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E-emsy Development in the Implementation of Psychiatric Emergency Training for Nurses and Doctors

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ABSTRACT
The use of e-learning as an internal training medium for medical personnel in Bantul Regency has not been implemented by the hospital as an effort to develop human resources, especially for handling psychiatric emergencies. Since 2016, Bantul Regency was in the top rank in Indonesia for its number of people with mental disorders (ODGJ), as many as 3,875. Thus, it is necessary to develop internal training in the form of emergency psychiatric training using e-learning. This study aimed to develop a web-based e-learning system with material competencies addressed to emergency psychiatric training as well as test the e-learning system on the effect of distance learning in improving the access to health education, ease of application, and development of quality and competent health resources. The research method used was R&D (Research and Development). Data collection was carried out by disseminating validation questionnaires to the subjects of doctors and nurses at community health centers in Bantul, as well as IT experts. The data were analyzed using the validity test, reliability test, frequency test using SPSS, and gray clustering. The process of developing this web application employed WordPress Content Management System (CMS). From the validity test results, all instruments showed the value of R-count> R-table, and the reliability test results of the instrument produced a value of 93.4%. According to the frequency test results, it is revealed that there are more users who agree with the innovation. Meanwhile, the gray clustering analysis results indicated that the Eleaning Emergency of Psychiatry (E-emsy) application was acceptable, and there was no need for improvement.

Keywords: *E-learning development, emergency psychiatry, CMS*

1. INTRODUCTION

The development of information technology in Indonesia's education sector continues to increase as evidenced by the Regulation of the Minister of Education and Culture Number 109 of 2013 concerning distance education. Distance education is an adaptation of technology-based education where teaching and learning activities are carried out remotely through the use of various communication media. Moore & Kearsley stated that technology development in the education sector has reached the 5th generation, namely internet or web-based education with the name e-learning[1]. E-learning is the use of information and technology to create a more flexible learning experience because it can be accessed anywhere[2]. E-learning in Indonesia aims to increase the expansion and distribution of access to education under Government Regulation Number 17 of 2010 Article 118 paragraph 1.

The use of e-learning in Indonesia can be a training medium that can reduce costs and save time if several learners are geographically separated. In this case, one of the human resources that need to be given the training to develop knowledge and expertise is medical personnel or health human resources. According to Depkes (Health Department), health human resources are professional health workers, strategic health workers, non-professional health workers, and health support or support personnel who are involved, work, and devote themselves to health efforts and management. Moreover, Indonesia is a member country of the South East Asia Regional, which is required to continue to improve the quality of health services[3]. Quality services are obtained from competent health human resources. One way to meet this demand is by providing training for them[4].

Internal training is usually given face-to-face. Nurses and doctors are physically present at the time set by the institution, causing nurses who work using the shift system to feel annoyed because they have to come to the hospital for internal training. Therefore, an alternative is needed to answer this problem, that is by providing e-

learning. Research uncovered that the application of e-learning by sharing knowledge and skills systematically at Singapore General Hospital (SGH) had a positive impact[5]. Through formal methods, the learning was carried out through interactive training modules and presentation slides with a narrative. Meanwhile, the informal method was conducted by peer group discussions and journal reviews.

Internal training using e-learning is crucial for nurses and doctors to improve their skills and knowledge. However, such training in Indonesia has not been carried out by many hospitals. Therefore, it is necessary to develop that kind of online training on handling cases of psychiatric disorders for nurses and doctors because it will be beneficial for them to master the emergency psychiatric material. Hence, it is necessary to develop E-emsy in implementing the emergency psychiatric training[6].

2. RESEARCH AND DEVELOPMENT METHODS

2.1. Research Methods

The development process was based on the instructional materials development designed by Borg and Gall. According to Borg and Gall, research and development (R&D) approach consists of ten stages. The stages in research and development are shown in Figure 1.

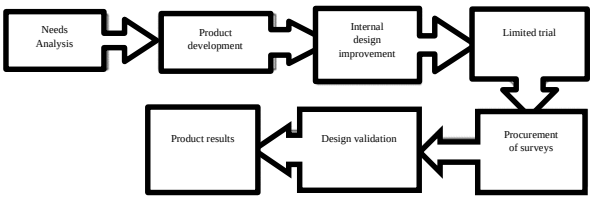

Figure 1. The stages of the research and development model

In the development process, limited trials and surveys using questionnaires to users are performed, and at the end of the process, the system result that has been developed is released. This development takes seven stages to develop the desired product in emergency psychiatric training. This development's final product is e-learning for web-based psychiatric emergency training using the course packet system.

