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The Role of Self-Directed E-Learning-Based Mental Health Models in Strengthening Mental Health Literacy among Nurses in West Lombok Regency, Indonesia: A Cross-Sectional Study

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ARTICLE INFO	ABSTRACT
	Introduction: Nurses at Public Health Centers (PHCs) are at the forefront of providing health services, including mental health services. Adequate Mental Health Literacy (MHL) is crucial to enhance their ability to recognize, manage, and support patients with mental health disorders. Improving MHL through an Self-Directed E-Learning (SDE) based learning approach is expected to be an innovative solution to strengthen nurses' competencies. The study aimed to analyze the association between the self-directed e-learning-based mental health model and the strengthening of MHL among nurses at PHC.
	Methods: The study used a cross-sectional design to analyze the association between exposure to SDE with the strengthening of MHL among nurses at PHC in West Lombok, West Nusa Tenggara, Indonesia, with a sample size of 263. Descriptive analysis was performed to describe the characteristics of the respondents. Chi-square and binary logistic regression tests were performed to determine the association between variables with a significance level of $p<0.05$ with 95% Confidence Interval (CI) and Adjusted Odds Ratio (AOR) to determine the depth of the association.
	Results: The results of the study show that most nurses with high SDE exposure have better MHL-work levels than nurses with low SDE exposure. Males have a higher chance of achieving competency improvement than females (AOR=3.046; p=0.004). Participants with a Diploma in Nursing also showed a significant improvement compared to Bachelor of Nursing graduates (AOR=2.208; p=0.042). Work experience of ≥5 years had a significant effect (AOR=2.851; p=0.006). A history of work-related MHL training significantly increased the likelihood of competency (AOR=3.575; p=0.001). Higher exposure to SDE, including the number of reflective discussion and practice sessions (AOR=2.333; p=0.029), longer e-learning duration (AOR=3.524; p=0.001), and the number of modules completed (AOR=2.617; p=0.018), and the number of mental disorder patients treated (AOR=3.703; p=0.001) were found to be significantly associated with increased competency. Meanwhile, workload did not show a significant association (p=0.231).
	Conclusions: The study findings confirm that experience, education, training, and intensity of involvement in the SDE program are important determinants in improving MHL competencies.

INTRODUCTION

Mental health is an important component in determining the quality of human resources, especially health workers (1). Nurses, as the frontline of healthcare services at the Public Health Center (PHC), not only play a role in providing promotive, preventive, curative, and rehabilitative services to the community, but are also required to have good mental health in order to provide optimal nursing care (2). Work stress levels, high workloads, administrative demands, and limited facilities and infrastructure in PHC often trigger mental health disorders among nurses (3). Studies show that nurses in primary care facilities, including PHC, are prone to work stress, burnout, and decreased motivation, which can affect the quality of care and patient safety (4).

On the other hand, Mental Health Literacy (MHL) is an essential skill that nurses need to have (5). MHL is defined as knowledge and beliefs about mental health disorders that help with the recognition, management, or prevention of mental health problems (6). Good MHL enables nurses to recognize signs of mental health disorders in themselves and others, have a positive attitude toward seeking help, and support colleagues experiencing psychological problems (7). Unfortunately, various reports and studies in Indonesia indicate that the level of MHL among health workers, especially in primary care, still varies and is not yet optimal (8). The lack of formal training, limited access to up-to-date information, and minimal free time for self-directed learning are major challenges to improving MHL among nurses (9). The high level of MHL enables nurses to not only maintain their own mental health, but also become agents of education for patients and the community (10). However, in various regions, including West Lombok Regency, literacy rates remain low (11).

Nurses in PHC face complex work challenges such as limited resources, high workloads, and dual roles as service providers and health educators (12). Therefore, a strategy to strengthen MHL is needed so that nurses are able to cope well with work pressure (13). A study conducted by Zhong et al. (2024) revealed that low MHL affects nurses' effectiveness in identifying signs of psychological disorders, both in themselves and in others (14).

