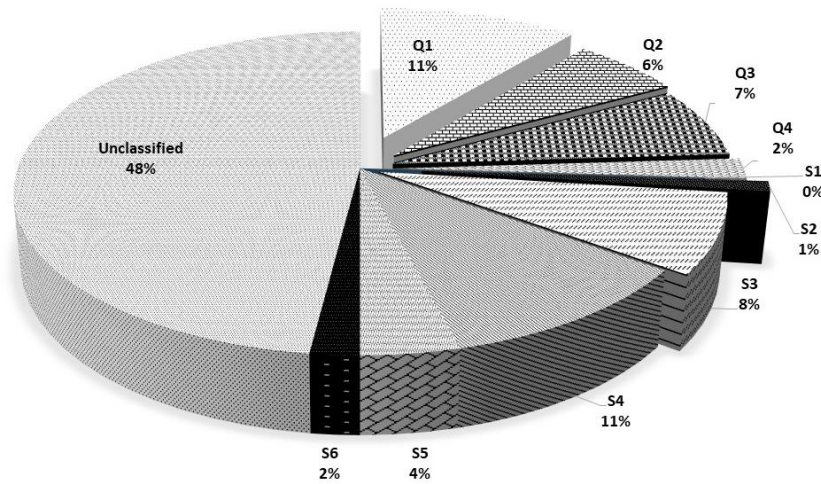


Figure 4. The reputation of published articles included in the systematic review

In Java alone, students and lecturers still complained about the supporting infrastructure in online learning, such as unstable internet access, obstacles to meeting quotas, unresponsive university LMS servers, and blackouts that often occurred in several cities. Setiawan’s research [21] stated that internet access is the biggest problem for students, with a percentage of 58.9%. Internet access was also a problem for students and lecturers living in the capital city [22], [23]. Figure 5 shows if there were still areas on Java Island with weak signal access. According to a report from social media management HootSuite and marketing agency (We Are Social), Indonesia has slow mobile and cable internet speeds globally. The mobile internet and internet speed in Indonesia is 17.24 Mbps, lower than in other Southeast Asian countries, such as the Philippines (18.79 Mbps for mobile internet and 49.16 Mbps for wired internet) and Malaysia (25.72 Mbps for mobile internet and 81.23 Mbps for wired internet) [24]. Weather affects internet speed in Indonesia, and if it rains heavily, the internet speed will be slower than usual [25].