The seven stages carried out in the study are as follows:

1. Needs analysis

   In making the system, there was a needs analysis stage. The needs analysis was obtained from literature studies and discussions with two psychiatrists, presented in tabular form and partly in the form of pictures or figures. Based on the discussions, the training was decided to use an online method with flexible time. Besides, the participants were instructed to read and understand the material provided by the instructor. After carrying out the process with the flow in Figure 2, the followings are the analyses obtained:

   a. In the first stage, the login page is to distinguish the admin as a system manager, the training instructor as a material carrier, and the participants as users.
   b. The participant dashboard page displays how many classes the participant has attended, and the participants' account name.
   c. The page to view participants' training classes
   d. The page to view class categories which is completed with class detail information
   e. The profile edit page for participants to set their name, mobile number, biodata, and profile photo
   f. Pages to manage the classes that the participants will participate in
   g. Pages for managing training materials
   h. Learning panel page to make it easier for participants during the training process
   i. The system must have a certificate feature that will provide a certificate if all the material has been followed completely.

2. Product development

   After performing a needs analysis, the authors then made an initial product of the online psychiatric emergency training web application used by the psychiatry team of Universitas Muhammadiyah Yogyakarta. In developing this web application, the authors employed a module created by the psychiatry team of Universitas Muhammadiyah Yogyakarta.

   The steps in making this psychiatric emergency online training web application are as follows:

   a. Determining the application used. In developing an application product, of course, several applications were needed to help the development process to be carried out correctly and adequately.
   b. Collecting materials to fill in the content, such as material containing images, videos, presentation slides, and learning modules
   c. Making a design
      1) Preparing text
         Text preparation in question was to prepare all material and data that would be inputted into the psychiatric emergency training application. Data were in the form of material, questions, answers, and everything that supported the text in making the system.
      2) Installing the WordPress CMS
         At this stage, the researchers installed a psychiatric emergency training application on the hosting server[7]. All components prepared would be transferred into the installation, so that the emergency psychiatric training application could work as expected[8].
      3) Inputting pictures and training materials
         Images and materials included in the emergency psychiatric training application

were from the psychiatry team of Universitas Muhammadiyah Yogyakarta.

4) Combining
Components that have been previously collected were arranged and combined to make the application of emergency psychiatric training more systematic.

3. Internal design improvement

After the product design was validated by a psychiatrist who was also the psychiatry team of Universitas Muhammadiyah Yogyakarta, based on Figure 3 that explains the suitability of the desired system, the weaknesses or shortcomings of the psychiatric emergency online training application could be determined. These weaknesses were then corrected to produce a better and more effective product.

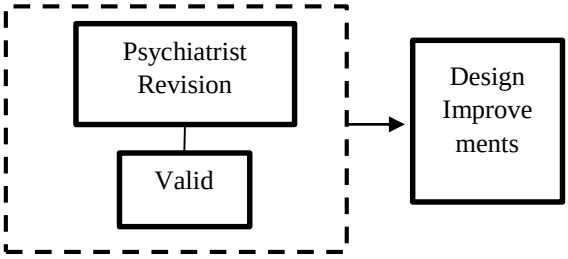

Figure 2. The flow of internal design improvement for application development

4. Limited trial

In this testing process, the authors only conducted trials in small groups or limited trials. A limited trial was carried out on 42 nurses and doctors. In this trial, respondents were given complete guidelines for participating in online training for emergency psychiatry and a questionnaire consisting of 12 questions regarding the application's quality.

5. Procurement of surveys for IT experts

It was addressed to information technology experts and trainees to determine whether the developed application was valid or not in terms of the ease of the application, the speed of the access, and the suitability. Validation sheets were utilized to find out whether the applications and instruments designed were valid or not. The validation instrument was prepared based on the assessment criteria of the information media instrument outline, information technology, clarity, and suitability of user characteristics. The questionnaire sheet instrument outline for IT experts is presented in the following table:

Table 1. The outline of information media validation, information technology, and effectiveness by the IT experts