West Lombok, as one of the districts in West Nusa Tenggara (WNT) Province, has an extensive PHC network with a significant number of nurses. However, geographical conditions and limited human resources and training facilities often pose obstacles to the implementation of face-to-face health worker capacity building programs (11). Therefore, innovative learning models that are flexible, independent, and based on information technology are urgently needed so that nurses in PHC can access mental health materials continuously without being limited by space and time (13).

Self-Directed E-Learning (SDE) is a modern learning approach that emphasizes participants' independence in accessing, studying, and internalizing material through digital media (15). This model allows nurses to adjust the learning pace according to their individual needs, access materials at any time, and reflect independently on their work experiences (16). A study by Chen et al. (2024) revealed that systematically designed e-learning can significantly improve the knowledge, attitudes, and skills of healthcare workers (17). However, scientific evidence regarding the association of the SDE model, particularly in the context of improving the quality of MHL among PHC nurses in Indonesia, especially in West Lombok, is still limited.

SDE-based mental health allows nurses to learn according to their own time, needs, and pace without being bound by space and time (18). The use of online platforms allows for the enrichment of material in the form of videos, interactive quizzes, case studies, and virtual discussions that can facilitate more active and reflective learning (19). For nurses working in areas with limited access to conventional training, e-learning is an innovative and efficient solution (20).

In West Lombok Regency, the use of information technology in nurse training is still very limited. The development of this e-learning model not only contributes to strengthening the capacity of human resources in health, but also serves as an innovation in health education that can be replicated in other regions (21). Improvements in MHL contribute to the psychological well-being of nurses themselves. This will have a positive impact on work performance and interpersonal association in the workplace (22).

This study is important considering that nurses at PHC in West Lombok face a double challenge: the need to maintain their own mental health and the demand to improve services to the community, which also experiences various psychosocial problems. Improving MHL through an SDE-based learning approach is expected to be an innovative solution to strengthen nurses' competencies. With increased MHL, nurses are expected to be better able to recognize signs of mental health problems in themselves and their patients, improve their positive attitude towards

seeking help, and develop appropriate early intervention skills in the workplace. The study aims to analyze the role of SDE-based mental health models in improving MHL among nurses.

METHODS
Study Design
The study was observational in nature and used a cross-sectional design. Data were collected once at a single point in time to assess the association between exposure to the SDE model for mental health and MHL-work levels among nurses. The study was conducted in 15 PHCs in West Lombok Regency, NTB, Indonesia that met the inclusion criteria. The study was conducted from July to September 2025.

Participants and Sampling
The study population consisted of all nurses working in PHC in West Lombok Regency, totaling 829 nurses. The research sample was taken using sample size proportion through the OpenEpi Version 3 calculator, on the page: https://www.openepi.com/SampleSize/SSPropor.htm numbering 263 nurses. Inclusion criteria include active nurses in PHC with a minimum of 1 year of work experience, willingness to participate in the intervention process until completion, and access to learning devices (smartphone/laptop) and the internet. Exclusion criteria include nurses who are on leave/study leave and who do not complete the entire intervention series.

Variables
Independent variables, namely SDE-based mental health. Dependent variables, namely the level of MHL-work among nurses. Demographic variables: age, gender, education level, length of service, workload, and previous MHL-work training history. SDE refers to a concept of independent learning that emphasizes the active involvement of participants in organizing, directing, and monitoring their learning process using digital media. SDE exposure (ordinal scale) is defined as the level of participant engagement in all self-directed learning activities related to mental health through the e-learning platform, which is measured by the intensity of participation, duration of interaction with the material, breadth of modules completed, and clinical experience related to mental health during the program. SDE exposure indicators include the number of reflective discussion sessions and practical sessions attended, total e-learning study duration, total modules completed, and the number of patients with mental disorders treated. The assessment procedure includes collecting data from the platform attendance log, participation calculated based on the percentage of sessions attended by nurses, activity duration log data from the digital platform, time calculated in total hours during the program period, verification of module completion status, and collecting data from clinical case logs and service records. The exposure level for each indicator was categorized as "High" if nurses completed ≥ 75% of the module and "Low" if nurses completed < 75% of the module.

