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The influence of android-based "ISLAM SEHAT" application for traditional Islamic boarding schools' (TIBS) students in Indonesia

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Abstract

Technology must provide benefits for the poor and marginalized people, especially those who have low access to technology and lack school fees to improve their welfare. In this case, the Android-based ISLAM SEHAT website application has been designed to help students, especially students of TIBS in Indonesia. This application provides students information about clean and healthy living procedures and opportunities to interact with doctors and teachers through a virtual forum. This study aimed to measure the responses of TIBS students to this application and measure its influence on the increase in average knowledge about health. An experimental design was conducted on 134 students from five TIBSs from four districts in West Java Province, Indonesia. Measurements were conducted using online and offline questionnaires based on EUCS Model and Nielsen Model to discover responses to website applications and Retrieval Knowledge (RK) Model to determine the increase in post-use knowledge (experimentation). Data processing used *Z*-test and *t*-test with a *p*-value of rejection at .01. The results show that the ISLAM SEHAT website application has a significantly high usability value, ease of use, ease to learn, and user satisfaction (Z = 38.87, p = .01.). This application also has a significantly higher mean score (Z = 28.56, p = .01.) of the measurement of display and design aspects. Similarly, it significantly influences increasing knowledge about clean and healthy living procedures (t = 9,414, p = .01.). These results open up opportunities for the development of the smartphone utilization model in the learning process within the environment of TIBS.

Introduction

Information and communication technology (ICT) such as smartphones, gadgets, tablets, and mobile phones, have increasingly broad functions. These are not only as a communication tool and sender of short message service (SMS) as a whole, but such devices are also able to combine three functions of C (computing, communication, and content producing). One of the developing functions these days is software for the user's health assistance.

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The use of health assistance has become a trend that has increased the number of production volumes and improved the capacity utilization of smartphones, gadgets, and mobile phones. Smartphones with Android and Apple operating systems (OS) are increasingly used to support users to improve their health and quality of life (Chan, Kow, & Cheng, 2017; Kalem & Turhan, 2015). Some applications have been offered for free through the App Store or Play Store, such as Halodoc, M-Health, mHealth Connect, and my-mhealth to support the users to realize the importance of health. The available platforms and menus will make it easier to find information about illness symptoms and their treatment and learn about health (Boulos, Brewer, Karimkhani, Buller, & Dellavalle, 2014).

The main strengths of smartphone applications are to build an awareness of a healthy life, maintain health, seek information about public health, and treat independently conducted by checking the simplicity of the media for use, the direct hand grip (compact), the availability of abundant information (big data), the interactivity with the source of information, and the ability to read thoughts and needs of users (artificial intelligence). The assistance from smartphone applications designed with an intervention model builds a feeling of support to people with lung cancer trying to get healthy again (Mueller et al., 2019).

The study proposed a hypothesis that the ISLAM SEHAT website application on a smartphone provides information about a clean and healthy life in TIBSs (Traditional Islamic Boarding Schools), which has limited access to technology. If the students use it, they will improve their knowledge of health and hygiene. This study attempted to create and measure the influence of an Android-based health web application (ISLAM SEHAT) on a smartphone about a clean and healthy life of a student in TIBSs.

More specifically, the problems were identified as follows: (1) To what extent the students' responses to the ISLAM SEHAT website application in meeting the needs of clean and healthy information of students in the TIBSs environment were; and (2) If there was any increase in students' average knowledge about clean and healthy life after using the ISLAM SEHAT website application.

Literature Review

Groups must utilize smartphones to improve knowledge and health management with limited economic, educational, and technological acces (Mayes, White, Byrne, & Mogg, 2016; Cook & Gregory, 2018). This phenomenon considers the aspect of coverage, the efficiency of learning cost, and the simplicity of using the device. One such group is students in traditional poor schools, namely TIBS, called *pesantren* in Indonesian. A TIBS is usually under the responsibility of a religious leader (hereafter referred to *kyai*), who provides free or inexpensive learning services for poor children with a traditional education model far from technology use. The culture of TIBS is being obedient to the character of the *kyai* as the main actor of religion as a role model. Therefore, TIBS education is always based on a solid relationship between the leader and the students (Rahardjo, 1998).

This is understandable because living in TIBS is related to something wet, moist, and dense. TIBS is dirty and has limited open space in which one room has five to ten students. As a result, some environmental diseases have been found, for example, skin disease and asthma in students because of the moist area and little clean water (Andayani, 2007; Ikhwanudin, 2013).

