 doi:10.20944/preprints202103.0563.v1

Case Study

The complexity of remote teaching in emergency situations: Initial basic principles to avoiding technological boundaries

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Abstract: Considering the challenges of sustainable education in emergency remote teaching (ERT) during the coronavirus (COVID-19) pandemic, this study provides basic principles for future ERT implementation based on the experience of higher education in Indonesia. Seven local expert distance educators reviewed the ERT principles, participating in the early stages to check the relevance, content validity, and readability of the five principles proposed in the context of Indonesian education. After an extensive expert review, the ERT principles were evaluated using quantitative data through an online survey (82 students and 45 faculty members). In addition, open-ended questionnaire responses, experiences, and challenges encountered by 21 respondents (College Dean, Associate Dean of Academics, and faculty quality assurance of seven universities/colleges in three provinces in Indonesia) in ERT were used and analyzed. This study suggests that ERT should be designed based on the principles of simplicity, accessibility, affordability, flexibility, and empathy in all learning activities in unfavorable situations. This study complements previous work and can thus be used for generalized principles for teaching activities in similar emergencies, especially in developing countries.

Keywords: emergency remote teaching; student-centered; COVID-19; Indonesia

1. Introduction

Since the World Health Organization (WHO) declared a pandemic in early 2020, COVID-19 has confronted teachers and administrators in Indonesia with many difficult challenges. Encountering a changing landscape – from face-to-face to online meetings – teachers engaged students in the online learning environments with marked variations in technological access, devices, pressure, and stress. Emergency remote teaching (ERT) is a mode of learning while facing various obstacles and policies on the trade-off between the quality and sustainability of education at a critical time. The education sector throughout the country is being tested to implement ERT quickly and effectively, without increasing the burden on students and parents during these difficult times. This situation can also answer questions about the readiness of higher education in facing the challenges of the digital era.

The first two cases of COVID-19 in Indonesia were confirmed in Jakarta. At a press conference in Jakarta on March 2, 2020, Indonesian President Joko Widodo announced a national epidemic and ordered large-scale social distancing as a prevention of the spread of COVID-19, including the education sector. In line with the presidential instruction, the Indonesian minister of education and culture canceled national exams for all levels: elementary, junior, and high schools on March 24, 2020 [1]. Furthermore, since March 2020, all education institutions have been instructed to start preparing to implement emergency remote teaching modes.

Emergency remote teaching is defined as a sudden interim shift of instructional delivery from face-to-face to an online delivery mode as a result of a disaster/crisis. ERT is contrary to online learning, which is pre-planned and designed to be delivered virtually

[2]. The main purpose of ERT is not to completely transfer the conventional methods to e-learning, but to provide temporary access during emergencies using various available and reliable media or platforms. Thus, ERT can be understood as a temporary solution and should be separated from the term "online learning" [2]. Accordingly, online learning is an alternative and flexible option for universities/colleges, while emergency remote teaching is an obligation to protect the educational community from spreading the virus. Therefore, online learning and emergency remote teaching are not the same since their purpose and function are different.

Designing remote teaching under the wrong assumptions and principles increases vulnerability to errors along the way. ERT is an obligation and a realistic solution during crisis circumstances. Each previous study had a different research focus, such as differences in online learning – ERT, emergency curriculum, and evaluation of ERT implementation. For example, Hodges et al. [2] specifically provide important points regarding the difference between ERT and online learning. Mohmmed et al. [3] evaluated ERT implementation. Wang and East [4] constructed an emergency curriculum during the pandemic, while Whittle et al. [5] developed a conceptual framework for responsive online teaching in crises. Other studies [e.g., 6,7] used the activity-centered analysis and design (ACAD) framework to design ERT in New Zealand, and Karakaya [7] focused on a human-centered approach. In the same vein, several researchers have focused on various pedagogical constraints in remote teaching activities [8-12], however, none have specifically developed the principles of implementing ERT, thus, this study aims to fill this gap.

