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E-Learning YOUTH4OSH Educcation: Analysis of Differences Safety Behavior During Practicum For State Vocational School Students

Fakhria Maulida, Hanifa M. Denny✉, Yuliani Setyaningsih
[1]Diponegoro University, Indonesia

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Abstract

Background: Education Youth4OSH e-learning is one of the ILO's efforts to reduce the high number of young worker accidents. This study aims to determine differences in knowledge, attitudes, and practices of safety behavior during practicum before and after being given education through Youth4OSH e-learning.
Methods: This research used a non-equivalent control group quasi-experimental study design, with a purposive sampling technique and a sample of 30 students in the control group and 31 students in the treatment group. Interventions involve OSH education through Youth4OSH e-learning, which is provided three times over three weeks. Data analysis utilized the Wilcoxon signed-rank test and Mann-Whitney U Test.
Results: The results of the Wilcoxon signed-rank test showed that there was an increase in the scores of knowledge (p= 0.000), attitudes (p= 0.000), and practices (p= 0.000) in the treatment group. Furthermore, differences in enhancement scores of knowledge, attitudes, and practices between the treatment group and the control group are observed using the Mann-Whitney U test, which showed a p-value of 0.000 (p<0.05).
Conclusions: There were differences in knowledge, attitudes, and practices of safety behavior before and after receiving Youth4OSH e-learning education.

✉ Correspondence Address:
Email : hanifadenny@live.undip.ac.id

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INTRODUCTION

According to the Social Security Administrator for Employment (BPJS Ketenagakerjaan), in 2021, 234,370 workers experienced work accidents or work-related diseases. A total of 41,862 (17.9%) workers in the 20-25 age group occupy the second-highest position after the 25-30 age group (Kemenaker RI, 2022). Besides the highest number of occupational accidents, the youth is experiencing several adjustments in the era of digitalization. One of them is adapting to the progress of digital technology and changes in learning (Patmanthara & Hidayat, 2018). One response that needs to be considered in the implementation of learning is the utilization of information and communication technology as a medium for learning (Patmanthara & Hidayat, 2018).

Gaps in digital literacy among job seekers must be noticed. One such gap involves vocational school graduates who are expected to be able to work in their respective fields upon graduation (Putri & Supriansyah, 2021). Many vocational school graduates require access to job information, which can lead to higher levels of job satisfaction (Badan Pusat Statistik, 2020). In addressing this problem, schools can proactively develop and train students to possess the required digital competencies (Setiyawan et al., 2023). Information literacy in vocational education can be used as a form of preparation for facing the industrial world (Ali, 2021).

To address this issue, ILO launched a program known as Occupational Safety and Health – Global Action for Prevention (OSH – GAP) in 2015 to protect young workers' safety and health. The purpose of this program is to integrate OSH into general education and vocational training programs. In addition, the "Youth4OSH e-learning" modules were released in 2021 to train the vocational school and college students on the Introduction to OSH, Workplace Hazards module, Causes and Types of Work Accidents module, and Management of Occupational Safety and Health (OSH) modules. (International Labour Organization, 2021).

Youth4OSH e-learning, as a digital literacy medium, can be utilized either as a face-to-face learning tool at school or by independent learning students online. Youth4OSH e-learning, focusing on occupational safety and health, serves as a form of literacy in information behavior-oriented toward working safely as a preventive measure against work accidents and occupational diseases. Using Youth4OSH e-learning can facilitate students' access to vocational digital literacy because it is accessible via the website for free. Moreover, it can be accessed not only via the learners' computers or laptops but also from their smartphones. OSH education, as a form of OSH promotion, represents a strategic step in improving students' knowledge of safety at school, although its implementation has yet to be widespread (Hapsari & Widowati, 2023).

According to the initial discussion with the Office of Educational Affairs of Semarang City, the recommendation of State Vocational Schools and mechanical engineering majors for the study was driven by these programs' exposure to high-risk industrial environments, making OSH knowledge critical for their safety. Moreover, vocational school graduates typically enter the workforce immediately after graduation, emphasizing the urgency of equipping them with essential OSH competencies to ensure safe and productive careers.

In Indonesia, Vocational High Schools or "SMKs" are taught in a learning system of 70% practice and 30% theoretical content, aiming to produce graduates who are ready to work and equipped with the necessary knowledge and skills to jump into the work market (Kemenaker RI, 2022). However, OSH-related material in vocational schools is limited to just one chapter in the curriculum. Basic mechanical engineering is taught only in the tenth grade. Young workers who receive OSH training at school have the possibility of experiencing lower accident rates, up to 50% lower than those who do not receive similar training. Implementing workplace safety education in schools will lead to changes in behavior, commitment, knowledge, and attitudes among students regarding safety (ENETOSH, 2017).

