

STUDENTS' KNOWLEDGE OF EMERGENCY RESPONSE SIMULATION AND ITS RELATIONSHIP WITH SATISFACTION AT ISLAMIC BOARDING SCHOOL IN MALANG, EAST JAVA

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Abstract Malang city, East Java has several modern Islamic boarding schools that carry out an integrated education curriculum between religious, national and international curricula. In order to support its education process, the schools provide modern facilities in the form of multi-storey buildings. Emergency response simulation is a crucial activities for the students not only to educate how to response an emergency situation but also to evaluate the protection facilities in the school. This research was conducted to identify the students' knowledge of emergency response simulation and its relationship with satisfaction of the simulation. A descriptive research method was carried out and the data collection techniques in this study used a questionnaire with 100 respondents from female and male students. The results of the questionnaire that had been obtained were analyzed using the Structural Equation Modeling (SEM) analysis test with AMOS version 23 application. The results of SEM analysis test on the covariance table produced P-Value of <0.01 ; hence, there is a correlation between the Pre Test and the Post Test results. The results of the linear regression test using ANOVA showed that all independent variables (Pre Test result) have an influence on the Post Test results at 0.396 or 39.6%. The Post Test results are influenced by 5 indicators of participant satisfaction. All of the indicators did not affect the Post Test results significantly.

Keywords: emergency response, multi-storey building, boarding school, Structural Equation Modeling (SEM).

1. Introduction

Buildings are the physical form of the results of construction work that is in unity with their location, partly or wholly on or in the land and or water, which functions as a place for humans to conduct their activities, both for residence or inhabitation, religious activities, business activities, social activities, cultural activities, or other specific activities [1]. Building construction must pay attention to the safety value against all hazards that might occur, for example fires [2]. The dangers of multi-storey buildings lie on the lack and limited access for people to save themselves; thus, it is necessary to take effective and efficient fire prevention measures and integrate them into one management system so that the implementation and renewal can adjust the needs [3].

Furthermore, Indrawan mentioned that from an official data from the *United States National Fire Protection Association* (US NFPA) published in 2008, the losses resulting from fire disaster in a year reached an average

of 350,000 times in residential and office areas. 15,300 times of fire incidents occurred in multi-storey buildings across the United States with an average number of casualties of 60 dead, 930 injured and 52 million dollars loss due to fire in multi-storey buildings.

The term fire here refers to the unwanted fire. Fire is potential to happen everywhere. A fire incident begins with fire burning, and then the fire is out of control and threatens the safety of life and property [4]. One of the most devastating fire incidents is the fire breaking out in urban areas [5]. There are a number of things that might cause a fire to break out, which are related to human negligence such as lack of understanding in terms of fire prevention knowledge, lack of care in using

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tools and materials that can cause fire, and lack of personal awareness or discipline. Fires due to natural events are mainly related to weather, sunrays, volcanic eruptions, earthquakes, lightning, wind and typhoons. Meanwhile, fires due to ignition are like a fire in a chemical warehouse where the material reacts with air, water and other flammable or explosive materials. Moreover, deliberate fires occur because of sabotage, seeking compensation for insurance claims, eliminating traces of crime, etc [6].

Fires can cause a lot of losses, among which are casualties, material losses, job losses and other indirect losses (7). The impacts of a fire will be even larger if it occurs on vital objects. Most cases of fires occur at the workplace because all the elements that can trigger a fire are in the workplace. It could also be identified that 20% of fires consumed the whole buildings. This description shows that at the scene, there are inadequate resources available to deal with fires.

Cases of building fires frequently occur due to the contact of electrical energy with other devices. Fires occurred in several universities including at the Faculty of Engineering in 2001 and the Faculty of Social and Political Sciences in 2014 of University of Indonesia [8], Riau University (UNRI) in 2010 [9], STIE Perbanas [10], and several other multi-storey buildings such as IFI Bank Building in 2009 [11], East Java Regional Police building in 2014 [12], Wisma Kosgoro in 2015 [13], and CIMB Niaga Bank in 2015 [14]. The fire in the building was triggered by an electrical short circuit.