MHL-Work refers to the ability of workers, particularly healthcare workers, to understand, recognize, and respond to mental health issues in the context of work. The level of MHL-Work is defined as an individual's ability to recognize, understand, respond to, and apply mental health knowledge and skills in the workplace. MHL-work consists of 4 sub-variables, namely: a. Knowledge about work-related mental health disorders, b. Ability to recognize signs/symptoms, c. Positive attitude towards seeking help, and d. Willingness to support colleagues experiencing mental health problems. The ability was measured using the MHL-Work instrument score, which covers aspects of knowledge, attitudes, and self-efficacy in the context of mental health in the workplace, categorized as "High" and "Low" based on the total score of the validated MHL-Work instrument.

Age, ratio scale, is defined as the age of the nurse from birth to the date of data collection, calculated in years. Gender, nominal scale, is defined as the gender listed in the respondent's personal data, categorized as male and female. The highest level of education is defined as the highest level of formal education in nursing pursued by the respondent, categorized as a Diploma 3 in Nursing and a Bachelor of Nursing. Length of service (ordinal scale) is defined as the length of time the respondent has worked as a nurse in PHC at the time of the study, calculated in years and categorized as "≥5 years" and <5 years.

Workload (ordinal scale) is defined as the level of nurses' workload measured based on the number of patients/clients handled per day and per hour, categorized as "High" if the number of patients per day and working hours is more than 50 patients and "Low" if the number of patients per day and working hours is less than 50 patients.

Previous MHL-work training history (nominal scale) is defined as the respondent's status of having attended mental health training/workshops prior to the study, categorized as "Yes" if the respondent has attended training and "No" if the respondent has never attended training.

Data Collection

Data collection was conducted using questionnaires distributed directly to nurses. Before use, the questionnaires were tested for reliability to determine their suitability. According to Pallant (2020), instruments with a Cronbach's Alpha value above 70% are considered reliable and suitable for measuring research variables (23). The results of the questionnaire reliability test revealed that Cronbach's Alpha value was 0.817 or 82%.

Data Analysis

Data analysis was performed using Statistical Package for the Social Sciences (SPSS) version 26. Descriptive analysis was conducted to describe the characteristics of respondents and data distribution. Chi-square tests and binary logistic regression were performed to determine the association between variables with a significance level of p-value <0.05 with 95% Confidence Interval (CI) and Adjusted Odds Ratio (AOR) to determine the depth of the association.

Ethical Approval

The study has obtained ethical approval from the Health Research and Academic Integrity Ethics Committee, Bima International University MFH with Number: 13/KEPK-IA/VII/2025. Each nurse has obtained informed consent stating their willingness to be a respondent. The researchers guarantee the confidentiality of the data provided by the respondents, who are also given the freedom to withdraw at any time without consequences.

RESULTS

Based on the results of the study in Table 1, the level of MHL-work among nurses in PHC shows that most respondents are in the high category, namely 159 people (60.5%). Meanwhile, 104 people (39.5%) are in the low category. The study findings show that the majority of nurses already have good MHL-work, both in terms of knowledge, ability to recognize signs/symptoms, positive attitudes, and willingness to support colleagues. However, there are still about 4 out of 10 nurses who have low MHL-work, so efforts to improve this need to be made, one of which is through an SDE-based independent learning model.

Table 1. Frequency Distribution of MHL-work among Nurses (n=263)

Variable	Frequency	Percent
MHL-work		
High	159	60.5
Low	104	39.5

The results of the analysis in Table 2 show a consistent pattern in the association between respondent characteristics, exposure to SDE, and work experience with the level of MHL-work. Based on gender, male nurses had higher MHL-work (115 people; 72.3%) than female nurses (44 people; 27.7%). Conversely, the proportion of nurses with low work MHL was greater among women (77 people; 74%) than men (27 people; 26%). This difference was significant (p<0.001).

