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# Analysis of Resilience of Education System in Higher Education Due to Covid-19 Pandemic in Indonesia: A Systematic Literature Review

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*Abstract*—This study discusses learning strategies resilience that can be used to improve learning outcomes during the current pandemic circumstances, which have limitations in face-to-face learning. Online learning has many limitations compared to offline one. However, it must keep running because one of the strategies against the SAR-Cov2 virus is to inhibit its spread by limiting direct contact with other people. The literature review is carried out with a protocol involving text mining tools to find the most widely used keywords and their relationships, which is then carried out by a snowball literature review to deepen these keywords. There are several findings from this study, namely (1) Three critical components that play a significant role in improving learning outcomes in the distance learning method, namely the role of students, lectures, and technology. (2) A framework must ensure that the other three components perform their functions properly and provide an effective learning environment. (3) Reward and punishment play a vital role in ensuring the framework is implemented as it should be. Integrating an effective learning environment with remuneration programs and teaching grants will encourage improvements in the learning process and increase the number of positive contents on the Internet. This learning environment can also be a model that supports independent learning activities - an independent campus, the Ministry of Education and Culture of the Republic of Indonesia's flagship program, and digital commercialization in the educational sphere.

Keywords—Online learning; technology; effective learning environment; framework; learning outcomes; roles; resilience.

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## I. INTRODUCTION

Based on world vision, education is the process where a person: develops skills essential to daily living, learns social norms, develops judgment and reasoning, and learns how to discern right from wrong [1]. Education also helps eradicate poverty and hunger, giving people a chance at better lives [1]. It means education has a critical role in social welfare; therefore, education cannot be interrupted or suspended for any cause, including the pandemic that has happened in recent years.

Since it is an extremely critical education, SDGS also mentioned it in the 4th goal: to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all. However, In 2020, as the COVID-19 pandemic spread across the globe, most countries announced temporary school closures, impacting more than 91 percent of students worldwide [2],[3].

One of the implementations to achieve the SDGS goal is through Effective learning environments, and UNESCO offers a solution using distance learning [4]. Face-to-face meetings are forced to be limited to avoid spreading this virus. However, the use of this technology in this field has several issues, such as limited pedagogical resources, lack of direct participation and engagement, and less interaction between students to students and students to lecturers [5]. In Indonesia, the University of Mataram, mainly the Dept of informatics, used this technology but based on the survey conducted in this university (March 2021) shows that the students' satisfaction needs to be leveraged, and the quality of learning materials has to increase as well. Decreased learning outcomes and learning targets because of reduction of study hours, new learning method/ technical problem, and the system is not fully ready to be used.

This study aims to identify the factors that influence the success of the online teaching and learning process and find solutions to improve learning outcomes amid the limitations of online learning in higher education institutions in Indonesia. Three research questions must be answered in this study, namely, RQ1: What are the strategies that must be used to increase learning resilience at universities in Indonesia in a pandemic situation like today? RQ2. How to develop an effective learning environment and RQ3: What theories can support an effective learning environment, and what are their roles?

#### II. MATERIAL AND METHOD

This research is used a quantitative approach with a systematic literature review protocol as follows:



Fig. 1 The Research Protocol

We collected the literature from scopus.com with the keywords "education, AND technology, AND theory AND learning AND outcomes." Year of publishing 2017-2022. All the abstracts queried through the Scopus website are analyzed using text mining tools to get the popular keywords and the relation among the keywords. A Snowball literature review has been done to get inside more deeply related to particular keywords. Fig. 1 shows the protocol conducted in this study.

#### III. RESULT AND DISCUSSION

According to the protocol that has been made, the query results using the keywords above are obtained from 429 articles. After all the abstract articles were entered into a text mining tool (https://voyant-tools.org/), the most common words appeared from the 429 articles, as shown by the cirrus diagram as shown in Fig. 2. The larger the size of the keywords that appear, the more often these keywords are mentioned in the entire abstracts. To get more insight, we find out relations among the keyword using Link diagram, as shown in Fig. 3.



#### Fig. 3 Link Diagram

By using a link diagram, the relationship between keywords can be seen. Fig. 2 shows that education strongly correlates with students, learning, technology, and research. Learning outcomes are closely related to students, because learning outcomes are measured on the student side. The learning process is the center of the link diagram and closely relates to teaching, students, and outcomes. Learning also has a relationship with technology closely connected to the framework to improve learning outcomes. Students have a close relationship with outcomes because the side of measuring outcomes is on students.

Looking at the problems faced and the link diagram, it can be concluded temporarily that to improve learning outcomes, the role of students, lecturers, and technology are very important to create an effective learning environment. In order to maintain the role of these components, it is necessary to create a framework that certain theories must support.