This study introduce the principles of ERT through the experience of higher education in Indonesia in the new adaptation period, which began in July 2020. The proposals for ERT principles were evaluated using qualitative data collected though an online questionnaire of administrators, teachers, and students. This study combined the principles of online learning, including flexibility, accessibility, affordability, and development of a robust educational ecosystem [2] and the three principles of simplicity, flexibility, and empathy [13]. This study sheds some light on ERT principles that administrators need, in order to design worthwhile learning activities and flourish in this new normal. Specifically, this study explored two research questions: (1) What are the main principles for implementing ERT?; (2) What are the challenges behind the implemented ERT model based on the current situation?. This paper provides valuable insights for education practitioners, policymakers, and researchers into the current situation as a reflection of national educational technology readiness, particularly in developing countries.

2. Materials and Methods

2.1. Research Design

This study adopts a case study methodology. Specifically, this study focuses on the experiences of faculty, teachers, and students in Indonesia in overcoming learning challenges in the COVID-19 pandemic. Seven expert distance educators from several universities reviewed the ERT principles for content validity, readability, and logical flow. Content validity was analyzed to quantitatively answer the first question, and reflection reports were analyzed to qualitatively answer the second question. A separate method was used to ensure that the principles developed had appropriate content and were relevant to conditions in Indonesia. This study invited administrators, faculty members, and students to reflect on the meaningful situation in two parts: the current situation and potential future actions.

2.2. *Participants and Procedures*

The study was conducted in two phases. First, we engaged a panel of seven experts in the initial design of ERT principles. To broaden the scope as much as possible, we included two practitioners from the field of educational technology and five senior lecturers from different universities. The five principles proposed based on the literature re-

view included simplicity, flexibility, empathy [8], accessibility, and affordability [2]. For content validity, they were asked to evaluate the appropriateness and relevance of the items to the Indonesian education context. Experts responded on a scale ranging from "relevant = 4" and "irrelevant = 1."

In the second step, after an extensive expert review, the ERT principles were evaluated quantitatively and qualitatively. The quantitative data were obtained from 82 students and 45 faculty members. Participation in an online survey to fill out this questionnaire is voluntary after approval through oral communication to the administrator of each university. In this emergency situation, no formal ethics approval was in place for data collection. Close-ended questionnaires were distributed to seven different universities in three provinces in Indonesia after approval of college administrators. Students and faculty members responded on a 4-point Likert scale ranging from excellent = 4 to poor = 1. Data from this stage were analyzed using descriptive statistical analysis.

Third, we selected 21 participants, consisting of the Dean, Associate Dean of Academics, faculty quality assurance from seven universities/colleges in three provinces in Indonesia. The heads of each university approved the participation through oral communication, following which, the participants were required to voluntarily fill out the open questionnaire in an online survey.

The data collected from both administrators and lecturers were regarded as evaluative rather than for research purposes; the primary goal was to evaluate the implementation of remote teaching, which is ongoing. This study uses an informal and collegial approach by survey coordinator (in this study as co-author), Prof. Sri Widyastuti. All qualitative data were reviewed and analyzed to identify emerging themes and patterns. These policies were analyzed to triangulate the data gathered for research questions [14]. We argue that this approach is well suited for this study for two reasons. First, this methodological approach balances the content validity of proposed ERT principles with the emergent needs of participants. Second, data collection in crisis contexts can be highly unstructured and unpredictable [15]. This situation allowed us to acknowledge the novelty of the ERT phenomenon quickly rather than gathering extensive data that would entail a long time to validate the theories. We conceive the principles from the first study and follow-up questionnaires to obtain opinions on the principles from the first phase as intertwined. The principles presented are grounded in the experiences of a limited number of teachers and administrators, but represent a fundamental, practically grounded approach to implementing remote teaching in emergencies.

