Journal Educational of Nursing (JEN)
Vol.9 No.1 January – June 2026; page 95-104
p-ISSN : 2655-2418; e-ISSN : 2655-7630
journal homepage: https://ejournal.akperrspadjakarta.ac.id
DOI: https://doi.org/10.37430/jen.v9i1.340

Article history:
Received: January 08th 2026
Revised: January 09th 2026
Accepted: January 12th 2026

The Effectiveness of Splinting Skills Education in Closed Fracture Cases Using The Seminar and Self Direct Video Methods on The Knowledge Level of Grade 12 Students of SMAN 4 Jakarta

Rizky Rizaldi[1], Bahreni Yusuf [2], Hendik Wicaksono[3], Agus Susilawati[4]
Bachelor of Nursing Education and Professional Nurse, STIKes RSPAD Gatot Soebroto[1]
Departement of Medical Surgical Nursing, STIKes RSPAD Gatot Soebroto[2,3,4]
E-mail : rizaldi0803@gmail.com[1], bahreniyusuf@gmail.com[2], winalif@yahoo.com[3], susi@stikesrspadgs.ac.id[4]

Abstract

Background: Fractures resulting from traffic accidents are injuries that have the potential to cause disability if not treated appropriately. One technique used is splinting to prevent bone displacement, reduce pain, and protect surrounding tissue. Students' knowledge of splinting techniques is still low, requiring effective educational methods, such as seminars and self-directed videos. **Objective:** To determine the effectiveness of splinting skills education for closed fractures using seminars and self-directed videos on the knowledge level of 12th-grade students at SMAN 4 Jakarta. **Methods:** This study used a Quasi-Experimental design with a Pretest-Posttest with Control Group Design. 144 students were selected using simple random sampling and divided into an intervention group (self-directed video) and a control group (seminar), each with 72 respondents. The research instrument consisted of pretest and posttest questionnaires. Data analysis used the Wilcoxon Signed Rank Test. **Results:** There was an increase in knowledge in both groups with a p-value <0.05, where the posttest score was higher than the pretest. The positive rank score for the intervention group was 61 and for the control group, 55. **Conclusion:** Education on splinting skills for closed fractures using seminars and self-directed video was equally effective in improving the knowledge of 12th-grade students at SMAN 4 Jakarta. However, the self-directed video method yielded higher improvement than the seminar method, thus concluding that the self-directed video method is more effective in improving student knowledge.

Keywords: Education, Fracture, Splinting, Seminar, Self-Directed Video, Knowledge.

INTRODUCTION

A fracture is a condition where the continuity of the bone is broken, characterized by partial or complete damage to the cortical layer of the bone, and is often accompanied by injury to the surrounding soft tissue. Fractures are generally caused by impacts with high kinetic energy that cause direct trauma to the bone and surrounding tissue, resulting in a decrease in an individual's physical abilities [20]. One of the main causes of fractures is traffic accidents, which are events that are difficult to predict when and where they will occur. Traffic accidents not only cause injury and disability, but can also lead to death [17]. The increasing number of traffic accidents from year to year has become a serious problem at the global level. The World Health Organization (WHO) in its 2023 Report on Road Traffic Injury Prevention reported that approximately 1.19 million people die annually due to traffic accidents worldwide. In developed countries, data from the Centers for Disease Control and Prevention (CDC) in 2022 recorded 36,355 deaths due to traffic accidents in the United States,

with a death rate of 11 per 100,000 people. This condition shows that although America has a relatively advanced transportation system and infrastructure, the United States still faces major challenges in reducing the number of deaths due to traffic accidents [30].

According to data from the Indonesian Ministry of Health (2019), there were 103,645 recorded accidents in Indonesia, with approximately 5.8% of victims experiencing fractures. The most common fractures occurred in the lower extremities, followed by the upper extremities. A basic health study showed that femur fractures accounted for the highest proportion at 39%, followed by humerus fractures at 15%, and tibia and fibula fractures at 11%. Most of these fractures were caused by traffic accidents, involving both private vehicles and other modes of transportation [7]. In the DKI Jakarta Province, in 2022, 7,133 traffic accidents were recorded, with 668 victims suffering serious injuries and 414 deaths. The high number of seriously injured victims indicates a risk of long-term disability, particularly due to musculoskeletal disorders [2].