Health applications through gadget or smartphone devices are similarly intended to help the student to understand the benefits of clean water, consuming suitable water , maintaining beds, study rooms, and bathrooms, taking care of the body and the importance of exercise, and recognizing types of illnesses. The information can be managed in good condition and provided in the application.

Although communication technology has become a crucial part of the dissemination and socialization of a clean and healthy life in TIBS, the attitude of each TIBS is different ; for example, there are quite a lot of TIBS groups that have started to deal with ICT (Rifai, 2017; Shiddiq, 2017). However, numerous TIBSs are really closed to ICT so that students maintain the purity of the school's teaching. Most TIBSs prohibit the use of communication technology in any form. In such contexts, it is detrimental to learning processes (Semenov, 2005; Ilias, Razak, Rahman, & Yasoa', 2009).

In health, a study on the use of applications on a smartphone shows excellent benefits, for example, mobile health (mHealth), which has the potential to increase smoking cessation, but little study has been conducted with Aboriginal communities in Australia(Navarro et al., 2018; Peiris et al., 2019). Other studies have shown the influence of technology in health care (Kalem & Turhan, 2015), whereas (Mayes et al., 2016)estimate smartphones promote global interactions, improve care, and reduce healthcare costs. Suppose the positive potential/ability of the smartphone is combined as one and the potential harm (the negative effect) is

reduced or eliminated. In that case, smartphone technology will give birth to a revolution in helping the health sector and changing the world even rural settings in Indonesia show that internet use and smartphone technology are good. Communities get information about a healthy life, caring for babies, and treatment methods from these media (Bajari, Susilawati, & Setiaman, 2014).

Other field evidence has shown that applications on the smartphone have helped users to reduce alcohol and smoking addiction, asthma, cancer, depression, diabetes, headaches, heart disease, HIV, hypertension, iron deficiency/anemia, low vision, obesity, and pain; manage body weight and health of women; and maintain general health and fitness, and physical activity (McKay et al., 2018; Mueller et al., 2019). A study in Australia shows that smartphone applications help to raise awareness of healthy life with consuming vegetables in adults (Hendrie et al., 2018). Additionally, the application of smartphone technology helps to treat the health care of people living with schizophrenia who relapse, and care for the welfare of the elderly (Kalem & Turhan, 2015). More interestingly, smartphone applications make users aware of diagnosing the disease independently and encourage them to go to a health care center (Mueller et al., 2019)

In line with this study, an innovation of the ISLAM SEHAT website application on a smartphone created in a simple design, systematic manner in the material presented, and easy interactivity with application providers is expected to be readily accepted by the student (Bajari, 2015). According to the Technology Diffusion Theory, the adoption process depends on several inherent variable attributes according to the adopter. The attribute variables are (1) costs incurred, time, or other resource costs to adopt and implement innovation; (2) effectiveness of technology that has been used; simplicity or ease of innovation understood and used; (3) compatibility or how suitable the innovation is in the way it has been set; and (4) observation or can be seen and easy to test (Baltaci-Goktalay & Akif Ocak, 2006; Dearing, 2009; Dearing & Cox, 2018).

Therefore, the use of the internet through various models and applications has generated an e-Learning Theory proposition providing an opportunity that allows users (students) to gain access to various types of education, knowledge catalogs (teaching materials) provided by experts and skills needed, and learning partners and teachers virtually. Thus, it reduces and eliminates the monopoly of education (Dočekal & Tulinská, 2015; Molenda et al., 1996).

Based on the review that has been described, it can be formulated that communication technology in the form of the internet, smartphone, and applied applications has made it easier to use and search for important information in maintaining the health of users. It indeed began with the simplicity and ease of operation of the applications provided on the smartphone they use (Arsham, 2013; Chin & Lee, 2000). Based on this literature review, this study sought to measure the impact of using applications for providing health information via smartphone on variables of increase in knowledge about health. In addition, this study also measured the usability variables while using smartphones and user perception variables of the performance dimensions of the application being developed.

Methodology

This study used an experimental field design named ISLAM SEHAT, that tested website applications about the clean and healthy life of students in the TIBS environment. The website application developed was based on the initial study. The study aimed to map the level of TIBS needs for health application, and the contents need to be compiled. This effort was through three processes first, executing the features; second, determining selected content in the specific cycle; third, examining the specifications of the technology. This study was designed as an experimental study with one experimental group using two measurements (pre-test and post-test), which were conducted to discover the increase in knowledge after using the ISLAM SEHAT website application. The selected students from five Traditional TIBSs from three districts and one city that had been given access to open the ISLAM SEHAT website application through mobile phones were selected. Ten mobile phones with similar specifications and researchers were used in turn by students from those five TIBSs.

