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Technology Support for Distance Learning at Indonesia's Underdeveloped Regions Universities

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Abstract

This research aims to assess the impact of The Ministry of Education (MoE) program to provide technology support in order to strengthen the educational capacity during the COVID-19 Pandemic. The assessment was based on three main aspects: the support of online learning, inequality in access to education, and increasing the quality of lecturers and the learning process. Meanwhile, MoE's support include educational tablets (DIKTI Edu), SPADA DIKTI (online platform of distance learning), internet satellite (VSAT), and Mobile VSAT. Descriptive statistics and a before-after statistical hypothesis tests were done based on survey data of 657 undergraduate students. The survey was conducted based on a purposive stratified sampling in underdeveloped areas from four chosen provinces. Results shows that the devices were well received and has been used as their primary device for distance learning. Moreover, the impact was promising because all three aspects indicated significant positive effects. Nonetheless, the MoE still must tackle some drawbacks:1. Students facing technical barriers feel that improvement in the accessibility to install vital software needed and providing a device with a sim card slot, for online learning is prominent, 2. Socialization of SPADA DIKTI and access to more relevant materials for broader students is also recommended and 3. In-depth studies on student I.T. awareness and further dynamics of grades should be conducted.

Keywords: Supporting Devices for Distance Learning, I.T. awareness, Online Learning, Learning Access, Quality of Learning Process, Comparison Analysis

INTRODUCTION

In the 4.0 Industrial revolution era, various aspects have been changed and accelerated to technological use, including in the education field (Penprase., 2018). The utilization of data science and technologies in the education field is necessary to support Sustainable Development Goals (SDGs) required to be accomplished by 2030. One of the priority agendas in SGDs is Quality and Accessible Education for All (Costa, Santos, & Oliveira, 2022). In order to achieve accessibility of education for all, the use of Distance Learning and learning activities should be realized at any moment with no hindrance of geographical location.

As the world's largest island country, Indonesia consists of thousands of Islands. Indonesia has various economic and geographical conditions (Nasir, et al., 2021). As a central business and political area, Java island has better economic growth and chances for the public to obtain advanced education.

According to the President Decree, Eastern Indonesia and the outermost regions have fewer chances for support, including in education. According to President's Decree No. 63 in 2020, 62 districts have become a priority to be supported by the central government. The reasons, which are low economic, limited infrastructure, lack of accessible transportation, insufficient qualified human resources, and traditional solid culture and beliefs, made these regions have additional facilitation by the central government. Access to underdeveloped regions is unique from one area to another area. In some locations, access to transportation could only be done over several hours of the road or by using airplanes that are only scheduled once a week. In addition, some places could be reached by sea. Moreover, in the region itself, there is a lack of public utilities, educational facilities, health facilities, limited communication networks, and also electricity (Syafii, 2018).

The covid-19 Pandemic made a considerable transformation in how academic fields respond. The limitations of face-to-face learning made students and lecturers meet through online platforms, including using social media as Whatsapp (Mulyono, Saskia, Arrummaiza, & Suryoputro, 2020). Therefore, using information technology becomes the primary and the only way for education to be performed (Shirish, Chandra, & Srivastava, 2021). Unfortunately, most educational institutes do not have any Learning Management System (LMS) or sufficient devices for distance learning. To strengthen educational capacity, especially during the COVID-19 Pandemic, the government provided various technology support grants through the Ministry of Education (MoE) Research and Technology. One of the critical grants is the distribution of educational tablets named DIKTI Edu to university students who study in underdeveloped regions (kemdikbud, 2020). These tablets feature many educational materials such as an e-book, PowerPoint presentations, 300 e-model, video tutorials, and needed software (Indriani, 2021). In addition, other supporting teaching materials could be downloaded through SPADA DIKTI, an online platform distance learning website of the Ministry of Education, Research and Technology, while connecting to the internet (kemdikbud, 2020). The students of underdeveloped area were satisfied of the SPADA-DIKTI, showed the Customer Satisfaction Index wa 75.39% (Yuliyanto, et al., 2022).

In 2021 MoE distributed around twenty thousand Dikti Edu tablets. The appearance of the Dikti Edu tablet can be seen in Figure 1, and the tutorials on how to use the Dikti EduTablet can be seen on youtube. The MoE certainly has high expectations that Dikti EduTablet will positively support distance learning in underdeveloped regions, mainly for university students during the Covid-19 pandemic era. This is MoE's pilot project for distributing Dikti EduTablet.

FIGURE 1. *Dikti EduTablet Package for University Students in Underdeveloped Regions*

The previous research about technology distance learning of underdeveloped regions were conducted by Yulianto, et al, which focused on the perception of SPADA-DIKTI services using Customer Satisfaction Index (CSI) and Importance Perfomance Analysis (IPA). Therefore, this paper focuse on analyzing the absorption and utilization of all distance learning support device policies in higher education institutions in undeveloped regions. Second, we would like to evaluate the impact of Dikti Edu Tablet or distance learning support device policies in undeveloped regions. More specifically, this research will look into whether the quality of education has improved because of the supporting device given. The quality improvement is analyzed from the following aspects: support online learning, inequality in access to education, and increasing the quality of lecturers and the learning process. Hence,

through research findings, we expect that MoE will be able to evaluate and improve the distance learning support device policy for undergraduate students in undeveloped regions.

