DEVELOPMENT OF EDUCATIONAL GAME SATRIA A SAVIOR THEMED ON DISASTER MITIGATION BASED ON ANDROID

Rizki Anugrah[1], Dedeng Hirawan [2]

[1,2] Informatics Engineering Program – Computer University of Indonesia
St. Dipatiukur No. 112-114, District of Coblong, Bandung City, West Java
E-mail : anugrsr@gmail.com[1], dedeng@email.unikom.ac.id[2]

ABSTRACT

Disaster risk reduction is important thing to human survival. The unpreparedness in the face of the disaster will have an adverse impact on the community. Lack of effecive media dissemination and learning about disaster management to the comunnity, so that it was built an educational game with disaster risk reduction themed based on an android. The learning method used in this research using the CMI (Computer Managed Instruction) Method with the model of tutorial and interactive game, and the software development method that is used in this research using Luther Method with the following steps: concept, design, material collection, assembly, testing, and distribution, with an Object-Oriented Program (OOP) based model. This system is develop using Construct 2 and Adobe Illustrator as main tools. Based on the result of research, it can be conclude with the existence of this system extension activiies can become more intersting and can help the community in knowing and understand how to handle disaster.

Keywords: Disaster risk reduction, Education game, CMI Method, Luther Method, OOP.

1. PRELIMINARY

1.1 Background

A natural disaster is a series of events that can cause a threat and nuisance to human life. Geography of indonesia located on the Ring of Fire causing natural disasters could potentially occur in Indonesia ranging from fires, floods, landslides, wind Stormwind, volcanoes, tsunamis, and earthquakes can occur along the the islands of Indonesia starting from Sabang until Merauke.

The results of the recapitulation of the disaster events in West Java province throughout the year 2016 happen as much as 1,183 disaster such as a fire broke out as many as 257 times, flood as much as 215 times, landslides as much as 480 times, Stormwind happened 185 times and the earthquake happened as much as 46 times. That number was increased in comparison to the year 2015, based on the increase in the number of victims affected by the impact of such disasters increased from 32,095 victims become 152,580 disaster victims. From these data the number of disasters that occurred in West Java province if not appropriately be solved then it can cause the number of victims affected as well as the destruction of various infrastructure that can be detrimental to the survival of man.

Based on the results of the now given to 100 respondents [1] Note that 93 people (93%) have experienced occurrences of natural disasters, and obtained that 67.3% have yet to figure out how disaster relief they've ever experienced. Then it can be inferred the community is still not so know and understand how disaster relief due to less effective media outreach and learning about disaster relief to the community.

Based on the results of the interview with Mr. Riswanda sexy as the head of the Agency's Disaster prevention area (BPBD) of West Java disaster way socialization activities are uncertain when he did, and socialization activities also done if there is a BPBD-party invite as speakers or speaker. According to BPBD the number of party activities of socialization are limited it is felt still less to socialize the way disaster relief to the community. Plus it still used the conventional way to socialize the way disaster response that is by using a slide presentation and hand out pocket book to the community. The way where can accelerate the process of socialization that way but of course has a deficiency such as presentation slides that are less attractive and the physical condition of a broken pocket book along with its use repeatedly.

The game is a media delivery information can be used as a substitute for or a way of socializing patterns on disaster relief to the community, because based on the results of the now done obtained results that 79% of respondents claimed to like the game play. With the popularity of the game dimasyarakat can be utilized as a medium of dissemination for disaster learning.

From the above problems, required intensive efforts in the form of a new extension to the public media, then woke up an educational game which is expected to be able to provide information to the public about the disaster response is more effective. Then her for this final task a title "Development Of Educational Game Satria A Savior Themed On Disaster Mitigation Based On Android".

1.2 Problem identification

Based on the description of the background, then can be identified a problem namely how to create an educational game for society that is able to introduce and teach disaster relief in the future, in order to interactively community to better prepared when facing natural disasters that occur.

1.3 Purpose and Objectives

Based on a problem that has been identified then it is the intent of this final task is to build educational games for media disaster relief information-based Android. As for the purpose of doing this research are as follows:

1. become a means of delivering information about disaster relief in an attractive and innovative.
2. Build a media outreach regarding learning to society in new ways.
3. To introduce to the public about pre disaster in the wake of disasters, and post disaster.