Factors that cause failures and obstacles in extinguishing fires can be in the form of inadequate fire protection equipment, unprepared human resources, or other obstacles [15]. The availability of adequate fire protection will greatly assist the process of fighting the fire; thus, it can minimize the losses obtained in the event of fires. Existing human resources can also aid to avoid the danger of fires.

Islamic boarding school is the oldest Islamic educational institution which exists as a product of Indonesian culture. The existence of Islamic boarding schools in Indonesia began

since Islam entered the country by adopting the religious educational system that actually had long been developed before the arrival of Islam. Islamic boarding schools are Islamic education and teaching in which interactions between the *kiai* and *ustadz* as teachers and the *santri* as students occurs in mosques or on dormitory (*pondok*) yards to study and discuss religious textbooks written by past scholars. Currently, many institutions have established modern boarding schools by collaborating the Islamic religious curriculum, the national curriculum, and the international curriculum. Modern boarding schools are increasingly in demand and are able to produce qualified graduates.

One of the modern Islamic boarding schools is located in Malang City, East Java. It has two main campuses, one for female students and other for male students. Campus 1 occupies an area of approximately 13,000 m² and campus 2 is located in an area of 15,000 m². Both campuses are equipped with modern new multi-storey building facilities. There are also 4 multi-storey buildings that function as the dormitories which have three until five floor. Other supporting are smart library, mosque, health service center, field, gazebo, observation deck, reading spaces, Qur'anic garden, food stall and mini market, and parking area. Observations deck is on the 5th floor which is the highest peak in the campus complex. Reading space is located on the top floor (rooftop) to read calmly and comfortably with views of Malang city and the entire campus complex.

In this campus area, there are students and teachers who interact every day. At present, the number of students is 430 female students and 345 male students from 24 provinces in Indonesia an overseas. They are supported by 77 teachers and managers. The students are required to live in the dormitories. With the dense activities and the vast area of the campus, it is necessary to anticipate the conditions of disasters or dangers, such as fires, earthquakes, and others.

Based on the interviews with managers, the obtained information shows that they have organized firefighting training routinely. This activity is carried out by involving all male and

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female students every year and inviting the firefighters from Malang. However, these activities have not been matched by a multi-storey building fire protection system which is also an important effort in preventing casualties from fires. The protection system in this case includes access to water supply for firefighting, rescue facilities, passive and active protection systems, building utilities, fire prevention in buildings, fire protection management in buildings, and supervision and control.

With such great risk, the campus unfortunately does not have a good fire protection system yet; thus, there is a high possibility that if there is a fire hazard, it cannot minimize the spread of fire. Moreover, the managers and students still need to improve their knowledge and expertise regarding fire protection systems in buildings. Therefore, based on the background of study, the author will conduct a research on *Students' Knowledge before and after Emergency Response Simulation and Its Relationship with Satisfaction at Islamic Boarding School in Malang, East Java*. It is expected that this event will provide knowledge to students and campus managers about the fire protection system and help design fire protection facilities in order to create a more conducive campus environment.

2. Research Method

This research was conducted by descriptive research method. The purpose of this study is to describe a number of variables related to the problem and the unit under study among the phenomena tested. In this study, the technique used to collect the research data was questionnaire as an instrument to answer a set of questions or written statements to respondents. The respondents of this study consisted of 100 participants in emergency response training consisting of students of Islamic boarding school. After the data from the questionnaire results have been obtained, and then it was analyzed using *Structural Equation Modeling* (SEM) analysis with AMOS version 23.

3. Literature Review

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The following is the result of literature study that is used as the theoretical basis for conducting the research.

3.1 Theory of Fire

Fire is a chemical reaction that is followed by three absolute elements, i.e.: Oxygen, Fuel, and Heat (16).