METHODOLOGY

This research focuses on undergraduate students in located within underdeveloped regions in Indonesia. In general, the methodology used for this study is as follow:

1. **Design Survey and Questionnaire**
   - **Select Target University**
     We first Define the number of universities that are surveyed. There were eight selected universities located in four eastern provinces of Indonesia, including North Maluku, East Nusa Tenggara, and Papua. These provinces are known to have many undeveloped regions. Thus, MOE distributed more than 3000 distance learning support devices to undergraduate students in this area.
   - **Select Sampling Method and Sample Size**
     Purposive Stratified sampling was done in order to calculate the minimum sample size needed. This method was selected to capture major variations among the selected provinces and universities. By setting the margin of error to 5% and a confidence level to 95%, the minimum sample size required was set at 400. However, if there were more students willing to participate in the survey, it was encouraged. Thus, we have a better accuracy that will lead to more precise conclusions. The proportion of undergraduate students sampled in each university was calculated based on the number of devices distributed in each university. The overall sample size was 657 undergraduate students. The distribution of undergraduate students can be seen in Figure 2.

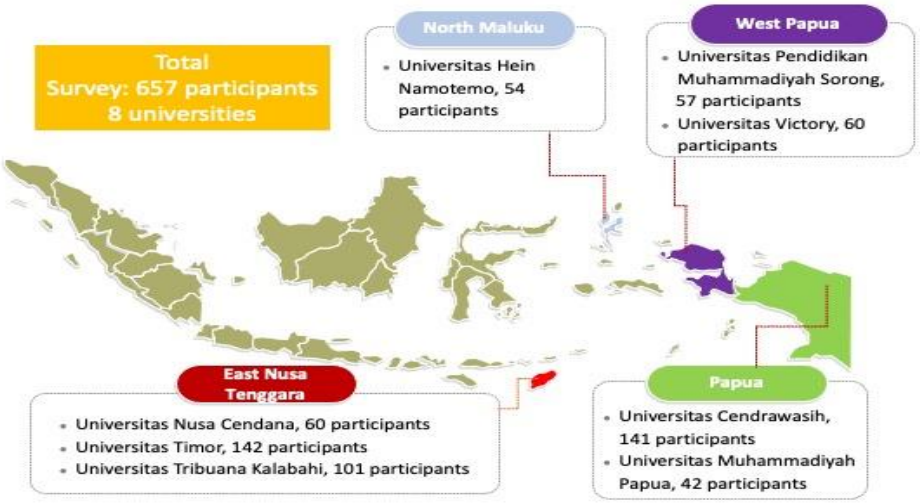

Figure 2. Distribution of Undergraduate Students Surveyed

   - Design Questionnaire and Hypothesis
     The questionnaire was developed to be able to answer key questions regarding evaluation to MoE's technology support program for distance learning. The evaluation process was mainly based on three main aspects, which include support for online learning, inequality in access to education, and increasing the quality of lecturers and the learning process. These aspects were selected based on expert judgement and further discussions with MoE. Based on these aspects there were a total of nine teen alternative hypothesis used in this study, which can be seen in Table 1.

2. Survey

The survey was conducted on spot in eight selected universities in November to October 2021. A team of MoE research guided the selected students to fill out an online survey. Guidance was needed in order to ensure better quality data and also assist students who have technical barriers. Unstable internet, power failure, and lack of computer literacy were the main issues commonly found in the surveyed areas.

3. Data Processing and Analysis

- **Data Preparation**: after all of the data was collected, missing data and unreliable data were not used in further analysis.
- **Descriptive Statistics** is a method of presenting and summarizing data in such a way that it becomes understandable information. Data description and exploration are carried out as a first step to determine the characteristics of undergraduate students in undeveloped regions. By conducting data exploration, we will also have a better understanding of the absorption and utilization of distance learning support devices.
- **Hypothesis Testing** is the most crucial component of decision-making in statistics. By testing the hypothesis, a researcher will be able to respond to the questions posed by indicating whether the hypothesis is rejected or accepted. Each hypothesis is going to be tested based on the characteristic of the measured variables. There are several types of variables and scales of measurements in this study; thus, different statistical hypothesis testing method is needed. In this study we use three types of tests, which are:

a. **The sign Test** is the most frequently used test for comparing two sample categorical or ordinal scaled data, especially Likert scaled. The impacts or changes that occur as a result of providing supporting devices, can be analyzed by testing the following hypotheses :

$H_0: \pi \leq 0.5$ (No significant positive impact because of the project)

$H_1: \pi > 0.5$ (There is a significant positive impact because of the project).