The effectiveness of the ISLAM SEHAT website application was measured from the visual and content display, the ease and usefulness of the website application, and the knowledge after opening the web application. The measurement model used was Jakob Nielsen model and the End User Computing Satisfaction (EUCS) model. These models tried to measure the usability aspects according to the users' experience of interacting with products or systems, whether websites, software applications, mobile technology, or other equipment operated by users (Abdinnour-Helm, Chaparro, & Farmer, 2005; Doll & Torzadeh, 1991; Lim, Lim, & Heinrichs, 2008). The Nielsen model measures the

dimensions of the developed application performance, including ease to understand, color in the design, proportion of material or content layout, speed of access to content, display reminder, and ease of application content.

Knowledge change measurement used Retrieval Knowledge (RK) model with two measurement patterns: pre-test and post-test to recall information in the cognition of users who have experienced media or communication technology exposure. The measurement of knowledge uses a measuring instrument model by developing 15 questions about efforts to maintain the health of individuals, groups, and *pesantren*/school environment based on the presented material in the application on a smartphone that has been read (Past Knowledge Recognition). This model is made simply by making key questions according to the teaching material that has been provided through the smartphone application. Questions are arranged in a composition of the low, medium, and high difficulty levels following a standard curve (the low and high difficulty level questions are balanced in number, and the medium ones are more numerous).

Inferential and parametric statistical tests measure the observation results. The process of conducting the experiment and measurement in this study can be described in Table 1 as follows:

This study was conducted on *Sala yah* TIBS, whose number is unknown. On average, in each district/city, only one or two TIBSs among the population of modern *pesantren*/Modern Islamic Boarding Schools or *Khalafiyah* (MIBS) exists. The International Crisis Group (ICG) reported that only 29 *Sala yah* TIBSs existed in Indonesia (Azra, 2018).

The population was TIBSs in West Java using a sampling technique, namely Al-Muslimin and MiftahulJannah TIBS from Karawang District, DarunNadwa TIBS Sukabumi District, Al-Falah TIBS from Bandung District, and Al-Musaddadiyah TIBS from Garut District. The proportion of students can be seen in the following Table 2.

The analysis of treatment effects used several testing techniques, namely different tests of two means, ANOVA (analysis of variance), and *t*-test for measuring the influence of website application developed. In addition, the data were also processed using descriptive analysis to determine mean, variance, median, and inclination in the processed data following the developed dimensions or indicators. Meanwhile, to test the mean results of the study compared to the hypothesis value, *z* statistical test was used. In testing inferential statistics, the confidence level for each test was at (*p*) .05. The entire process of processing descriptive and inferential statistics used Megastat Release 10.3 software in 2016.

Results and Discussion

The experimental process took place through the following stages: (1) introduction of researchers and institutions, followed by briefing ISLAM SEHAT website application from the opening application, registering and introducing page, and logging out application; (2) pre-test about health knowledge; (3) the implementation of experiments beginning with registering an account, opening content, observing it, trying it, using the question and answer feature discussion with doctor or teacher (*ustadz* in Indonesian), and logging out application; and (4) post-test about knowledge and measurement or evaluation to the website application.

Table 2 The proportion of student according to the experimental group

District/City	Traditional TIBS (TIBS)	Total Respondents
Karawang	Al-Muslimin	29
	MiftahulJannah	20
Bandung	Al-Falah	33
Sukabumi	DarunNadwa	20
Garut	Al-Musaddadiyah	32
Total	5 TIBSs	134

Table 1 Experiment Design and Measurement Plan

Measurement	Group			
	Measurement 1 Pre-test	Treatment (Application Usage)	Measurement 2 Post-test	Mean of Measurement
Dimensions of EUCS model	-	X	Y	m
Dimensions of Nielsen model	-	X	Y	m
Knowledge (Cognitive Dimension)	Y	X	Y	m

Table 3 presents the results of processing the frequency distribution of students' responses to the ISLAM SEHAT website application using two types of measurement models: the EUCS and Nielsen model. The measurement results of the EUCS model have described student perceptions or opinions on four dimensions or indicators, namely, the level of usability, ease of use, ease to learn, and satisfaction using the ISLAM SEHAT website application. At the same time, the Nielsen model was used to discover students' opinions on the website application's visual display.