Fig. 4 The Online Learning Framework

Regarding the importance of the framework in improving learning outcomes in this study, a literature review was conducted using the snowball method. At this stage, the role of motivation theory, incentive theory of motivation in relation to learning media, and pedagogical behavior in online/distance learning environments are studied more deeply. The role of knowledge management in the learning process is also explored according to what was conveyed by Judrups [6].

In line with UNESCO recommendation to improve learning outcomes with limited face-to-face meetings, it is necessary to increase student satisfaction with using the online learning system [5], [7], [8]. Student satisfaction in using e-learning is believed to escalate learning outcomes [9], [10]. Based on the deepening of the material using the snowball method, it is known that some of the weaknesses of online learning and solutions can be taken, as shown in Table 1. The weaknesses and the solution are then compiled as a learning framework that can be used as a guideline for running an online learning system, hoping to improve learning outcomes, as shown in Fig. 4.

The Figure 4 shows the tasks and functions of the three important learning components in higher education: lecturers, technology, and students, who have their respective roles. This role must be maintained properly.

TABLE I WEAKNESS AND SOLUTION OF ONLINE LEARNING

No	Weakness	References	Solutions	References
1.	Low student satisfaction	Survey (2021), Oliveira Dias et al., 2020[5]; Perraton, 1988[7]; Zhang, 2005[8]	Increase satisfaction by providing suitable material and good pedagogical	Baber, 2020[9]; Vermeulen & Schmidt, 2008 [10]
2.	Lack of engagement and less interaction	Oliveira Dias et al., 2020[5]	Ice breaking, replicate offline model, learning behavior theory	Schlosser et al., 1994[11]; WGU, 2020)[12]
3.	Communication problem and pedagogical	Oliveira Dias et al., 2020[5], Moore, 1983[13]	Use chat room, show video	Bri Stauffer, 2020[14]
4.	Learning material not structured enough and difficult to understand	Survey (2021)	Interactive learning media	Zhang, 2005[8]
			Behaviors are learned through interaction with the environment providing drills to help students do repetition and reinforcement	WGU, 2020[12]
			The incentive theory of motivation to take	Kendra Cherry,
			certain acts because of external rewards	2020[15]
			Knowledge Management Theory	Nonaka, 1995[16]. Judups, 2015[6]
			Incentive theory	Gong et al., 2021[17], 2021; Kendra Cherry, 2020[15]
5.	Lack of motivation	Richard M. Ryan & Edward L. Deci, 2000[18]	Multimedia content	Richard E. Mayer, 2014[19],
			Influenced by media	Tingting Lu, M.A, 2008[20], Yeh.R, Zoecler, 2022[21]
			Enjoyment, curiosity motivated students to	Brüggen et al.,
			use eLearning	2011[22]
			Increase student's motivation and interest	Rossini et al., 2021[23]
			Interactive learning media	Zhang, 2005[8]

The role of a framework based on the theory of incentive of motivation is very important to keep this environment running effectively. The roles of these three components are described as follows:

#### A. From the Lecturer's Side

In online learning, the lecturer has a triple role as a knowledge holder, knowledge organizer, and instructional designer [6]. Lecturers must be able to organize their knowledge, create explicit knowledge and organize learning in learning media uploaded in the Learning Management System (LMS), and still carry out the teaching and learning process through video meetings. In general, lecturers will be satisfied if their students are successful [15], [17], [24] and will try to provide better and better performance [25]. However, there needs to be a reward and punishment to improve lecturer performance. Reward & punishment can be done by giving awards to lecturers who have done their job well. This award can be in the form of incentives or points calculated in the lecturer performance award [15], [24] as shown in Fig. 4.

#### B. From the student side

Students are knowledge seekers [6] who generally attend lectures to gain knowledge. Students must attend lectures to receive lectures. Students can also use the material prepared by the lecturer in the LMS, do the assignments given by the lecturer, and receive feedback from the lecturer (learning explicit knowledge). Materials obtained by attending lectures and materials obtained from LMS will be internalized by students so that they can later be used during exams or dissemination in real life [16]. Student feedback in the form of questions is especially important for lecturers to improve lecturer performance. The incentive theory of motivation is also implemented for students. Incentives received by students can be in the form of grades, awards, or others. Student satisfaction in attending lectures will be able to improve learning outcomes[9], [10].

#### C. From the technology side

Technology, in this case, is tasked with helping online lectures and preparing communication suggestions between lecturers and students. Technology also plays a role in making quality learning materials, disseminating information, monitoring the performance of lecturers and students, and providing feedback.