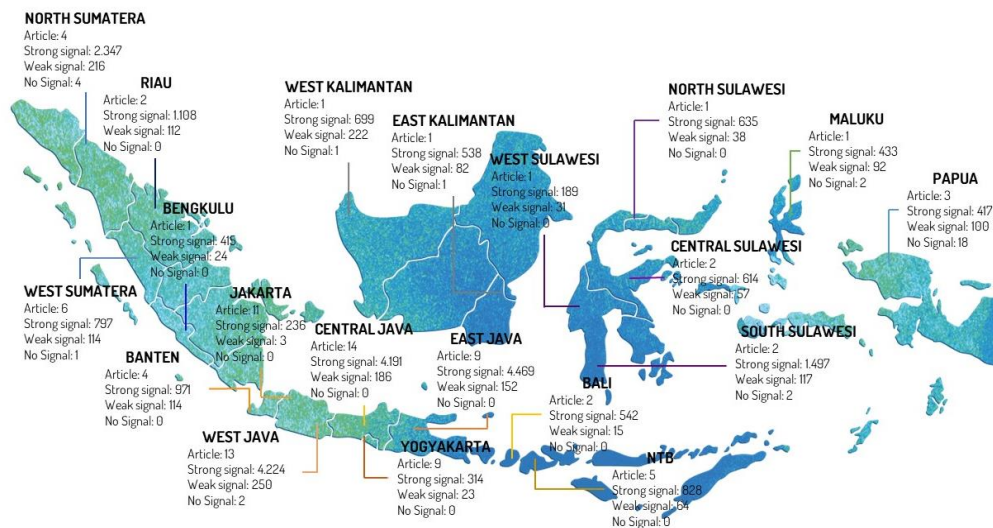


Figure 5. Internet coverage in research areas

Another problem related to internet infrastructure was the limited internet quota to participate in online learning. Alvianto [26] showed that as many as 82% of students use mobile internet to support the implementation of online learning. A report by the Association of Indonesian Internet Service Providers (APJJI) in 2022 showed that only 24.36% of the population subscribed to fixed broadband to access the internet [27]. During online learning, students spend at least 10-20 GB of data packages a month [28]. If

converted into rupiah, students spent at least Rp. 250,000.00 per month for monthly internet fees [21]. This expense is quite burdensome for students because many parents still earn less than 300 dollars or around Rp. 4,500,000.00 while they still have to cover their children's internet costs [29]. To reduce internet quotas, the university has made a policy of limiting video conferencing in online learning to a maximum of 30 minutes [19]. As a result, lecturers were not free to deliver lecture material directly.

Infrastructure that supports online learning, such as electricity access and LMS, has been highlighted in several articles. Students and lecturers complain about blackouts that often occur in several areas [30], [25]. Blackout causes students and lecturers to find it challenging to organize online learning because online learning is very dependent on electronic devices (laptops or cellphones). In addition, students also complained about the difficulty of uploading assignments to the LMS, and server downs often occurred due to the large number of students accessing the LMS simultaneously [23].

3.2. Trends and stakeholders' interest in online learning

The second objective of this systematic review wanted to describe the connection between trends of online learning's growth and stakeholders' interests. To investigate the stakeholders' interests, we tried to find what scopes or focus of studies' trends in the collected articles. Figure 6 shows that the highest concentration of the research scopes was in the study programs' level (52%). The second position was at the university level (28%). Meanwhile, there were only 16% of the studies were consortium research among universities in the same province [12], [31], [32], or in region-based universities [26], or a national consortium [17], [18], [33]. Only 4% of the studies were course-level research. The last fact showed that the focus on interactivity lacks the micro and fundamental level of interactivity. In the middle level of study programs, researchers tried to find the effectiveness of online learning. While in the university level, the research focused on assessing online learning during the pandemic state. We delved further into this focus of studies and found that the highest research was in the education department.

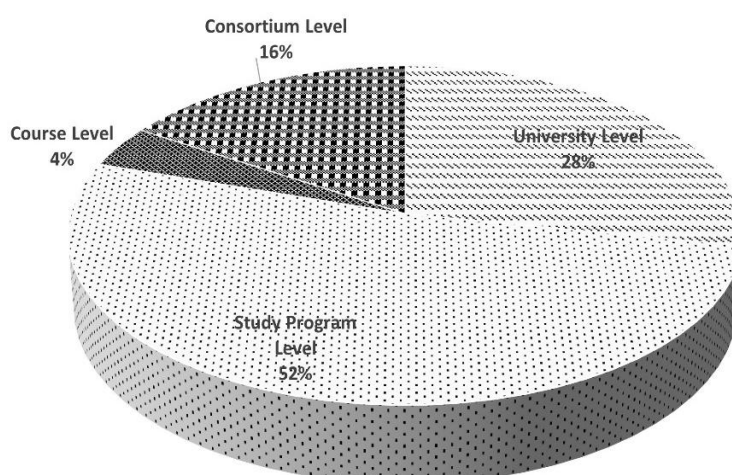


Figure 6. Focus scopes of the research in online learning in Indonesia higher education

If we counted with STEM education, the results showed significant numbers. Table 2 showed the detailed study programs in each field of study. This finding revealed that higher education in Indonesia still found difficulties in the online learning implementation within the smallest units of the higher education operational management. Therefore, in discussing the level of universities and the country, we needed to overcome the operational level. Solving the problems of interest in online learning at the operational level would be the basic need that higher education top-level managers must do. Failure to fulfill the basic needs would lead to stagnation or even collapse. The collapse scenario may relate to the future scenarios discussed.

