doi:10.31674/mjn.2020.v12i02.008

MJN

COMPARISON OF TABLETOP DISASTER EXERCISE (TDE) AND EDUCATIONAL FILM ON DISASTER PREPAREDNESS AMONG INDONESIAN VOCATIONAL HIGH SCHOOL STUDENT: A QUASI-EXPERIMENTAL STUDY

Imroatus Sholihah[1]*, Masruroh Rahayu[2], Suryanto[3]

[1]Postgraduate Program of Nursing, School of Nursing, Universitas Brawijaya, Indonesia
[2]Department of Neurology, Medical Faculty, Universitas Brawijaya, Indonesia
[3]Department of Emergency Nursing, School of Nursing, Universitas Brawijaya, Indonesia

**Corresponding Author's Email: imroatus.sholihah.ijo@gmail.com*

ABSTRACT

Background: Teenagers play an essential role in the Disaster Risk Reduction program or DRR. Teenagers need to get adequate knowledge related to disasters through disaster education. Various studies have been conducted to obtain effective media in disaster education, some of them are Tabletop Disaster Education (TDE) and educational film. However, there are no studies yet comparing the effectiveness of these media in increasing disaster preparedness. **Aim:** The purpose of this study is to compare TDE and educational film in increasing disaster preparedness in flash floods for vocational students. **Methods:** A quasi-experimental with a pretest-posttest nonequivalent control group was used in this study. One hundred and four students in tenth-grade vocational high school participated in this study and were divided into two groups, TDE group, and the educational film group. Samples were taken using a simple random sampling technique. Data were analyzed using paired *t*-test and independent *t*-test with SPSS software version 22.0. **Result:** There was a significant difference in disaster preparedness between the two groups before and after treatment (p=0.000), and there was a significant difference in disaster preparedness between the TDE and educational film (p=0.000), with a higher variance of TDE of 6.94. **Conclusion:** This study demonstrated that there was a significant difference in disaster preparedness between two groups, and TDE showed better results in increasing disaster preparedness among students compared to the educational film. **Recommendation:** Further research is needed that involves confounding factors of academic intelligence and knowledge retention in both media TDE and educational film.

Keywords: Tabletop Disaster Exercise, Educational Film, Disaster Preparedness

INTRODUCTION

Indonesia lies on the convergence between the Australian plate, the Pacific Plate, and the Eurasian plate (Adi, 2013; Agustiana, Wibawa, & Tika, 2013; Saputri & Sudarmilah, 2019) which cause the high potential for natural disasters. Being located at the equator, Indonesia has a high potential for hydrometeorological disasters such as floods, flash floods, extreme weather, drought, abrasion, land, and forest fires (Maarif, 2014). Badan Nasional Penanggulangan Bencana (2018) or The National Disaster Management Agency of Indonesia claims that floods, landslides, and tornadoes dominate the highest number of disasters in Indonesia.

Flash flood is a hydrometeorological disaster whose intentions have been increasing lately (Adi, 2013). Flash floods have their characteristics, and it has a rapid onset that makes this phenomenon very dangerous (Hoedjes *et al.*, 2014). Jember is a city located in East Java that has a high incidence of flash floods (Badan Nasional Penanggulangan Bencana, 2019).

Since 2010 Indonesia began to change the paradigm of disaster management from responsive to preventive which is considered more effective because it can reduce or eliminate the impact of disasters more effectively, save lives, reduce the risk of injury, prevent the effects of extensive damage and accelerate the post-disaster

recovery process (Johnson *et al.*, 2016; Maarif, 2014; Wandasari, 2013).

Teenagers play an essential role in disaster risk reduction (Newnham *et al.*, 2019). Therefore teenagers need to get adequate knowledge related to disasters and adapt to the post-disaster environment through disaster preparedness education to build disaster conscious behavior that will continue into an adult (Newnham *et al.*, 2019; Rahmawati & Asyanti, 2017).

