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Game Education of Disaster Mitigation: A Systematic Literature Review

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ABSTRACT

Disaster mitigation is highly needed to be educated to the community in general in order to maximally reduce its risk. Learning about disaster mitigation happily performed will provide more effective impact especially for the children's age sensitivity factor. The video game can be appicated as an instrument to this education on it. Systematic Literature Review (SLR) related to game education for disaster mitigation would be taken as a method in this study. Research contributions forward are exploration results suggested that technology in reducing disaster risk has been a mitigation technology/disaster management based on computer and conventional. Multimedia technology will be the alternative for disaster mitigation education instrument.

Key words : Disaster mitigation, Education, Systematic Literature Review, Video Game.

1. INTRODUCTION

United Nations International Strategy for Disaster Reduction (UN-ISDR) stated that exposure to community or total human being who may become the victim of disaster risk in Indonesia is very high [1], [2]. Due to this, disaster risk reduction program has been very important to be noticed.

Disaster risk reduction program as a disaster mitigation is a set of efforts to reduce disaster risk, through either physical development or awareness and ability improvement to face disaster threat either in fatalities or wealth. One of disaster mitigation objectives is reducing vulnerability from that disaster [3]–[5]. The vulnerability in question is the social vulnerability on children and mental vulnerability such as, ignorance, unawareness, lack of self confidence and some others. Education in disaster mitigation is the important key in reducing the available vulnerability including children in which it can be conducted through video game media.

On the other side, the recent video game application is not a rare thing, in fact, it can be said that it has been common, particularly for children and teenagers' age categorized as native digital generation. This native digital generation has been very familiar to gadget technology [6], [7] including video game application. This is greatly supported by gadget possession that is very various, the native digital generation's intensity usage and preference in accessing video game. Demography data about it provides the available fact description regarding children's condition and perception about video game [8].

Video game usage as the media to submit disaster mitigation knowledge in a vulnerable place such as Indonesia has been highly needed and the recent media delivery is still very limited particularly for the children age. This study is to deeply explore and dig about reference discussing video game technology in disaster mitigation.

2. METHOD

This article explores and explains literature review by employing Systematic Literature Review (SLR) [9] with article choice criteria as disaster mitigation applying technology through digital reference on IEEE explore and Science Direct database. In addition, the criteria have been limited to journal from the year of 2013 to 2019. Key word criteria are "*disaster management technology*", "*computer*" and "*video game*". Flowchart from this method is its SLR criteria detail shown in Figure 1.

3. TECHNOLOGY IN DISATER MITIGATION /MANAGEMENT

Disaster event finds out to be very close to our life. In the last decades, the number of disasters reported have experienced increasing trend in Indonesia dominated by natural disaster

such as flood, landslide, typhoon and earthquake based on official website report profile *Badan Nasional Penanggulangan Bencana* (BNPB)/National Disaster Management Agency [2], detail data for the last 5 years can be seen in Figure 2. There has been growing number of people who are harmed by these events. This disaster event especially in Asia included Indonesia has eventually damaged various infrastructures having impact on long term damage [5], [10]. Children will endure the impact either in the short or long term [11], such as the one documented by some reports. This disaster impact projected that the affected children would be increased from about 66.5 million per year in the end of 1990s, to 175 million per year in the next decade [12].

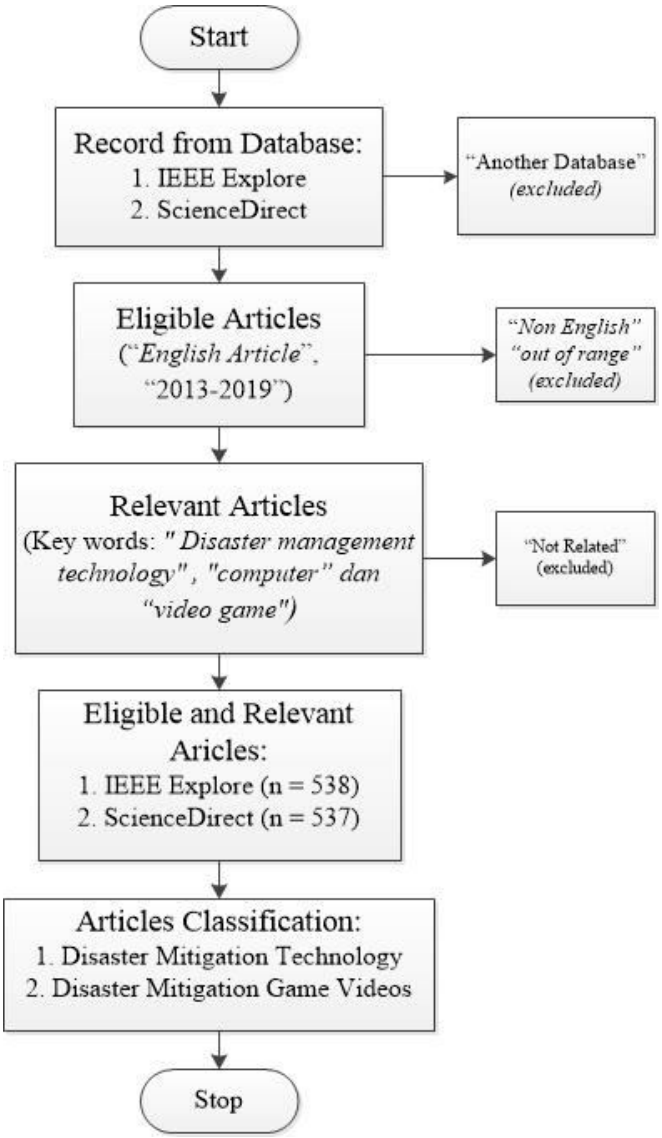

Figure 1: Flowchart of Systematic Literature Review (SLR) Method

The impact reduction of disaster event keeps conducting from many stakeholders including the technology usage. Based on some literature review performed, the technology used for disaster risk reduction has been divided into two, i.e. disaster management/mitigation technology having or not computer basis. Mitigation technology without computer basis is the one that its operation doesn't need computerization by computer instrument. As example, heavy equipment technology in evacuating landslide disaster victim, rubber boat technology in evacuating flood victim and many others. While technology based on computer are as follow: disaster management information system [13], geographical information system (GIS) in disaster mapping and evacuation [14], remote sensing system in monitoring and predicting disaster cause [14] and of course multimedia in educating people in disaster mitigation [15], [16].