2. CONTENT

2.1 Theoretical Base

Here are the used theories and related research of the systems will be built.

2.1.1 Mulitimedia

Mulitimedia are applications that use various elements in their utilization, including text, photos, images, animations, video, sounds, and some kinds of interactivity. In this scenario, PC (Personal Computer), DVD, games, digital TV, interactive website, wireless network and so on can be called as part of multimedia products. Multimedia is one of the most interesting projects in the world of computer science. Graphics, visualization, HCI, computer vision, data compression, graph theory, crawl, and database systems; They all have an important role in making multimedia today. [2]

2.1.1.1 The Component of Multimedia

Merging of writing, sound, photos, images, animation, and video in multimedia is used in various: [2]

1. Video teleconferencing.
2. Learning media for higher education.
3. Telemedicine.
4. High-quality video and image search as visual objects.
5. Augmented reality.

2.1.2 Disaster Management

Disaster Management is a process which is dynamic, integrated and sustainable manner to improve the quality of measures related to the handling, is a series of activities that include prevention, mitigation, preparedness, response emergency, rehabilitation and reconstruction. The purpose of disaster management is [3] :

1. to provide protection to the public from the threat of disaster.
2. Harmonizing existing legislation.
3. the Guarantee in this disaster response programmatically, integrated, coordinated, and comprehensive.
4. Appreciate the local culture.
5. building partnership and participation of the public as well as private.
6. Encourages the spirit of solidarity, mutual, and generosity.
7. Create peace in the life of society, nation, and State.

2.1.3 Disaster

According to UU Number 24 year 2007 About disaster management, disaster is an event or series of events that threaten and disrupt the lives and livelihoods of communities caused by natural factors and/or human factors so that resulted in the incidence of fatalities, damage to the environment, loss of property and psychological impact. [4]

A natural disaster is a disaster caused by the event or series of events caused by nature, among others, in the form of earthquakes, volcanoes, tsunamis, floods, droughts, hurricanes and landslides. [4]

1. Earthquakes

   Is the berguncangnya of the earth caused by the collision between the plates of the Earth, the active volcano activity or a mound of rocks.
2. Volcanic Eruption

   It is part of the volcanic activity is known by the term "eruption". The danger of volcanic eruption can be either the hot clouds, pebbles while letting the material (incandescent), raining ash, lava flows, poisonous gases, lava floods and tsunamis.
3. The Tsunami

   A tsunami is a series of ocean waves with a long period of disruption caused by impulsive from the seabed. Tsunami can be caused by: an earthquake followed by a dislocation/displacement time ground/very large rocks under water (Lake/sea), landslides in the sea, the volcanic eruption under the sea or the volcano island.
4. Landslides

   Is one type of mass movement of soil or rock, or a mixture of both, down or out of the slope due to the disruption of stability of soil or rock on these slopes constituent.
5. The flood

   Interpreted as a runoff water that exceed the height of the face normal water, so the melimpas of the riverbed caused inundation in the presence of low land on the side of the river. In general the floods caused by high rainfall above normal so that drainage system consisting of rivers and creeks as well as the natural drainage

system and holding an artificial flood Canal there is not capable of accommodating the accumulated rain water such overflows.

6. Forest fire

   Forest fires are the changes directly or indirectly against biological and physical properties or that cause less the proper functioning of the forest or land in a sustainable life support as a result of uncontrolled use of fire as well as the natural factors that can lead to the occurrence of forest fires or land.

7. Hurricane

   Is the vortex of winds with wind speeds of 120 km/h or more are common in the tropical region between the Tropic of cancer and South, except in areas that are very close to the equator. A whirlwind is caused by pressure differences in a weather system.

8. Tidal Wave

   High waves are caused due to the effects of tropical cyclone occurrence around the region of Indonesia and potentially powerful cause natural disasters. Indonesia is not a region of tropical cyclone path but the existence of the tropical cyclone will give strong influence the onset of strong winds, high waves accompanied by heavy rain.