The variable of highest level of education (Table 2) shows that nurses with a Diploma in Nursing have a higher MHL-work (126 people; 79.2%) than those with a Bachelor's Degree in Nursing (33 people; 20.8%). Conversely, in the low MHL-work category, nurses with a Bachelor's degree were more dominant (65 people; 62.5%) than those with a D3 (39 people; 37.5%) (p<0.001). In terms of length of service, nurses with ≥5 years of service had higher MHL-work (103 people; 64.8%) compared to those with <5 years of service (56 people; 35.2%). Conversely, low work MHL was more prevalent in those with <5 years of work experience (77 people; 74%) compared to those with ≥5 years (27 people; 26%) (p<0.001).

Workload variables (Table 2), nurses with high workload had higher MHL-work (113 people; 71.1%) compared to those with low workload (46 people; 28.9%), while in low MHL-work, nurses with low workload were more dominant (65 people; 62.5%) (p<0.001). In the variable of previous work MHL training history, nurses who had participated in training had higher MHL-work (127 people; 79.9%) compared to those who had never participated in training (32 people; 20.1%). Conversely, low MHL-work was more prevalent among nurses who had never participated in training (69 people; 66.3%) (p<0.001).

Table 2. Results of Bivariate Analysis of SDE Exposure with MHL-work (n=263)

Variables	MHL-work High n (%)	MHL-work Low n (%)	Total n (%)	χ^2	p-value
Gender					
Male	115 (72.3)	27 (26)	142 (54)	54.413	<0.001*
Female	44 (27.7)	77 (74)	121 (46)		
Highest Level of Education					
Diploma in Nursing	126 (79.2)	39 (37.5)	165 (62.7)	46.870	<0.001*
Bachelor of Nursing	33 (20.8)	65 (62.5)	98 (37.3)		
Employment Period					
≥5 Years	103 (64.8)	27 (26)	130 (49.4)	37.902	<0.001*
<5 Years	56 (35.2)	77 (74)	133 (50.6)		
Workload					
High	113 (71.1)	39 (37.5)	152 (57.8)	29.047	<0.001*
Low	46 (28.9)	65 (62.5)	111 (42.2)		
Previous MHL Training History					
Yes	127 (79.9)	35 (33.7)	162 (61.6)	56.783	<0.001*
No	32 (20.1)	69 (66.3)	101 (38.4)		
SDE Exposure					
The number of reflective discussion sessions and practical sessions attended				56.892	<0.001*
High	122 (76.7)	31 (29.8)	153 (58.2)		
Low	37 (23.3)	73 (70.2)	110 (41.8)		
Total e-learning study duration					
High	121 (76.1)	35 (33.7)	156 (59.3)	46.943	<0.001*
Low	38 (23.9)	69 (66.3)	107 (40.7)		
Total modules completed					
High	120 (75.5)	42 (40.4)	162 (61.6)	32.722	<0.001*
Low	39 (24.5)	62 (59.6)	101 (38.4)		
Many patients with mental disorders are treated					
High	118 (74.2)	29 (27.9)	147 (55.9)	54.742	<0.001*
Low	41 (25.8)	75 (72.1)	116 (44.1)		

*: Significant level p<0.05.
χ^2: Pearson Chi-square; MHL: Mental Health Literacy; SDE: Self-Directed E-Learning.

The results of the analysis show a consistent and significant association between various indicators of SDE exposure and MHL-work levels among nurses in PHC (p<0.001 for all indicators in Table 2). Judging from the number of reflective discussion and practice sessions attended, nurses with high exposure (attending more discussion/practice sessions) had higher work MHL, namely 122 people (76.7%) compared to only 37 people (23.3%) in the low category. Conversely, in the low exposure category, there were more nurses with low MHL-work, namely 73 people (70.2%) compared to 31 people (29.8%) with high MHL-work. This difference was statistically significant (p<0.001), indicating that the more often nurses participated in discussion and practice sessions, the higher their MHL-work. (Table 2).

On the total e-learning duration indicator, nurses with high learning duration had a higher proportion of MHL-work (121 people; 76.1%) compared to respondents with low MHL-work (35 people; 33.7%). Conversely, among those with low learning duration, there were more nurses with low MHL-work (69 people; 66.3%) than those with high MHL-work (38 people; 23.9%) (p<0.001). This indicates that the longer the duration of independent learning, the greater the chance that nurses will have high MHL-work (Table 2).