To analyze different online learning tools utilized by higher education in Indonesia, we summarized the findings in Table 3. There were six studies whose universities provided in-house LMS. Meanwhile, only one university utilized SPADA (<https://spada.kemdikbud.go.id>), an Indonesia massive open and online learning course (MOOC) provided by the Ministry. Most studies showed that branded online learning tools were provided for public utilization. Like the trend of online learning in the world, most higher education institutions in Indonesia utilize WhatsApp, Google Classroom, Zoom, and Microsoft Teams [8], [34]–[36]. Stakeholders chose the public online tools primarily because of their usability and friendliness to the users.

WhatsApp, for example, is the simplest way to communicate between teachers and students [37]; the app is also the most reliable online tool when it is in a weak signal [23], [34], [38], [39]. Moreover, the application showed the simplest communication method, especially for the senior lecturers [4], [37], [38], [40].

Table 2. Field of studies in the reports

N articles	Field of study	Study program names
20	Education & Social Science Education	Early Childhood Education Economics Education Education Educational Technology Islamic Education Physical Education English Education
13	Social Sciences	Accounting Commercial Administration Communication Study Economics Economics and Business English Psychology
8	STEM Education	Biology Education Chemistry Education Geography Education Mathematics Education
6	STEM	Electrical Engineering Industrial Engineering Informatics Engineering Mathematics
2	Medicine	

Table 3. Online learning tools

Reference	Preferred online learning tools
[41]	SIAP (in-house LMS)
[26]	Sipedar (in-house LMS)
[42]	ELITA (in-house LMS)
[43]	ViLearn UNNESA (in-house LMS) and Google Classroom
[44]	iSpring (in-house LMS), WhatsApp, and Google Form
[45]	ELITA (in-house LMS), Zoom, YouTube, and Instagram
[37]	WhatsApp
[46]	Google Classroom
[47]	Edmodo
[48]	Online learning website
[49]	TikTok
[50]	Discord
[51]	Open learning application
[52]	Google Meet and SPADA (Indonesia MOOC)
[53]	Google Classroom and YouTube
[54]	Google Classroom, Schology and WhatsApp group
[4]	Google Classroom, Zoom and WhatsApp.
[7]	Zoom, WhatsApp, Google Form, and voice note
[35]	Microsoft Teams, Zoom, Google Meet
[17]	Blackboard Collaborate, Webex, Microsoft Teams, Google Meet, and Zoom
[34]	Edmodo, Google Classroom, WhatsApp, and Zoom
[11]	SPOT UPI, Google Classroom, Schology, Edmodo, Webex, Moodle, Skype, Kahoot, Quipper, Zoom, WhatsApp group, Google Meet, and Google Duo.
[8]	Zoom, WhatsApp, Google Classroom, and YouTube
[36]	Zoom, WhatsApp, Google Classroom, YouTube, and email
[55]	Zoom, WhatsApp, Google Meet, and other application (not mention)
[38]	Zoom, WhatsApp, Google Classroom, YouTube, and Telegram
[23]	Zoom, WhatsApp, Google Meet, and email
[40]	e-learning, Zoom, WhatsApp, Google Classroom, and YouTube
[56]	Moodle, Microsoft Teams, Zoom, WhatsApp, Google Meet, and email
[57]	e-learning fipp, Zoom, and WhatsApp
[58]	Zoom, WhatsApp, Google Classroom, Google Form, email, YouTube, Quizizz, and Mentimeter
[21]	Zoom, Google Classroom, SIP, and SPADA (Indonesia MOOC)
[39]	Zoom, WhatsApp, and Google Classroom
[59]	Zoom, WhatsApp, Google Classroom, email, and other applications (not mention)
[60]	Zoom, WhatsApp, Google Classroom, Cisco Webex Meet, and email
[61]	LMS Uniqbha, Zoom, WhatsApp, Google Classroom Webex, and email.