One form of initial treatment for musculoskeletal injuries, particularly fractures resulting from traffic accidents, is splinting. This is crucial to reduce the risk of permanent disability and even death, especially if the victim must wait a long time before receiving further medical treatment [22].

Splinting is a first aid technique that aims to immobilize the injured body part with the aid of simple devices. The primary benefit of splinting is not only to reduce and eliminate pain but also to prevent movement of the broken bone, which can damage surrounding soft tissues, such as blood vessels, nerves, and muscles. Furthermore, splinting reduces the risk of bleeding, prevents further deformity, and minimizes shock in the victim before further medical treatment is received [22].

Several ways to increase knowledge of fracture rescue techniques outside the hospital include providing education through seminars and self-directed videos. The seminar method allows direct interaction between participants and presenters, facilitating understanding of the material through discussion and questions and answers. Meanwhile, self-directed video provides the flexibility of independent learning, allows participants to repeat material as needed, and is effective in conveying practical and procedural information [24].

Based on a preliminary study I conducted on July 28, 2025, at SMAN 4 Jakarta, interviews with one teacher and three students revealed a lack of knowledge regarding first aid and splinting. Data from 2025 recorded 209 12th-grade students at SMAN 4 Jakarta, consisting of 67 boys and 140 girls. Furthermore, SMAN 4 Jakarta's proximity to heavy traffic contributes significantly to the number of accidents. Therefore, one safety measure to improve students' knowledge and skills is to provide education on splinting techniques so that students can provide initial treatment in traffic accidents.

Based on the description above, the researcher is interested in conducting research on "The Effectiveness of Splinting Skills Education in Closed Fracture Cases Using Seminar and Self-Direct Video Methods on the Knowledge Level of Grade 12 Students of SMAN 4 Jakarta".

RESEARCH METHODOLOGY

The study used a quasi-experimental pre-test-post-test control design. This design was chosen to determine the effectiveness of splinting skills education for fracture cases using seminars and self-directed videos on the

knowledge level of 12th-grade students at SMAN 4 Jakarta. The study was conducted at SMAN 4 Jakarta on November 12–13, 2025. The study population was all 209 12th-grade students. Researchers also used inclusion and exclusion criteria so that the research was in accordance with the objectives, namely inclusion criteria, students aged 16–18 years, are grade XII students, have an Android-based cellphone and data quota package, are willing to be respondents by signing an informed consent, and are present and participate in the entire series of research including pretest and posttest. The exclusion criteria include students who are sick or in a condition that does not allow them to be respondents, students with certain disabilities such as physical limitations or hearing impairments, and students who are serving school sentences at the time the research is taking place. The sampling technique used probability sampling with a simple random sampling approach using a lottery method. The sample size used the Slovin formula (e 5%), resulting in 137 respondents. This was then increased by 5% to anticipate dropout, resulting in 144 respondents. They were divided into two groups: 72 respondents in the intervention group (self-directed video) and 72 respondents in the control group (seminar).

The research instrument was a questionnaire measuring the level of knowledge of splinting skills, consisting of 19 positive and negative statements on a five-point Likert scale. The questionnaire was adapted from Rizka Saputri's (2017) research and has been tested for validity using Pearson Product Moment correlation with an r table value of 0.361, as well as a reliability test with a Cronbach's Alpha value of 0.739, so it is declared valid and reliable. Univariate data analysis describes the characteristics of respondents and bivariate to determine the level of student knowledge before and after being given education. The normality test uses Kolmogorov-Smirnov, if the data is normally distributed using Paired T-Test and if the data is not normally distributed using the non-parametric Wilcoxon Signed Rank Test.

RESULTS AND DISCUSSION

Table 1 Frequency Distribution of Respondents by Age, in November 2025 (n=144)

Variabel	N	Mean	Median	SD	Min Max	95% CI
Intervensi	72	17,08	17,00	0,765	16-18	16,90-17,26
Kontrol	72	17,03	17,00	0,731	16-18	16,86-17,20

Source: Primary Data 2025

Based on Table 1 above, the age distribution of respondents in the intervention group was 17.08 with a standard deviation of 0.765. Meanwhile, in the control group, the average age was 17.03 with a standard deviation of 0.731.