In terms of the number of modules completed, nurses who completed more e-learning modules had higher MHL-work (120 people; 75.5%) compared to those with lower MHL-work (39 people; 24.5%). Conversely, in the group that completed fewer modules, the proportion of lower MHL-work (62 people; 59.6%) was higher than that of higher MHL-work (42 people; 40.4%) (p<0.001). This indicates that completing more modules contributes positively to an increase in MHL-work (Table 2).

The final indicator, the number of patients with mental disorders treated, also showed a similar pattern. Nurses who treated patients with mental disorders more frequently had higher MHL-work (118 people; 74.2%) compared to those who treated them less frequently (41 people; 25.8%). Conversely, nurses with low patient exposure had lower MHL-work (75 people; 72.1%) compared to those with high exposure (29 people; 27.9%) (p<0.001). This indicates that direct practice experience also plays an important role in increasing MHL-work (Table 2).

Overall, the four SDE exposure indicators (number of discussion/practice sessions, total learning duration, number of modules completed, and number of patients with mental disorders treated) were found to be significantly associated with nurses' MHL-work levels. The higher the intensity of SDE exposure and the more practical experience gained, the higher the level of MHL-work among nurses in PHC.

Table 3. Results of Binary Logistic Regression Analysis of SDE Exposure with MHL-work (n=263)

Variables	AOR	95% CI	p-value
Gender (ref: Female) Male	3.046	1.430–6.485	0.004*
Highest Level of Education (ref: Bachelor of Nursing) Diploma in Nursing	2.208	1.029–4.738	0.042*
Employment Period (ref: <5 Years) ≥5 Years	2.851	1.353–6.005	0.006*
Workload (ref: Low) High	1.602	0.741–3.464	0.231
Previous MHL Work Training History (ref: No) Yes	3.575	1.674–7.635	0.001*
SDE Exposure			
The number of reflective discussion sessions and practical sessions attended (ref: Low) High	2.333	1.091–4.986	0.029*
Total E-learning Study Duration (ref: Low) High	3.524	1.663–7.466	0.001*
Many modules completed (ref: Low) High	2.617	1.183–5.785	0.018*
Many patients with mental disorders are treated (ref: Low) High	3.703	1.764–7.774	0.001*

*: Significant level p<0.05.
AOR: Adjusted Odds Ratio; 95% CI: 95% Confidence Interval; SDE: Self-Directed E-Learning.

The results of the analysis in Table 3 show several factors that are significantly associated with the level of work-related MHL among nurses in PHC. For the gender variable, an AOR of 3.046 (95% CI: 1.430–6.485; p=0.004) was obtained. This means that, after controlling for other variables, male nurses are approximately three times more likely to have higher work MHL than female nurses.

The variable of highest level of education was also significantly associated. Nurses with a Diploma in Nursing degree were 2.208 times more likely to have high MHL-work compared to nurses with a Bachelor of Nursing degree (95% CI: 1.029–4.738; p=0.042). These findings indicate that different levels of education are associated with MHL-work levels. Length of service shows a similar pattern, with an AOR of 2.851 (95% CI: 1.353–6.005; p=0.006), which means that nurses with ≥5 years of service are almost 3 times more likely to have high MHL-work than nurses with <5 years of service (Table 3).

Conversely, the workload variable did not show a significant association with MHL-work (AOR=1.602; 95% CI: 0.741–3.464; p=0.231). This indicates that the workload level does not have a direct association with the MHL-work level after taking other variables into account. For the variable of previous MHL-work training history, an AOR of 3.575 was obtained (95% CI: 1.674–7.635; p=0.001). This means that nurses who have participated in MHL-work training are more than 3.5 times more likely to have high MHL-work compared to those who have never participated in training (Table 3).