To analyze further, we discussed the attitude of stakeholders (teachers and students) during online learning. To remind the readers again, interactivity was a serious matter wanted by both teachers and students [30], [47], [55], [62]. However, both parties found difficulties in performing interactivities. A teacher-centered paradigm would tend to have less interactivity during online learning. When this happened, teachers complained about the student's attitude to set the camera off during the online video conference [20]. Teacher-centered learning in online learning would be the same as teaching in front of the class [63]; as we all know, this approach will detach students from meaningful learning [64]. We reflected on our findings that communication awareness among teachers and students would be crucial to guarantee interactivities. Table 4 summarizes the success or failure in communication awareness between teachers and students.

Table 4. Interactivity in terms of communication awareness in online learning

Reference	Subject	Communication awareness
[54]	Teachers	Communication between lecturers & students ran effectively & efficiently because the lecturers used more than one online learning tool.
[19]	Teachers	Lecturers and students interacted via text messages & held video meetings for a short period (no more than 30 minutes). Students were more active when invited for text chat discussions.
[7]	Teachers and students	Lecturers have limitations in the ability to accommodate students' diverse interests, learning styles, and abilities due to limitations in analyzing & evaluating students learning outcomes.
[10]	Students	Students missed the interaction during offline activities.
[65]	Students	Student-faculty interaction & communication technology were rated as "fair" for most students.
[34]	Students	Students were active during online learning, & some lecturers gave feedback on students' assignments.
[11]	Students	Students agreed that communication remained intertwined despite no direct face-to-face learning.
[36]	Students	Lecturers & students interacted asynchronously via Google Classroom or WhatsApp. In addition, lecturers provided feedback in the form of comments on Google Classroom.
[66]	Students	Online learning made some students struggle with loneliness, frustration, & boredom.
[67]	Students	Students still feel lonely & sad because they did not have enough time to talk to their classmates. Lecturers did not have enough time to give a broad explanation.
[62]	Students	Students feel the lack of intensity of interaction between students and lecturers, technical problems, and difficulty in understanding instructional objectives.
[55]	Teachers and students	Teachers & students felt that online learning's interactions & interactivity were unachievable. However, the survey showed the normality curve for the increased effort & the results of students' interest in online learning. In addition, the survey showed that teachers are ready to run online learning, with almost 50% adequate skills and around 23% high skills.
[28]	Students	Learning activities became monotonous & less interactive.
[68]	Students	In the interview, students also highlighted the lack of interactive communication. Students needed feedback and would increase their confidence when lecturers gave them feedback. Unfortunately, they did not find in most of the lecturers' attitudes.
[22]	Students	Students did not like online learning because they could not meet their friends, and learning did not feel real. In addition, online learning was less effective because students were passive.
[38]	Teachers and students	Communication between students and lecturers had problems, so the material was difficult to understand, especially for practicum courses.
[56]	Students	The negative impression of online learning, according to students: boring because students tend to like interacting directly with lecturers and their friends.
[47]	Students	The application of online learning using Edmodo made students more active in learning and more interested & motivated to learn.

The awareness to perform interactivity is related closely to trustworthiness [69], [70]. So, likewise, interactivity in online learning needs trust [71]. Questions to reflect on about trust related to the actors' trustworthiness: Have all the actors trusted each other? What about competencies? Would students in online learning be as competent as onsite learning? Will project-based learning fulfill the excellent fate of trust between teachers and students? These pondering questions made us seek further in our collected articles. Finally, we summarized our findings in Table 5. Further exploration of these findings led to the subtle teaching and learning paradigm problem. Thus, changing the paradigm toward more student-centered learning [72]–[74] with the possibility to learn further between peers would also develop students' trustworthiness and, in turn, teachers' trust. Therefore, we summarized the theme of interactivity in online learning related to trustworthiness and peer-to-peer learning (Tables 5 and 6).