2.1.4 Game

Game is a kind of game activity, which provides an unreal context of reality, and brings its players to complete at least one goal or mission by playing a role in the rules of the game. Game is a type of media that can be a means to train and develop thinking power such as sharpened the concentration, strengthen memory and train logic to solve a problem, and as a container to convey the information to the players in an interesting way. Because based on the results of research conducted by the University of Rochester in New York mentions that learning through games is very easy and quickly absorbed by someone. [5]

Some experts have different definitions of the game, as quoted through the book The Art of Game Design. Elliot Avedon and Brian Sutton-Smith say the game is "An exercise of voluntary control systems," which according to Greg Costikyan's game is "An interactive structure Of endogeneous meaning that requires players to struggle toward a goal ". Another case with Tracy Fullerton, Chris Swain, and Steven Hoffman who has the definition of "A game is a closed, formal system, that engages players in structured conflict, and resolves in an unequal outcome". [6]

So that got a few points about the nature and terms of the game based on the notions that is: [6]:

1. Game gives a sense of desire to play it
2. Game has a purpose
3. Game has a conflict
4. Game has a rule
5. The game can be won or beat the player
6. Game is interactive
7. Game is challenging
8. Games can create their own internal values
9. Game menarik bagi pemainnya
10. Game is a closed formal system.

The most important elements in the game are the rules, goals, games, and elements of pretense. Games are interactive media, they need active players who participate in changing events in the game's story.

Based on its genre, it is divided into several kinds, such as [7]:

1. Action Games
2. Strategy Games
3. Role-Playing Games (RPG)
4. Sport Games
5. Driving Simulation
6. Construction and Management Simulations
7. Adventure Games
8. Artificial Life and Puzzle Games
9. Online Games

While according to its platform, the game is divided into [7]:

1. Home Game Consoles
2. Personal Computer
3. Handheld Game Machines
4. Mobile Phone and Wireless Device
5. Arcade Machines

2.2 Problem Analysis

Analysis of the problems arising in this research is:

1. the Community has yet to understand how a proper disaster mitigation due to inovatifnya yet the means of delivery of information on disaster relief to the community.
2. the Community is not yet aware of the importance of disaster response appropriately, with the number of victims affected by the consequences of the disaster, people are still not aware of the importance of disaster management appropriately.
3. the Community still do not know the characteristics and signs of disaster.
4. Uncertainty guidance activities carried out by the BPBD to the community and media outreach that are not yet effective are still conventional in nature.

2.2.1 Analisis Sistem yang Sedang Berjalan

Analysis of the running system describes a phenomenon that is happening in environmental research. There are two processes that are currently occurring :

1. Society: About how society recognize the signs of impending disaster, what to do in the wake of disasters, and what to do in post disaster.

2. BPBD: on how process guidance or socialization which is currently being done to the community.

The following is the procedure that is going on in the community, along with the indicated image using BPMN (Business Process Model and Notation):

1. The community has not been aware of impending disaster.
2. The community seeking shelter in the wake of the disaster.
3. Officers came to the scene of the disaster.
4. The officer helped the community in the process of evacuation.
5. The officer helped the community toward a shelter.

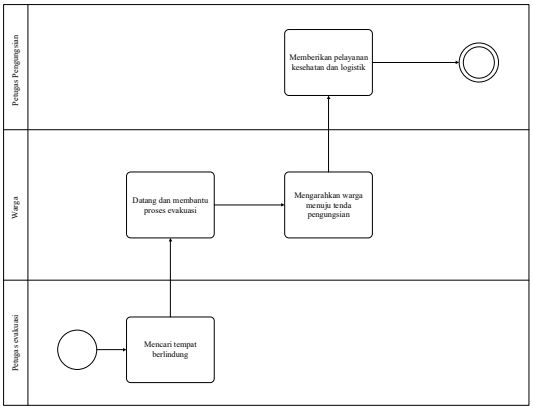


Figure 1 The current system in Society

The following is a procedure done BPBD in doing outreach to the community:

1. The community organizer socialization socialization needs to send the mail BPBD.
2. BPBD to receive and send an email reply.
3. BPBD issued the warrant travel socialization.
4. BPBD preparing planning departure.
5. BPBD checking material completeness or media socialization.
6. BPBD travel to the location of socialization.
7. BPBD met the public who need socialization.
8. The organizers set up the target of socialization.
9. Implementation of socialization by BPBD
10. After the event finished, BPBD back and drawing up reports.

