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THE EFFECT OF SMART BOXES ON ELEMENTARY SCHOOL STUDENTS' KNOWLEDGE OF EARTHQUAKE DISASTER PREPAREDNESS

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Abstract

School-age children are vulnerable to the impact of disasters due to their lack of understanding and knowledge about earthquake preparedness. To increase children's disaster preparedness knowledge, an attractive learning media smart boxes can be employed. This study aims to analyze the effect of smart box education on students' knowledge of earthquake disaster preparedness. The research design was a quasi-experiment with two groups and a pre-post-test control group. The population consisted of 180 elementary school students, selected by cluster random sampling, with 130 students involved in the study (65 in the intervention group and 65 in the control group). Data were collected using an earthquake preparedness knowledge questionnaire. The intervention group received smart box education, while the control group received lecture-based education. The pre- and post-tests were conducted on the same day. The study took place on February 27, 2025, at Madrasah Ibtidaiyah Muhammadiyah Sedayulawas in the Brondong District of the Lamongan Regency. The data were then analyzed using Wilcoxon and Mann-Whitney tests ($\alpha \leq 0.05$). The results showed that 60% of students had poor knowledge before receiving smart box education while after receiving smart box education, 58.5% of students had good knowledge. Providing smart box education and lecture media increased students' knowledge about earthquake disaster preparedness ($p=0.000$), with an average score of 25.77 in the intervention group and 4.77 in the control group. Smart box education proved to be more effective than lectures in increasing students' knowledge of earthquake preparedness because smart boxes encourage critical thinking and hands-on learning, whereas lectures only require students to listen.

Keywords: disaster preparedness, earthquake, *smart box*

INTRODUCTION

Indonesia is highly vulnerable to earthquakes and has the highest earthquake potential in the world (Rosyida et al., 2023). Earthquakes are the sixth most common disaster in Indonesia, after drought, due to its location at the intersection of three tectonic plates: the Eurasian, Indo-Australian, and Pacific plates (Maharani, 2020). However, many people, including children, lack knowledge about earthquake preparedness (Narayana et al., 2022). According to Law No. 24/2007, elementary school children are a vulnerable group susceptible to the impact of disasters, including earthquakes (Pahleviannur, 2019). In reality, however, their knowledge of disaster preparedness, especially for earthquakes, remains low. Consequently, many children worldwide become victims of natural disasters, particularly earthquakes (Afifaturrahmi et al., 2022).

According to the Meteorology, Climatology, and Geophysics Agency (BMKG), of the 34 Indonesian provinces for which earthquake frequency statistics are calculated on an annual, monthly, and daily basis, as well as by magnitude and depth, Maluku Province has experienced

the highest frequency of earthquakes over the last 11 years, with 8,834 events (Sabtaji, 2020). Sari (2019) research showed that knowledge of earthquake disaster preparedness at SDN 1 Poka in Maluku Province was low; 74.8% of students did not know about earthquake disaster preparedness. Another study showed that most students at SDN 2 Tiakur in North Maluku had low knowledge, with 75.7% of respondents unprepared for earthquakes (Antari & Setyaningrum, 2023). Research by Syamila et al., (2023) showed that 57.63% of SDN 1 Panji Lor Situbondo students had insufficient knowledge about earthquake preparedness. In addition, Amalia et al., (2022) found that the level of knowledge about earthquake disaster preparedness among students at MI Tarbiyatut Tholabah Paciran Lamongan was still low: 80% of students had moderate knowledge of earthquakes, and 12.3% had limited knowledge.

A lack of understanding of earthquake disaster preparedness among children may influence their level of knowledge (Afifaturrahmi et al., 2022). This results in many children becoming victims of earthquakes, which affect both physical health and psychological well-being (Setyaningrum & Sukma, 2020). Kharisna et al., (2023) suggest that increasing elementary school children's disaster preparedness knowledge can be achieved by providing relevant education and learning materials, such as animations, socialized classroom learning, lectures, songs, simulations, and learning materials with motor work systems. Students' knowledge of disaster preparedness can be improved by providing educational materials on disaster preparedness using effective, easy-to-understand media, such as PowerPoint presentations, leaflets, pocket books, e-books, smart boxes, and audio-visual media, such as animations (Opabola et al., 2022).