Many incidents indicate that vocational school students need to comply consistently and need to be more serious about implementing

OSH regulations, especially regarding the use of Personal Protective Equipment (PPE) during practical work. This behavior increases the risk of accidents in the workplace even further because non-compliance with these rules is tolerated (Mariani et al., 2020). For instance, there were accidents at SMK Negeri 7 Semarang in 2016, involving four accident cases, three of which resulted in injured students due to contact with machinery. One student suffered a bruised wound (Nabilah & Mardiana, 2017). This finding aligns with the preliminary observations at two State Vocational Schools in Semarang City, indicating that the implementation of OSH in these schools does not adhere to the required standards.

From these problems, improving knowledge, attitudes, and practices can be achieved through health education interventions (Alallah et al., 2019). Therefore, researchers aim to conduct OSH education interventions through Youth4OSH e-learning targeting vocational school students. These interventions would improve their safety behavior during students' laboratory sessions for State Vocational School, especially machine engineering students in the city of Semarang.

METHODS

This quantitative research study implemented a quasi-experimental design with a pre-test and post-test of a non-equivalent control group design. The study was conducted between January and February 2024. The population under study consists of machine engineering program students from two State Vocational Schools in Semarang City, selected using purposive sampling techniques. The sampling technique used in this study was Purposive Sampling, which involved selecting participants based on specific objectives and criteria. The inclusion criteria included students from the machine engineering program at SMK A and SMK B in Semarang City who had not previously received OSH (Occupational Safety and Health) education through any media. Additionally, participants needed to have access to a smartphone and internet for the intervention and be willing to participate fully in the study, as confirmed by signing an informed consent form. The exclusion criteria were students who failed to complete all intervention sessions or did not participate in the pre-test and/or post-test.

The sample size for the study was determined using Lemeshow's formula to calculate minimum sample sizes. Based on the calculations, the minimum required sample size was 30 students per group. A correction factor of 15% was applied to anticipate the dropout or participant's withdrawal, resulting in an adjusted sample size of 31 students in the treatment and 30 students in the control group. This selection brought the total sample size for the study to 61 students, ensuring adequate statistical power and reliability of the findings. The selected samples had yet to receive OSH education and were not currently receiving it through any media during the intervention period.

After obtaining a certificate of ethical clearance, the researcher initiated the data collection process. The researcher first submitted a formal request for academic permission from the Faculty of Public Health, Diponegoro University, along with the research proposal, to two vocational schools in Semarang City and one additional vocational school for a questionnaire trial. Permission was also sought from the Central Java Provincial Education and Culture Office for the issuance of an official memo allowing research in the selected schools. Respondents were chosen based on specific criteria approved by the schools, and informed consent was obtained after explaining the study's purpose and methods. Preparations for the intervention, including venue setup and technical arrangements with research assistants, were conducted beforehand.

The intervention phase began with a pre-test questionnaire assessing knowledge, attitudes, and practices. The intervention group received training using the Youth4OSH e-learning platform, delivered in 90-minute sessions once a week for three weeks, covering four modules. The post-test was conducted on the same day as the third session. Meanwhile, the control group received no intervention, with their pre-test and post-test spaced one week apart. This structured approach ensured thorough data collection and the effective implementation of the intervention.

The variables under consideration included the levels of knowledge, attitudes, and practices of the students. The independent variable was providing OSH education using Youth4OSH e-learning available on https://www.youth4osh.com/eoshlearning, where the corresponding author for this manuscript was actively involved in the development of this e-learning content. The OSH Modules include Workplace Hazards, Causes and Types of Work Accidents, and OSH Management. The researchers were guided to create the learner's account, sign in, and then learn the contents under the guidance of the researchers. However, due to the inability to access the result for pre- and post-test OSH Learning from its encrypted test website, the evaluation of learning test methods was simplified using manual pre-and post-tests that were explored from the website.

The intervention consisted of three sessions conducted over three weeks. Measurement of the variables was carried out before and after the intervention using pre-test and post-test questionnaires. Due to the non-normal distribution of all data, hypothesis testing was conducted using the Wilcoxon Signed Rank Test to assess the difference in scores before and after the intervention for each group and the Mann-Whitney U test to examine the difference in mean score enhancements between the two groups. Ethical approval for this research was obtained from the Committee of Diponegoro University Ethics with number 20/EA/KEPK-FKM/2024.

RESULTS AND DISCUSSIONS

The treatment group showed improvement in knowledge, with the percentage of participants with good knowledge increasing from 0% to 19.4% and those with sufficient knowledge increasing from 3.2% to 80.6% after receiving treatment with Youth4OSH e-learning. No changes were observed in the control group. Regarding attitudes, the treatment group also demonstrated improvement, with the percentage of participants in the good category increasing from 74.2% to 100%. In comparison, the control group saw an increase from 63.3% to 70% of respondents in the good category. Similarly, improvements were observed in the practices of the treatment group, with the percentage of respondents in the good category increasing from 38.7% to 100%. However, there was a decrease in the control group's practices, with the percentage dropping from 30% to 16.7% in the good category (Table 1.).