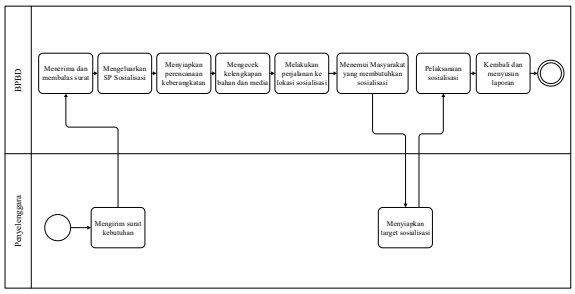


Figure 2 The Current System in BPBD

2.2.2 The Needs Analysis

Needs analysis is the stage of defining existing needs with the goal of getting a clear understanding about the software that will be developed. [8] While according to Wiegers needs analysis aimed at perfecting existing needs to ensure stakeholders understand and discover the mistakes, negligence, and other shortages if there is. [9]

2.2.2.1 A Non-Fungsional Needs Analysis

Non functional needs analysis is the phase of defining system requirements specification regarding a component of what is needed to build the system. This specification addresses the aspects related to the analysis software, hardware analysis.

2.2.2.1.1 Software Analysis

Software needs analysis i.e. minimum specifications define the phase is the software required to build and use this system. Table 1 describes the specifications of the software must be owned to build the system.

Table 1 The Analysis of Software Needs

No	Perangkat Lunak	Spesifikasi
1	Sistem Operasi	Windows 10 64bit
2	*Engine*	Unity
3	*Software* pendukung	Adobe Photoshop
4	*Software* pendukung	Adobe Illustrator

2.2.2.1.2 Hardware Analysis

Needs analysis of the hardware on which games will be built this describes the bare minimum that should have to play this game. Table 2 below will explain the specifications of the hardware used to play this game.

Table 2 The Analysis of Hardware Needs

No	Perangkat Keras	Spesifikasi
1	*Processor*	Quad core Exynos 4412 Quad
2	RAM	1 GB
3	Sistem Operasi	Android 4.2 Jellybean
4	GPU	Mali-400
5	Ukuran layar	4.8 inch
6	Resolusi	1280 x 720 pixels

2.2.2.2 A Fungsional Needs Analysis

System analysis is done using the Object Oriented approach to Analysis using UML models. Stages in the analysis of this system consists in Use Case diagrams, Use Case Scenarios, Sequence Diagrams, and Class diagrams.

2.2.2.2.1 Use Case Diagram

Use case is a situation where a system used to meet one or more of the needs of the user himself, a use case of capturing a portion of the functionality of a given system. [10] Here's a use case from the games will be built.

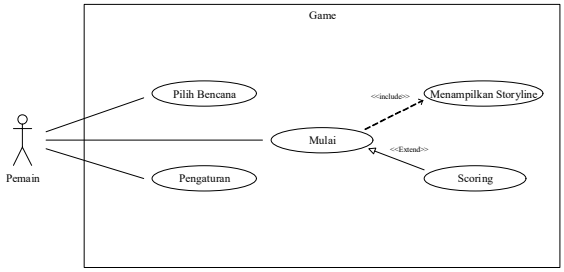


Figure 3 Use Case Diagram System

2.2.2.2.2 Class Diagram

Class is the core of object-oriented systems; Therefore, it is followed by a diakuinnya diagram of classes as UML diagrams are the most popular. The structure of a system made up of a collection of parts that are referred to as objects. Classes describe the difference in the types of the objects that the system had, and diagram indicate the class of the class as well as their colleagues. [10] Figure 4 below shows the class diagram on the system being built.