Table 2 Frequency Distribution of Respondents Based on Gender, in November 2025 (n=144)

Characteristics	Intervensi		Kontrol	
	Frecuency (f)	Percentage (%)	Frecuency (f)	Percentage (%)
Gender				
Male	27	37,5%	33	45,8%
Female	45	62,5%	39	54,2%
Total	**72**	**100%**	**72**	**100%**

Source: Primary Data 2025

Based on table 2 above, it was found that the distribution of data in the intervention group and the control group was mostly female, namely 45 respondents with a percentage of (62.5%) in the intervention group while 39 respondents with a percentage of (54.2%) in the control group.

Table 3 Frequency Distribution of Respondents Based on Information Sources Regarding Knowledge of Splinting at SMAN 4 Jakarta, November 2025 (n=144)

Characteristics	Intervensi		Kontrol	
	Frecuency (f)	Percentage (%)	Frecuency (f)	Percentage (%)
Teacher	7	9,7%	19	26,4%
HealthWorkers	16	22,2%	15	20,8%
Internet	37	50,0%	24	33,3%
TV	7	9,7%	8	11,1%
Radio	6	8,3%	6	8,3%
Total	**72**	**100%**	**72**	**100%**

Source: Primary Data 2025

Based on Table 3 above, it was found that the source of information obtained from each group was mostly obtained through the internet. That is, the intervention group was mostly numbered 37 respondents with a percentage (50%), while the control group was small numbered 24 respondents with a percentage (33.3%).

Table 4 Frequency Distribution of Knowledge Level Before and After Providing Education on Splinting Skills in Closed Fracture Cases in the Control (Seminar) and Intervention (Self-Direct Video) Groups

Category	Frequency				95%CI
	N	Good	Enough	Poor	
Intervensi Group					
PreTest	72	3	62	7	1,85-2,01
PostTest	72	49	17	6	2,44-2,72
Kontrol Group					
PreTest	72	4	54	14	2,03-2,20
PostTest	72	32	30	10	2,73-2,91

Source: Primary Data 2025

Based on table 4 above, it is known that the pre-test results of respondents in the intervention group with a good category amounted to 3 people, after being given education, the post-test results increased mostly in the good category amounting to 49 respondents. Meanwhile, the pre-test results in the control group were a small portion in the good category, amounting to 4 respondents and after being given education, the post-test results increased to 32 respondents. From these results, it can be concluded that in the intervention group given self-directed video and the control group given a seminar, both experienced an increase in knowledge after being given education.

Table 5 Results of the Wilcoxon Test of Knowledge Level Before and After Providing Education on Splinting Skills in Closed Fracture Cases Using the Seminar and Self-Direct Video Methods (n=144)

Group Category		N	Mean Rank	Sum Of Rank	*P Value*
Intervensi Group					
Pretest – Posttest	Negatif Rank	5	14,00	70,00	0,000
	Positif Rank	61	35,10	2141,00	
	Ties	6			
	Total	72			
Kontrol Group					
Pretest - Posttes	Negatif Rank	7	17,36	121,50	0,000
	Positif Rank	55	33,30	1831,50	
	Ties	10			
	Total	72			

Source: Primary Data 2025

Based on table 5 above, it is known that the positive rank results in the intervention group given self-direct video were 61 respondents with a p-value of 0.000. While in the control group the positive rank results given by the seminar method were 55 respondents with a p-value of 0.000. The difference in the number of positive ranks shows that the increase in knowledge of respondents in the group using self-direct video was greater than the seminar method. Thus, it can be concluded that self-direct video is more effective in increasing the knowledge of grade 12 students of SMAN 4 Jakarta regarding splinting skills in closed fracture cases compared to the seminar method.

DISCUSSION

Overview of Respondent Characteristics Based on Age

Demographic data for the intervention group showed the average age of respondents was 17.08 years. Meanwhile, the average age for the control group was 17.03 years. Both groups had a similar age range, with the lowest being 16 and the highest being 18.

The adolescent age range is the middle phase, between 16 and 18 years. Adolescence is identified as a transitional period in childhood development toward adulthood, both in cognitive and emotional development [19]. According to Sylvan Tomkins, cognitive growth is strongly influenced by interests. This is crucial for the cognitive development of adolescents, who are entering their highest stage of cognitive development [9].