Table 3 shows that the measurements using the EUCS and the Nilsen models tend to give the same results. The percentage of the majority measurement results lies in the high category for all measurement indicators. Thus, it can be said that users or TIBS students descriptively gave a good (positive) perception of the application being made.

Table 4 presents the descriptive statistical analysis of measurements with the EUCS and Nielsen models seen from various aspects: minimum and maximum scores, ranges, standard deviation, standard errors, hypothesis values, and *Z* test. The purpose of descriptive processing is to determine the performance of the ISLAM SEHAT application according to the user's/student's perceptions.

Table 4 shows that the mean measurement of student's opinions on the ISLAM SEHAT website application is 39.57, and the maximum score is 49. Then, if observed following the grouping of students' responses about the ease of use, their majority opinions are from medium to very high (97%). Meanwhile, the biggest category is located in the highest group (54.50%). The test result of the *z*-test with the hypothesis is that the mean score is greater than the medium score or the hypothesis value of 29. After conducting measurement, it is proved that Ho is rejected with the tested coefficient $Z = 26.04$, and the *p*-value is lower than .01.

Second, the student's perception of the ease of use of the ISLAM SEHAT website application is 52.99 from a maximum of 63 for its mean. If it is compared to the measurement result presented in Table 4, the majority of the ease of use level according to the student is in the

Table 3 Measurement results

Category	Measurement					
	Measurement with EUCS					Measurement with Nielsen Model
	Usability	Ease of Use	Ease to Learn	Satisfaction	Cumulative	Visual Display
Very Low	0.0	0.0	0.7	0.0	0.0	0.0
Low	3.0	0.0	1.5	3.7	0.0	1.5
Medium	35.0	17.2	6.7	33.6	36.6	26.1
High	54.5	66.4	49.3	55.2	61.2	53.7
Very High	7.5	16.4	41.8	7.5	2.2	18.7
Percentage	100	100	100	100	100	100

Table 4 Results of Descriptive Analysis and Mean Measurement Hypothesis Test

Measurement	EUCS Dimensions				EUCS Cumulative Score	Visual Display Score (Nielsen Model)
	Usability	Ease of Use	Ease to Learn	Satisfaction		
Mean	39.57	52.99	17.60	35.03	145.19	41.39
Minimum score	28	39	6	21	113	30
Maximum score	49	63	21	42	172	49
Range	21	24	15	21	59	19
Standard deviation	4.701	5.337	2.715	4.445	13.196	5.022
Standard error	0.406	0.461	0.235	0.384	1.140	0.434
Hypothesis value	29	37	13	25	101	29
Z test and *p*-Value	26.04 .00E+00.	34.67 .00E+00.	19.64 .00E+00.	26.12 .00E+00	38.77 .00E+00.	28.56 .00E+00.

middle-to-high group with the percentage reaching 81.30. Therefore, it can be concluded that this application is perceived as having a good level of ease of use in providing the required health information. In addition, the result of the *z*-test with the hypothesis value is 37 as a medium score for the measurement of the ease of application dimension, and the mean score is 52.99, significantly more significant than the hypothesis value of 37. The *z*-test coefficient obtained is 34.67 and significant at $p = .01$.

Third, the ease of learning the ISLAM SEHAT website application, whether the student considered the steps using this application difficult or easy to understand, reached 17.60 as its mean score of the maximum score of 21. In addition, based on the distribution of measurement data in Table 3, the mean score shows that 91.1 percent is located in the highest and very high categories. This website application is considered easy and very easy to understand and learn. The results using the *Z* test are 19.64 at $p = .01$. and a hypothesis value of 13. It is proved that the mean score is higher than the hypothesis value.

Fourth, the student's satisfaction level using the ISLAM SEHAT website application during an experiment reached the highest percentage presented in Table 3 (55.20%). It means that the majority of the students like and are satisfied with the application being tested. Furthermore, Table 4 presents a mean score of 35.03. After being tested by the *Z* test with a hypothesis value of 25, it is proved mean score is higher than the hypothesis value that has been determined with a z score = 16.12, and the *p*-value is lower than .01.