Table 1. Distribution Frequency of Knowledge, Attitude, and Practice Categories.

Variable	Treatment Group				Control Group			
	Pre-Test		*Post-Test*		*Pre-Test*		*Post-Test*	
	f	%	f	%	f	%	f	%
Knowledge								
Good	0	0	6	19,4	0	0	0	0
Enough	1	3,2	25	80,6	0	0	0	0
Not enough	30	96.8	0	0	30	100,0	30	100,0
Attitude								
Good	23	74.2	31	100,0	19	63,3	21	70,0
Not good	8	25.8	0	0	11	36,7	9	30,0
Practice								
Good	12	38.7	31	100,0	9	30,0	5	16,7
Not good	19	61.3	0	0	21	70,0	25	83,3

The Wilcoxon Signed Rank Test showed a p-value of 0.000 for the variables knowledge, attitudes, and practices in the treatment group. As the result is <0.05, it indicates a significant difference in knowledge, attitudes, and practices between the pre-test and post-test in the treatment group. Different from the control group, the significance values or p-values range between 0.605 and 0.755. These figures were greater than 0.05, indicating that there was no difference between the pre-test and post-test in the control group (Table 2.).

Table 2. Different Test Results for Each Group.

Variable	Treatment Group Mean (SD)	Control Group Mean (SD)
Knowledge		
Pre-Test	8.35 (2.46)	7.07 (1.88)
Post-Test	14.74 (1.15)	7.20 (1.62)
Wilcoxon Signed Rank Test (Asymp . Sig (2-tailed))	0,000	0.605
Attitude		
Pre-Test	8.00 (0.73)	7.83 (0.75)
Post-Test	9.45 (0.63)	7,87 (0,86)
Wilcoxon Signed Rank Test (Asymp . Sig (2-tailed))	0,000	0.755
Practice		
Pre-Test	7.48 (0.85)	6.97 (1.07)
Post-Test	9.77 (0.56)	7.03 (0.56)
Wilcoxon Signed Rank Test (Asymp . Sig (2-tailed))	0,000	0.735

The average score increase in the treatment group was 6.39 for knowledge enhancement, 1.45 for attitude enhancement, and 2.29 for practice enhancement. This enhancement score demonstrated that providing OSH education using Youth4OSH e-learning could have improved attitudes, knowledge, and safety behavior practices during practicum for State Vocational School machine engineering students in Semarang City. The difference between the intervention provision in the treatment group and the control group was examined to compare the pre-test and post-test scores between each group using the Mann-Whitney U test. The test results indicate significance for knowledge (0.000), attitude (0.000), and practice (0.000). With a p-value of <0.05, this suggests a significant difference in knowledge, attitudes, and safety behavior practices during practicum for State Vocational School mechanical engineering students in Semarang City (Table 3.).

Tabel 3. Different Test Between Treatment Group and Control Group.

Variabel	Kelompok Perlakuan	Kelompok Kontrol	*p-value*	Ket
	Mean±SD	Mean±SD		
Pengetahuan	6,39±2,82	0,13±1,48	0,000	Ada beda
Sikap	1,45±0,89	0,03±1,21	0,000	Ada Beda
Praktik	2,29±1,07	0,07±1,05	0,000	Ada Beda

In this study, most of the treatment group participants exhibited inadequate knowledge and practiced unsafe behavior before taking the training. However, upon receiving OSH training using the Youth4OSH e-learning, there was a significant increase in knowledge, attitudes, and practices of safety behavior during their laboratory practice work. On the other hand, the control group, which did not receive intervention, showed no increase in their score.

These findings were consistent with the previous results on "nutrition education using the website" on eating behavior among teens. In the study, significant differences were observed in attitudes, knowledge, and practices regarding balanced nutritional eating behavior between intervention groups before and after the intervention (Lathifa & Mahmudiono, 2020). In addition, other studies involving educational interventions, such as anemia education using a website for teenage girls, indicated successful increases in attitudes, knowledge, and practices after the intervention (Ernawati et al., 2022).