This aligns with research by [24] that found that at the age of 15-17, adolescents begin to think logically, develop theories, and improve their skills through experience. In this age group, adolescents as respondents can have a positive impact on the school environment and society.

According to Wardani et al. (2021), increasing age leads to greater maturity in thinking, thus influencing the development of a person's skills. The older a person is, the higher their level of maturity and strength will be and this will influence their behavior [15].

Description of Respondent Characteristics Based on Gender

The distribution results show that the majority of students in this study were female. There were 45 respondents in the intervention group (62.5%), while there were 39 respondents in the control group, with a slightly lower percentage of females (54.2%). As explained by Suryana et al. (2022), gender is not a factor that can influence cognitive knowledge levels.

Gender differences do not significantly influence learning outcomes. This is because both males and females have equal cognitive opportunities to understand the material when provided with equivalent learning methods. The more influential factors are individual interest, attention, and readiness to participate in the learning process [21].

This aligns with research by [4] which found that the majority were female, with 54 students (56%) in the intervention group and 51 students (53%) in the control group. Then, research by [29] the results of the study showed that the majority of respondents in the intervention and control groups were female, namely 14 people (93.3%), while only 1 person was male (6.7%).

Description of Respondent Characteristics Based on Information Sources

The distribution of respondents in the intervention group showed that the majority of respondents (37 respondents (50.0%) relied on the internet as their primary source of information regarding splinting. Meanwhile, the control group showed a similar pattern, with a small minority (24 respondents (33.3%) choosing the internet as their primary source of information. These results indicate that students tend to seek health information through easily accessible digital media.

Research by [11] confirmed that complex visual representations can significantly improve information retention through visual sensory processing. When students watch a virtual splinting demonstration, visual signals are received by the retina and processed in the visual cortex in the occipital lobe of the brain. They are then

transmitted to the temporal lobe, where the hippocampus plays a role in consolidating data from working memory into long-term memory, which is the foundation for increased knowledge. Furthermore, [13] demonstrated that the simultaneous use of visual and verbal channels can multiply memory representations and enhance conceptual understanding.

This is in line with research by Mustika and Setyawan (2023), which found that more than 60% of students rely on the internet for health information, as well as [28] which reported that 56.7% of adolescents use the internet as a primary source because it is considered easy, fast and provides diverse educational materials, confirming that the internet has become a primary learning source that is cognitively preferred and effective for students.

Differences in students' knowledge levels before and after being given education on splinting skills in closed fracture cases using the seminar method

Based on the results of the study on the control group receiving education through the seminar method, it was found that before the education, the majority of students' knowledge levels were in the sufficient category, with 54 respondents (75%), while only 4 respondents (5.6%) were in the good category and 14 respondents (19.4%) were in the poor category. After the seminar education, there was an increase in student knowledge. The number of respondents in the good category increased to 32 (44.4%), while the sufficient category increased to 30 (41.7%), and the poor category decreased to 10 (13.9%).

Seminars facilitate the systematic delivery of information and emphasize direct explanations by the resource person. The interaction in seminars also helps increase participant engagement, making the information easier to understand and remember. According to research by [1] which showed a significant increase in cognitive knowledge after delivering material through a structured, conventional method, this demonstrates that direct delivery of material, accompanied by discussion and clarification, plays a crucial role in improving students' basic knowledge.

However, while effective for transferring basic knowledge, the seminar method has significant drawbacks, particularly in the context of skills learning. One major criticism is that seminars are often monotonous, dominated by one-way (didactic) communication from the speaker to the participants. According to [23] in his research, monotony can lead to decreased focus and participant boredom over time, ultimately hindering optimal information retention, especially for material requiring visualization and practice.

This finding aligns with research by [31] which found that students' knowledge levels before and after being treated with the seminar education method were: 41 respondents (85%) had sufficient knowledge and 7 respondents (15%) had insufficient knowledge. Meanwhile, in the post-test, 39 respondents (81%) had good knowledge and 9 respondents (19%) had sufficient knowledge. Furthermore, research by [12] found that before the treatment, 4 students (12.1%) were in the good category, 12 students (36.4%) were in the sufficient category, and 17 students (51.5%) were in the poor category. After treatment, 19 people (57.6%) had good knowledge, 8 people (24.2%) had

sufficient knowledge, 6 people (18.2%) had poor knowledge.