No.	Assessment aspects	Indicators	Question number
	Media	Effectiveness and efficiency	1
		Loading speed	2
		Clarity of language	3
	Information Technology	Neat interface design	4
		The attractiveness of interface design	5
		Neat animation and image layout	6
	Clarity	Color contrast accuracy	7
		The match between the font type and the target characteristics	8
		Font size suitability	9
	User Characteristics	Image size accuracy	10
		Ease of navigation e-learning	11
		Ease of understanding the procedure for using e-learning	12
	Simplicity and Effectiveness	Suitability of selecting symbols, icons, and buttons	13
		The suitability of e-learning to user characteristics	14
		Product suitability for interactive multimedia characteristics	15

6. Design validation

Questionnaire sheet for participants or users of validation sheet was addressed to participants or users to determine whether the developed application was considered valid or not in terms of the ease of the application, application appearance, and application suitability. The questionnaire sheet instrument grid for participants is displayed in the following table:

Table 2. The outline of the user validation questionnaire instrument

No.	Assessment aspects	Indicators	Question number
	Convenience	The operation of the web application is easy to learn.	
		Web application interactions are easy to understand.	
		The web application is easy to use for learning purposes.	
		The web application has an attractive appearance.	
	Display	The web application has an attractive appearance.	
		The web application creates an atmosphere of a learning/ training community.	
		Web applications have a variety of content forms such as video, display, text, and images.	

		The web application has a variety of quizzes that support training.	
	Suitability	The web application has rich material that is competent and organized.	
		The web application provides features that support the training process.	
		The web application is compatible with the appearance of a training website in general.	
		Web applications can be implemented for psychiatric training purposes as soon as possible.	

7. Material maturity outline

Table 3 serves the indicators to find out whether the material in the application is weighty or not.

Table 3. Material readiness

No.	Aspects	Indicators	Question number
	Material relevance	The relevance of material with KI (Core Competencies) and KD (Basic Competencies)	1
		The truth of the material concept from a scientific aspect	2
	Organizing material	The delivery of the material is clear and systematic.	
		Material usefulness	
		Material completeness	
		Material actuality	
		The suitability of the evaluation with the material	
	Evaluation and practice questions	Concept correctness of questions	
		The truth of the answer key	
		Variation of questions	
		Problem difficulty level	
	Language	The accuracy of using terms	
		The Ease of understanding the flow of material through use and language	

2.2. Testing Method

This study used data from the questionnaire results to be carried out for the validity test, reliability test, frequency test[9], and gray clustering test. To answer the statements that have been described, the researchers employed a Likert scale table, as shown in the column below:

Table 4. Likert scale table

Answer Scale	Letter	Value
Strongly agree	SA	5
Agree	A	4
Quite agree	QA	3
Less agree	LA	2
Disagree	DA	1

1. Validity test

The instrument is said to be valid if r-count> r-table. This study's validity test involved 46 respondents from nurses and doctors and 32 respondents from IT experts, with an alpha (α) significance value of 5% or 0.05.

2. Reliability Test

This reliability test employed consistency to measure reliability, while the coefficient used was the Cronbach Alpha method to test the instrument. The measurement indicator is reliable if the results of the reliability test show several parts as follows:

0,800 - 1,000: Very high
0,600 - 0,799: High
0,400 - 0,599: Moderate
0,200 - 0,399: Low
0,000 - 0,199: Very low

3. Frequency test

The frequency test is a descriptive statistic that describes data in a quantitative form that does not include hypothesis making. Frequency description statistics in this study were used to:

a. Understand the frequency of each data variable
b. Understand the distribution of responses from each respondent (for example: agree, disagree, etc.)

4. Gray clustering test

The white weight function in gray clustering analysis was used for similar factors to create complex but simplified systems. The advantage of gray clustering analysis is to treat the distribution of the sample object grouping without special requirements through a simple calculation process to obtain more useful grouping information.

Classification validity (ηj) was determined by various criteria, where $0 < \eta j < 1$. The closer the value of 1, the more important the criterion is. This research was conducted on two experts (in Mental Health).

The classification group is defined as *k*. Each k has three parts, namely:

a. Class k = 1 (colored green) in web version, no need for improvement
b. Class k = 2 (colored yellow) in the web version, criteria can be accepted, provided that there is a need for a systematic or logical revision of the criteria concerned.
c. Class k = 3 (colored red) in the web version, the criteria cannot be accepted, so there is a need for an overall improvement process on the criteria concerned.