Where π denotes the proportion of positive impact after the supporting devices have been given. In order to test the hypothesis, the z test will be used for paired data (before and after conditions) with a large sample size with the following formula

$$z = \frac{(X \pm 0.50) - \mu}{\sigma}$$

Where μ is the estimated mean that we can calculate from $0.5n$ and σ is the estimated standard deviation driven from $0.5\sqrt{n}$ (Mann, 2016)

b. **The t Test**, is used if we want to compare the mean of ordinal data, such as we want to examine whether the impact or changes that occur are as expected.

$H_0: \mu \leq a$ (There is no significant positive expected impact because of the project)

$H_1: \mu > a$ (There is a significant positive expected impact because of the project)

At first, we have to set a measurable target that we want to achieve (a) after this pilot project. If Ho is rejected, it signifies that the supporting devices distributed in underdeveloped regions have had a beneficial impact. On the other hand, if we do not have enough evidence to reject Ho, it means that there has been no significant impact. The t-test will be used to test the hypothesis, utilizing the following formula:

$$t = \frac{\bar{x} - a}{s/\sqrt{n}}$$

Where $\bar{x}$ is the estimated mean and s is the estimated standard deviation that we can calculate directly from the data. Meanwhile, n is the sample size used for testing the hypothesis (Mann, 2016).

c. **The Friedman Test** is more complex and can be used when we use ordinal k sample data. Friedman test is a nonparametric test for k-Samples related (dependent) on a minimal scale of an ordinal size that does not require the assumption of a normally distributed population with homogeneous variance. This test is performed using data from a sample of size n entered into a tabulation with k columns, each of which is assigned a ranking value for each row ranging from 1 to k. If the values are the same, the average of the same ranking values is applied to some of the same values (Frey, 2018). The hypothesis:

$$H_0: \mu_i = \mu_j \; with \; i = 1,2,3 \; and \; j = 1,2,3$$
$$H_1: \mu_i \neq \mu_j \; with \; i = 1,2,3 \; and \; j = 1,2,3$$

Friedmann's Bidirectional Ranking Test Assumptions are: The variable of tested is a continuous variable, No interaction exists between groups and treatments, and Each group's observations/observations can be sorted by size. The testing procedure is described in Figure 3, where n is the number of rows, k is the number of columns, and R_J^2 is the number of ranks in column j squared. The testing procedure is as follows.

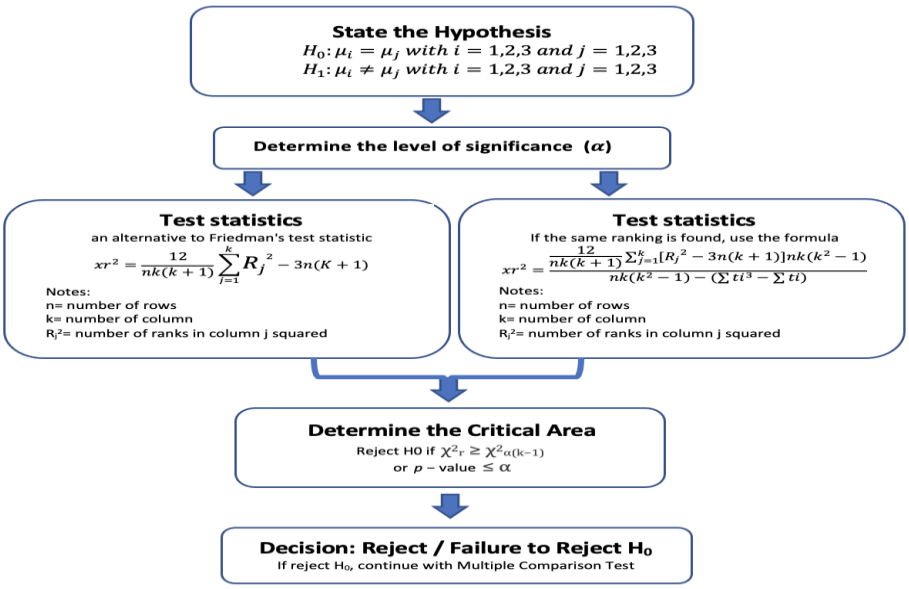

Figure 3. Stages of a Friedman Hypothesis Testing

- Each hypothesis was tested and appropriate method can be seen in detail in Table 1.

Table 1. Hypothesis Tested for Each Aspect. Its Variable Type, and its Statistical Tests

Alternative Hypothesis	Aspect	Type of Variable and Scales	Statistical Tests
H1: Improvement in students' activity after the program	Support online learning	Ordinal Two Sample with Likert scale (1=Never – 5=very often)	Sign Test
H2: Improvement in the frequency of online classes after the program		Ordinal Two Sample (1= never, 2=1-7x, 3=8-14x, 4= >14x)	Sign Test
H3: Improvement in the distribution of online materials after the program		Ordinal Two Sample with Likert scale (1=Never – 5=very often)	Sign Test
H4: Improvement in the existence of online learning media after the program		Ordinal Two Sample (0= No and 1=Yes)	Sign Test