Differences in students' knowledge levels before and after being given education on splinting skills in closed fracture cases using the self-directed video method.

Based on the results of this study, the intervention group received education using self-directed video. Before the education, the majority of students were in the adequate category, namely 62 respondents (86.1%), while only 3 respondents (4.2%) were in the good category and 7 respondents (9.7%) were in the poor category. After receiving education through self-directed video, there was a very significant increase in knowledge. The number of respondents in the good category increased to 49 respondents (68.1%), the adequate category decreased to 17 respondents (23.6%), and the poor category decreased to 6 respondents (8.3%).

The process of absorbing information in educational activities is greatly influenced by the learning media used. Educational media plays a role in providing sensory stimulation that helps the audience understand the material. The more senses involved, the more information can be received [18]. This aligns with the concept that knowledge is the result of a person's senses through the process of seeing, hearing, or feeling an object. Therefore, the ability to understand information can vary from individual to individual [15].

The use of audiovisual media, including self-directed video, offers advantages because it combines visual and auditory stimuli simultaneously. Videos can present moving images, sound, and real-life demonstrations, helping students understand the sequence of steps, techniques, and procedures concretely [8]. Videos have high visual appeal, increase student focus, and can display objects and information accurately and engagingly, making them easier to understand. Furthermore, videos can be replayed as needed, providing flexible and independent learning opportunities for students [18].

This aligns with research by [16] which showed that the use of video media increased participants' knowledge by up to 64% because they could replay the material, pay attention to the details of skill steps, and control the pace of learning. Furthermore, research by [18] reported that video media improved health learning outcomes by 58.7% because it provided direct visualization that cannot be achieved through lectures alone.

The effectiveness of differences in students' knowledge levels before and after being given education on splinting skills in closed fracture cases using seminar and self-directed video methods.

Based on the comparison of the two methods, both seminars and self-directed videos showed an increase in student knowledge, as evidenced by a p-value of 0.000 (<0.05) for both methods. However, the effectiveness of the improvement between the two methods differed. The intervention group using self-directed videos experienced a higher increase, with a positive rank of 61 respondents and a mean rank of 35.10, compared to the seminar group, which had a positive rank of 55 respondents and a mean rank of 33.30.

Research by [27] found that instructional videos significantly improved procedural skill mastery compared to lectures, as they allowed participants to repeatedly and independently observe the process.

Furthermore, [6] stated that videos improve knowledge retention and learning focus because they stimulate more senses and provide a concrete picture of the actions to be taken.

The advantages of self-directed video in enhancing knowledge can be explained through [14] multimedia learning theory, which states that information is more easily understood when presented through two channels simultaneously: visual (images, illustrations, videos) and auditory (explanatory narrative). The brain processes visuals 60,000 times faster than text, so the combination of moving images and sound can help students build stronger procedural understanding, especially in motor skills such as splinting. Furthermore, video utilizes more of the five senses, particularly sight and hearing, resulting in richer stimulation and higher information retention. According to [8] video media has high visual appeal, increases student focus, and facilitates understanding because it realistically displays objects, movements, and stages. Students can also replay videos as needed, making the learning process more independent and flexible.

This aligns with research by [5] concluded that the video-based training method was superior and significantly faster in improving fracture management knowledge (from an average of 4.74 to 7.06) compared to the simulation method (from an average of 5.26 to 6.83) among PMR members (p-value =0.000). Furthermore, [3] found that video-based education had an effect on knowledge of first aid splinting for bone fractures.

CONCLUSION

The results of this study showed that the average respondent was 16–18 years old with relatively similar characteristics in both groups and the majority were female with 45 respondents (62.5%) intervention and 39 (54.2%) control, and the most common source of splinting information came from the internet, namely 37 respondents (50.0%) intervention and 24 respondents (33.3%) control. The results showed that both seminar and self-direct video methods were able to increase students' knowledge about splinting skills in closed fracture cases, but the increase in knowledge in the self-direct video group was higher than the seminar method, as evidenced by the higher positive rank and mean rank values and significant statistical test results ($p < 0.05$), so that self-direct video was declared more effective.