Previous studies showed that disaster education for teenagers using conventional simulation methods brings poor results (Codreanu, Celenza & Ngo, 2016). Various efforts were made in developing effective learning media in disaster education, such as Tabletop Disaster Exercise (TDE) that can be used to test the disaster preparedness of various elements related to disaster preparedness and management (Nielson & Kitching, 2012; Sandström *et al.*, 2014). Audiovisual media such as video and film are widely used in disaster education in this digital era. Previous studies mention that educational film about disasters can increase preparedness and self-efficacy in dealing with emergencies (Faradinah, Rokhmah, & Ririanty, 2015; Saputri & Sudarmilah, 2019).

The purpose of this study is to compare between Tabletop Disaster Exercise (TDE) and educational film in increasing disaster preparedness of high school students in facing flash floods.

METHODOLOGY

Design. A quasi-experimental study with a pretest-posttest nonequivalent was used in this study.

Sample. 104 samples were used in this study. They were tenth-grade students in Vocational High School SMK Al Hasan, Jember town, Eas Java Province, Indonesia. Samples were divided into 2 groups, TDE group and educational film group with 52 students in each group. Samples were selected using a simple random sampling with inclusion criteria: 1) willing to be a respondent in the study; 2) follow all process in this study, from beginning to end; and exclusion criteria: 1) students who have received previous disaster education; 2) students who have been actively involved in disaster activities, for example participating in a team of disaster volunteers.

Place. This study was conducted at vocational school, SMK Al Hasan Jember, East Java, Indonesia.

Tool. An educational film titled "Waspada Banjir Bandang" produced by the Japan International Corporation Agency or JICA in collaboration with the Ministry of Public Works, the Directorate General of Water Resources, and the Directorate of River and Coastal Indonesia was used in this study. Content of film: knowledge about the flash flood, planned activities for the disaster, disaster warning system, and resource mobilization including evacuation. The second tool is a TDE consisting of 1.5 x 2 meters board on which the miniature of town, and a scenario consisting of disaster cases and the role of each respondent. The duration of TDE is ±60 minutes, consisting of preparation, rehearsal, and simulation. TDE was developed by researchers. The content of the TDE was adjusted with the educational film so that the information obtained by the two groups was the same.

Data collection and data analysis. Data collection was carried out before and shortly after treatment. Disaster preparedness was assessed using a questionnaire from the Indonesian Institute of Sciences or LIPI in collaboration with the United Nations Educational, Scientific, and Cultural Organization (UNESCO) 2006, which was modified by the researcher. The questionnaire consists of 25 items, which are scored on 0-1 point, where individuals rate items as "false (0)", "not sure (0)", and "true (1)". Scores ranging from 0 to 25, higher scores indicating higher preparedness, with category 20-25 = high preparedness, 15-19 = medium preparedness, and <15 = low preparedness.

The data obtained were analyzed using SPSS software version 22.0. Univariate analysis was used to determine respondent characteristic data and disaster preparedness before and after treatment. Bivariate analysis using a paired *t*-test was used to find out the increase in preparedness in both groups. In contrast, the independent *t*-test was used to find out the differences in preparedness between the two groups.

Validity and Reliability. The validity test was performed using the Pearson Product Moment test with the results of all r counts for 25 questions >r tables (r table = 0.576 for n = 12, a significance level of 5%) so that all questionnaire questions were concluded as valid. The reliability test was carried out using the Cronbach's alpha test, and the results obtained $\alpha = 0.967$ and r table 0.567 (n =12, a significance level of 5%) so that $\alpha >$ r tables means that the questionnaire was reliable or consistent.

RESULTS

Univariate analysis

Table 1: Distribution of Respondents by Gender and Majors

No.	Characteristics of respondents	Frequency (n)	Percentage (%)
1.	Sex		
	Male	57	55
	Female	47	45
	Total	104	100
2.	Major		
	Agribusiness	25	24
	Accounting	28	27
	Marketing	30	29
	Multimedia	21	20
	Total	104	100

Table 1 showed most of the respondents were male, the number of male respondents (55%) was more significant than female respondents (45%). Respondents are divided into 4 majors, and marketing is the highest number of respondents amounting to 30 respondents.