2.3. Design and Development

This website design included several things, such as use cases, designing activity diagrams, and designing the appearance of the online psychiatric emergency training web application[10].

1. *Use case diagram*

Use case diagrams illustrate the impact of functionality expected by the system. As a rule, a use case can be included more than another so that duplication of functionality can be avoided by pulling out common functionality[11].

a. Use case diagram for admin
The use case diagram is shown in Figure 5.

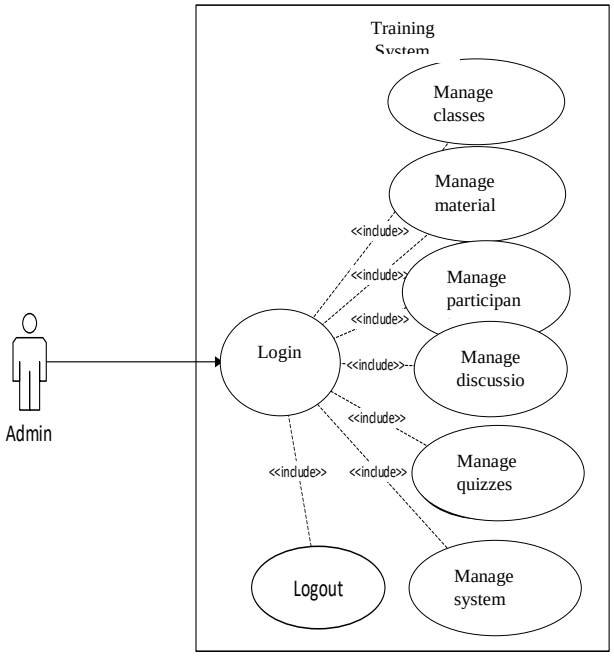

Figure 3. Use case diagram for admin

1) Login
Admin must first log in and enter a username and password before they can take the next steps.
2) Manage classes
Admin can manage classes or courses such as adding, deleting, changing, and viewing classes. Later, the classes will be displayed to users or participants.
3) Manage materials
Admin can manage the material in each class or course, such as adding parts of the material or lessons on each topic.
4) Manage discussion forums
Admin can manage discussion forums such as viewing, editing, deleting, and changing discussion data.
5) Manage quizzes
Admin can manage quizzes, such as seeing participants who have taken the quiz and assessing them.
6) Manage system
Admin can manage the training system by changing certificate settings, profiles, views
7) Logout
Admins can log out from the admin dashboard by logging out.

b. Use case diagram for instructor
The training instructor's use case is displayed in Figure 4.

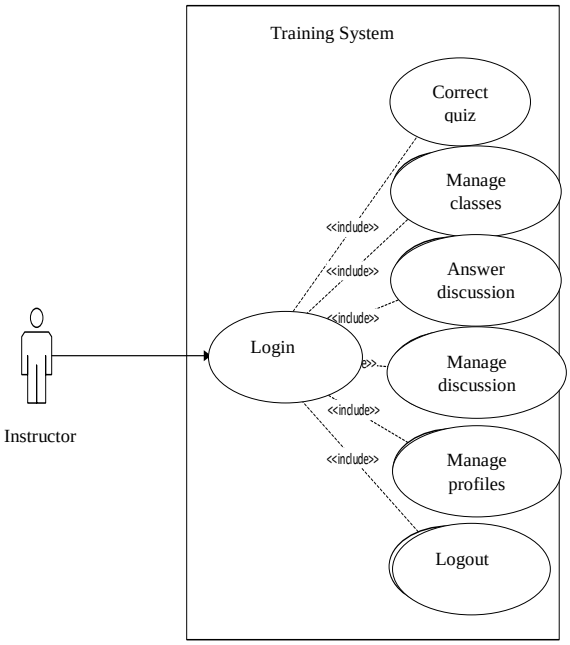

Figure 4. Use case diagram for instructor

1) Login
The instructor must log in first and enter a username and password before carrying out the next steps.
2) Correct quiz
The quiz that has been done by participants will be corrected by the instructor in each training class.
3) Answer discussion forums
In the discussion forum, there will be participants who ask and answer questions with the instructor. Later, the instructor can

answer, so that there is an interaction between the participants and the instructor.

4) Manage discussion forums
   The instructor can delete and view discussion data submitted by participants.
5) Manage profiles
   The instructor can manage profiles, such as changing names, uploading profile photos, and changing biodata, so that participants can recognize the instructor easily.
6) Logout
   The instructor can exit the instructor dashboard by logging out.

c. Use case diagram for participants
Use case diagramfor participants are exhibited in Figure 5.