Alternative Hypothesis	Aspect	Type of Variable and Scales	Statistical Tests
H5: Improvement in the use of online zoom classs after the program		Ordinal Two Sample (0= No and 1=Yes)	Sign Test
H6: Improvement in the use of Gmeet online classes after the program		Ordinal Two Sample (0= No and 1=Yes)	Sign Test
H7: Improvement in the use of Microsoft Teams online classes after the program		Ordinal Two Sample (0= No and 1=Yes)	Sign Test
H8: Improvement in the use of SPADA DIKTI after the program		Ordinal Two Sample (0= No and 1=Yes)	Sign Test
H9: Improvement in the quality of connections of online classes after the program		Ordinal Two Sample with Likert scale (1=Never – 5=very often)	Sign Test
H10: Improvement in the use of gadgets after the program	Inequality in access to education	Ordinal One Sample (1=< 2 hours, 2=2-5 hours , 3= > 5 hours)	T-Test
H11: Improvement in the quality of connections on campus after program		Ordinal Two Sample (1= No Signal, 2= week signal, 3= unstable, 4= strong signal)	Sign Test
H12: Improvement in the quality of understanding materials through tablet	Increasing the quality of lecturers and the learning process	Ordinal k Sample with Likert scale (1= No Improvement – 5= Greatly Improved)	Friedman Test
H13: Improvement in the quality of understanding materials through internet satellite (VSAT)		Ordinal k Sample with Likert scale (1= No Improvement – 5= Greatly Improved)	Friedman Test
H14: Improvement in the quality of understanding materials through SPADA DIKTI		Ordinal k Sample with Likert scale (1= No Improvement – 5= Greatly Improved)	Friedman Test
H15: Improvement in facilitating online forum discussions after the program		Ordinal Two Sample (0= No and 1=Yes)	Sign Test
H16: Improvement in exam deliveries after the program		Ordinal Two Sample (1=Offline exams, 2= Exams Sent to student's house, 3=Online)	Sign Test
H17: Improvement in understanding of online classes after the program		Ordinal Two Sample (0=No material, 1= hard to understand,2=easy to understand, 3= very easy to understand)	Sign Test
H18: Improvement in the frequency of online discussions after the program		Ordinal Two Sample (1= no discussion, 2= discussion between students, 3= discussion between lecturer & student)	Sign Test
H19: Improvement in the frequency of grades in a semester after the program		Ordinal k Sample (1=declined, 2= stagnant, 3=improved)	T-Test

RESULT AND DISCUSSION

Characteristics of the Undergraduate Students

The support devices for online learning were granted to 8 underdeveloped universities and used by students aged 16 to 40 years, with a mean of 21 years. The age of undergraduate students also tends to skew to the right, indicating that there is quite a large age gap between students that might affect the way of I.T. adoption as the younger generation tend to learn and adapt faster compared to the older generation. As for gender, undergraduates being studied consist of 64.6% female and 35.31 % male. The majors and semesters of the students quite vary and can be seen in Figure 4. Mostly, undergraduates are in their first and fifth semesters. They are generally studying Agribusiness, Information Technology (I.T.), and Nursing Science.