Overall, these findings indicate that gender, highest level of education, length of service, and previous MHL-work training history are factors that are significantly associated with MHL-work levels among nurses in PHC. Meanwhile, workload is not significantly associated. These findings provide empirical evidence that training programs, work experience, and individual background play an important role in improving MHL-work among nurses

The results of multivariate logistic regression analysis (Table 3) on SDE exposure components show that all SDE exposure variables have a significant association with nurses' MHL-work levels. The variable of the number of reflective discussion and practice sessions attended showed a regression coefficient (B) value of 0.847 with an AOR of 2.333 (95% CI: 1.091–4.986; p=0.029). This indicates that nurses who participated in reflective discussion and practice sessions with high intensity had approximately 2.3 times greater chance of having high MHL-work compared to nurses who participated in fewer discussion sessions, after accounting for other variables.

For the variable of total e-learning duration, B=1.260 was obtained with an AOR of 3.524 (95% CI: 1.663–7.466; p=0.001). This indicates that nurses with longer e-learning duration have more than 3.5 times greater odds of having high work MHL compared to those with shorter learning duration. This finding confirms the importance of sufficient time involvement in the e-learning process to improve work MHL. The variable of the number of modules completed was also significantly associated. The coefficient was B=0.962 with an AOR of 2.617 (95% CI: 1.183–5.785; p=0.018). This means that nurses who completed more e-learning modules had approximately 2.6 times higher odds of having high MHL-work compared to those who completed fewer modules. The more modules completed, the greater the likelihood of increased MHL-work (Table 3).

Meanwhile, the variable of the number of patients with mental disorders treated showed the largest coefficient (B=1.309) with an AOR of 3.703 (95% CI: 1.764–7.774; p=0.001). This indicates that nurses who treat more patients with mental disorders are nearly 3.7 times more likely to have high MHL-work compared to those who treat fewer patients with mental disorders. Broader clinical experience in treating patients with mental disorders appears to contribute significantly to increased MHL-work (Table 3).

The results of the study show that the higher the exposure to SDE, whether through the number of reflective discussion sessions and practices, the total duration of e-learning, the number of modules completed, or the number of patients with mental disorders treated, the higher the likelihood of nurses having good work MHL. Thus, exposure to SDE is an important factor that can be utilized in programs to strengthen work MHL in nurses.

DISCUSSION

The study found that the SDE-based mental health program effectively improved nurses' MHL-work in West Lombok PHC. The analysis showed significant differences in MHL-work levels based on several individual characteristics, namely gender, highest level of education, length of service, workload, and previous MHL-work training history. This indicates that demographic factors and work experience play an important role in determining the success of SDE implementation as a strategy for improving nurse capacity. The study findings are in line with adult learning theory (andragogy), which emphasizes the importance of experience, motivation, and work context in improving the effectiveness of independent learning (24).

The gender variable shows a significant association with MHL-work levels. Male nurses are more likely to have high MHL than female nurses. The results of the study can be interpreted to mean that male nurses in West

Lombok PHC may have greater opportunities or exposure to mental health cases in the field, thereby increasing their knowledge and skills. However, the literature also shows that gender differences in MHL are often related to differences in perception, self-confidence, and access to learning resources (25). Therefore, the SDE program needs to consider a more inclusive and gender-sensitive approach so that its effectiveness is evenly distributed.

The study findings indicate that the highest level of education has a significant association with the level of MHL-work. Nurses with a Diploma in Nursing have a higher proportion of MHL-work than nurses with a Bachelor's degree in Nursing. This phenomenon is interesting because, in theory, a Bachelor's degree should provide a broader foundation in mental health science. These results may be due to differences in curriculum focus, clinical practice experience, or additional workloads for nurses with a Bachelor's degree, which limit the time available to utilize SDE (26). The study findings emphasize the importance of developing SDE modules that are tailored to the needs and educational backgrounds of nurses in order to accommodate differences in their basic competencies.

The length of service variable was also significantly associated with the level of work-related MHL. Nurses with ≥5 years of service were more likely to have high MHL compared to those with <5 years of service. Longer work experience allowed nurses to encounter more mental health cases and become more accustomed to treating patients, making it easier to absorb and apply SDE material (27). This is consistent with previous studies which state that work experience is one of the key factors that influence the ability of health workers to identify and treat mental health disorders (28). Thus, the SDE program can serve as a refreshing medium as well as a means of strengthening the competencies of senior nurses.

