

Effectiveness of a Health Promotion Website Platform as a Learning Model and Practice for Public Health Students

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ABSTRACT

Background: Health promotion websites have been widely recognized as digital literacy media, including among university students. However, evidence regarding the effectiveness of these media in improving students' knowledge and skills remains very limited. This study aimed to evaluate the effectiveness of a health promotion website among public health students. **Method:** This study employed a quasi-experimental design using a pretest–posttest non-equivalent control group design. The sample consisted of 30 students in the intervention group and 30 students in the control group. A paired-samples t-test and analysis of covariance (ANCOVA) were used in this study. **Results:** There were increases in knowledge (0.34) and skills (0.43) scores from pretest to posttest. However, statistically, there were no differences in scores between the two groups for either variable (knowledge, $p = 0.555$; skills, $p = 0.731$). **Conclusion:** Students' skill and knowledge scores increased from pretest to posttest; however, there were no significant differences in either variable between the intervention and control groups. The website platform has potential as a medium for digital health promotion learning, particularly through strengthening interactive learning, increasing the duration of platform use, and actively engaging users in website content development and management.



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Introduction

The development of information and communication technology has changed the way people obtain, understand, and use health information. Digital transformation in the health sector has driven increased use of the internet as a primary source of health information, making access to health information faster, broader, and more accessible to various groups of society (1). The World Health Organization (WHO) emphasizes that health literacy is an important determinant of improving population health, as it plays a role in individuals' ability to access, understand, assess, and apply health information for appropriate decision-making (2). A survey in Indonesia reported

that internet use varied across the 38 provinces, with Central Java experiencing a rapid increase from 62% in 2019 to 81% in 2022 (3).

The high level of internet use in Indonesia provides a substantial opportunity for the development of digital-based health promotion. In Indonesia, internet use has also increased significantly. Data from the Indonesian Internet Service Providers Association (APJII) in 2024 showed that internet penetration reached more than 79% of the Indonesian population, or approximately 221 million users (4). The high level of internet use has made digital media a primary means for people to obtain health information (5). However, this ease of access also presents challenges, including the circulation of invalid health information, health-related hoaxes, and misinterpretation of health information by the public. Therefore, the ability to search for, understand, evaluate, and appropriately use health information is highly important (6).

University students are among the age groups that use the internet most actively. APJII data from 2024 showed that Generation Z was the largest group of internet users in Indonesia among those under 25 years of age (7). This situation places university students in close contact with digital technology and various internet-based sources of health information. Therefore, digital health literacy is an important competency for university students to possess in responding to the increasingly rapid development of health technology (8).

For public health students, the ability to access and evaluate health information plays a more important role because they are being prepared as future health promotion professionals (9). Therefore, public health students need not only to be able to access and evaluate health information, but also to have the skills to process and produce accurate, communicative, and evidence-based digital health promotion content. One approach that can be used to develop these competencies is the use of digital-based learning media. Digital media enables students to gain more interactive and independent learning experiences that are aligned with the characteristics of technology-based learning today (10).

Among the various digital media available, health promotion websites have the advantage of integrating various forms of educational media, such as articles, videos, infographics, podcasts, and discussion forums, within a single platform that is easily accessible (11). Websites also allow learning to take place continuously without being limited by space and time. Unlike digital educational media that are used only as a means of delivering information, health promotion websites allow students to actively engage in the planning, content development, information management, and evaluation of health promotion media (12).

Several studies on the development of health promotion websites have previously been conducted. A health website development study involved experts and prospective users; however, its effectiveness in terms of knowledge, attitudes, and behavior had not yet been tested (13,14). Although a literature review had explored the effectiveness of web-based health interventions, only 13 articles reported significantly positive results, and these findings were classified as low-quality evidence (15). A study involving 589 health students that measured knowledge after a website-based educational intervention showed only short-term outcomes and did not assess the long-term retention of knowledge, attitudes, and behavior. Specifically, most studies on health promotion media in Indonesia have focused on social media, WhatsApp, videos, and leaflets (16,18), while studies evaluating the effectiveness of health promotion websites in the Indonesian context remain very limited (19,20). Therefore, this study aimed to evaluate the effectiveness of a health promotion website platform as a learning model and practice for public health students. Unlike previous studies that primarily focused on website development or short-term educational outcomes, this study used a quasi-experimental pretest–posttest non-equivalent control group design to compare changes between students who received the website-based intervention and those who did not. The study also assessed both knowledge and skills related to the development and management of digital health promotion content using research instruments that underwent expert content validity assessment and reliability testing. The use of a control group and pretest–posttest measurements provided a basis for determining whether changes observed after the intervention differed from those occurring in the control group.