Practices toward peer-to-peer learning using online learning tools have been engaging. Table 6 showed some examples of these best practices. Paristiowati *et al.* [33] researched online summer course activities held by an Indonesian university collaborating with other universities from America, Indonesia, Thailand, and Malaysia. There were 75 participants in this program. The participants were divided into groups and were asked to do a project. The online summer course program supported the participants to work in a multicultural environment. The participants faced some problems, such as time differences and scheduling conflicts, but they still enjoyed the program. Research by Nadeak [75] found that students were more comfortable asking questions or expressing opinions during online learning. Students did not feel

pressured by their friends and were more confident. Parmin *et al.* [76] implemented online scientific argumentation to improve pre-service science teachers' scientific reasoning. The results showed that this strategy was successful and allowed students to interact with others. To make students active in online learning, lecturers need to create activities that force the participation of every student. Another example implementation of online learning gives students the opportunities to collaborate with other universities [77].

Table 5. Interactivity in terms of trustworthiness in online learning

Reference	Subject	Trust
[20]	Teachers	Students have poor study habits, such as making excuses for stopping online teaching or not completing tasks.
[8]	Students	Lecturers could not fully control online classes, such as accompanying students during group discussions or answering students' questions during synchronous learning. Therefore, some students were often not allowed to attend lectures because of signal problems.
[68]	Students	Looking at the detailed results of the study, students showed an unwillingness to share ideas and pose questions. These two characteristics are part of interactive learning. Lack of sharing and posting questions may lead to trivial learning.
[23]	Teachers and students	Lecturers found it challenging to observe student activity during online learning. Students were often passive in online learning, even though these students filled the attendance list. In addition, some students were often not allowed to participate in online learning due to internet quota constraints.

Table 6. Interactivity in terms of peer-to-peer in the online learning

Reference	Subject	Peer-to-peer
[33]	Teachers and students	Participants enjoyed working in a multicultural environment. However, there were several obstacles due to the participants' diversity—the problems faced by participants: were time differences and constrained scheduling of discussions.
[65]	Students	Path analysis research showed active, collaborative, and enrichment learning had a dominant role compared to online classes.
[75]	Students	Students were more comfortable asking questions and expressing opinions, did not feel pressure from friends, fostered learning independence, and had no physical barriers and limitations of space and time in communicating.
[76]	Pre-service teachers	Argumentation strategies were an alternative practical solution during the pandemic state. In addition, this activity allowed pre-service teachers to interact with each other.
[78]	Students	Interactive media for online learning improved students' and lecturers' interaction.
[47]	Students	The application of online learning using Edmodo also made students more active in learning and more interested and motivated to learn.
[59]	Students	Interactivity within vocational and skills/practicum-based those needed more face-to-face (including micro-teaching for pre-service teachers).
[77]	Teachers and students	Students learned more efficiently, and lecturers collaborated with university partners.

Online learning demands readiness from the main stakeholders: teachers, students, and the supporting units in the higher education institutions. Looking back to Figure 4, we see that 68% of the articles mentioned readiness to perform online learning. If we go deeper into the topic, most articles highlight students' readiness for online learning. Only a few articles showed that lecturers and universities' supporting units were not ready for online learning as shown in Table 7. Lack of knowledge and skills in online learning delivery and tools proficiency made lecturers accommodate the diverse students' interests, learning styles, and abilities [7]. In addition, the habit of working and studying from home was unfamiliar before the pandemic. Thus, the atmosphere and disturbances during a stay at home may affect online learning readiness [30]. Readiness is also closely related to the infrastructure of online learning tools provided by universities and internet connections provided by the government [17], [55]. Abrupt changes at the beginning of the pandemic often raised one of the reasons faculty members could not perform well during online learning [79]–[81]. However, the last reason for the right person would be innovation, for example, the acceleration in micro-learning credentials due to pandemic disruption and online learning raising [82], [83].