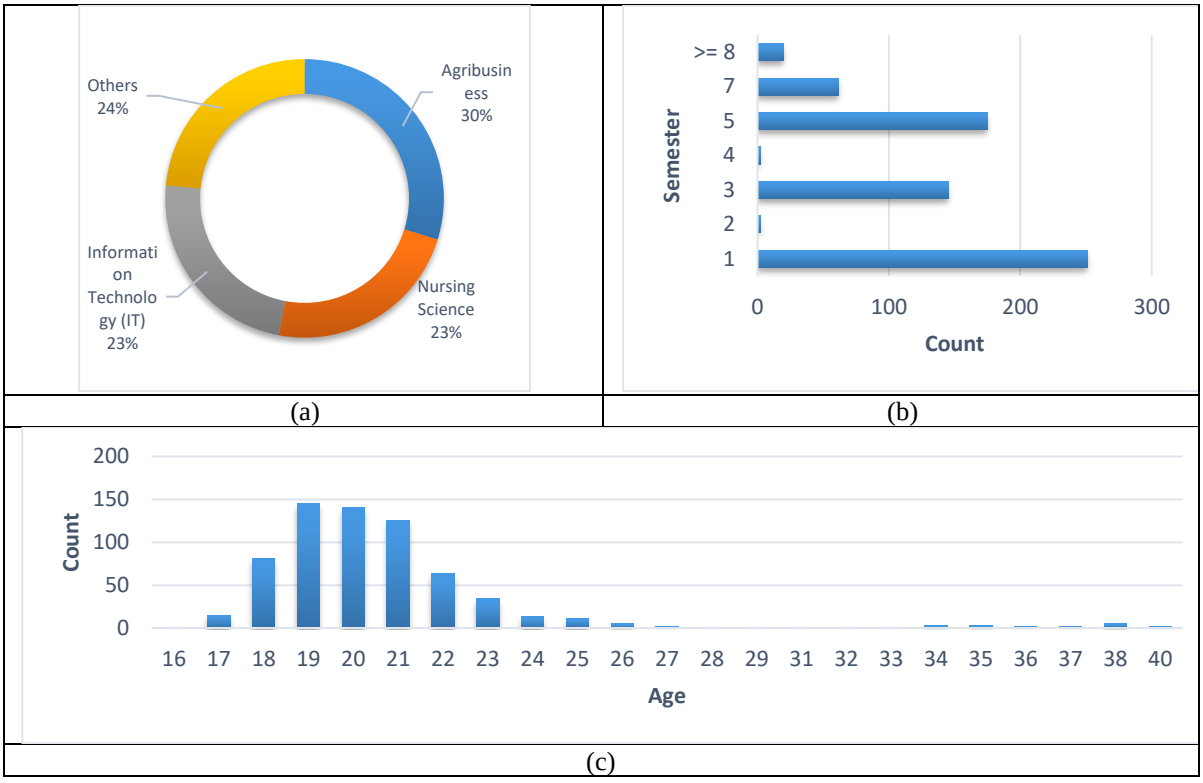

FIGURE 4. *The Distribution of Program Study (a), Semester (b), and Age (c) of Undergraduate Students Surveyed*

In order to have a better understanding of the limitations of infrastructure faced by undergraduate students coming from Indonesia's underdeveloped regions, the study specifically asked about the electrical power and also the availability of internet access in each student's household. Commonly low access to electricity and the internet is found in many underdeveloped regions. In our studies, it was found that 98 % of the houses have electricity from Indonesia's State Electricity Company. Only 1 % of undergraduate students don't have any electricity at all in their houses. 97 % of undergraduate students have access to the internet in the area where they study at the university. Only 3 % of the students don't have any access at all to the internet. Utmost these students mostly come from the East Nusa Tenggara Province (Tribuana Kalabahi University and Cendana University) and Papua Province (Muhamadiyah Sorong University and Cendrawasih University). Consequently, better internet facilities should be prioritized in these universities because undergraduate students need internet access to optimize the utilization of the supporting devices.

Furthermore, the information gathered in the survey also includes the gadgets that they owned and used for online learning before the supporting devices were given. The majority of students own a

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smartphone (94.05 %), followed by a laptop (53.89 %) and a tablet (27.48 %). While only a few students own a desktop (18.63 %). This data also reveals that some students have more than one gadget. In online learning, up to 75 % of students use their phones as their primary device, and 30 % use the laptop as their second device. Tablets and desktops are not as commonly used for online learning. Considering these facts, it could be apprehensive that the distribution of supporting devices might be less effective for students who already own a laptop or tablet.

Undergraduate Student's I.T. Awareness and The Utilization of Supporting Devices

Frequently, students in underdeveloped areas claim that they have email accounts (97%), and only around 3% do not have an email. In this study, we also ask about their social media accounts. Almost all respondents have social media accounts, whereas only less than 1% have no social media account. It is interesting that the number of students having social media accounts is higher than the number of students having email accounts. Meanwhile, in order to have social media, most applications require email addresses. It is apparent that students might have forgotten about their email accounts. Researchers also seek information about students' knowledge of Microsoft office, and the respondents claim that 96% know about the utilization of Microsoft office. Based on this information, we can conclude that, in general, the undergraduate students receiving the support devices have a good basic I.T. awareness.

Next, it was found that 97% out of 657 respondents that received the supporting devices claimed that they had used this device. Based on deep interviews and direct visits from researchers to the field, the main reason that some of the undergraduates did not get a chance to use the devices is because there is an insufficient number of learning support devices compared to the number of students on campus. Second, in some universities, there is limited transportation to campus, and there is quite a long distance for students to go to campus to receive the learning support device. So, it is also very costly for some students to go to campus, and they hesitate to do so. Last but not least, due to pandemic restrictions on coming to campus, some students had just got the device before the survey was carried out. Hence, they had not enough time to explore it.

During the COVID-19 Pandemic, 66% of undergraduate students used these learning support devices as their main devices during the distance learning period. Others prefer to use a laptop, handphone, or computer P.C. as their choice of a support device for learning. Most students prefer to use other devices because there are some technical and non-technical barriers which will be explained in more detail below.

As for the technical barriers, most of the undergraduate students (60%) claimed that they do face technical barriers. Commonly they say that the applications installed in the supporting devices are too complicated (22%). Some even said that the applications needed for online learning, such as Google Chrome, Zoom, YouTube, and WhatsApp, can’t be used or are not compatible. This is followed by 14 % of the students who don’t know how to operationalize the device and declare that learning materials are hard to find in the device. Therefore, they feel that they need to have a tutorial video (52%), technical guidance (45%), and manual guidebooks (35%). Another technical barriers faced by students are that the device doesn't have a sim card slot, which enables them to use the device when there is no internet access. Internet access limitations are also commonly found in these underdeveloped areas, especially outside of the campus and when there is bad weather. Some others also feel that more materials are needed, there is a lag period when accessing the device, and the size of the device is not suitable enough.