Nearly all measurement dimensions of the EUCS model show that the ISLAM SEHAT website application is perceived positively in the high category by the student. The measurement results of all indicators are combined to prove it further. Table 4 shows the mean score of 145.19 from the highest score of 172. Then, Table 3 shows that the majority of scores are in the highest category. After comparing the mean score to hypothesis value (101) with $p = .01$., a z score = 38.77 is obtained, and the *p*-value is lower than .01. Therefore, the measurement of the ISLAM SEHAT website application by the EUCS model is effective when it is viewed from all measurement indicators with the EUCS Model.

The measurement by using all indicators is essential in developing smartphone applications. The reason is that the users will understand the message content presented in the smartphone application if it is supported by usability, the ease of operation and learning, and the satisfaction obtained. The test results on the four indicators of the EUCS model have shown that the scores obtained from this application are significantly above the average measurement. Based on the Nielsen model attempting to measure visual display or attractiveness, this website application was developed concisely and simply and dominated by green as the color of Islamic teachings. Table 3 column 4 shows that the distribution of the highest scores lies in the high category showing that this application has a good rating. The mean score of measurement is 41.39, from the highest value of 49. After comparing the mean score to hypothesis value (29) with $p = .01$., a z score = 28.56 is obtained, and the *p*-value is lower than 0.01. In conclusion, conclusively, the measurement of the ISLAM SEHAT web application with the Nielsen model is significantly perceived as high (good) when viewed from the visual display's performance.

Figure 1 presents the measurement results of the knowledge variable obtained by the students before the

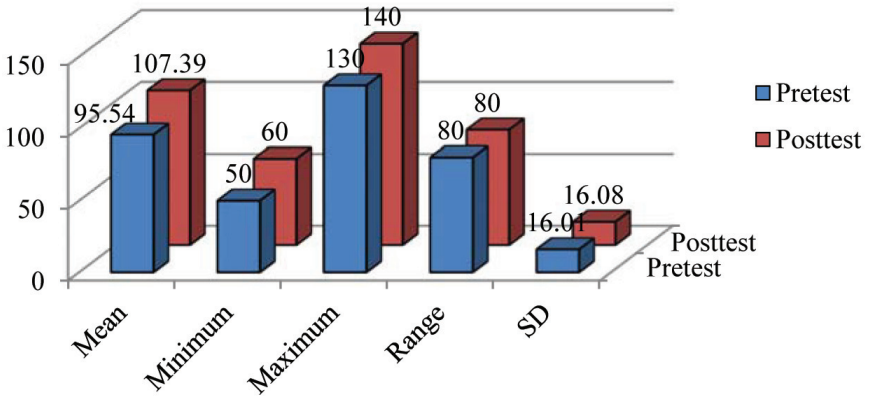

Figure 1 Summary of comparison of pre-test to post-test results of content knowledge of ISLAM SEHAT Website Application

treatment (pre-test) and after the treatment (post-test). Figure 1 results from measurements with the Retrieval Knowledge (RK) model for students during the study. In summary, the distribution of the lowest pre-test score was 50, and the highest was 130. Likewise, with the post-test score where the lowest score moved to 60, the highest was 140. The data in Figure 1 clearly show a considerable difference in the mean score of post-test measurement which was 107.39, and the pre-test which was 95.54. At the same time, the results of the range of pre-test and post-test measurement scores have similarities, namely, 80.

The comparison of two means, mean y post-test, mean y pre-test, were then statistically tested byH1: The mean score of the student's knowledge after the experiment was significantly higher than the mean before the experiment regarding health information. Statistically, it is seen that the test result showed a *t*-value of 9.414, *p*-value (two-tailed, upper) 1.94E-16., df = 133, *n* = 134, and standard deviation of 14.573 in which *p*-value was smaller than the *p*-value for rejection of .05. and .01. It means that Ho was rejected and H1 was accepted, where the mean was significantly different, or the ISLAM SEHAT website application influenced the increase of students' knowledge about health information.

The overall test results at all schools involved in the experiment resulted in the conclusion that the application of ISLAM SEHAT had been proven to increase the average knowledge of students about importance of health while being TIBS students. The next step was to analyze the difference in the average post-test and pre-test for each TIBS in each study location. This test aimed to obtain accurate information, whether the test results were applied to the entire TIBS or not. If different results were found, an in-depth observation had to be conducted to see the uniqueness of the TIBS and the procedure for experimenting.