Ready or not ready, online learning for higher education has been rising since the pandemic state. In this case, it takes an innovative attitude; universities get challenges from users to continue online learning. Regarding primary complaints about infrastructure, it means that the government needs to improve, but on the other hand, this trivial thought is an obstacle to progress. How will you think of doing something more advanced if the mundane is the main thought? Therefore, we propose future scenarios based on the findings of this systematic review.

Table 7. Readiness in online learning

Reference	Subject	Readiness
[30]	All stakeholders	Working and studying from home was challenging, especially if living with family or neighbors' disturbance.
[17]	Accounting academics	All six universities had readiness at a relatively equal level to deal with the ICT demand.
[55]	Teachers and students	Most of the teachers were inexperienced & the institution's administration was underprepared. In addition, most students & teachers were not provided with any information about the online learning tools. Students had difficulties understanding the teacher due to the distorted network.
[7]	Teachers and students	Lecturers have limitations in the ability to accommodate the diverse interests, learning styles, & abilities of students due to limitations in analyzing & evaluating students learning outcomes.
[84]	Students	The first- and second-year students had high enthusiasm for learning new things. In addition, all educational groups did not experience difficulties interacting with teaching materials. Students from universities with a high e-learning culture were more disciplined and adaptive. Female students were more enthusiastic about solving a problem, seeking information, and being creative than male students. Students living in rural and urban areas significantly differ in online learning.
[85]	Students	Students had poor self-management, which caused academic stress.
[86]	Students	Self-competence was the most influential factor affecting students' perceptions of readiness.
[87]	Students	Students generally had a moderate to a high level of positive perception towards online learning and relatively high levels of positive and moderate negative emotions.
[32]	Students	Students experienced high levels of academic stress due to difficulty adapting to technology in online learning. Students did not complete assignments on time because they were required to understand technology.
[20]	Teachers	Students were unfamiliar with the technological tool and lack of technology skills. In addition, students had poor study habits, such as making a personal excuse for stopping online teaching/not completing tasks.
[11]	Students	Students had limited knowledge and skills of various platforms for online learning.
[68]	Students	Students generally had a high readiness for online learning regarding computer/internet self-efficacy, learning motivation, and online communication self-efficacy. However, students felt it difficult to control themselves from online distractions unrelated to the instructions.
[88]	Students	Students felt they could not learn independently and were dissatisfied with receiving learning materials.
[21]	Students	Student efforts in online learning are pretty good, with the readiness percentage reaching 52.4%.

3.3. Scenarios for the future of online learning in higher education

Ultimately, this systematic review wanted to forecast the scenario after seeing the overall progress of online learning in higher education institutions in Indonesia. This forecast will describe everything from the policy to the classroom activities. An example of future scenarios in higher education came from the UK. The trend in using public tools or white label public tools showed the readiness of the stakeholders. In the future, this will also provide a future probability. In Institute for Futures Thinking (IFTF), the creation of future scenarios can look at drivers or signals that support the occurrence of specific scenarios. In simple terms, scenarios can be divided into four quadrants. Based on the four quadrants, it can be called scenarios: collapsed, transformation, growth, and constraint scenarios [89]. Through learning scenarios, higher education stakeholders can explore future education by analyzing the risks and opportunities of current trends in higher education [89], [90]. There are four phases for compiling scenarios that are helpful for creativity to determine the future direction, namely planning, production, implementation, and evaluation [91].