For non-technical barriers, 56% of the undergraduate students had no complaints. However, around one-third of the students feel that they have economic difficulties in their location; furthermore, around 14% of students claimed that they have an unfavorable environment to do learning activities during the COVID-19 pandemic time.

Supporting Devices Impact on Online Learning

To evaluate the quality improvement of online learning after the supporting devices have been given, there nine hypotheses were tested (Table 1). In general, all hypotheses have been rejected. There is only one hypothesis (H7) that is rejected by using a 15% significance level. Meanwhile, the other hypotheses were significant at a 5% significance level. This indicates that there is a difference in conditions before and after the supporting devices.

Nevertheless, we must keep in mind that the difference between the conditions before and after the supporting device has been given can be positive or negative. Positive changes indicate improvement as negative changes indicate there have not been Improvements, or also it can mean that the conditions before supporting devices were given are already decent. Further examination will be done to have a better understanding of this issue.

The support devices have a positive effect on the student's extracurricular activity during the Pandemic. Students tend to be more active in attending webinars, online courses, or competitions after they receive the supporting device. Eventhough there is improvement after the device has been distributed, the majority of students in developed areas still rarely follow these events, which is indicated by a low average of 3.08 (rarely participate in extracurricular activity). The scores are calculated based on a Likert scale of 1 to 5, where one indicates never participating, and five is very active in participating. When students actively participate in extracurricular activities, their skill sets will improve because through active participation in online courses, webinars, conferences, or even competitions. The students will gain wider knowledge that is not delivered in regular classes. They will also have an opportunity to expand their network. Hence, we suggest that lecturers and mentors in these universities enhance students' motivation to participate in extracurricular activities.

Another positive aspect that has been found due to the distribution of supporting devices is an improvement in the frequency of online classes in a semester. Each Semester, it is required that the number of classes delivered by a lecture should be 14 meetings. Even though students perceive that the frequency of online classes in a semester is still low, which is indicated by a low average of 2.47 (the frequency of online classes is still less than 14 times), it has slightly improved from previous conditions meaning that there is a tendency for students to be given more online classes after the supporting devices have been distributed.

The last positive aspect that is significant due to the distribution of supporting devices is the improvement in the use of SPADA DIKTI. SPADA DIKTI itself is a Learning Management System (LMS) used to manage online courses, distribute online materials, and enhance collaboration between lecturers and students. This LMS is specially designed for facing the challenges of learning during the pandemic era. Direct observations show that the awareness of SPADA DIKTI as an LMS is still very minimal. Most of the students use the embedded learning modules on their tablets, which is just a part of SPADA DIKTI. In order to access these modules, students don't have to use internet services. Therefore it should be very effective for students living in rural areas. Survey results show that at the beginning, only 13% of students used SPADA DIKTI, and surprisingly, after the supporting devices were distributed, the awareness was raised up to 31%. Nevertheless, the utilization of SPADA DIKTI is still under 50%. Hence further socialization is needed to optimize the benefits of SPADA DIKTI, especially for students in underdeveloped areas.

TABLE 2. Hypothesis Test Results of the Impact Supporting Devices Impact on Online Learning

Alternative Hypothesis	z	p-Value	Mean Before	Mean After	Delta Mean
H1: Improvement in students' activity after the program	-6.161	0.000	2.86	3.07	+0.21
H2: Improvement in the frequency of online classes after the program	-2.857	0.004	2.43	2.47	+0.04
H3: Improvement in the distribution of online materials after the program	-2.656	0.008	3.82	3.88	+0.06
H4: Improvement in the existence of online learning media after the program	-2.002	0.045	0.17	0.13	-0.04

Alternative Hypothesis	z	p-Value	Mean Before	Mean After	Delta Mean
H5: Improvement in the use of online zoom classs after the program	-9.321	0.000	0.82	0.59	-0.23
H6: Improvement in the use of Gmeet online classes after the program	-7.986	0,000	0.67	0.49	-0.18
H7: Improvement in the use of Microsoft Teams online classes after the program	-1.636	0.102	0.17	0.14	-0.03
H8: Improvement in the use of SPADA DIKTI after the program	-8.301	0.000	0.13	0.31	-0.18
H9: Improvement in the quality of connections of online classes after the program	-7.518	0.000	3.44	3.51	-0.29

Another hypothesis was also significant but had a negative mean difference. The quality of connections of online classes before the supporting devices were given is considered to be sometimes weak or unstable (80 %); the project has not yet proven to deliver a big impact in improving the quality of connections because these gadgets only rely on Wi-Fi. When students are out of campus, the quality of Wi-Fi really depends on the location of their houses. Most areas don't have access at all. That is why many students suggested that the MoE should improve the quality of devices by adding cellular internet access. Other hypotheses regarding the existence of online learning media, the use of Zoom, G-meet, and also Microsoft Teams, also show the same effect. It was already mentioned early on that there were limitations of applications that were applicable in the devices, therefore causing less impact. The majority of students use Zoom and G-meet; therefore, MoE should make sure that this software can be applied to future devices.