3. Results

3.1. Content Validity

This section analyzes academics' feelings (administrators, teaching staff, and students) about the implementation of ERT and the deployment of the five proposed principles (simplicity, accessibility, affordability, flexibility, and empathy) during the COVID-19 pandemic. Figure 1 presents a circle of principles to organize the analysis, which will help explore, clarify, and compare the application of these principles in the practice of remote teaching.

 doi:10.20944/preprints202103.0563.v1

Figure 1. *Five Principles of Emergency Remote Teaching*

The first stage of the study answers the question "What are the main principles for implementing ERT?". The content validity index (CVI) was used to assess the feasibility of an item. In this study, the five principles proposed based on the literature review included simplicity, flexibility, empathy [13], accessibility, and affordability [2]. The five proposed principles were considered relevant based on a CVI value> 0.80 [16,17]. Thereafter, the experts were asked to give ratings ranging from most important to less important. From these results, we sequentially obtained five main principles in developing ERT, including simplicity, accessibility, affordability, flexibility, and empathy. Table 1 shows the mean scores ranging from 3.43 - 3.86 and the item-level content validity index ranging from 0.89 - 0.93,which meets the content validity standard [16].

Table 1. *Mean Ratings, Content Validity Index (CVI), and Standard Deviation (SD)*

	Mean	CVI	SD
Simplicity	3.57	0.89	0.53
Accessibility	3.71	0.93	0.49
Affordability	3.57	0.89	0.53
Flexibility	3.71	0.93	0.49
Empathy	3.86	0.96	0.38

Notes: CVI = Common variance index; *SD* = Standard Deviation

3.2. *Evaluation based on faculty' and student's perspectives*

The second research question asked respondents to rate the implementation of ERT based on the current situation. Statistical analysis using nonparametric testing (Mann–Whitney U Test) found that there were significant differences between faculty and students on the principles of "simplicity,""affordability,""flexibility," and "empathy" ($p<0.05$). Meanwhile, the principle of "accessibility" was rated equally in the perceptions of students and faculty members. All principles were rated higher by faculty members than students (see Table 2).

 doi:10.20944/preprints202103.0563.v1

Table 2. *Perceptions of ERT principles by faculty and students (poor to excellent)*

	Group	Mean	*SD*	Mann-Whitney U Test	
				Z	Asymp. Sig.
Simplicity	S	2.354	1.011	−2.651	.008
	FM	2.920	.702		
Accessibility	S	2.634	1.000	−1.512	.130
	FM	2.960	.841		
Affordability	S	2.232	.972	−4.077	.000
	FM	3.200	.866		
Flexibility	S	2.366	.949	−5.478	.000
	FM	3.680	.627		
Empathy	S	2.134	.953	−4.442	.000
	FM	3.080	.702		

Notes: S = students, FM = Faculty members; *SD* = Standard Deviation; Faculty member: $n = 45$; Student: $n = 82$

Sequentially, students gave the highest ratings to the principle of Accessibility, followed by flexibility, simplicity, affordability, and empathy. On the other hand, faculty members give the highest ratings to the principle of flexibility, followed by affordability, empathy, accessibility, and simplicity. This difference in rank indicates that students and faculty members have different perceptions in implementing ERT (see Figure 2). The following provides an explanation of the implementation of these five principles based on the perspectives of the College Dean, Associate Dean of Academics, and faculty quality assurance.

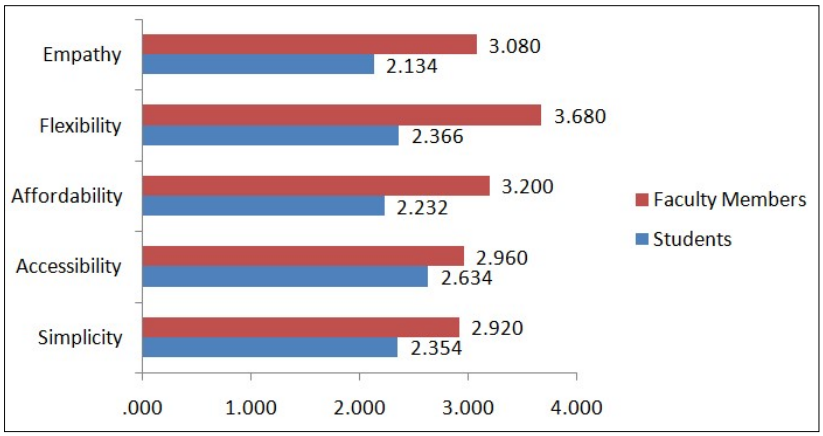

Figure 2. Mean ratings of implementation of ERT principles between students' and faculty members' perspectives (1 = poor to 4 = excellent)