Table 2: Distribution of Respondent by Age

No.	Characteristics of respondents	N	Mean±SD	Min-Max
1.	Age	104	15.95±0.68	15-18

Table 2 showed the average age of respondents being 16 years with the lowest age is 15 years, and the highest age is 18 years.

Table 3: Level of Disaster Preparedness Before and After Disaster Education TDE Group and Educational Film Group

Variable	Groups	N	Pre-test/ post-test	Category	Frequency (n)
Disaster preparedness	TDE	52	Pret-test	High	1
				Medium	19
				Low	32
			Post-test	High	37
				Medium	12
				Low	3
	Educational film	52	Pret-test	High	0
				Medium	8
				Low	44
			Post-test	High	4
				Medium	41
				Low	7

Table 3 showed the distribution of respondents based on their level of disaster preparedness before and after disaster education in TDE group and educational film group. The TDE group before treatment showed that most of the respondents had a low level of preparedness (n=32). After surgery, the majority of respondents' preparedness level was high (n=37). In the educational film group, the majority of respondents' preparedness level before treatment was low (n=44), after treatment, the respondent's preparedness level was mostly medium (n=41).

Bivariate Analysis

Table 4: Disaster Preparedness Before and After Disaster Education Using TDE and Educational Film

Variable	Groups	N	Pre-test/ post-test	Mean	Difference	*P**
Disaster preparedness	TDE	52	Pret-test	13.98	6.94	0.000
			Post-test	20.92		
	Educational film	52	Pret-test	12.02	4.53	0.000
			Post-test	16.55		

Table 4 showed the distribution of respondents' disaster preparedness between the TDE group and educational film before and after disaster education is given. It was found that the disaster preparedness of respondents in each group, both TDE and educational film, had different mean. In the TDE group, difference means before and after was 6.94, and in the education, film group difference means before and after treatment was 4.53.

Based on the table above it can be seen that there was a *p*-value 0.000 ($\alpha < 0.05$) in both groups, which means a significant difference in disaster preparedness before and after treatment in both groups. This shows that both TDE and educational film provide a significant increase in the preparedness variable.

Table 5: Different Tests for Preparedness Before and After Disaster Education Using TDE and Educational Film

Variable	Groups	N	Difference	*P**
Disaster preparedness	TDE	52	6.94	0.000
	Educational film	52	4.53	

Table 5 showed the difference in respondents' disaster preparedness between the TDE group and the educational film group. The TDE group has a higher score which is different from that of the educational film group. So it can be concluded that disaster education using TDE is better in increasing disaster preparedness for teenagers. Independent *t*-test obtained *p*-value=0.000

(p-value <0.05) that interpreted there is a significant difference in increase disaster preparedness after getting disaster education between those using TDE with educational film.

DISCUSSION

The difference in Increased Disaster Preparedness in Facing Flash Floods Between Before and After Disaster Education Using Tabletop Disaster Exercise (TDE)

Disaster education using Tabletop Disaster Exercise (TDE) provided a significant increase in the preparedness in tenth-grade students. Disaster preparedness consists of some indicators: knowledge about disasters, planned activities for disasters, disaster warning systems, and resource mobilization. TDE is one of the simulation media that makes respondents actively involved. Sandström *et al.*, (2014), in their study, claims that disaster education using TDE media is more interesting compared to conventional simulations. This will have an impact on the retention of knowledge, which makes it easier for respondents to understand simulated material. Pate *et al.*, (2016) argues that there is a significant increase in respondent preparedness after being given treatment in the form of disaster preparedness education using TDE. Respondents seemed very enthusiastic, and this improves their attention. Proper attention during education helped to acquire maximum understanding. Chung (2013) claims that TDE is effective in improving the knowledge and confidence of health practitioners. The study showed there was a significant increase in the knowledge and confidence of respondents in dealing with pediatric patients during disasters after receiving treatment using TDE. Respondents' confidence increases due to increased knowledge. Another study conducted by Colleran-Santos & Toronto (2014) involved 12 final-year nursing students who were given TDE treatment regarding hepatitis A outbreak. The results showed a significant increase in disaster preparedness and emergency management of the hepatitis A outbreak disaster.