1. Oxygen is the air around us that contains 21% oxygen, 76% nitrogen, 15% argon and other small amount of gases. Under normal circumstances, fuel combines easily with oxygen.
2. Heat is the particular increase of fuel temperature until it reaches the combustion temperature. Before burning, the fuel forms vapor first and mixes with oxygen. Then, to continue burning, the fuel must remain hot.
3. Flammable material is all types of flammable material. Considering its form, it can be divided into three, which are:
 - a. Solid fuels: wood, paper, plastic.
 - b. Liquid fuels: kerosene, gasoline, methylated spirits, thinner.
 - c. Gas fuels: LPG, acetylene, oxy, propane.

3.2 Fire Classification

Fire is classified into groups of A, B, C and D and other types of Light Fire Extinguishers (water, foam, dry flour and gas) (16).

1. Class A is a fire caused by solid objects such as paper, wood, plastic, rubber, foam and others. Firefighting media for this class are in the form of water, sand, wet jute sacks, and fire extinguishers (APAR) or dry chemical flour fire poisons.
2. Class B is a fire caused by liquid flammable objects such as gasoline, diesel, kerosene, methylated spirits, alcohol and others. Firefighting media for this class are in the form of sand and fire extinguisher (APAR) or dry chemical flour fire poison. It is forbidden to use water for this type because the specific gravity of water is heavier than the specific gravity of the materials above; hence, if we use water

- the fire will spread everywhere.
3. Class C is a fire caused by electricity. Firefighting media for this class are in the form of fire extinguisher (APAR) or dry chemical flour fire poison. Turn off
 4. Class D is a fire caused by the burning of metal objects such as aluminum, steel, zinc, and other metal objects.

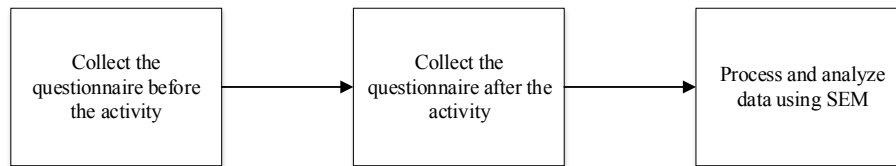


Figure 1. Flowchart of Research Method

3.3 Fire Protection Facilities

The initial identification was carried out by observing active and passive fire protection facilities that include:

1. Active fire protection facilities

Active fire protection facilities are in the form of tools or installations prepared to detect and or extinguish fires. Among the active fire protection facilities are:

- Smoke, fire and heat detectors
- Automatic and manual fire alarms
- Extinguisher/ fire extinguisher (lightweight fire extinguisher)
- Hydrant system
- Sprinkler system

2. Passive fire protection facilities

Passive fire protection facilities are in the form of tools, facilities or methods/ways to control smoke, heat and hazardous gas in the event of fires. Among the passive fire protection facilities are:

- Compartmentation system (separation of high fire risk buildings)
- Evacuation facilities and evacuation aid.
- Smoke and fire control systems and tools
- Fire retardant

3.4 Fire Fighting Unit

Fire Fighting Unit is a work unit established and assigned to handle fire prevention problems in the workplace that includes administrative activities, identification of sources of danger, inspection, maintenance,

and improvement of fire protection systems. Meanwhile, the officer in the role of fire management is an officer who is appointed and entrusted with additional tasks to identify the source of danger and carry out fire prevention efforts in his work unit (17). The role of the officer when there is a fire is:

1. Identifying and reporting the presence of factors that could cause a fire hazard.
2. Extinguishing the fire at the early stage.
3. Directing the evacuation of people and goods.
4. Coordinating with related agencies.
5. Securing the location of fire.

3.5 Disaster Mitigation and Education

Mitigation is a series of efforts to reduce risks and impacts caused by disasters, from planning and implementing spatial planning based on disaster risk analysis (structural mitigation), then regulate the construction, infrastructure development, and building layout (structural mitigation), as well as the provision of education, training and counseling (non-structural mitigation) (19). The spread of fire in high rise buildings is relative fast compared to other buildings above the ground. This is because high rise buildings have a "stack effect" like a chimney, where lighter air will be drawn upwards. This causes the spread of smoke from the lower floor to the upper floor will take place quickly, making it easier to spread the fire. In addition, one of the vulnerabilities of multi-storey buildings is the limited access to enter and exit the building in case of fire. Thus, blackout efforts will

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experience high difficulties including efforts to rescue victims (18). When disaster strikes, not everyone knows when it can happen. Therefore, to anticipate fires, school management must educate and mitigate emergency response. The benefit of the activity is that everyone in the building is able to put out small fires before a big fire and raise awareness of the importance of preventing fires.