4. Discussion

4.1. Principle 1: Simplicity

Simplicity refers to simple, uncomplicated, and freedom from complexity. The main purpose of ERT is not to completely transfer conventional methods to e-learning but to provide temporary access during emergencies using various available and reliable media or platforms. Thus, ERT is neither an attempt to fully teach the study material in an online mode using various "advanced" applications, nor is it the time to strive for the

"best practice" in online delivery [4]. Instead, ERT is focused on delivering practical learning with quick and simple approaches to online delivery of materials and assignments. ERT is not intended to meet learning objectives and standards in normal times but rather to provide convenience by reducing basic competencies and study subjects.

The main objective of ERT is to keep learning functioning and feasible for remote online delivery without overburdening students, teachers, and parents during a crisis [4,21]. However, to be a simple system, the design and implementation of ERT is related to a curriculum specifically designed for emergency situations. Adopting an emergency curriculum enables teachers to respond quickly to maintain educational sustainability and ensure that students are supported in achieving their learning goals in a difficult situation. As a frontline in education learning systems, teachers need an emergency curriculum to help them make decisions about implementing learning activities and evaluating student learning outcomes [4]. The following is a comment from respondent:

> "Not reducing the material, just trying to tighten the learning hours, the duration is made not burdensome for students by adding more flexible discussion sessions after the delivery of the material."

It is vital to indicate that curriculum change is an effort to continue executing educational activities and is also used as a coping strategy for the pandemic crisis. The emergency curriculum is a simple version of the standard curriculum in a normal situation. The main objective of this curriculum is to continue to implement the learning functions that are feasible for remote online delivery without giving teachers and students an additional burden in difficult times.

4.2. Principle 2: Accessibility

Accessibility is the practice of learning delivery usable by as many people as possible. The lack of access to fast, affordable, and reliable Internet connections must be handled by selecting the applications that are used the most and many students' lack of necessary electronic devices [12]. The other difficulties that the ERT activities face include the lack of online teaching infrastructure. Other problems also arise regarding the information gap, the complex environment at home (for example, the use of the device alternately with other family members, the existence of a family exposed to the virus), and so forth [18]. Using special programs that require fast Internet access and high random-access memory (RAM) on mobile devices will cause new problems, such as obstruction of the learning process. Consequently, there are many technical problems that occur in video conferences, such as loss of sound, delayed images, or inability to access classes due to low Internet networks and the technical capabilities of the devices used (for example, devices do not meet the minimum requirements for the application).

This study found that the majority of respondents stated "Internet speed instability" as a major issue for lecturers and students. Applications such as WhatsApp, Google Classroom, Google Meet, and Zoom were used in combination as the learning delivery media by the majority of respondents. These applications were chosen based on considerations of accessibility, convenience, and in general, ease of use, both by lecturers and students. Accordingly, we agree that the learning delivery used met the elements of accessibility, lecturers creatively innovate in delivering material by combining video recordings, modules, and power points. One respondent argued that:

> "We conducted an initial discussion through the WhatsApp group to determine what application was the most suitable and easily accessible to students. Finally, from the discussion, the applications for the most efficient and accessible virtual class were Gmeet and Zoom, while for our assignments and discussions, we use a mix of Google Classroom and WhatsApp Group..."

 doi:10.20944/preprints202103.0563.v1

In the present situation, the majority of campuses have support teams that are available to help faculty members implement online teaching even though the team members are limited in numbers and capacities. In some situations, the support team also helps lecturers upload teaching materials and create virtual classes. One lecturer argued that:

> "The support team is relatively limited, but we still appreciate what they have done, especially for lecturers who do not have the experience of doing online learning. The initial implementation is very chaotic, but over time lecturers can learn to get used to teaching online through various available platforms."