We divided four future scenarios on online learning in Indonesian higher education institutions as in Figure 7. We call the growth scenario Edgy Acceleration. Our transformation scenario is Cyber Growth. The transformation scenario may refer to the improvements of online learning while we will still be doing hybrid learning for specific areas of studies and social interaction needs [92]. Distinctive hybrid learning incorporated the principle of time, task, and evaluation [93]. We believe the Cyber Growth scenario is preferable for governments (the Ministry) and higher education sectors. Meanwhile, the Business-as-Usual scenario is a constraint scenario. Finally, the collapsed scenario that we did not expect, we named as Back to the Old-school scenario. Downtrends in online learning showed the evidence came from the downsizing of start-ups in education in 2022, right in the coming back of office and schools after the pandemic state. Thus, trends in online learning should set the bar, especially in three areas: a seamless journey, an engaging teaching approach, caring network [94], [95]. Back to the old school is caused by the external socio-political condition; even climate change or the worsening situation in social, political, and economic may eliminate the betterment of online learning. In this scenario, online learning will decline. As a result, people may return to the old teaching and learning style in higher education. We compiled the four scenarios using the signals collected in this review.

This systematic review found signals that contributed most to future scenarios. The majority of the article mentioned that the main problem was internet access. The government's prominent role in improving infrastructure has undoubtedly become the government's agenda in the strategic planning of the countrywide Indonesian. For example, this is included in the RPJM medium-term development plan on higher education and technology. The infrastructure for online learning in HEI is thus a signal that can strengthen or weaken

depending on the player and planning. The players are government and higher education parties. Planning may compare strategic planning with operational planning.

This systematic review also showed the interactivity signals that were the needs of our higher education's leading actors. On a vast scale, the need to interact exists at the level of institutions and societies. At the micro level, the main actors are teachers and students. The form of interactivity can be divided into two quantities, namely groups and individuals. Figure 7 shows the second signal on the right side with a map of the movement of the four scenarios.

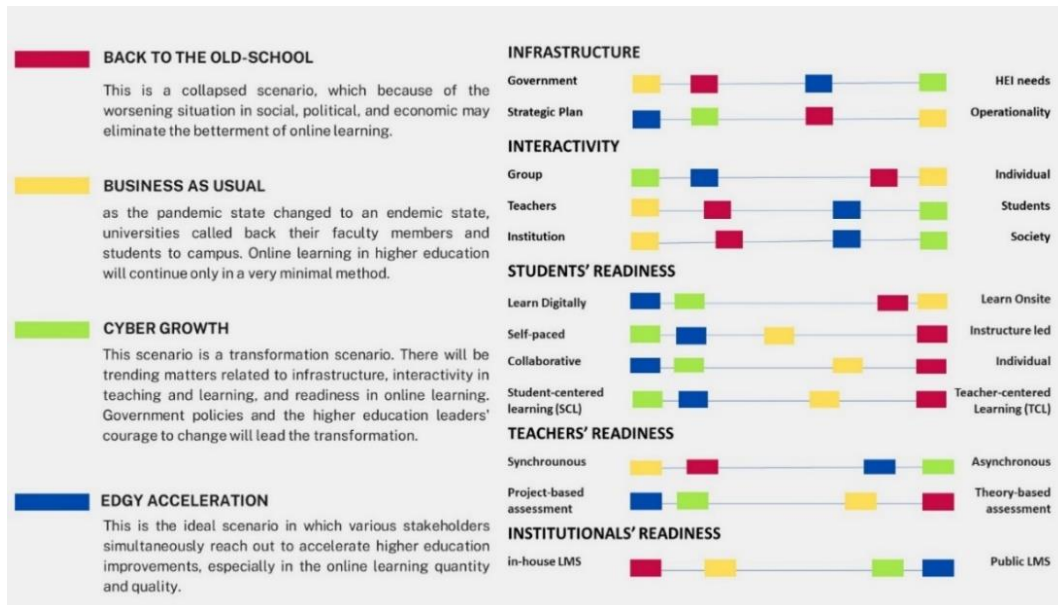


Figure 7. Proposed future scenarios on the online learning in Indonesia higher education based on the systematic review