In general, safe behavior during laboratory work activities among vocational school students has yet to reach the desired level. Despite practical implementations being supervised by teachers and equipment technicians, many students still need to obey OSH rules (Mariani et al., 2020). Youth4OSH e-learning represents one form of cognitive,

educational intervention, focusing on understanding beliefs and concepts related to a particular (Azhari, 2021). The enhancement of knowledge relies on the individual's utilization of their senses; the more senses employed, the greater the knowledge acquired (Setiawan et al., 2020). In supporting an effective and efficient learning process, the use of media plays an important role, ultimately improving knowledge (Siswanto et al., 2023). Individual decision-making is significantly influenced by good knowledge (Dewi & Caesar, 2022). A solid understanding of OSH serves as the primary foundation for students to adopt safe behaviors, especially during practical activities. Safe behavior can become ingrained habits that persist even after students enter the workforce.

According to Lawrence Green's theory, attitude is a predisposing factor. The process of forming attitudes, which marks the end stage, begins with attention and understanding, both of which depend on the amount of information comprehended by individuals (Novaryan et al., 2021). Every individual possesses traits that are not stable and tend to change over time, leading to continuous changes in attitudes (Fitriani et al., 2022). A positive attitude serves as the foundation for consistent behavior because it originates from within the individual. Positive attitudes directly influence behavior as they are considered key factors influencing an individual (Manik et al., 2020).

BPJS Ketenagakerjaan's data has shown a high number of work accidents or occupational diseases. Therefore, steps focused on reducing work accidents that prioritize reducing unsafe behaviors are in line with the phenomenon that needs to be addressed. The awareness of students in implementing OSH behavior in each practice is crucial, with a strong understanding of OSH being the key factor. The students' behavior in applying OSH principles can be observed during their work in a practical delivery (Lembong et al., 2022). Meanwhile, knowledge plays a role in shaping action. However, not all actions must be based solely on an individual's knowledge or attitudes (Sudarman et al., 2020). Therefore, the approach to safety behavior instilment must be delivered proactively.

This study indicates a significant difference in the improvement of knowledge, attitudes, and practices between the treatment group and the control group. This difference occurred in intervention among the treatment participants who received three times in the Youth4OSH e-learning. The research suggests that the positive impact of education contributes to the improvement of knowledge, attitudes, and practices regarding safety behavior during practicum (Mustikaningrum et al., 2023). Other studies' findings state that teaching programs utilizing videos regarding the measurement of OSH vulnerabilities are effective in enhancing the knowledge, attitudes, and practices of respondents (Thiruvengadam et al., 2016). According to the World Health Organization (WHO), providing information that can enhance knowledge and influence behavior according to one's knowledge is one of the strategies for behavior change (Herman et al., 2020). Behavior stemming from a general understanding is more effective compared to behavior not based on knowledge (Sholehah et al., 2019). By acquiring new knowledge, individuals develop a new understanding, which influences their response to stimuli and encourages them to act differently from their environment (Herman et al., 2020).

The Youth4OSH e-learning intervention significantly enhanced knowledge, attitudes, and practices of safety behavior among vocational school students in the treatment group. Knowledge improvements were particularly evident in topics such as chemical hazards and factors contributing to workplace accidents, which saw the highest post-test scores. This score aligns with studies demonstrating the importance of targeted educational modules in fostering awareness of critical safety issues and improving knowledge retention among students. The average knowledge score increased by 6.39 points, compared to a negligible 0.13-point gain in the control group, underscoring the program's effectiveness. This finding is consistent with prior findings that interactive and multimedia-based e-learning, like Youth4OSH, enhances comprehension and supports behavior change by engaging multiple sensory modalities.

Attitudes and d significant improvements. Positive attitudes towards safety increased from 74.2% to 100% in the treatment group,

supported by modules on the importance of OSH, physical hazards, and ergonomic risks. Practices such as adherence to OSH regulations and workplace discipline similarly reached 100%, demonstrating the intervention's comprehensive impact. Research has shown that educational programs tailored to local needs effectively influence safety behavior and reinforce long-term changes. Meanwhile, the control group improved, emphasizing the need for structured interventions like Youth4OSH. These results support integrating such programs into vocational curricula to enhance safety outcomes, reduce occupational risks among young workers, and contribute to national safety initiatives.

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CONCLUSION

The results of this study examine the influence and differences of interventions in the form of OSH education through Youth4OSH e-learning on increasing knowledge, attitudes, and practices of safety behavior during practicum for State Vocational School machine engineering students in Semarang City. This research indicates that there are significant differences in the levels of knowledge, attitudes, and practices of safety behavior during practicum after OSH education using Youth4OSH e-learning is implemented. To further enhance this research, subsequent observations can be conducted on the students' practices during their laboratory work practices, and retention tests can be performed to assess the cognitive abilities of respondents in recalling the interventions that have been provided. The provincial Department of Education and Culture is responsible for senior high school and vocational high schools. It should collaborate with the Education Department branches in each region to integrate Youth4OSH e-learning into the curriculum. This integration can be achieved by providing direct access to schools and expanding the range of socialization efforts.

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