4.3. Principle 3: Affordability

Affordability level is the limit of ability that can still be used for learning purposes. In this context, students whose families have economic problems due to COVID-19 are a major concern. Using a virtual class/videoconference with a synchronous mode, apart from requiring fast Internet access, can also consume Internet data. Most Indonesian Internet users rely on expensive limited-capacity mobile networks [19], which makes it difficult for students to use their broadband networks to meet online learning requirements. For example, video conferencing uses large volumes of data. This condition creates difficulties for students to obtain a high-speed broadband network in an online class. A senior lecturer says:

> "Not all students have WIFI facility in their homes, and most use prepaid Internet data. Using the video conferences application caused their Internet quota to run out quickly, and many complained about the high cost. We are addressing this matter not to impose online meetings to be held every week. In my opinion, the blended between asynchronous and synchronous is a trade-off between lightening the burden on students and material achievement. However, thanks to the Indonesian government through the Ministry of Education and Culture, which since July 2020 has distributed Internet quota for students."

We appreciate the work of lecturers who have a sense of social responsibility of not imposing certain applications as a medium for delivering the material. The majority of respondents stated that the use of certain applications needs to be discussed with students to ensure that the learning process can run efficiently. Thus, learning delivery can use a mixture of synchronous and asynchronous environments based on the evaluation of the situation.

4.4. Principle 4: Flexibility

Flexibility is the priority is to address the learning process and outcomes. Although moving to online instruction can enable the flexibility of teaching anywhere and anytime without having face-to-face meetings, the speed to change from conventional methods to online is authentic and staggering [2]. Some universities provide high flexibility concerning material delivery through video recordings that can be accessed anytime and anywhere by students. However, in terms of lecture time, students are still required to attend virtual classes according to predetermined hours and days. We fully agree with this step by understanding that the pandemic situation that occurred has decreased relatively in November 2020 (even in some parts of Indonesia, some schools have been given permission to conduct face-to-face classes while following the health protocol from the government). A senior lecturer stated:

 doi:10.20944/preprints202103.0563.v1

> "We try to be flexible as possible to make it easy for students. We understand that the current situation is unfavorable, and many of us have also been directly affected by this pandemic. But we also keep our virtual meetings on schedule to monitor the student's condition, I think this is the best way we can do it…"

The pandemic crisis has changed the environment of society, education, the economy, and the individual. From the perspective of complexity theory, the systems are unpredictable and organizations must be able to continue to interact and obtain accompanying feedback on what to do while considering the social and organizational changes. Thus, the implementation of ERT needs to emphasize a shared responsibility among faculty members and supporting staff], and requires a collective decision from all participant groups (including students) rather than a centrally managed plan [4].

4.5. Principle 5: Empathy

Pedagogical innovations for the ERT aim to increase student engagement by creating a climate of empathy and care [21], motivation, achievement, and a sense of belonging for students in an online course [4]. The pedagogical challenges are principally associated with teachers' and learners' lack of digital skills [12]. In remote teaching during crisis students should know where to find support from teachers and the campus. One lecturer expressed how they felt about the empathy showed during emergency teaching:

> "We heard that many of our students have been exposed to COVID-19.There are some of our students who take online study and exams while being treated at the hospital. However, I only got this information when the student had recovered. I am grateful and proud of the students' enthusiasm for learning."

Another effort made by the faculty is to provide information and a complaint center. Some universities provide a 15 percent discount on tuition fees, waivers for tuition fees, and even full scholarships. They also provide assistance with Internet quota fees and several other policies to ensure that students in poor financial situations can continue their studies. ERT focuses more on the teacher's efforts to execute the learning function and is feasible for remote online delivery without enhancing stress among students and teachers during difficult times [4]. A lecturer gave the following opinion:

> "We are fully aware that many families have been directly affected by the pandemic, such as the inoperability of the business sector, reduced salaries, and even job cuts experienced by parents of students. I always give messages to lecturers to actively ask about the conditions of students, giving them be enthusiastic if someone is hit by a bad situation, and continue to maintain student learning motivation. So far, I have heard that lecturers have a direct connection with student groups through WhatsApp groups, so that any information can be easily discovered by the lecturer."