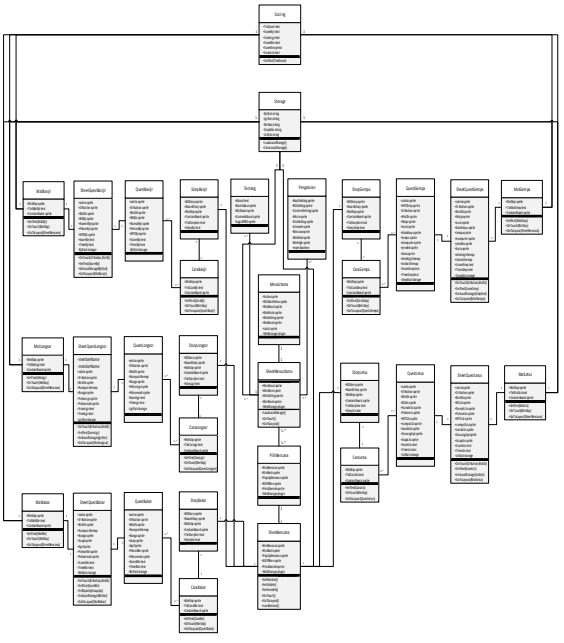


Figure 4 Class Diagram System

2.3 Design

The next stage is the design of the concept, by describing clearly about what will be done in stages, then proceed with the concept of how to build the system. At this stage will be outlined the design of a network interface, menu structure, and semantics.

2.3.1 Interface Design

The design of the interface is the depiction of roughly about the initial design of the display that will be created on the system to be built in for easy aiming to implement and make the application. Here is a mock up of the application that is being built is described in the following explanation.

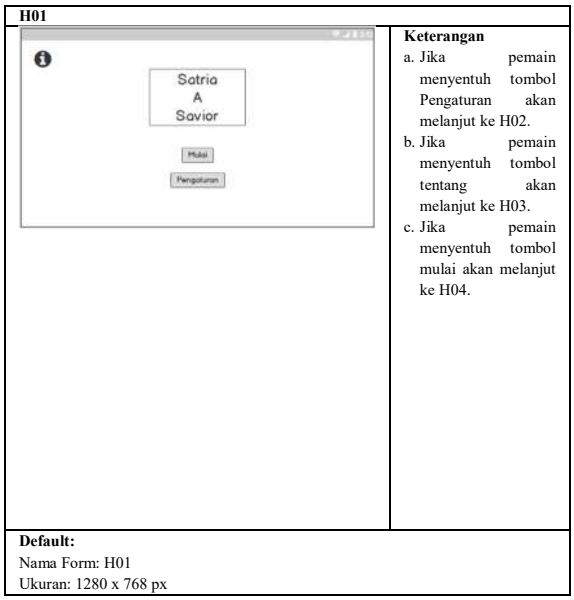


Figure 5 Main Menu Interface

2.3.2 Semantic Network

Semantic Network describes the relationship between each display has been depicted on the design of the interface. The following figure 6 describes the semantic networks in a game that was built.

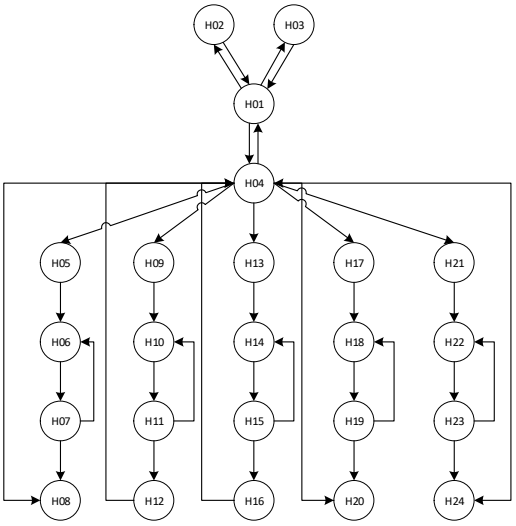


Figure 6 Semantic Network of System

2.3.3 Structure of Menu

The design of the structure of the menu is the depiction on the menus of connected in the construction of the system. Menu structure on games that are built are described in Figure 7 below.