Although many studies show that workload is related to the performance of health workers, the study found that workload had no significant association with the level of work-related MHL. Although nurses have a high workload, this does not reduce the sustainability of the SDE program in improving work-related mental health. This condition may be due to the flexibility of the SDE method, which allows participants to study independently in their spare time, so that it does not interfere with their routine tasks (9). The study findings support the concept of e-learning as a means of continuous learning that is adaptive to the time constraints of healthcare workers (3).

The variable of previous MHL-work training history showed a highly significant association with the level of MHL at work. Nurses who had previously participated in MHL training were more likely to have high MHL after participating in the SDE program than those who had not. This shows that previous training served as baseline knowledge that made it easier for participants to absorb new material from SDE (16). In other words, SDE can be an effective reinforcement tool to strengthen existing knowledge and skills (29). The study's findings are in line with the principles of blended learning, which emphasize a combination of face-to-face learning and technology-based independent learning for optimal results (13).

The results of the study show that the SDE-based mental health program has been proven to have a significant association with improving the work quality of MHL at the West Lombok PHC. All SDE exposure indicators analyzed, including the number of reflective discussion and practice sessions attended, total e-learning duration, number of modules completed, and number of patients with mental disorders treated, showed a significant association with MHL-work levels. The study findings indicate that the intensity and quality of nurses' involvement in the SDE program have a real impact on improving their knowledge, attitudes, and skills in dealing with mental health issues in the workplace.

SDE is an independent learning method that allows participants to learn at their own pace, according to their needs and schedule (30). In the context of this study, the active involvement of nurses in various learning activities, both through reflective discussions and practice, was key to the program's success. These results are consistent with adult learning theory (andragogy), which emphasizes the importance of active participation, experience, and relevance of material in the adult learning process (7). Thus, the higher the nurses' exposure to SDE components, the greater their chances of improving work MHL.

The study findings show that nurses who participate in more reflective discussion and practice sessions have a greater chance of achieving high MHL-work compared to those who participate in fewer sessions. Reflective discussions provide opportunities for nurses to share experiences, analyze real cases, and receive feedback from facilitators and peers (31). Practices accompanying discussions help internalize the material more deeply (10). This is in line with a study by Kavanaugh (2021) which states that reflective and experiential learning approaches improve understanding and knowledge retention among healthcare workers (32).

Reflective discussions in SDE also serve as a means of forming positive attitudes and improving critical thinking (33). Through discussion, nurses not only receive information passively, but also process, critique, and relate the material to their work context (2). This process helps nurses more quickly recognize the signs and symptoms of mental disorders in patients, and increases their willingness to support colleagues experiencing mental health issues (27). In other words, the more often they participate in reflective sessions, the higher their ability to apply MHL-work in practice (8).

The total duration of e-learning also shows a significant association with improvements in work-related MHL. Nurses who allocate more time to learning have a greater chance of comprehensively understanding the material and completing the available modules. Longer learning times allow participants to review the material, explore additional resources, and delve deeper into relevant topics (34). This supports the spaced learning theory, which states that repeated and scheduled learning is more effective than rushed or brief learning (35).

Adequate learning duration also allows nurses to be more flexible in integrating learning with their work schedules (10). SDE offers the advantage of being accessible at any time, so it does not interfere with daily work at PHC. With good time management, participants can maximize their learning time to strengthen their competencies (13). This explains why in this study, longer learning duration is directly proportional to an increase in MHL-work.

The results of the study also show that the number of modules completed is positively associated to the level of occupational MHL. Nurses who completed more modules had a broader and deeper understanding of occupational mental health topics (35). The modules are designed systematically and progressively, so that each module complements the previous knowledge. The more modules completed, the higher the nurses' skills in recognizing mental disorders, making appropriate decisions, and demonstrating a positive attitude towards patients and colleagues (9).