Previous research indicates that the use of educational videos effectively increased students' knowledge of earthquake disaster preparedness at SDN 1 Pundong Bantul Yogyakarta (Antari & Setyaningrum, 2023). Rahayuni et al., (2022) found that using a crossword puzzle game significantly increased children's knowledge of earthquake and tsunami disaster preparedness at SDN 1 Subangan Karangasem. Research conducted by Amalia et al., (2022) found that educational methods combining music therapy and booklets were effective in increasing earthquake preparedness knowledge among SD 2 Sigar Penjalin students. In specific to smart boxes, they can be used to provide education to children. According to Aminah & Yusnaldi (2024), a smart box is a teaching tool in the form of a box filled with pictures and words that teachers use to deliver learning materials and attract students' attention. Abral et al., (2020) studied smart boxes in elementary school children to

increase their knowledge of dental health. Suharyanti (2024) also studied smart boxes to increase children's knowledge about tooth brushing and oral hygiene.

Some of these studies have shown that researchers did not use smart box media for disaster mitigation education. Therefore, researchers were interested in using smart box media for this purpose. Smart box media is selected chosen because it can improve child development, increase activity and creativity, and provide educational value. Smart box is designed to support various aspects of child development, including cognitive, motor, social, and emotional development. These aspects are tailored to the child's developmental level and can help them grow and develop properly. Additionally, it provides opportunities for children to engage in activities that stimulate creativity and critical thinking (Rahayuningsih et al., 2019). The difference between this smart box and the previous ones lies in the learning material and content. This smart box presents earthquake mitigation material in the form of definitions, types of earthquakes, and impacts. It also explains how to save yourself during an earthquake and is adapted for elementary school students. This study aims to determine the effect of smart box education on students' knowledge of earthquake disaster preparedness.

METHOD

This was a quantitative research study using a quasi-experimental two-group pre-test post-test design with a control group. It was conducted at Madrasah Ibtidaiyah Muhammadiyah Sedayulawas in Brondong District, Lamongan Regency from February 27 2025 to March 1, 2025. The study population consisted of 180 elementary school students in grades four, five, and six. Of those, 130 students met the inclusion criteria, and were divided into two groups using cluster random sampling: 65 students in the intervention group and 65 students in the control group.

The inclusion criteria were students aged 10-12 years (grades 4, 5, and 6), understood Indonesian well and correctly, and be willing to participate. The exclusion criteria were fourth grade students aged <10 years, sixth grade students aged >12 years, and students who were absent during the study. The dropout criterion was defined as students who did not participate in the activity until the end.

The research instrument was a smart box designed by the researcher. It contained materials about knowledge, attitudes, skills, emergency response planning, disaster warnings, and resource mobilization. These topics were presented through pictures and writings about

earthquake disaster preparedness. The research instrument used a knowledge questionnaire about student preparedness in the event of an earthquake disaster. The questionnaire consisted of 20 closed questions with a Guttman scale answer type, consisting of "yes" or "no" options. The questionnaire referred to the four preparedness parameters from LIPI-UNESCO/ISDR (2006), which the researcher modified for the age of the respondents. A validity test on 30 elementary school students from Siser Village in the Laren subdistrict of Lamongan Regency showed that the questionnaire was valid, with an r-count value of 0.964 (r-count > r-table value of 0.374), and reliable, with an alpha-Chronbach value of 0.942 ($\alpha > 0.60$).

The intervention group began by dividing into four groups of five to six students each. Then, they filled out the pretest questionnaire. Then, for 10 minutes, the students received an education through demonstrations about the contents of the smart box and how to play it. After that, the students played the smart box for 60 minutes, accompanied by one research assistant in each group. Afterwards, the students were given a post-test questionnaire. The control group began with a division into four groups of five to six students, followed by the completion of a pretest questionnaire. Then, they received 20 minutes of earthquake disaster preparedness education through a lecture, followed by the post-test questionnaire.

After filling out the pre- and post-test questionnaires, a data normality test was carried out using the Kolmogorov-Smirnov test, which showed abnormal data distribution (p=0.000). Therefore, the Wilcoxon test was used to measure the effect of the smart box on the preparedness knowledge of the intervention and control groups. The Mann-Whitney test was used to compare the disaster preparedness knowledge of the intervention and control groups after the test, with an error rate of $\alpha \leq 0.05$.

RESULTS

A total of 130 students were selected from 180 students and divided into two equal groups: 65 in the intervention group and 65 in the control group. None of the students were absent or dropped out.

Table 1. Respondent Demographic Data (n=130)

Variable		Intervention Group		Control Group	
		N	%	N	%
Gender	Female	34	33.7	34	33.7
	Male	31	30.7	31	30.7

	Total	**65**	**100**	**65**	**100**
Age (Years)	10	28	43.1	28	43.1
	11	22	33.8	22	33.8
	12	15	23.1	15	23.1
	Total	**65**	**100**	**65**	**100**

Based on Table 1, 33.7% of students in both groups were female, while 43.1% were 10 years old.