Materials and Methods

This study employed a quasi-experimental design using a pretest–posttest non-equivalent control group design (21). A total of 60 university students participated in the study, consisting of 30 students in the intervention group and 30 students in the control group (22). The groups were formed based on the sequence of participant recruitment and intervention implementation rather than by pre-existing classes or cohorts. The first 30 students recruited were assigned to the

intervention group and were met individually by the researcher to receive the website intervention. The subsequent 30 students were assigned to the control group and completed the study questionnaire without receiving the direct website intervention. The intervention was conducted individually on a one-to-one basis rather than as a classroom-based activity. Website access was conducted once on average, with an access duration of approximately 15–30 minutes. There was no scheduled or repeated website-based learning session. During the intervention, students accessed the practice article creation menu and learned how to create and submit articles, including understanding the layout and functions of the menus used for article submission and publication. The intervention focused on providing students with direct experience in using the website as a platform for practicing the creation and management of health promotion content. Measurements were conducted before and after the intervention using the predetermined instruments, and the results of the two groups were then compared to assess the effectiveness of the website platform (23).

The user needs identification stage involved a literature review, observation, and analysis of learning needs. The design stage included the development of the system design, navigation structure, learning materials, and research instruments. Next, during the development stage, the website platform was developed and functional testing was conducted. The implementation stage involved 60 students from the Public Health Study Program at Universitas Ahmad Dahlan.

The website platform, research instruments, and data supporting the study findings are retained by the researchers and are available to readers for research verification or replication upon reasonable request to the corresponding author. This study did not use a public database and therefore has no accession number.

The study received ethical approval from the Research Ethics Committee of Universitas Ahmad Dahlan under approval number REC-UAD/01/01/05-2026/235. All respondents participated voluntarily after receiving an explanation of the study objectives, procedures, benefits, and risks, and signed an informed consent form before data collection.

The research instruments consisted of two sections: skills and knowledge. The skills instrument consisted of 15 items measuring students' ability to use the website platform and carry out activities related to the creation and management of health promotion content. The knowledge instrument consisted of 15 items measuring students' ability to plan, develop, and produce health promotion content. Each item was assessed using a 5-point Likert scale, ranging from strongly disagree to strongly agree. Both instruments were administered during the pretest and posttest stages. The research instruments underwent content validity testing by experts in health promotion, and the instrument demonstrated a reliability coefficient of 0.853.

The data were analyzed descriptively, with the mean and standard deviation $\pm$ calculated for continuous variables. A paired-samples t-test was used to analyze differences in pretest and posttest scores for both skills and knowledge. Subsequently, analysis of covariance (ANCOVA) was applied to evaluate differences in the research variable scores after the pretest and posttest, with the pretest scores included as a covariate. A p-value of 0.05 was considered statistically significant. All data analyses were performed using SPSS software.

Results

A total of 60 public health students participated in the study, with 30 students assigned to the intervention group and 30 students to the control group (Table 1). There was an increase in the mean scores for skills and knowledge from pretest to posttest. The mean skill score increased from 3.17 (SD = 0.726) at pretest to 3.60 (SD = 0.733) at posttest, representing a mean increase of 0.43 points.

Table 1. Pretest and posttest scores for skills and knowledge

Variable	Pre-test Mean $\pm$ SD	Post-test Mean $\pm$ SD	Change
Skill	3.17 $\pm$ 0.726	3.60 $\pm$ 0.733	0.43
Knowledge	3.24 $\pm$ 0.698	3.58 $\pm$ 0.743	0.34

Differences in Pretest and Posttest Scores

Differences in scores were observed between the pretest and posttest for both skills and knowledge. The mean skill score among students increased by 0.43 points and showed a statistically significant difference ($p < 0.001$); the same pattern was observed for students' knowledge (Table 2).

Table 2. Results of the Test of Differences in Pretest and Posttest Scores

Variable	Pre-test	Post-test	Mean Difference	t	p
Skill	3.17	3.60	0.43	-9.216	<0.001
Knowledge	3.24	3.58	0.34	-7.336	<0.001

Comparison of Changes between the Intervention and Control Groups

The change variable was calculated as the difference between the posttest and pretest scores for each respondent. For skills, the mean change score was 0.45 (SD = 0.356) in the intervention group, compared with 0.41 (SD = 0.377) in the control group, indicating a slightly greater increase in skills in the intervention group. In contrast, for knowledge, the mean change score was 0.28 (SD = 0.359) in the intervention group, compared with 0.40 (SD = 0.358) in the control group, indicating a greater increase in knowledge in the control group than in the intervention group. Thus, the direction of change differed between skills and knowledge. However, the differences in change scores between the intervention and control groups were not statistically significant for either skills ($t = 0.422$, $p = 0.674$) or knowledge ($t = -1.273$, $p = 0.208$) (Table 3).

Table 3. Comparisons of changes between intervention and control groups

Variable	Intervention Mean $\pm$ SD	Control Mean $\pm$ SD	t	p
Skill	0.45 $\pm$ 0.356	0.41 $\pm$ 0.377	0.422	0.674
Knowledge	0.28 $\pm$ 0.359	0.40 $\pm$ 0.358	-1.273	0.208

Furthermore, the ANCOVA results showed no statistically significant differences in posttest scores between the intervention and control groups after adjusting for pretest scores, for both knowledge ($F = 0.352$, $p = 0.555$) and skills ($F = 0.119$, $p = 0.731$) (Table 4).