More detail about the role of components in this environment will be discussed in this section. As illustrated in Fig. 4, the Framework in this study is an amalgamation of regular online meetings and efforts to maximize the facilities offered by the LMS, in this instance Moodle. The framework uses an approach to motivation theory, knowledge management, and learning behavior. The incentive theory of motivation is used as a guide to ensure that the framework functions properly, including incentives and penalties.

## D. Role of Video Meeting

One of the causes of e-learning user dissatisfaction is the lack of communication and interaction between students and lecturers and suitable pedagogical material [5], [26]. The problem of communication, stating that communication is the most crucial aspect of the teaching and learning process. The communication in distant learning is vitally crucial [11], [13]. Schlosser et al [11] also stated expressly that online lectures must mimic offline lectures.

This paradigm encourages communication facilities, such as live chat or expressive tools like the raised hand, to support these models. To switch on communication and participation in online lectures, lecturers might also pose questions that students must react to. According to learning behavior theory, regularly questioning students will cause them to learn and strive to follow the lecturers' learning patterns.

## E. Role of Multimedia Contents

Based on the theory of motivation, student satisfaction can increase when someone encourages students to do learning either because of interesting content related to mental satisfaction (intrinsic motivation) or other material incentives (extrinsic motivation) such as grades or other awards [20]. Multimedia learning content is believed to increase student motivation [8] to use this content. This type of content is also believed to be more quickly absorbed by students. This is supported by multimedia cognitive theory, which is based on the idea of how the human mind works [19]. There are three assumptions supporting this theory: (1) The dual channel assumption, which states that humans have two channels to process visual and auditory information, according to Paivio's dual coding theory [27] and Baddeley's working memory model [28]. (2) According to Sweller's cognitive load theory, the limited information capacity of each channel at one time is limited [29], (3) The active processing hypothesis assumes that humans are active actors in selecting, organizing, and integrating incoming information to produce coherent mentality [19].

The lecturer plays an important role in this section; he or she must convince students to watch the multimedia content by giving a pretest and a posttest. Since the posttest is hidden in the middle of the video content, students must view the multimedia content to acquire the posttest and get a grade.

## F. Role of the Incentive Theory of Motivation

It is stated in the preceding section that multimedia contents can improve student motivation, but who guarantees that these multimedia contents are used/viewed by students? Students are motivated to view videos/multimedia content by introducing questions that must be answered utilizing the theory incentive of motivation. Every time a student answers a question, they are rewarded with grades and feedback. Questions are placed at various points throughout the lecture to deter students from viewing the entire video based on the content of the lecture. At the end of the video/learning content a button is placed to submit the answer for additional calculation of the value, to assess students' grasp of the topic. Students who do not view the video will certainly not answer the questions, implying that the student has no grades (Failed). This strategy intends to encourage students to view multimedia content to get grades (extrinsic motivation). Awards to students can also be given in the form of trivial things like applause or other awards if he/she correctly answers questions from the lecturer. Although it may appear insignificant, a stimulus (positive reinforcement) such as this will alter pupils' attitudes [12].

Based on Skinner theory [30] students have been given multimedia content (video with assignment in the video), so students have to answer the assignment to get a grade. Regarding learning behavior theory, in the subconscious, the student will continue to remember that he has to watch the video until it runs out because there are questions that must be solved to get a score. it is one way to force students to enjoy videos and answer questions [31]. They also mentioned that Humans enjoy searching for and discovering hidden items. For example, if a baby is given a bag, he will open all of the bags to look for something hidden inside, same as when people are given a birthday gift, they will eagerly open the gift wrapper to uncover something hidden inside. This notion is used in this framework [31] by offering questions that are buried in learning videos, and students will get marks if they can answer them correctly.

On the other side, in this model, the lecturer's burden as a knowledge holder will increase because, in addition to regular online lectures, uploading lecture videos to the LMS, creating multimedia content complete with questions inserted in the video, giving assignments with some variation to measure learning outcome, and providing feedback to students, the lecturer's burden as a knowledge holder will increase. If there is no additional incentive, the lecturer will not comply to make qualified multimedia content.

To leverage the willingness of lecturers to create multimedia content, there needs to be a policy of granting content creation, such as in the research grant scheme whose output from this grant can be in the form of attractive multimedia content. Funding schemes to increase the compliance of lecturers can also be carried out through a remuneration scheme, by giving certain points to lecturers who succeed in making interesting video content based on evaluations from certain teams. It should be noted that lecturers in Indonesia are entitled to a certification allowance [32] and a lecturer performance allowance [33], if they succeed in collecting in the fields of teaching, research and community service

Students can be rewarded in the form of grades, prizes, and so on, whereas instructors can be rewarded in the form of grants, remuneration, and so on. Student happiness with the system will have an impact on boosting learning outcomes, and enhancing learning outcomes will increase student satisfaction. Increased student learning results boost lecturers' happiness, allowing them to bring new energy to the lecturers to generate more and better content.