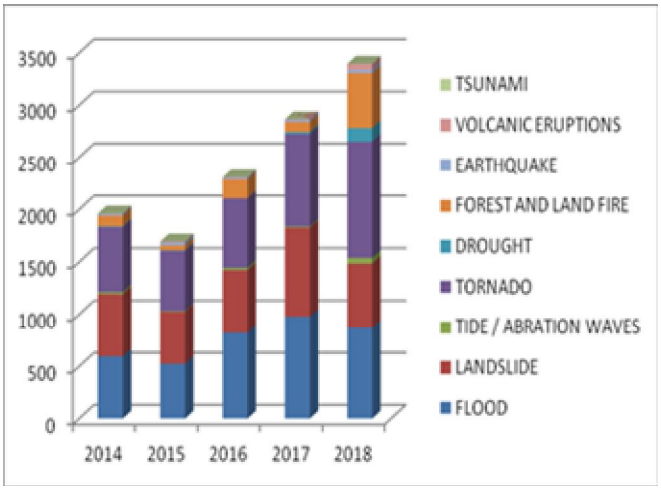

Figure 2: Disaster Data of BNPB in the last 5 years (2014-2018)

The multimedia employed in educating community vulnerable to disaster can be performed using animation method, film and video game [15], [16]. Educative disaster mitigation can eventually be performed either in conventional or computer based technology. At the time the disaster risk reduction is conducted and the conventional recovery seems to be very effective as a result of limitation and thus there will be many infrastructures damaged during disaster. While the technology based on computer particularly multimedia will be the very attractive and effective alternative as a mitigation instrument when all infrastructures such as electricity, computer, and gadget are available, especially those with educative character.

Disaster mitigation education particularly for children age has been more interesting if it is designed using video game technology, since the child adjacency to video game [17]. This video game attractiveness to children was judged by the author as being useful as the very effective education instrument.

4. VIDEO GAME FOR DISASTER MITIGATION EDUCATION

Video application has recently been a very general thing for all age, most children have the tendency to be more live up to playing game and this can be used for learning in a manner suited to children's development and fun for them [8], [18] Video game can be employed as learning media that will provide output for user (children) as the improvement of science/cognitive ability regarding disaster management [19]. This would be explained by Martinovic as shown in Figure 3. Although at present, it is assessed that the games available in market have given negative impact to children as they provide bad character and violence [20]. Video game has recently aimed not only to entertainment, but also to be serious games [21] that can be used to education, simulation, health study [22], [23], and therapy. Among those functions are education and disaster mitigation simulation.

This type of video game for disaster mitigation has been studied in few studies. Some of them were game as education media of earthquake disaster [15], [24], [25], flood [26] (Tsai, Chang, Kao, & Kang, 2015), landslide, fire, volcano eruption and others. In fact, there is a video game specifically aimed to be designed for earthquake mitigation for children with special need, autism [24].

Video game technology applied in constructing a learning media regarding the disaster mitigation is various, starting from two dimensional (2D) technology [15], [27], three dimension (3D) [28], augmented reality (AR) to virtual reality (VR) [29]–[32]. Furthermore, the video game technology can also be used as therapy instrument [29] for children or even adult having trauma toward the natural disaster they experienced.

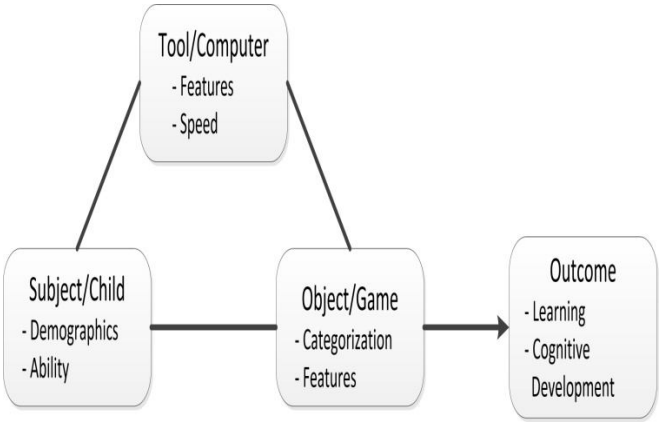

Figure 3: The association between video game, child's cognitive ability and the learning process

The study of education for disaster mitigation by employing video game media has been assessed by researchers as needed to be much developed and it can be a very prospective research area in which Indonesian profile is geographically very sensitive toward natural disaster. This is also supported by increasingly better game technology, varieties and enjoyable for children and thus they can learn much about disaster mitigation in a fun way.

5. CONCLUSION

The exploration result from systematic literature review conducted would be concluded that the technology applicator to reduce disaster risk was mitigation technology/disaster management based on computer and conventional. Technology based on computer would be very attractive and effective as the disaster mitigation instrument especially the one as being educative in present and future.

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