Finally, we asked two questions about the effectiveness of ERT in terms of student interaction and learning material achievement, and "If you can choose, do you prefer online or face-to-face?" Although more than 50 percent of respondents stated that material achievement and student interaction had gone well, more than 65 percent preferred face-to-face learning for post-pandemic. A limitation of technology resources is that obstacles are encountered during online tutorials in low and unstable Internet networks in several regions in Indonesia. This condition emphasizes that the application of distance

learning in Indonesia still requires time and an in-depth evaluation before being widely implemented.

5. Implications and limitations

The five ERT principles are novel in their foundational work and guide the development of online courses and distance learning modes in unplanned or responsive remote teaching situations, especially in Indonesia and similar developing countries. This study offers five principles of remote teaching, which will be transferred to the learning activities of any educators, especially in developing countries that have limitations in technological infrastructure.

5.1. Implications

These five ERT principles are a synthesis of the three principles proposed by the University of Auckland [13], including simplicity, flexibility, and empathy, the emergency curriculum design [4], and the important work of Hodges et al. [2] regarding the difference between ERT and online learning. We have proposed five principles for implementing ERT as basic assumptions for ERT planning, preparation, and development during emergency/crisis situations. In contrast to online learning, which is deliberately designed to be technology-based, ERT must be designed by prioritizing social justice and equity perspectives.

The findings of this study have several implications. From a theoretical perspective, the principles of applying ERT cannot be separated from psychological and socioeconomic aspects. In an emergency, we cannot obsessively focus on teaching delivery, knowledge transmission, and lecturing using sophisticated technology [21]. We support the term "humanizing pedagogy" [22], where the focus of ERT is pushing beyond purely cognitive approaches and becoming more reflexive [16]. Humanizing pedagogy as a part of human-centered design may help university teachers build empathy. Therefore, the ERT design needs to be preceded by assessment of students' needs and available technological resources. In general, these five principles support the application of learning based on the evaluation of needs and environmental situations (e.g., physical, psychological, economic, health, and spiritual).Thus, the five principles can be integrated with the ACAD framework [see 23] and are in line with human-centered design [24].

From a practical viewpoint, ERT should be treated as a temporary solution and should be distinct from the term "online learning" [2]. In this sense, online learning and emergency distance teaching are not the same; they differ in both purpose and function. Internal organizational resources such as IT support, readiness, and proficiency of lecturers in ERT implementation guidelines are important factors for the success of ERT implementation. Therefore, this study argues that the implementation of ERT should be a collective decision from all participant groups. Imposing a teacher-selected or technology-driven learning delivery without considering the macro socio-economic environment or individual resources can prevent ERT from meeting the principles of accessibility and affordability. Conducting discussions with groups of students by personal lecturers may find the most effective midpoint for the implementation of learning and reduce the effects of social inequality.

The administrators and teachers are constrained from finding meaning in the current pandemic situation as a result of the tension between educators' pedagogical practices and situational constraints, such as standardized and national-mandated curriculum, technological resources (lack of access to a fast, affordable, and reliable Internet connection), and teachers-students readiness. The schools/administrators need to understand that this is not a normal situation in which learning competency standards must be rigorously met. In a crisis, and given facts from the field that show disparities in technology and Internet networks, curriculum fulfillment is not the only issue of concern; it is also important to care for and support learners during this difficult time.

Adopting an emergency curriculum enables teachers to respond quickly in order to maintain education sustainability and ensure that students are supported in achieving their learning goals in a difficult situation. Since teachers are on the front lines, they need an emergency curriculum to help them make decisions about implementing learning activities and evaluating student learning outcomes [4].