Table 2. Students' Knowledge of Preparedness: Pre-Test and Post-Test in the Intervention and Control Groups (n=130)

Group	**Preparedness**	**Pre test**		**Post test**	
		N	**%**	**N**	**%**
Intervention	Good	0	0	38	58.5
	Fair	26	40.0	27	41.5
	Poor	39	60.0	0	0
	Total	**65**	**100**	**65**	**100**
Control	Good	0	0	0	0
	Fair	9	13.8	22	32.3
	Poor	56	86.2	44	67.7
	Total	**65**	**100**	**65**	**100**

Based on Table 2, 60.0% of students had poor knowledge before receiving education, and 58.5% had good category knowledge after receiving education. Of the students who received lecture-based education, 86.2% had poor category knowledge before and 67.7% had poor category knowledge after.

Tabel 3. Statistical analysis of the effect of smart box media education on knowledge about disaster preparedness between treatment and control groups (n=130)

Knowledge	**N**	**Min-Max**	**Mean ± S.D**	***p***
Pre-Test Intervention	65	40-75	55.00±8.615	0.000
Post Test Intervention	65	60-100	80.77±10.429	
Pre-Test Control	65	35-65	50.38±7.143	0.000
Post Test Control	65	45-65	55.15±4.839	

The Wilcoxon test results showed that providing education through smart box media and lectures had an effect on students' knowledge of earthquake disaster preparedness (p = 0.000; p = 0.000), with a mean difference of 22.77 and 4.77, respectively (Table 3).

Table 4. Comparison of Elementary Students' Preparedness Knowledge between the Intervention and Control Groups (N = 130)

Group	**N**	**Mean±SD**	***p***
Post-test Intervention	65	80.77±10.429	0.000
Post-test Control	65	55.15±4.839	

The Mann-Whitney test revealed differences in earthquake disaster preparedness knowledge between the intervention and control groups after receiving smart box method education (p = 0.000), with a mean difference of 25.15 (Table 4).

DISCUSSION

Using smart box to educate students about earthquake disaster preparedness has been proven to significantly increase their knowledge. Anabela (2025) used smart box in healthy snacks PHBS education, which was effective in increasing knowledge. Additionally, Aminah and Yusnaldi's (2024) research showed that smart box could improve elementary school students' learning outcomes in social science subjects at Madrasah Ibtidaiyah. Another study used educational media for elementary school students to increase students' knowledge of preparedness, though not as effectively as smart box. Anggraeni et al. (2022) found that education using the lecture method influenced clean and healthy living behavior in elementary school children. Budiono et al. (2022) found that education using the lecture method affects nutrition education and healthy snacks among elementary school children.

Smart box proved to increase students' knowledge more effectively than lectures because it develops students' creative and critical thinking skills. It presents learning situations that require students to find solutions and think innovatively. Smart boxes not only increase factual knowledge but also hone thinking skills that are important for a more comprehensive understanding and application of knowledge in real life Ekayani (2021). Compared to lectures, smart boxes attract students' interest in the learning process because students focus on more

than just listening, which quickly leads to boredom. Smart boxes have attractive images and colors. They can also train students' ability to understand the provided material.

According Rahayuningsih et al., (2022), interactive media combine visual, kinesthetic, and exploration activities, thus encouraging students to actively participate, discuss, and think creatively. The use of smart box is proven to improve creative thinking skills and deeper understanding of concepts because students not only listen, but can also see and interact directly with learning materials (Rahayuningsih et al., 2022). Smart box also facilitates discussion, exploration, and collaboration among students, which helps them relate the subject matter to their daily experiences so that the knowledge gained becomes more meaningful and memorable (Anggraeni et al., 2022).

Compared to smart box, the lecture method focuses more on verbally delivering information, which students tend to passively receive. This method lacks the ability to encourage active engagement or the development of critical or creative thinking skills. Therefore, although lectures can improve basic knowledge, interactive learning media, such as Smart box, are more effective. Smart box combines various learning styles and significantly increases students' learning motivation (Kristianty, 2021). Based on the above explanation, Smart box media is a more feasible way to educate elementary school students about disaster preparedness than the lecture method. However, from a physical standpoint, smart box is large and difficult to carry. Additionally, smart box requires knowledge and expertise in manufacturing, limiting their production

Conclusion

Providing education using smart box media has been proven to significantly increase elementary school students' knowledge of earthquake preparedness because smart box media is three-dimensional and interesting, with images. Additionally, it can train the cognitive, motor, social, and emotional development of elementary school children, unlike lecture-based education, where students only focus on listening, which quickly leads to boredom. Future researchers are expected to develop digital smart box media so that it is more easily accessible to children through gadgets.