Disaster education using TDE makes respondents actively involved. Respondents are involved in role-play, which is part of the simulation, according to the scenario in TDE. Role-play is effective in the development and improvement of respondent skills by combining concepts and problems that occur in the surrounding environment. Respondents are actively involved in learning and trained to think critically in problems solving. Besides, respondents were also active in conducting movements and interactions among them during the activity. This interaction allows information processing at various levels. Movement allows both sides of the brain to be activated. Various studies have proven a strong relationship between motoric and cognitive behaviour. This allows the information input process to be more leverage (Clapper, 2010). Rao & Stupans (2012) further explore the effectiveness of role-playing in education. Role-play is an active learning approach that involves active student involvement in learning so that it has the potential to increase students' understanding of the material. Role-play can be a valuable teaching approach to knowledge acquisition (cognitive domain), learning about communication in health education, practicing skills by replaying roles using feedback (psychomotor domain), developing attitude (affective domain), and spontaneous emotions may be important (Clapper, 2010; Rao & Stupans, 2012). Heyward (2010) mentioned that role-play as a pedagogical approach to improve learning through students' emotional involvement. When students are involved in class activities, and they are emotionally involved, their chances of understanding and defending the concepts they learn will increase. It seems that emotions associated with social interactions that occur in learning activities are important and fundamental points in maintaining the long-term retention of the concepts.

Disaster education that researchers used in this study consist of the definition of disaster, the definition of flash floods, signs of flash floods, plans before flash floods occurrences, disaster warning systems, and evacuation routes during disasters. The total time required in one session is 60 minutes. 10 minutes for preparation, 15 minutes for scenario sharing, roles and rehearsals, and 30 minutes for the TDE simulation process. The scenario includes the case and the role of each respondent. Respondents were getting time to learn their role and dialogue. Researchers as facilitators are tasked to arrange the course of activities to fit the scenario. During the activity, the respondents seemed enthusiastic and enjoyed the simulation from the beginning to the end.

The Difference in Increased Disaster Preparedness in Facing Flash Floods in Tenth Grade Students Before and After Disaster Education Using Educational Film

The educational film is one of the media that can be used in disaster education. Statistical analysis showed a

significant increase in knowledge among tenth-grade students before and after getting disaster education using educational film. Najafi Ghezeljeh *et al.*, (2019) claims that a combination of text, sound, and images significantly increased disaster preparedness for respondents. The study showed that respondents who received interventions in the form of virtual social networks showed higher disaster preparedness compared to the control group. The combination provides positive cognitive stimulus in learning as well as motivation (Hicks *et al.*, 2017; Ismaili, 2013; Stoddard & Marcus, 2010) so that learning outcomes indicated by posttest scores are better than before. The video makes respondents interested in learning.

The Difference in Increased Disaster Preparedness in Facing Flash Floods in Tenth Grade Students Between Disaster Education Using Tabletop Disaster Exercise (TDE) and Educational Film

Statistic results indicate disaster education using both TDE and educational film increases the disaster preparedness of tenth-grade students, and the TDE is better in increasing the disaster preparedness of tenth-grade students. TDE makes respondents to actively participate in simulations through a role-play. So the retention of knowledge obtained is better than the lecture method without assistive media or disaster education using passive electronic games (Addiarto & Wahyusari, 2018; Chung, 2013). A previous study conducted by Chung (2013) compared 2 different treatments among 175 respondents divided into table-top role-playing group and electronic games group. This study obtained 85% of respondents who received treatment of table-top role-playing with higher increase in knowledge compared to respondents who received disaster education using electronic games, which was 77%. The active involvement of respondents in simulations using TDE helps respondents understanding more optimally. A real learning experience that closely resembles an actual setting and reflection is the key component to improve understanding and communication skills about process of communication flow and the action to be taken in disaster.