5. Results

The following is the result of data testing and processing obtained from the distributed questionnaire.

5.1 SEM Test Analysis

The data from the questionnaire statements by respondents were then analyzed using SEM AMOS Version 23. To facilitate the analysis, a SEM model was made between the *Pre Test* and *Post Test results*. The following is a SEM model between the *Pre Test* and *Post Test results* along with the indicators that have been made.

Based on the results of Regression Weights output above, column P showed p-value > 0.01 . The research hypothesis is as follows:

H_0 : There is no correlation between the Pre Test Variable and Post Test Variable

H_1 : There is a correlation between Pre Test Variable and Post Test Variable

In this case, when the test statistic used is p-value $>$ significance level (0.05), H_0 is accepted and when p-value $<$ significance level (0.05), H_0 is rejected.

Considering the generated output, the p-values of satisfaction1, satisfaction2, satisfaction3, satisfaction4, and satisfaction5 variables are higher than 0.05; thus, H_0 is accepted on these variables, which means that there is no correlation between the variables

with the Post Test results.

The estimate value shows how strong the correlation is. The greater the value, the stronger the correlation is - minimum 50% (0.5). When the value < 0.5 , the relationship is very weak. Based on the Standardized Regression Weights table above, it can be observed that the entire five variable indicators have a very weak correlation to the Post Test results.

H_0 : There is no correlation between the Pre Test variable and Post Test Variable

H_1 : There is a correlation between the Pre Test variable and Post Test Variable

The p-value in the covariance table is shown with *** symbol which indicates that the p-value is < 0.01 or smaller than 0.05, so H_0 is rejected, which means that there is a correlation between the Pre Test results and the Post Test results with the estimation of standard error of the covariance is 19.502 and the critical ratio is 5.302.

5.2 Reliability and Validity Tests

Reliability is an index that is utilized to indicate the extent to which a measuring instrument is used to measure the same symptom gauge twice; thus, the measuring instrument (questionnaire) is reliable. In other words, reliability shows the consistency of a measuring instrument for measuring the same symptoms. Reliability can also indicate the extent to which the gauge is reliable and avoids errors during measurement.

The following table is the results of the reliability test from the assessment results of the Pre Test and Post Test as well as partner satisfaction using SPSS 25 software.

Based on the reliability test using SPSS

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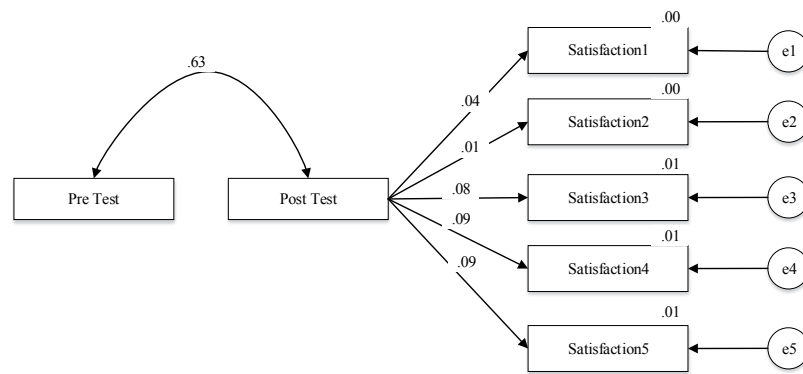


Figure 2. Results of the Variable Relationship Model of Pre Test and Post Test with the Indicators

Table 1. Results of Regression Weights

Regression Weights: (Group number 1 - Default model)					
	Estimate	S.E.	C.R.	P	Label
Satisfaction1 <--- PostTest	.004	.011	.414	.679	
Satisfaction2 <--- PostTest	.001	.010	.067	.947	
Satisfaction3 <--- PostTest	.009	.011	.815	.415	
Satisfaction4 <--- PostTest	.009	.10	.857	.391	
Satisfaction5<--- PostTest	.010	.011	.858	.391	

25, the results showed the output, *Cronbach's alpha* value of >0.06 , which is equal to 0.740. Hence, it can be stated that the whole items in the questionnaire of the comparison of the Pre Test and Post Test results are reliable.