References

Abral, A., Kristianto, J., Maryani, Y., Setiawaty, N., & Sofian, R. (2020). Smart Dental Box

Sebagai Media Penyuluhan Untuk Peningkatan Pengetahuan Dan Perilaku Kesehatan Gigi Mulut. *Quality: Jurnal Kesehatan*, *14*(1), 38–45. https://ejournal.poltekkesjakarta1.ac.id/index.php/adm/article/view/92

Afifaturrahmi, A., Hartati, S., & Akbar, Z. (2022). Meningkatkan Pengetahuan Kesiapsiagaan Gempa Bumi Melalui Video Animasi Pada Anak Usia 5-6 Tahun. *Aulad: Journal On Early Childhood*, *5*(3), 343–348. Https://Doi.Org/10.31004/Aulad.V5i3.388

Agus Narayana, I. G., Sukarja, I. M., Sukawana, I. W., & Juniari, N. M. (2022). Edukasi Media Audiovisual Meningkatkan Kesiapsiagaan Siswa Dalam Menghadapi Bencana Gempa Bumi. *Jurnal Gema Keperawatan*, *15*(2), 160–171. Https://Doi.Org/10.33992/Jgk.V15i2.1869

Amalia. (2022). *Keywords : Disaster Education , Playing Music Therapy , Earthquake Knowledge . https://jppipa.unram.ac.id/index.php/jppipa/article/download/6325/4442*

Aminah, S., & Yusnaldi, E. (2024). Pengembangan Media Smart Box Untuk Meningkatkan Hasil Belajar Siswa Pada Mata Pelajaran Ilmu Pengetahuan Sosial Di Madrasah Ibtidaiyah. *Didaktika: Jurnal Kependidikan*, *13*(3), 3077–3086.

Anabela, A. (2025). *Efektivitas Media Smart Box Terhadap Pengetahuan Dan Sikap Siswa Mi Hidayatus Syam Pada Phbs Di Sekolah Indikator Jajanan Sehat*. Universitas Jambi. https://repository.unja.ac.id/78083/

Anggraeni, R., Feisha, A. L., Muflihah, T., Muthmainnah, F., Syaifuddin, M. A. R., Aulyah, W. S. N., Pratiwi, I. R., Sultan, S. H., Wahyu, A., & Rachmat, M. (2022). Edukasi Perilaku Hidup Bersih Dan Sehat Untuk Meningkatkan Pengetahuan Murid Sekolah Dasar. *Promotif: Jurnal Pengabdian Kepada Masyarakat*, *2*(1), 65–75. https://repository.unja.ac.id/78083/

Antari & Setyaningrum. (2023). Pengaruh Video Edukasi Bencana Gempa Bumi Terhadap Tingkat Pengetahuan Kesiapsiagaan Bencana Gempa Bumi Pada Siswa Sdn 1 Pundong Bantul, Yogyakarta. *Jurnal Kesehatan Masa Depan*, *2*(April), 138–148. https://jurnal.ruangide.org/index.php/JKMD/article/download/77/50/659

Budiono, I., Putriningtyas, N. D., Indrawati, F., Kasman, K., & Kurniawan, F. (2022). Upaya Peningkatan Pengetahuan Tentang Gizi Seimbang Melalui Edukasi Dengan Media Permainan Ular Tangga Pada Siswa Sekolah Dasar. *Jurnal Pengabdian Kesehatan Masyarakat (Pengmaskesmas)*, *2*(2). http://jurnal.um-tapsel.ac.id/index.php/martabe/article/view/17368

Kharisna, D., Wardah, W., Safitri, D., Andriyani, D., Masyita, S., Erica, L., & Gulo, W. A. (2023). Peningkatan Kesiapsiagaan Siswa Sekolah Dasar Dalam Menghadapi Bencana Gempa Bumi Dan Kebakaran. *Jurnal Abdimas Bsi: Jurnal Pengabdian Kepada Masyarakat*, *6*(2), 191–198. Https://Doi.Org/10.31294/Jabdimas.V6i2.14882

Kristianty, D., & Sulastri, S. (2021). Pengaruh Metode Ceramah Dan Dialog Terhadap Motivasi Belajar Siswa. *Jurnal Madinasika Manajemen Pendidikan Dan Keguruan, 3(1), 21–30.* Https://Doi.Org/Http://Ejurnalunma.Ac.Id/Index.Php/Madinasika