Furthermore, in the readiness criteria we observed through the systematic review, this theme was divided into three things: students' readiness, teachers' readiness, and institutions' readiness. Through this systematic review, we see the majority of articles have discussed students' readiness in the sense of criticism of paradigms (SCL versus TCL). Furthermore, the lack of a form of teaching and learning approach in collaborative while individual approaches come to the fore more often. Online learning also requires self-readiness for students. In this case, there is a signal of self-paced learning or instructor's paced learning. Self-learning supports the rise of personalized and collaborative learning [96]. Personalized teaching and learning need more mentorship, coaching, problem-based learning, and project-based learning to be relevant to the market. Thus, along with personalized, the generation needs more collaboration [96]. Students' readiness will be driving a change toward learning digitally while there is also a push back to campus (onsite) for some courses or courses.

In the teachers' readiness criteria, we look at two main signals that affect the online learning scenario in Indonesia's higher education. The first is about the innovation of assessment based on project-based and less theory-based exams. Assessment is critical because the assessment element is the realm of universities represented by professor scholarships. Assessment encourages the learning process and fosters students. The second signal is synchronous versus the asynchronous system. In online learning, the ability of teachers to conduct asynchronous teaching supports the development of online learning. This ability certainly needs support. The institutional readiness criterion indicates such support. The existence of an in-house LMS versus a public LMS is clearly the institution's readiness to continue developing online learning. Public LMS shows a strengthening signal by strengthening stakeholders who can think and work in a massive and collaborative ecosystem. For example, a large IT company that has mastered a significant market share (Microsoft, Google) [97]. If the government provides interventions in the form of acceleration in policies related to online learning in higher education or its convergence, this will encourage HEI institutions in Indonesia to think institutionally.

Stakeholder interests in almost all of this article exist, from students, lecturers, and support units. Policy movements widely in the country and institutions will support the transformation of online learning to the classroom level. Interaction becomes a critical point (Figure 4) in the classroom. With the front line being the lecturers with students, the primary interaction that will change the landscape of online learning is the interaction in that classroom. This change (transformation) is found when the institution supports it. Institutions can support if there is a push from the Indonesian government's policy. The Indonesian government will also use this authority for joint private intervention. From the strategic plan to the operation at the level of government, we hopefully see the improvement of infrastructure that flow to the higher education institutions. At the study programs and classrooms level, stakeholders of interest would then utilize the improvements to rearrange teaching and learning processes toward readiness and interactivity in online learning [98], [99]. As a result, this improvement would impact learning processes in the classroom. Future curriculum needs creative teaching and learning approaches, including assessment using the authenticity approach [100], such as the design of project-based learning through a semester with the product of a real project-based exam.

4. CONCLUSION

This systematic review summarized the growth of online learning for higher education during the COVID-19 pandemic in Indonesia. There was a significant increase in the growth of online learning in Indonesia, as evidenced by the many studies related to online learning since the pandemic. In addition, the result found that video conference applications were the most preferred online learning tools in Indonesian universities, and internet connection became the main problem in online learning.

The study scrutinized the search engines to finally collect 85 primary articles that showed international and national accredited publications. This study showed that infrastructure, interactivity, and readiness were the three main drivers for all stakeholders to perform online learning in higher education. Furthermore, those drivers may affect the future scenarios of online learning in higher education in Indonesia. Therefore, we concluded the systematic review with four future scenarios on online learning in Indonesian higher education. The most preferred scenario was the Cyber Growth scenario, with the possibility to improve infrastructure, interactivity, and teachers' and students' readiness. This forecasting would support the actualization of policy toward classroom activities.

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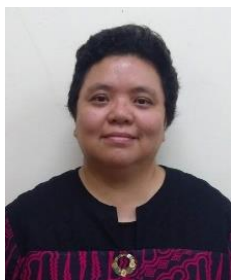
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