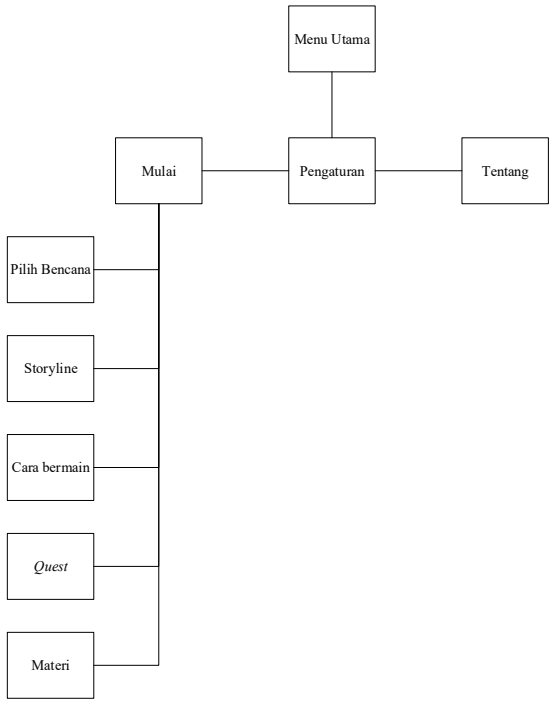


Figure 7 Menu Structure of System

2.4 System Implementation

Implementation is the stage of development of the software and also the advanced stage of designing the system. This stage is a stage where the system is ready to operate. The system was built with the name Knights of A Savior is formatted system. apk and it can be installed without using the help of other applications.

2.4.1 Hardware in Testing Application

Devices used in performing the testing for the game Knights of A Savior who has built can be seen in table 3.

Table 3 Table Hardware in Testing Application

No	Perangkat Keras	Spesifikasi
1	*Processor*	1.2GHz Dual core ARM Cortex-A7 CPU
2	RAM	512MB
3	Sistem Operasi	Android Jellybean 4.2.2
4	Ukuran Layar	4.0 inch
5	Resolusi	480x800 pixel

2.5 System Testing

The test system is the stage to find errors or flaws in the system to be built and then tested. Testing is done to determine if the system has been built and is working as a function that's been designed before, and achieve the purpose of the construction of the system. Testing was done using the technique of black box testing and UAT (User Acceptance Test).

2.5.1 Black Box Testing

Black box testing is the testing that was performed to test the system in terms of functionality that has been built, to find errors and rejection shown system. Based on the results from testing the system Black Box, which was built has filled the whole functionality and runs well, are described in table 4.

Table 4 The Black Box Testing of Main Menu

Kasus dan Hasil Uji					
No	**Aksi**	**Deskripsi**	**Yang Diharapkan**	**Hasil Yang Keluar**	**Keterangan**
1	*On Touched Button*	Pemain menekan tombol Main	Pergi ke halaman Pilih Daerah	Pergi ke halaman Pilih Halaman	[√] Diterima [ ] Ditolak
2	*On Touched Button*	Pemain menekan tombol Pengaturan	Pergi ke halaman Pengaturan	Pergi ke halaman Pengaturan	[√] Diterima [ ] Ditolak
3	*On Touched Button*	Pemain menekan tombol Tentang	Pergi ke halaman Tentang	Pergi ke halaman Tentang	[√] Diterima [ ] Ditolak

2.5.2 User Acceptance Testing (UAT)

UAT testing done by disseminating a questionnaire to the community and also the interview to the Agency, this test is done to find out the response from the users of the system that has been built, whether the system has overcome the whole issue of the background research. Testing is done by means of an interview.

2.5.2.1 Interview Test

Testing conducted by questioning to target users in this case to the Department of environment staff to know the mistakes and discrepancies that are not found by builders. It is also testing to see if the system has fulfilled its purpose.