Supporting Devices Impact on Learning Access

In order to reduce the inequality of access to education, supporting devices have been given, and there were two hypotheses being tested (Table 3 and Table 4). Each hypothesis has been tested based on the proper tests explained in the methodology. In general, all hypotheses have been rejected. For the use of the gadget, the t-Test result showed that p-value < alpha (5%), so there is a significant difference with the mean score. It could be concluded that the devices support the student activity in the learning process.

TABLE 3. Hypothesis Test Results of the Use of Gadgets

Alternative Hypothesis	t	p-Value	Mean
H10: Improvement in the use of gadgets after program	-20.676	0.000	1.49

Then after analyzing the response of respondents towards the signal in the campus area that can be seen in Table 3, there is a significant difference between before and after the supporting devices received. There was a slight improvement in connection quality, and it could be observed by analyzing the mean score. Before the supporting devices were given, the quality of signal on campus was relatively categorized as weak, and after the supporting devices were given along with an internet satellite and mobile satellite, the connection was not weak anymore but still considered unstable. Nevertheless, improvement is still needed in order to have a strong signal, even though it will be challenging due to the remoteness and extreme environment of the underdeveloped regions.

TABLE 4. Hypothesis Test Results of University Internet Connections

Alternative Hypothesis	z	p-Value	Mean Before	Mean After	Delta Mean
H11: Improvement in the quality of connections on campus after the program	-6.556	0.000	2.87	3.08	-0.221

Supporting Devices Impact on Increasing the Quality of Lectures and Learning Process

With the aim of Increasing the Quality of lecturers and the learning process, there were nine hypotheses being tested (Table 5, Table 6, and Table 7). We will elaborate on the results based on the appropriate hypothesis tests used. Table 5 shows improvement in the quality of understanding materials through all the supporting devices, which include DIKTI EDU, internet satellite, and SPADA DIKTI, which will be tested based on Friedman Tests. Table 6 shows the improvement of lecturers and the learning process after the devices were distributed. In conclusion, Table 7 will indicate whether there is an improvement in grades, which is one of the key elements in this study.

Based on the survey results, it could be concluded that there are differences in students' understanding of the material when using tablets, the presence of internet satellites, and SPADA DIKTI. Satellite internet provides the greatest improvement in the quality of understanding material, which is followed by tablets, and the least is SPADA DIKTI. Even though having the lowest score, the presence of SPADA DIKTI is still essential in improving students' understanding. Taking into consideration the information above, more modules and intensive socialization are crucial to increase its impact.

TABLE 5. Hypothesis Test Results of Improvement in Quality of Understanding Materials through Supporting Devices

Alternative Hypothesis	Chi-Square	p-Value	Mean
H12: Improvement in the quality of understanding materials through tablet	25.934	0.000	2.88
H13: Improvement in the quality of understanding materials internet satellite (VSAT)			2.98
H14: Improvement in the quality of understanding materials through SPADA DIKTI			2.80

Next, an evaluation of how lecturers have improved the quality of the learning process can be seen by measuring the enhancements in online forums, exam deliveries, course clarity, and online discussions. All have proven to be significant, except for online discussions. There is no difference between before and after device support. Nevertheless, discussions between students and lecturers had already been established even before the devices were given. Less than 7% have said that there is no discussion during online learning in the pandemic era, and after the devices are given, not much has changed. Most of these students come from more remote universities, such as Tribuana Kalabahi University and Muhamadiyah University Sorong, where almost 2% of the students have claimed to never communicate with friends or lecturers during the online learning process. These students must have struggled through the process; therefore, special attention should be given.

The positive impact of the devices was directed to an improvement in online forums and a better understanding of online classes. For the Online Forum (H15), it was found that the positive impact was significant. Accordingly, more students had access to online forum discussions after the devices were distributed. There is a 4% increase in students who now have access to online forums. Thus, more students and lecturers are able to discuss materials, homework, exams, etc., which will hopefully lead to a better understanding of the materials given. The significant positive impact on students' understanding of the courses can also be seen in Table 6. Before, it was slightly harder for students to understand the materials delivered, but after the devices were given, the materials became easier to understand. This is proven by the increase in mean scores before and after the devices were given.

TABLE 6. Hypothesis Test Results of Improvement in the Quality of Lectures and Learning Process

Alternative Hypothesis	z	p-Value	Mean Before	Mean After	Delta Mean
H15: Improvement in facilitating online forum discussions after the program	-2.98	0.003	1.85	1.89	+0.04

Alternative Hypothesis	z	p-Value	Mean Before	Mean After	Delta Mean
H16: Improvement in exam deliveries after the program	-4.217	0.000	1.74	1.64	-0.1
H17: Improvement in understanding of online classes after the program	-8.615	0.000	1.84	2.02	+0.18
H18: Improvement in the frequency of online discussions after the program	-0.089	0.929	2.66	2.65	-0.01

As for the last indicator, which is improvement in grades given by lecturers in a semester (H19), there has not been any evidence of success yet shown that can be seen by the significance value, which is greater than alpha (5%) indicating that we don't have enough evidence to reject the null hypothesis. Grades have been perceived as stagnant after the devices have been given. The grant itself started less than six months before this assessment was conducted; consequently, a direct impact on grades can't be established. It's recommended that after a year, a more intensive evaluation could be deliberated on the dynamics of students' grades.