Finally, university administrators must ensure that teaching staff has two essential lecturer competencies: technical and pedagogical. To be effective, administrators should focus on the technical skills of lecturers to run ERT. Although this task can be assisted by IT support in some ways, for the effectiveness of future learning, each lecturer needs to prepare technical knowledge and skills in managing online-based learning. Apart from technical skills, the most important aspect is pedagogical ability in managing learning. This ability is needed to maintain student motivation in difficult situations. Lecturers can take advantage of various free resources such as YouTube and OpenLearn as well as other Open Education Resources, to enrich the learning delivery. The principle of ERT is to provide educational services that are simple, accessible, affordable, flexible, and provide clear support to students with an empathetic attitude rather than just delivering the best lectures.

5.2. *Limitations and future work*

This study obtained opinions from teachers and administrators in universities to capture the current situation and various inputs related to the five proposed principles. However, the short duration of the study did not allow an in-depth evaluation of these principles. Based on these limitations, a longitudinal study should be performed to evaluate these principle in different situations and countries. Future researchers can revisit these principles based on the readiness of technology and the socio-economic conditions of each region. For example, a country with a high technology infrastructure and low economic inequality is likely to focus more on simplicity, flexibility, and empathy than affordability and accessibility. Thus, these five principles constitute one unit whose order can be adjusted after considering the situation in the field.

6. Conclusions

This study provided basic principles for future emergency remote teaching implementation. The unexpected changes in the world of education due to the crisis can be a benchmark for organizational agility, with several educational institutions seeking to maintain educational sustainability in a simpler way. The primary focus of ERT is not on using sophisticated technology for transfer of educational content to the Internet but rather as a temporary solution. Thus, ERT should be designed based on the principles of simplicity, accessibility, affordability, flexibility, and empathy in all learning activities in unfavorable situations. In the context of higher education in Indonesia, simplicity and accessibility are the two principles that have the lowest ratings based on the experiences of students and teachers. The implementation of ERT must consider situational factors and social conditions to enhance the effectiveness of remote teaching. These five principles identified herein can serve as the main principles for implementing ERT in such difficult times.

The COVID-19 pandemic has made us realize that information technology infrastructure is the key to the success of remote teaching education. The speed needed to adapt to environmental changes requires high preparedness, and adaptation cannot proceed effectively without the support of adequate technological resources. The lack of access to a fast, affordable, and reliable internet connection in some areas of Indonesia is a fundamental problem in implementing ERT, and it is likely to occur in other developing countries that have similar geographical characteristics to Indonesia. Next is increasing the readiness of administrators, teachers, and students to switch from face-to-face instruction to an online mode based on experiences at the beginning of the pandemic. In

general, we appreciate the various efforts made by educational institutions and the Indonesian government to maintain a balance between health protection and education sustainability.

Finally, the COVID-19 pandemic has become a stimulus and motivation for educational institutions in the future to start investing in technology education as an option to increase the flexibility of learning activities. This study complements previous work and can therefore provide generalized principles for teaching activities in similar emergency situations.

Author Contributions: Conceptualization, Ani Cahyadi; methodology, Hendryadi; formal analysis, Ani Cahyadi and Hendryadi; data curation, Ani Cahyadi, Hendryadi, and Sri Widyastuti.; writing—original draft preparation, Ani Cahyadi and Hendryadi; writing—review and editing, Sri Widyastuti. Funding acquisition: Ani Cahyadi

Funding: This research received no external funding.

Data Availability Statement: Data sharing is not applicable to this article as no new data were created or analyzed in this study.

Acknowledgments: Special thanks to the College's Dean, Associate Dean of Academic, and Lecturers from Universitas Pancasila, Universitas Islam Negeri Antasari Banjarmasin, Universitas Nasional, Universitas Islam Negeri Sultan Maulana Hasanuddin Banten, Universitas Pancasakti Tegal, Insitut Agama Islam Negeri (IAIN) Samarinda, and Institut Agama Islam Sahid Bogor for their participation in this research. We also would like to thank Editage (www.editage.com) for English language editing.

Conflicts of Interest: The authors declare no conflict of interest.

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