Completing the module also provides participants with the opportunity to self-evaluate the competencies they have achieved (28). This process supports the formation of independent learning habits (lifelong learning), which are important for healthcare workers. Previous studies have shown that healthcare workers who are accustomed to independent learning are more adaptive to scientific developments and more confident in clinical practice (31). Therefore, completing the modules in SDE not only improves MHL-work, but also strengthens the overall professional capacity of nurses.

The variable of the number of patients with mental disorders treated was also found to be significantly related to the level of MHL-work. Nurses who more frequently treat patients with mental disorders tend to have broader practical experience, making it easier for them to apply SDE material (10). This hands-on experience reinforces the theoretical understanding gained through e-learning, while also improving empathy, communication, and clinical decision-making skills (3). Thus, exposure to real-life cases strengthens the association between SDE and improved work-related MHL (32). The study findings emphasize the importance of comprehensive and sustainable SDE programs as a strategy to strengthen nurses' ability to understand, recognize, and support mental health in the workplace.

Study Limitations

The cross-sectional study design only allows for the identification of the association between the SDE-based mental health model and the strengthening of MHL in nurses, but cannot yet prove a direct causality. The data obtained is largely based on self-reports from respondents who are prone to recall bias and social desirability bias, which may affect the accuracy of information regarding exposure to reflective discussion sessions, e-learning duration, number of modules completed, and the number of patients with mental disorders treated.

In addition, the study was conducted in a relatively limited scope, namely among nurses at PHC West Lombok, so the results may not fully represent the characteristics of nurses in other areas with different resource conditions, workloads, and training experiences. Other important variables that could potentially influence MHL strengthening, such as organizational support, leadership style, or the quality of e-learning materials, were not explored in depth in this study. Thus, further studies with a longitudinal design and broader regional coverage are needed to more comprehensively test the effectiveness of this SDE model in improving nurses' MHL in various healthcare settings.

Implications and Recommendations for Future Research

The results of this study confirm that the success of SDE-based mental health programs in improving nurses' MHL-work is largely determined by the extent to which participants are exposed to various learning components. The more reflective discussion and practice sessions they attend, the longer the duration of e-learning, the more modules they complete, and the more patients with mental disorders they treat, the higher their MHL-work. These findings have important implications for managers of nurse training programs in PHC, namely the need to ensure equitable access, time management support, and monitoring of participant engagement so that the effectiveness of SDE can be optimal and sustainable.

CONCLUSIONS

The study results confirm that SDE-based mental health programs have been proven to have a significant association with improving the MHL performance of nurses in PHC. Individual characteristics such as gender, highest level of education, length of service, and previous MHL-work training history play a significant role in nurses' MHL-work levels. Male nurses with ≥5 years of work experience, a D3 Nursing degree, and a history of previous MHL training are more likely to have high MHL-work compared to other groups. Conversely, workload does not show a significant association and therefore is not a dominant factor in strengthening MHL-work. The study findings reinforce the understanding that educational background, work experience, and previous training experience are important factors in nurses' readiness to adopt new knowledge and skills acquired through the SDE program.

In addition to demographic factors, exposure to the SDE program has been shown to have a strong and consistent association with improved MHL-work. Nurses who participated in more reflective discussion and practice sessions, had longer total e-learning study durations, completed more learning modules, and had more experience treating patients with mental disorders showed a significantly higher chance of having good MHL-work compared to nurses with lower exposure. Thus, SDE-based mental health programs are not only effective in improving nurses' knowledge and positive attitudes toward mental health in the workplace, but also capable of strengthening their practical abilities in recognizing, supporting, and handling mental health issues in PHC. The study results indicate that SDE can be used as an appropriate continuous training strategy to improve nurses' capacity in primary mental health services.

AUTHOR'S CONTRIBUTION STATEMENT

S, WDS, and MH: Conception and designing of work, data acquisition and analysis, along with manuscript writing, and revision. S and MH: Conception of work, data analysis, and data acquisition. All authors critically reviewed the manuscript and gave final approval of the manuscript.

CONFLICTS OF INTEREST

The authors declare that they have no conflict of interest.

DECLARATION OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

Using Grammarly for Punctuation and Grammar Correction in manuscript.

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