Table 5 UAT of Interview

Objectives	Question	Answer
Be the means of delivery of information on environmental education in an attractive and innovative.	1. is this game make it easier in the process of delivery of the materials to the community? 2. is the delivery of material in this game is easy to understand? 3. If the look of the game is already interesting?	*1. This Game is more easy to understand for children up to adults in the process of delivering the material to the public, because it is more facilitated in delivery.* *2. Understand all, due to the*

Objectives	Question	Answer
	4. does the Mission contained in this easy to understand? 5. does the Mission contained in this game already interesting?	*explanations given in those games (npc).* *3. For me it's been interesting, it's nice and very interesting.* *4. I think it is easy to understand, because each area provide info about its mission.* *5. It's been interesting, from the segment to another segment. So in a game that has been around the system sort out the sebuhan to complete the mission.*
Build media outreach on learning to the community in a new way.	6. is this game can help in public? 7. will display in this game already according used as media outreach? 8. is this game with the public becoming more attractive?	6. Oh helpful at all because it has been made into an application like that, indirectly provide guidance through this game. 7. If display is seen in the community has been getting penyeluhan indirectly found in-game. 8. More exciting because if a mission is performed is not successful the player will repeat again from the beginning so that players are able to evaluate the errors committed when defeated, making it more challenging.

Based on the results from testing of the interview then obtained the conclusion that the system being built have met the goal number 1 and number 5, i.e. a system built of media can be a means of delivering information in an attractive and innovative system built can be used as media outreach to the community in a new way.

2.5.2.2 Questionnaire Test

Testing is done by giving a questionnaire to the community to try the system and know whether the system has met its objectives well. In this test the questionnaire was given to 35 respondents. The percentage of each question given to the respondent has 5 scales using Likert scale. With the score criteria described in **Error! Reference source not found.**6 the following:

Table 6 Likert Score Criteria

Skala Jawaban	Keterangan	Skor	Persentase
SS	Sangat Setuju	5	100% - 80%
S	Setuju	4	79% - 60%
C	Cukup	3	59% - 40%
TS	Tidak Setuju	2	39% - 20%
STS	Sangat Tidak Setuju	1	19% - 0%

Here is the result of the percentage of answers obtained from the questionnaires which are then calculated using the above formula, described in Table 7.

1. Do you agree the Mission in this game makes it easy for you to understand the impact of natural disasters ?

Table 7 Table Result of Questionnaire

Pertanyaan	Keterangan	Skor	Frekuensi	S
1.	SS	5	13	65
	S	4	18	72
	C	3	4	12
	TS	2	0	0
	STS	1	0	0
		Jumlah	35	149

$$\frac{149}{175} \text{ x } 100\% = 85\%$$

Based on the percentage of the values in the Table, it can be concluded that the assessment of the question about setujukah the respondent if the built in-game mission makes it easier to understand the impact of natural disasters is 85% of the 100% It is expected, then it can be categorized as very agree.

Based on the testing that has been done using questionnaires to the 35 respondents, obtained conclusions include:

1. in-game Mission built makes it easier to understand the impact of natural disasters.
2. the material presented in this game makes it easy to understand the disaster by their very nature.
3. The Mission contained in this game is quite difficult to resolve.
4. The Mission contained in this game where it will impact that can be inflicted by a natural disaster.
5. the material contained in this game are able to introduce you to the way – how to disaster mitigation.
6. Display embedded in this game is able to make the respondents distinguish the nature of the disaster.
7. After playing the game the respondents became familiar on how – how to disaster mitigation.
8. the material contained in this game helps in disaster relief.
9. Display embedded in this game makes the respondent can be distinguished by their very nature disaster.

10. the mission is contained in this help respondents in knowing the appropriate place to take cover in accordance with the disaster happened.

Thus it can be concluded that the system has met the purpose built development to the community.

3. CLOSING

3.1 Conclusion

After the analysis, design and testing, then a conclusion can be obtained as follows:

1. Sistem dapat digunakan sebagai sarana penyampaian informasi kepada masyarakat dengan cara yang menarik dan inovatif.
2. Sistem mampu mengenalkan kepada masyarakat mengenai dampak dari bencana alam.
3. Sistem mampu mengenalkan kepada masyarakat cara penanggulangan bencana alam.
4. Sistem dapat digunakan sebagai media penyuluhan dengan cara yang baru.

3.2 Suggestion

Suggestions for the development of the game Knights of A Savior so that better future is as follows:

1. Design in the game made more real and clarified.
2. Added interaction on a more interesting game.
3. Expanded animation and effects on the game.

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