Table 4. Difference in scores between groups in intervention and control groups

Variable	F	df	p-value	Partial η^2
Knowledge	0.352	1; 56	0.555	0.006
Skill	0.119	1; 56	0.731	

Discussion

The results showed an increase in students' skill and knowledge scores from before to after the intervention. The mean skill score increased from 3.17 at pretest to 3.60 at posttest, while the mean knowledge score increased from 3.24 to 3.58. The paired-samples t-test showed that these increases were statistically significant for both skills and knowledge, with $p < 0.001$. These findings indicate that during the study period, changes occurred in students' abilities in terms of skills and knowledge related to learning and practicing digital health promotion. A randomized controlled trial conducted in Egypt showed that increased knowledge scores were followed by improvements in attitudes and the adoption of the intended outcomes (24). Nevertheless, the overall increase in scores cannot be interpreted as evidence that the website platform was the primary cause of these improvements. When the changes in scores were compared between the intervention and control groups, no statistically significant differences were found. For skills, the mean change score was 0.45 in the intervention group and 0.41 in the control group, with $p =$

0.674. Meanwhile, for knowledge, the intervention group showed a change of 0.28, compared with 0.40 in the control group, with $p = 0.208$.

In addition, the different directions of change observed for knowledge and skills require consideration. The intervention group showed a slightly greater increase in skills than the control group (0.45 vs. 0.41), the increase in knowledge was greater in the control group than in the intervention group (0.28 vs. 0.40). These differences were not statistically significant ($p = 0.674$ for skills and $p = 0.208$ for knowledge); therefore, the observed differences in direction should not be interpreted as evidence that the website intervention reduced knowledge or improved skills more effectively. One possible explanation is that the intervention in this study was primarily oriented toward practical activities, particularly practicing article creation and learning the layout and functions of the menus for submitting and publishing articles. The intervention was also relatively brief, with students accessing the website for approximately 15–30 minutes on average once, without scheduled or repeated learning sessions. Such an intervention may provide a more direct opportunity to practice skills than to develop broader knowledge. In contrast, knowledge related to health promotion content may have been influenced by learning experiences and information obtained from sources outside the website intervention. Students in the control group may also have continued to access other digital learning resources during the study period. Thus, the inverse direction observed for knowledge may reflect differences in the nature of the learning outcomes and the limited intensity of the website exposure rather than a negative effect of the intervention. These findings suggest that the effectiveness of a website platform may depend on the type of learning outcome assessed, the intensity and duration of use, and the extent to which students actively engage with the learning content. Consequently, the difference in exposure between the intervention and control groups may have been relatively small, making the additional effect of website use difficult to detect. This is consistent with the importance of students' digital health literacy in accessing, understanding, evaluating, and using health information, as emphasized in previous research (1,6,8). The findings of this study are more appropriately interpreted as showing that, under the conditions and intervention design used, the additional effectiveness of the website platform could not be statistically demonstrated. The website nevertheless has potential to support health promotion learning because it can provide students with a space to access learning materials while also practicing the production of digital content. However, its use needs to be positioned as part of a more structured learning strategy rather than merely as a medium for providing information. From the perspective of competency development among public health students, these findings imply that the use of digital platforms should not stop at providing articles or learning materials. Students need activities that encourage active engagement, such as developing health promotion articles, creating infographics, developing content based on scientific sources, receiving feedback, and revising the content they have produced. Such an approach is more consistent with the purpose of the platform developed in this study, which was not only to provide information but also to provide students with opportunities to practice creating and managing health promotion content.

This study has several strengths. First, the study employed a pretest–posttest design with intervention and control groups, allowing changes in students' abilities to be observed before and after the study and compared between groups. Second, the instruments demonstrated acceptable internal validity, with a Cronbach's alpha value of 0.853, indicating good internal consistency. Third, the analyses were conducted sequentially, beginning with normality testing and comparison of score changes, followed by ANCOVA controlling for pretest scores. Thus, the interpretation of intervention effectiveness was not based solely on changes in scores before and after the study. However, this study also has several limitations. The sample size was relatively small, consisting of 60 students from a single institution, so the generalizability of the findings to public health students at other institutions should be considered with caution. In addition, although the intervention duration and frequency of website access were specified, the study did not quantitatively measure individual students' engagement with the platform, such as the extent of interaction with the available menus or content. Therefore, differences in the level of engagement among students in the intervention group could not be determined. Other learning factors outside the website were also not controlled in detail. This is important because the improvement in abilities observed in both groups suggests that factors other than the website intervention may have contributed to the changes in scores.

Conclusion

This study showed differences in students' skills and knowledge scores from pretest to posttest. However, the scores between the intervention and control groups indicated that these improvements did not differ significantly. Therefore, the use of the health promotion website platform in this study did not demonstrate greater effectiveness than the control condition in improving public health students' skills and knowledge. Nevertheless, the website platform has potential for further development as a medium for learning and practicing digital health promotion. Future development should strengthen interactive and structured learning activities, increase the intensity and duration of platform use, and actively involve students in the creation and management of health promotion content. Future studies should also involve larger samples and more diverse institutions and measure students' level of engagement with the platform to obtain a more comprehensive assessment of its effectiveness.

Declaration

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Conflicts of Interest: The authors declare that there are no conflicts of interest in this research.

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