Based on the reliability test using SPSS 25, the output is *Cronbach's alpha* value of >0.06 , which is 0.964. Thus, it can be stated that the whole items in the questionnaire of the partner satisfaction are reliable.

Validity test shows the extent to which

the questionnaire can measure what the focus of the researcher is. The following is the validity test results from the Pre Test and Post Test assessment and Partner Satisfaction results using SPSS 25 software.

Based on the validity test using SPSS 25, the output is that the whole values of *Cronbach's Alpha if item deleted* in the table have a smaller value than *Cronbach's Alpha* which is 0.756. Thus, it can be stated that all the question items on the research questionnaire are valid.

Table 2. Results of Standardized Regression Weights

Standardized Regression Weights: (Group number 1 - Default model)	
	Estimate
Satisfaction1 <--- PostTest	.042
Satisfaction2 <--- PostTest	.007
Satisfaction3 <--- PostTest	.082
Satisfaction4 <--- PostTest	.086
Satisfaction5<--- PostTest	.086

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Table 3. Results of *Covariance Model*

Covariances: (Group number 1 - Default model)

	Estimate	S.E.	C.R.	P	Label
PostTest <--> PreTest	103.394	19.502	5.302	***	

Table 4. Reliability Test Results of Pre Test and Post Test Results

	Cronbach's Alpha Based on Standardized Items	N of Items
Cronbach's Alpha	.740	2

Table 5. Reliability Test Results of Partner Satisfaction

	Cronbach's Alpha Based on Standardized Items	N of Items
Cronbach's Alpha	.964	5

Table 6. Validity Test Results of Pre Test, Post Test and Partner Satisfaction Result Variables.

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
PreTest	60.82	150.129	.644	.450	.237
PostTest	50.64	306.576	.579	.433	.229
Satisfaction1	95.59	620.143	.276	.828	.502
Satisfaction2	95.60	619.737	.292	.843	.501
Satisfaction3	95.40	616.343	.321	.865	.498
Satisfaction4	95.63	618.377	.317	.754	.500
Satisfaction5	95.34	614.873	.337	.833	.496

Table 7. Comparison of *Cronbach's Alpha* scores and results

	<i>Cronbach's Alpha</i>	<i>Cronbach's Alpha if item deleted</i>	Results
PreTest	.756	.237	Valid
PostTest	.756	.229	Valid
Satisfaction1	.756	.502	Valid
Satisfaction2	.756	.501	Valid
Satisfaction3	.756	.498	Valid
Satisfaction4	.756	.500	Valid
Satisfaction5	.756	.496	Valid

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5.3 Correlation Test Analysis

The following is the result of correlation analysis conducted to see the relationship between the Pre Test results and the Post Test results.

Table 8. Results of Correlation Test

		PreTest	PostTest
PreTest	Pearson Correlation	1	.630**
	Sig. (2-tailed)		.000
	N	100	100
PostTest	Pearson Correlation	.630**	1
	Sig. (2-tailed)	.000	
	N	100	100

*** Correlation is significant at the 0.01 level (2-tailed).

Table 5 shows the correlation value. Based on the testing criteria, H_0 is accepted if the Sig value > 0.05 and H_0 is rejected if the Sig value < 0.05 . From the results of the correlation test, it was found that the Sig value on both variables, the Pre Test and Post Test results, is less than 0.05, which means that the Pre Test results have a correlation with the Post Test results.