The results of the analysis in each TIBS can be described in the following explanation. First, at Al-Falah TIBS, Bandung District, the mean score of post-test was 113.03, and the pre-test was 103.93. The statistical test results showed a *t*-value of 3.616, *p*-value (one-tailed) .0010., df = 32, *n* = 33, and a standard deviation of 14.44. The *p*-value is smaller than the rejection *p*-value of 0.05. and even 0.01.

Second, at Mifathu lJannah TIBS, Karawang District, the mean score of post-test was 105.5 and the pre-test was 90.60. The results of the statistical test showed a *t*-value of 2.939, *p*-value (one-tailed) 0.0084, df = 32, *n* = 33, and a standard deviation of 21.151. The p-value is smaller than the rejection *p*-value of .05 and even .01.

Third, at l-Musaddadiyah TIBS, Garut District, the mean score of post-test was 108.75, and the pre-test was 94.38. The statistical test results showed a t value of 5.578, *p*-value (one-tailed) 4.09E-06., df = 31, *n* = 32, and a standard deviation of 14.58. The *p*-value is smaller than the rejection *p*-value of .05., even .01.

Fourth, at Al-Muslimin TIBS, Karawang Regency the mean score of post-test was 106.897 and the pre-test was 94.483. The statistical test result showed a *t*-value of 5.143, *p*-value (one-tailed, upper) of 1.88E-05., df = 28, *n* = 29, and the standard deviation of 12.999. If it is compared, its *p*-value was smaller than the rejection *p*-value of .05.

Fifth, at Darun Nadwa, Sukabumi Regency, the mean score of post-test was 120.500 and the pre-test was 111.000. The statistical test results showed a *t*-value of 3.707, a *p*-value (one-tailed) of .0015, df = 19, *n* = 20, and a standard deviation of 11.459. If it is compared, its *p*-value was smaller than the rejection *p*-value of .05.

The test results in each region supported the overall conclusion of the test. In this case, no different test results were found on the evidence of the ISLAM SEHAT application significantly. All test results partially showed that the ISLAM SEHAT application increased students' knowledge about health in each TIBS studied. Thus, although TIBS locations differed according to regions and managers (institutions), the results were still the same.

Conclusion and Recommendation

Android-based ISLAM SEHAT website application has a high assessment score above the hypothesized value set on all aspects or dimensions of the effectiveness of website application innovation as learning media by using EUCS and Nielsen models. This application is significantly assessed as having usability, ease of use, ease to learn, and satisfaction in use. Furthermore, the score of front-page display dimension includes the ease to understand, color in design, the proportion of material or content layout, ease of menu, speed of access to content, display reminder, and ease of application content.

The success of this application in increasing TIBS students' knowledge could not be separated from the display developed on the front page. Dominance green as a characteristic of Islamic colors and close to the world of health was becoming more easily recognized. Furthermore, the registration on the ISLAM SEHAT application account was more straightforward with a column system that has been adapted to the format of an android smartphone. This format certainly supported the ease of operating the service. After users logged in, they

were immediately faced with prominent features such as the most up-to-date article title in order, news about TIBS health, and selected TIBS profiles, and QA (Question-Answer) or consultation with doctors or medical personnel about health problems moderated by the administration.

Technically, Minimum System Requirement (MSR) specifications for the application being developed are Android with a minimum 4.4.2 Kit Kat version, 1 GB RAM, and an estimated application capacity of 10 MB. With these specifications, this application can work on low-level class smartphones at low prices.

It was shown that ISLAM SEHAT website application can also increase users' knowledge significantly, in this case, students, after conducting experiments. Knowledge about a clean and healthy life becomes significantly higher on the mean score after opening this application. It is known that the pre-test measurement had an average of 95.54 and the post-test measurement of 107.39, and the test results show a *t*-value of 9.414 with a *p*-value of 1.94E-16, which is lower than the rejection *p*-value of .05.

The results of this test provide new offers to open up opportunities for ICT to enter the environment of TIBSs, which have been known to be closed to technology. This effort is mainly to help teachers teach about health to the student who has not been included in the curriculum of TIBSs, and students learn more independently. The challenge is that TIBS managers must be open to communication technology and teaching materials outside the standard curriculum guided by the TIBS yellow book as it is known that the TIBS *(Salafiyah)* is very closed to technological changes and has a standardized use of learning sourcebooks (yellow book), learning models, and learning interactions. Therefore, providing a little openness to communication technology or providing a smartphone on a particular schedule and days will allow children to learn about materials outside of religious knowledge, such as health.

Conflict of Interest

There is no conflict of interest

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