Luh, N., & Ekayani, P. (2021). Pentingnya Penggunaan Media Pembelajaran Untuk

Meningkatkan Prestasi Belajar Siswa,. *Urnal Fakultas Ilmu Pendidikan Universitas Ganesha Singaraja*. Https://Doi.Org/J March, 1–16. Https://Www.Researchgate.Net/Profile/Putu-Ekayani/Publication

Maharani, N. (2020). Tingkat Pengetahuan Siswa Tentang Kesiapsiagaan Bencana Gempa Bumi Di Smpn 3 Kuta Selatan Badung Provinsi Bali. *Pendipa Journal Of Science Education*, *4*(3), 32–38. Https://Doi.Org/10.33369/Pendipa.4.3.32-38

Opabola, E., Galasso, C., Rossetto, T., Meilianda, E., Idris, Y., & Nurdin, S. (2022). Investing In Disaster Preparedness And Effective Recovery In Education Systems. *Ssrn Electronic Journal*, 1–30. Https://Doi.Org/10.2139/Ssrn.4231149

Pahleviannur, M. R. (2019). Edukasi Sadar Bencana Melalui Sosialisasi Kebencanaan Sebagai Upaya Peningkatan Pengetahuan Siswa Terhadap Mitigasi Bencana. *Jurnal Pendidikan Ilmu Sosial*, *29*(1), 49–55. Https://Doi.Org/10.23917/Jpis.V29i1.8203

Rahayuni, N. W. A., Mertha, I. M., & Ari Rasdini, I. G. A. (2022). Pemberian Edukasi Dengan Media Permainan Teka-Teki Silang Dan Pengetahuan Kesiapsiagaan Siswa Menghadapi Bencana Gempa Bumi Dan Tsunami. *Jurnal Gema Keperawatan*, *15*(1), 68–78. Https://Doi.Org/10.33992/Jgk.V15i1.1933

Rahayuningsih, S. S., Soesilo, T. D., & Kurniawan, M. (2019). Peningkatan Kemampuan Mengenal Huruf Pada Anak Usia 5-6 Tahun Melalui Metode Bermain Dengan Media Kotak Pintar. *Scholaria: Jurnal Pendidikan Dan Kebudayaan*, *9*(1), 11–18. https://ejournal.uksw.edu/scholaria/article/view/1884

Rosyida, A., Aziz, M., Firmansyah, Y., Setiawan, T., Pangesti, K. P., & Kakanur, F. (2023). Buku Data Bencana Indonesia 2023. *Buku Data Bencana Indonesia*, *3*, 3–11. https://www.bnpb.go.id/buku/buku-data-bencana-indonesia-tahun-2023

Sabtaji, A. (2020). Statistik Kejadian Gempa Bumi Tektonik Tiap Provinsi Di Wilayah Indonesia Selama 11 Tahun Pengamatan (2009-2019) Statistics Of Tectonic Earthquake Events Each Province In Indonesia Territory For 11 Years Of Observation. *Buletin Meteorologi, Klimatologi, Dan Geofisika*, *1*(7), 31–46. https://journal.binawan.ac.id/index.php/JNMS/article/download/817/330/3292

Sari, D. P., & Suciana, F. (2019). Pengaruh Edukasi Audio Visual Dan Role Play Terhadap Perilaku Siaga Bencana Pada Anak Sekolah Dasar. *Journal Of Holistic Nursing Science*, *6*(2), 44–51. Https://Doi.Org/10.31603/Nursing.V6i2.2543

Setyaningrum, Y. I., & Sukma, G. I. (2020). Peningkatan Pengetahuan Siswa Sma/Smk Malang Melalui Pendidikan Bencana Gempa Bumi Dengan Metode Simulasi. *Indonesian Journal For Health Sciences*, *4*(2), 68–73. https://journal.umpo.ac.id/index.php/IJHS/article/view/2414

Suharyanti, S. (2024). *Pengaruh Media Smart Dental Box Terhadap Pengetahuan Kesehatan Gigi Dan Mulut Pada Siswa Sekolah Dasar*. Poltekkes Kemenkes Yogyakarta. http://eprints.poltekkesjogja.ac.id/16140/

Syamila, I., Nurika, G., & Ridzkyanto, R. P. (2023). *Sekolah Siaga Bencana : Peningkatan Pengetahuan Dan Keterampilan Siswa Dalam Upaya Mitigasi Bencana Gempa Bumi Di*

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