5.4 Analysis of Linear Regression Test

This linear regression method is intended to identify how much the level of influence that the Pre Test results have on the Post Test results. This linear regression calculation uses the ANOVA test.

From table 9, it could be identified that the Sig value is close to (0), ($0.000 < 0.05$), so H_0 is rejected and H_1 is accepted. Thus, it can be concluded that there is an influence between the Pre Test and Post Test results.

In the table above, the magnitude of the influence or contribution of the independent variables (X) together to variable (Y) can be seen from the magnitude of double determination coefficient (R^2), which is a value between zero and one. If the value of R^2 obtained from the calculation is greater (closer to 1), the influence of the independent variables on the dependent variable is getting bigger, and the vice versa, if the results of the calculation is smaller (closer to 0), the influence of the independent variables on the dependent variable

is getting smaller. Based on the table above, the value of R^2 is 0.396, meaning that all independent variables (Pre Test result) have an influence on the Post Test results at 0.396 or 39.6%.

6. Discussion

The analysis carried out in this study started from processing the questionnaire data. Then from the results of the questionnaire, SEM test was performed. From the SEM analysis test, the results show that the values of satisfaction1 and satisfaction2 variables are more than 0.05, which means that there is no correlation between these variables with the Post Test results. Meanwhile, other variables have a positive correlation with the Post Test results. According to what is shown in table 2, the results show that the 5 satisfaction variables have a weak correlation with the Post Test results. From the Covariance test results, however, p-value is < 0.01 or smaller than 0.05, so H_0 is rejected, which means that there is a correlation between the Pre Test results with the Post Test results.

After that, the reliability and validity test was performed. Once the data was declared reliable and valid, the test was continued by conducting a correlation analysis to find out whether there is a correlation or relationship between the Pre Test results and the Post Test results. The results of correlation analysis using *Pearson* correlation show less than 0.05, which means that the Pre Test results have a correlation with the Post Test results.

Next, a linear regression analysis was performed using the ANOVA test. This linear regression test is intended to identify how much the level of influence that the Pre Test results have on the Post Test results. In accordance with the results of the analysis obtained by ANOVA test, it can be observed that the magnitude of the effect of the Pre Test results on the Post Test is 0.396 or 39.6%.

Consequently, based on the analysis of available data, it is stated that the Pre Test results affect the Post Test results of disaster response training participants. Furthermore, the Post Test results obtained by the participants are also influenced by the participant

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satisfaction as during the provision of the training material.

Therefore, in order to maximize the knowledge and attitude of students' emergency response, the boarding school can carry out special training or seminars that are packaged in

an interesting way with the hope that they are able to educate students. This activity is also conducted to anticipate the casualties when a disaster occurs and create a more conducive school atmosphere.

Table 9. Results of ANOVA Linear Regression Test

	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4470.221	1	4470.221	64.379	.000 ^b
	Residual	6804.689	98	69.436		
	Total	11274.910	99			

a. Dependent Variable: PostTest

b. Predictors: (Constant), PreTest

Table 10. Summary Model

Model Summary ^a										
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	Change Statistics				Durbin-Watson
						F Change	df1	df2	Sig. F Change	
1	.630 ^a	.396	.390	8.333	.396	64.379	1	98	.000	1.964

a. Predictors: (Constant), PreTest

b. Dependent Variable: PostTest

7. Conclusion

Based on the results of the study and the results of the analysis that has been performed, the following conclusions can be drawn:

1. The results of the students' Pre Test and Post Test are correlated. This can be seen from the results of the output that resulted in the P-Value of religiosity level variable <0.01 , which means that H_0 is rejected. Hence, the Pre Test results have a correlation with the Post Test results. The level of influence between the Pre Test and Post Test results is 0.396 or 39.6 %.
2. The Post Test results are influenced by 5 indicators of participant satisfaction. All of the 5 indicators, did not affect the Post Test results significantly.
3. Activities regarding knowledge and attitude of disaster emergency response need to be conducted continuously because they are expected to educate all elements in boarding schools. The aim is to reduce

the casualties when a disaster occurs and create a more conducive school atmosphere.

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