TABLE 7. Hypothesis Test Results of Improvement in Grades

Alternative Hypothesis	t	p-Value	Mean
H19: Improvement in the frequency of grades in a semester after the program	-0.321	0,374	1.99

CLOSING

Conclusion and Recommendation

Through this study, we know that, in general, there is quite a large age gap between students that might affect the way of I.T. adoption. Commonly low access to electricity and the internet is found in many underdeveloped regions, but that was not the case in this study. Only 1 % of undergraduate students don't have any electricity at all in their houses, and only 3 % of the students don't have any access at all to the internet. Nevertheless, still better internet facilities should be prioritized for students who mostly come from the East Nusa Tenggara Province (Tribuana Kalabahi University and Cendana University) and Papua Province (Muhamadiyah Sorong University and Cendrawasih University). The researchers also found that most of the undergraduate students have a good basic I.T. awareness, but further observation and in-depth studies are suggested; therefore, we have a better understanding of how deep their I.T. awareness is.

Was the distribution of devices effective? Considering that 94.05% of students own smartphones and 53.89 % of students own laptops that were used as their main device for online learning, a more detailed selection, and screening process should be done in order to make sure that students receiving the devices are really in need. However, still, the device was received positively and used by 66% of the undergraduate as their main device during the distance learning period. After using the device, students were faced with technical barriers. Most implied that the applications installed in the supporting devices are too complicated (22 %) and the applications needed for online learning, such as Google Chrome, Zoom, YouTube, and WhatsApp, are not compatible. Some of the students even don't know how to operationalize the device and declare that learning materials are hard to find on the device. Additional diverse materials were also needed. Another issue raised is that the device doesn't have a sim card slot, which enables them to use the device when there is no internet access. These technical issues encountered by students should be improved if the MoE distributes more devices in the Future. Tutorial videos and clear technical guidance on how to use the device and access materials are also recommended to be better prepared and socialized.

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The device's impact on online learning improvement is very positive for many indicators, such as students' extracurricular activity, frequency of online classes in a semester, and distribution of online materials through SPADA DIKTI. Nonetheless, it was revealed that even though improving, undergraduates' participation in extracurricular activities is still low, and the awareness of SPADA DIKTI is still under 50%. For that reason, enhancing students' motivation to participate in extracurricular activities and further socialization of SPADA DIKTI is vital. In addition, there are some aspects that are less successful, especially in the improvement of the quality of connections of online classes and overall media and software experience. Students were not too impressed by the lack of versatility in adding essential media and software needed for online learning purposes. They were also not too impressed by the fact that the device lacks a sim card option which is not ideal if there is limited Wi-Fi access.

Positive results were also shown regarding the device's impact on reducing the inequality of access to education. After the devices were distributed, it has been able to support the student activity in the learning process and also improve the quality of signal on campus. Before the supporting devices were given, the quality of signal on campus was relatively poor, and after the supporting devices were given along with an internet satellite and mobile satellite, the connection was not weak anymore but still considered unstable. Thus, room for improvement is still needed.

As for the last aspect, positive results are also shown in the improvement of lecturers and the quality of the learning process through online forums, exam deliveries, and course clarity. Online discussions were considered to be quite established even before the devices were given; therefore, the effect was too apparent. Improvement in grades given by lecturers in a semester has not been proven successful yet, which is not surprising when we keep in mind that the grant itself started less than six months before this assessment was conducted. It's suggested that a more intensive evaluation of the dynamics of students' grades could be considered after a year.

Making a prominent impact on every aspect of distance learning in higher education stated above is quite challenging, especially regarding the short timeline of fewer than six months. Overall based on the results above, it is suitable to accomplish that through the device and technology support policy, there has been a lot of positive improvement. Nevertheless, there are still some areas that need to be improved and should be done in the upcoming years. Henceforward, distance learning in higher education in Indonesia's underdeveloped regions will excel.

Future Work

In this research authors focused on how to assess the program based on three main aspects, namely impact on online learning improvement, reducing the inequality of access to education, and improvement of lecturers and the quality of the learning process had not done any. Further work should be done on analyzing each grants relative importance and performance to determine which features of the technology support needs to be improved and which elements can be removed. Thus, it is possible to maximize each attribute's effectiveness according to the users preferences while minimizing costs. Another alternative study could also be done to analyze if there are any cluster effect of respondents based on their responses during the survey. By conducting cluster analysis, the MoE will gain more information on what can be improved in the future for each cluster. Therefore, the MoE can make strategic decisions on what they have to improve and do if this type of grant will be given again in the future.

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