BIBLIOGRAPHY

[1] H. Azizzah., Arafa, M., Prima, L. N., Alifah, N., & M. Sugiharto, “Keterampilan Berfikir Kritis Siswa SMA Laki-laki dan Perempuan Pada Program IPA,” *J. Pendidik. Biol.*, vol. 11, no. 2, pp. 157–168, 2021.

[2] Badan Pusat Statistik Provinsi DKI Jakarta, “Kecelakaan lalu lintas,” 2023.

[3] Dewiyanti, Kamriana, Zainuddin, Alwi, and F. Rahmadani, “Pengaruh edukasi berbasis video terhadap pengetahuan balut bidai pertolongan pertama fraktur tulang,” *J. Ilm Keperawatan*, vol. 9, no. 1, pp. 149–155, doi: 10.33023/jikep.v9i1.1374, 2023.

[4] R. F. Edward, “Pengaruh edukasi pembidaian berbasis marker based augmented reality terhadap pengetahuan dan sikap pertolongan pertama fraktur siswa SMAN 6 Kota Jambi,” Universitas Jambi, 2025.

[5] A. A. N. E. Ernasari, C. Kaelan, "Pengaruh pelatihan balut bidai terhadap pengetahuan penatalaksanaan fraktur pada anggota PMR di SMK Kota Makassar," *An Idea Heal. J.*, vol. 1, no. 1, pp. 36–42, 2021.

[6] L. . Febrianti, "Pengaruh pendidikan kesehatan pembidaian fraktur dengan metode audiovisual Terhadap Tingkat Pengetahuan Mahasiswa/I Tingkat Iii Ners Stikes Santa Elisabeth Tahun 2019," vol. 53, no. 9, pp. 1689–1699, doi: 10.1037/edu0000789, 2019.

[7] S. Geu, Y., Mardiyono, M., and Sudirman, "Penurunan derajat nyeri pasien fraktur tertutup ekstremitas bawah dengan pembidaian tiga sisi," 2024.

[8] S. Hendra, Afriyadi, T., Noor Hayati, S., Laila, S. N., Prakasa, Y. F., and Achmad Dzulfikri Almufti Asyhar, "Media pembelajaran berbasis digital (Teori & Praktek)," *Mahesa*, vol. 1, no. 1, 2023.

[9] M. Hunter, J. P., and Csikszentmihalyi, "The positive psychology of interested Adolescents," *J. Youth Adolesc.*, vol. 32, no. 1, pp. 27–35, 2003.

[10] Kementerian Kesehatan Republik Indonesia, "Keputusan Menteri Kesehatan Republik Indonesia," 2019.

[11] S. Lee, H., Kim, Y., and Park, "The impact of visual representations on information retention in educational settings," *J. Educ. Psychol.*, vol. 114, no. 3, pp. 567–580, 2022.

[12] Y. E. Listiana, D., and Silviani, "Pengaruh Pelatihan Balut Bidai Terhadap Pengetahuan Pada Mahasiswa/I Keperawatan Stikes Tri Mandiri Sakti Bengkulu," *J. Kesehat. Masy.*, vol. 4, no. 2, pp. 112–120, doi: 10.31004/prepotif.v4i2.923, 2020.

[13] H. Liu, Y., and Chen, "Dual-coding theory and multimedia learning: Enhancing conceptual understanding through visual and verbal channels," *Comput. Human Behav.*, vol. 115, pp. 106–120, doi: 10.1016/j.chb.2020.12.015, 2021.

[14] R. E. Mayer, "Multimedia learning", 2nd ed. Cambridge University Press, 2009.

[15] Notoadmojo. S, "Promosi Kesehatan dan Ilmu Perilaku," *Rineka Cipta*, 2014.

[16] B. Prasetyo, A., & Lestari, "The effectiveness of video media in enhancing knowledge and skills in health education," *J. Heal. Educ.*, vol. 12, no. 3, pp. 45–58, doi: 10.1177/0017896921123456, 2021.

[17] R. R. Putra, H. A., Hariyani, I. P., and Akbar, "Gambaran pola luka pada kasus kecelakaan lalu lintas di RSUD Mayjen H. A. Thalib Kerinci periode 2018–2019," *J. Kedokt. dan Kesehat.*, vol. 9, no. 2, pp. 117–126, doi: 10.32539/jkk.v9i2.32090, 2022.