#### G. Knowledge Management Perspective

This framework also incorporates Nonaka's and Judrups' Knowledge Management concepts. When a lecturer creates elearning content (regular, multimedia, or assignment) as a knowledge holder, the lecturer is making explicit knowledge. This explicit knowledge will be learned by students, resulting in a codification from explicit to explicit (externalization) [16] however, when lecturers teach through video meetings, tacit knowledge is also transferred to students, whether consciously or unconsciously, through attitudes or discussion [6].

According to knowledge management theory, video meetings are used because there is a transfer of tacit knowledge from the knowledge holder, in this example, the lecturer, to the knowledge seeker (student) when the lecturer explains, discusses, or asks questions. Feedback from students is also vital for lecturer in order to improve content in the future.

Knowledge seekers will assimilate both explicit and tacit knowledge, which will then be employed in daily life or when completing assessments. The outcomes of this internalization will be visible in the learning outcome.

## H. Results of the poll

The findings of a small survey conducted in October-November 2021 among students and educators at 19 universities in eight Indonesian provinces about the value of Reward and Punishment (RP) and its impact on the intention to use and disseminate this framework. There were 442 student respondents and 156 lecturers that took part in the poll. According to the survey findings, each of the three criteria relating to RP received a score of more than 85 out of 100, as indicated in the graph in Fig. 5



Fig. 5 The importance of Reward & Punishments in people's mind

In the case of students, feedback from lecturers is a critical motivator for them to gain knowledge. With ratings of 86.2 and 87.54, grading as a positive and negative reinforcement, as well as how they perceive grading motivates them, has a significant impact. On the lecturer's side, reward and punishment perception affects their performance relatively lower than students.

The perception of a grant for the lecturers is an appreciation with the highest score (85.81). Grant also influences the performance of lectures to make proper learning contents with score 75.9. However, penalty to lecturers in case they do not wish to create appropriate learning content have the lowest score (69.74). These fact shows that both students and lecturers believe that RP is very important to be implemented in the online learning system. Fig. 6 depicts students' and lecturers' intentions to use FW based on RP. On the student side, their intents to follow, use, and advise others to use were highest when agreeing to use FW with a score of 88.37 and lowest when suggesting FW to others with a score of 79, possibly because they were unsure to whom they were promoting.

The lecturer's responsibility is to generate appropriate learning content, follow the FW role, and deliver the best to students who have a score of more than 82. As a result, the goal of a lecturer to deliver the best to pupils reaches 89.36. This number indicates to lecturers' high idealism and willingness to welcome new innovations based on RP.





These facts show that RP is influence both students and lecturers in their intention to follow their roles in FW and do their best.

#### IV. CONCLUSION

From the preceding description, it can be inferred that in a pandemic situation such as the current one, education innovation is critical to ensure that advocacy and information transfer processes continue to function smoothly without compromising the quality/standards that must be fulfilled. To address the learning in these pandemic circumstances, this study has made an effective learning environment that involves the cooperation of all parties involved in the learning system, and by preparing a learning framework to regulate and ensure this learning process runs well. Reward and punishment is also implemented in the framework which is the implementation of motivation theory and incentive theory of motivation is used as the basis so that this framework keep run well.

To build an effective learning environment, it is necessary to participate in all components in the learning system and ensure the system can run properly. In this study measurable reward & punishment is used as a tool to keep the system running well.

There are several theories involved in developing an effective learning environment in this research, such as Knowledge management which plays a role in the transfer and absorption of knowledge from knowledge holders to knowledge seekers. Learning behavior theory and motivation theory play a role in pedagogical online learning, including in the creation of multimedia-based learning materials. Incentive theory of motivation implemented in reward and punishment plays a major role in the learning process including grading. This theory also plays a major role so that the learning environment can work by itself without too much intervention of management.

The development of an effective learning environment is in line with the university's remuneration program and teaching grant program. Both programs will be a reward & punishment that can stimulate the enthusiasm of lecturers to develop adequate learning materials and carry out their roles according to the framework. If this can be encouraged continuously, the quality of learning will increase, the level of satisfaction of students and lecturers will increase and the learning outcomes will also increase.

With the advancement of information technology as it is today, all the weaknesses of online learning can be overcome, and even provide more benefits because students and lecturers enter a new era, where all study files are recorded in digital media, which can be accessed anytime and from anywhere. This digital learning media will also have multiple roles in addition to helping the learning process better, it can also offset the growth of negative content that poses a lot of racial issues, hate speech, and pornography. This learning environment can also be a model that supports independent learning activities independent campus, the Ministry of Education and Culture of the Republic of Indonesia's flagship program, and digital commercialization in the educational sphere.

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