Disaster education using both TDE and educational film can increase disaster preparedness, with their advantages and disadvantages. TDE is an interactive media because it involves students in activities. Ranging from scenarios to media in the form of miniatures on the table. Facilitators in TDE must also be compatible, given their crucial role in organizing activities to fit the scenario. While educational film are easier to use because they can be done without specific preparation. The video or film that uses can be repeated. But the duration of the film will determine the attention and retention of knowledge among respondents. Educational film must be short to maximize the attention of respondents. Guo, Kim & Robin (2014) examined the optimum duration of students watching streaming video. They explained that the average engagement time for film with a duration of <6 minutes was close to 100%, which meant students tended to watch the whole film. But when the duration is extended, the involvement of students decreases. The maximum duration for film is 6 minutes. Therefore, making film longer than 6-9 minutes is likely to be in vain.

Limitations

This study did not analyze academic intelligence as a confounding factor that might have an effect on increasing student disaster preparedness before and after disaster education.

CONCLUSION

The study concluded that both TDE and educational film significantly increases disaster preparedness of tenth-grade students Vocational High School (SMK) in facing flash floods, and TDE is better in increasing disaster preparedness compared to educational film.

RECOMMENDATION

Tabletop Disaster Exercise (TDE) is an interactive and innovative media that can be used in disaster education for vocational or high school students. This process significantly improves the disaster preparedness in facing flash floods. Standardization of scenarios, modifications, and development of TDE is needed to get more applicable and standardized media for maximum output.

Conflict of Interests

The authors declare that they have no conflict of interest.

ACKNOWLEDGEMENT

The authors are thankful to the institutional authority for completion of the work.

REFERENCES

Addiarto, W. & Wahyusari, S. (2018). Efektivitas Tabletop Disaster Exercise (Tde) Sebagai Media Simulasi Dalam Ruang Untuk Meningkatkan Kemampuan Triage Dan Alur Rujukan Korban Bencana. *JI-KES (Journal Ilmu Kesehatan)*, 2(1), pp 12–22.

Adi, S. (2013). Karakterisasi Bencana Banjir Bandang di Indonesia. *Journal Sains Dan Teknologi Indonesia*, 15(1), pp 42–51.

Agustiana, I.G.A.T., Wibawa, I.M.C. & Tika, I.N. (2013). Pengaruh Model Pembelajaran Mitigasi Dan Ketahanmalangan Siswa. *Journal Pendidikan Dan Pengajaran*, 46(2), pp 97–105.

Badan Nasional Penanggulangan Bencana (2018). *Info Bencana*. Retrieved from: https://bnpb.go.id//publikasi/info-bencana

Badan Nasional Penanggulangan Bencana (2019). *Data Informasi Bencana Indonesia: Tren Kejadian Bencana 10 tahun Terakhir*. Retrieved from: http://bnpb.cloud/dibi/laporan5

Chung, T. S. (2013). Table-top role playing game and creativity. *Thinking Skills and Creativity*, 8(1), pp 56–71.

Clapper, T.C. (2010). Role Play and Simulation: Returning to Teaching for Understanding. *Education Digest: Essential Readings Condensed for Quick Review*, 75(8), pp 39–43.

Codreanu, T.A., Celenza, A. & Ngo, H. (2016). Disaster Risk Education of Final Year High School Students Requires a Partnership with Families and Charity Organizations: An International Cross-sectional Survey. *Prehospital and Disaster Medicine*, 31(3), pp 242–254.

Colleran-Santos, C.C. & Toronto, C.E. (2014). Innovative Teaching Method in Emergency Response Education of Undergraduate Nursing Student. *Journal of Nursing Education*, 53(8).

Faradinah, E.D., Rokhmah, D. & Ririanty, M. (2015). Pengaruh Pemutaran Film "Waspada Banjir Bandang" Terhadap Mitigasi Bencana Banjir Bandang (The Influence of Film Playback "Flash Flood Wary" toward Mitigation Flash Flood Disaster). *E-Journal Pustaka Kesehatan*, 3(2), pp 370–374.

Guo, P.J., Kim, J. & Robin, R. (2014). How video production affects student engagement: an empirical study of MOOC videos. *Proceedings of the First ACM Conference on Learning at Scale*, pp 41–50.