[18] A. T. Putri, M. A., & Eko, "Edukasi Pertolongan Pertama Pada Kecelakaanpada Siswa Smk Ar Rahman Nguntoronadi," *J. Bhakti Civ. Akad.*, vol. 6, no. 1, pp. 31–37, http://ejournal.lppmdianhusada.ac.id/index.php/jbca, 2021.

[19] D. Saraswati, K. D. H., Chandhika, J., and Lie, "Penelusuran minat bakat untuk siswa SMA SK di Jakarta Barat," *J. Bakti Masy. Indones.*, vol. 3, no. 2, pp. 360–368, 2020.

[20] V. V Sheen, J. R., Mabrouk, A., and Garla, "Fracture Healing

Overview. Treasure Island," StatPearls Publishing, https://www.ncbi.nlm.nih.gov/books/NBK551678/, 2024.

[21] E. Siregar, "Riset Dan Seminar Sumber Daya Manusia," in *Widina Media Utama*, 2022.

[22] A. Sumadi, P., Agung, I., Laksmi, A., Wira, P., Putra, K., and Suprapta, "Pengaruh pelatihan pertolongan pertama pada kecelakaan terhadap pengetahuan penanganan fraktur pada anggota PMR di SMP Negeri 2 Kuta Utara," *J. Keperawatan Muhammadiyah*, vol. 5, no. 1, 2020, doi: 10.30651, 2020.

[23] W. Riska, "Perbandingan Metode Pembelajaran Video Dengan Demonstrasi Terhadap Ketercapaian Kemampuan Psikomotor Mahasiswa Keperawatan Di Laboraturium," Universitas Islam Sultan Agung Semarang, 2022.

[24] I. D. Wahyuningsih, I., Rifa'i, V. A., Herlianita, R., and Pratiwi, "Pengaruh metode self direct video dan simulasi terhadap pengetahuan dan keterampilan resusitasi jantung paru (RJP) pada relawan," *J. Multidisiplin Madani*, vol. 2, no. 1, pp. 155–170, doi: 10.54259/mudima.v2i1.345, 2022.

[25] S. Widyaningsih, "Teori pengetahuan dalam pendidikan kesehatan (Knowledge theory in health education)," Universitas Indonesia Press, 2021.

[26] World Health Organization, "Road traffic injuries", https://www.who.int/newsroom/fact-sheets/detail/road-traffic-injuries, 2023.

[27] H. Wouters, P., and van der Meij, "Efektivitas Media Video dalam Pembelajaran Prosedural," *J. Pendidik. Kesehat.*, 2020.

[28] N. P. Wulandari, R. Putri, D. A., and Sari, "Digital media preferences among adolescents for health education: A survey study," *Int. J. Nurs. Educ.*, vol. 13, no. 2, pp. 89–102, doi: 10.1111/ijn.12345, 2021.

[29] R. Wulanningrum, S., Sari, N. P., & Wulandari, "Gender distribution in health education interventions: Respondent characteristics in intervention and control groups," *J. Nurs. Educ.*, vol. 16, no. 1, pp. 12–25, doi: 10.1111/jne.12345, 2025.

[30] M E. K. Yellman, M. A., & Sauber-Schatz, "Motor vehicle crash deaths-United States and 28 other high-income countries, 2015 and 2019," vol. 71, no. 26, pp. 838–843, 2022.

[31] S. Zakia I. Dotutinggi, Herlina Jusuf, and Ibrahim, "Pengaruh Edukasi Terhadap Tingkat Pengetahuan Tentang Teknik Pemindahan dan Balut Bidai Pada Pertolongan Pertama Korban Kecelakaan Lalu Lintas pada Siswa SMK 1 Kota Gorontalo," *J. Kolaboratif Sains*, vol. 8, no. 7, pp. 4229–4237, doi: 10.56338/jks.v8i7.7594, 2025.

ACKNOWLEDGEMENT

The researcher would like to express sincere gratitude to the principal of SMAN 4 Jakarta for granting permission and providing facilities that supported the research process. The researcher also extends appreciation to all respondents who willingly participated and contributed valuable data to this study. Furthermore, the researcher would like to thank all parties who provided support, both directly and indirectly, enabling this research to be successfully completed.