Heyward, P. (2010). Emotional Engagement Through Drama: Strategies to Assist Learning through Role-Play. *International Journal of Teaching and Learning in Higher Education*, 22(2), pp197–203.

Hicks, A., Armijos, M.T., Barclay, J., Stone, J., Robertson, R. & Cortés, G. P. (2017). Risk communication film: Process, product, and potential for improving preparedness and behavior change. *International Journal of Disaster Risk Reduction*, 23(April), pp 138–151.

Hoedjes, J.C.B., Kooiman, A., Maathuis, B.H., Said, M.Y., Becht, R., Limo, A., Mumo, M., Nduhiu-Mathenge, J., Shaka, A. & Su, B. (2014). A conceptual flash flood early warning system for Africa, based on terrestrial microwave links and flash flood guidance. *ISPRS international journal of geo-information*, 3(2), pp 584-598.

Ismaili, M. (2013). The Effectiveness of Using Movies in the EFL Classroom – A Study Conducted at South East European University. *Academic Journal of Interdisciplinary Studies*, 2(4), pp 121–132.

Johnson, V.A., Ronan, K. R., Johnston, D.M. & Peace, R. (2016). Improving the Impact and Implementation of Disaster Education: Programs for Children Through Theory-Based Evaluation. *Risk Analysis*, 36(11), pp 2120–2135.

Maarif, S. (2014). *National Disaster Management Plan (Rencana Nasional Penanggulangan Bencana 2015-2019)*. Retrieved from: https://www.bnpb.go.id//uploads/renas/1/BUKU RENAS PB.pdf

Najafi Ghezeljeh, T., Mohammad Aliha, J., Haghani, H. & Javadi, N. (2019). Effect of education using the virtual social

network on the knowledge and attitude of emergency nurses of disaster preparedness: A quasi-experiment study. *Nurse Education Today*, 73(2018), pp 88–93.

Newnham, E.A., Tearne, J., Gao, X., Guragain, B., Jiao, F., Ghimire, L., Balsari, S., Chan, E., Leaning, J., Newnham, E.A., Tearne, J., Gao, X., Guragain, B., Jiao, F., Ghimire, L., Balsari, S., Chan, E. & Leaning, J. (2019). Tailoring disaster risk reduction for adolescents: Qualitative perspectives from China and Nepal. *International Journal of Disaster Risk Reduction*, 34, pp 337–345.

Nielson, N.L. & Kitching, B. (2012). Table-top Disaster Exercise to Enhance Risk Management Education. *Risk Management and Insurance Review*, 15(1), pp 23–34.

Pate, A., Bratberg, J.P., Robertson, C. & Smith, G. (2016). Evaluation of a table-top emergency preparedness exercise for pharmacy students. *American Journal of Pharmaceutical Education*, 80(3).

Rahmawati, A. & Asyanti, S. (2017). Fenomena perilaku agresif pada remaja dan penanganan secara psikologis. *Prosiding SEMNAS Penguatan Individu Di Era Revolusi Informasi*.

Rao, D. & Stupans, I. (2012). Exploring the potential of role play in higher education: Development of a typology and teacher guidelines. *Innovations in Education and Teaching International*, 49(4), pp 427–436.

Sandström, B. E., Eriksson, H., Norlander, L., Thorstensson, M. & Cassel, G. (2014). Training of public health personnel in handling CBRN emergencies: A table-top exercise card concept. *Environment International*, 72, pp 164–169

Saputri, S. & Sudarmilah, E. (2019). Game Edukasi Mitigasi Bencana Banjir "Tirta Si Pejuang Banjir." *Journal of Technology and Informatics (JoTI)*, 1(1), pp 10–19.

Stoddard, J.D. & Marcus, A. S. (2010). More Than "Showing What Happened": Exploring the Potential of Teaching History with Film. *The High School Journal*, 93(2), pp 83–90.

Wandasari, S.L. (2013). Sinkronisasi Peraturan Perundang-Undangan Dalam Mewujudkan Pengurangan Risiko Bencana. *Unnes of Law Journal - Jurnal Hukum Universitas Semarang*, 2(2), pp 137–150.