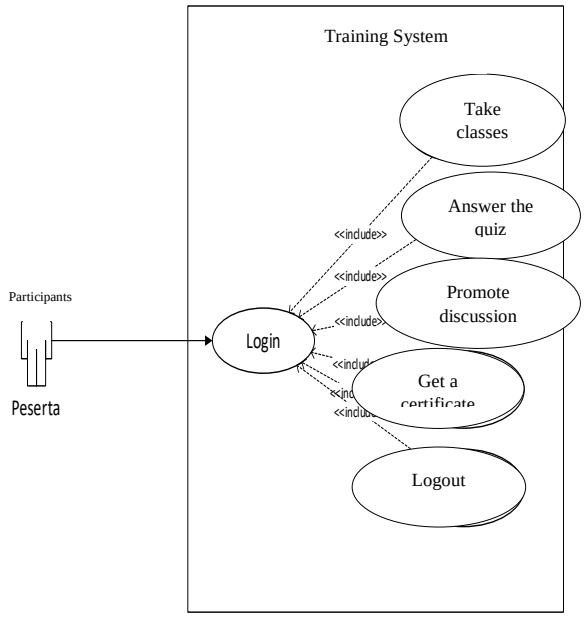

Figure 5. Use case diagram for participants

1) Login
   Participants must first log in and enter a username and password before they can take the next steps.
2) Take classes
   Participants can attend or enroll in classes that have been provided by the instructor. In the class, participants can see the material displayed per topic.
3) Propose discussion
   Participants can propose a discussion with the instructor to create an interactive space.
4) Answer the quiz
   Participants can follow and work on quizzes that have been made by the instructor and get results after working.
5) Obtain a certificate
   After participants have followed all the material completely, participants will get a certificate based on the class they take.
6) Logout
   Participants can exit the instructor dashboard by logging out.

2. Activity diagram

An activity diagram is a description/ flow of the system work order indicated by actions and activities[12].

a. *Activity diagram login*
The admin activity diagram is shown in Figure 6.

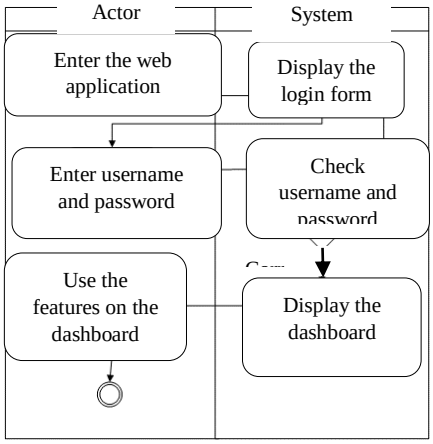

Figure 6. Activity diagram login for participants

Activity login applies to all actors. Figure 6 explains that when the actor enters the web application, a login form will appear, and the actor will enter a username and password on the form. Then, the system will check the username and password whether it matches or not. If it does not match, the system will display the login form again and give an error message that the username and password are incorrect. If the username and password match, the actor can enter the dashboard and access the features.

b. *Activity diagrams for admin and instructor in managing classroom*
This activity applies to the training administrator and instructor roles. Figure 7 explains that when accessing the dashboard, the system will display the dashboard of each role. To manage classes, both roles must go to the Class menu, then My Course to manage classes, such as adding, changing, deleting, and viewing classes. Then, after managing, the system will save the changes.

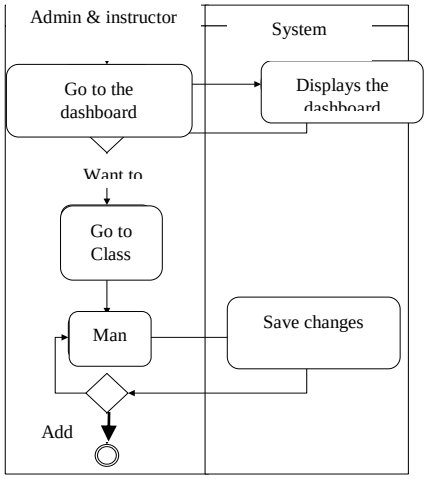

Figure 7. Activity diagram for admins and instructors in managing classroom

c. *Activity diagrams for admin and instructor in managing materials*

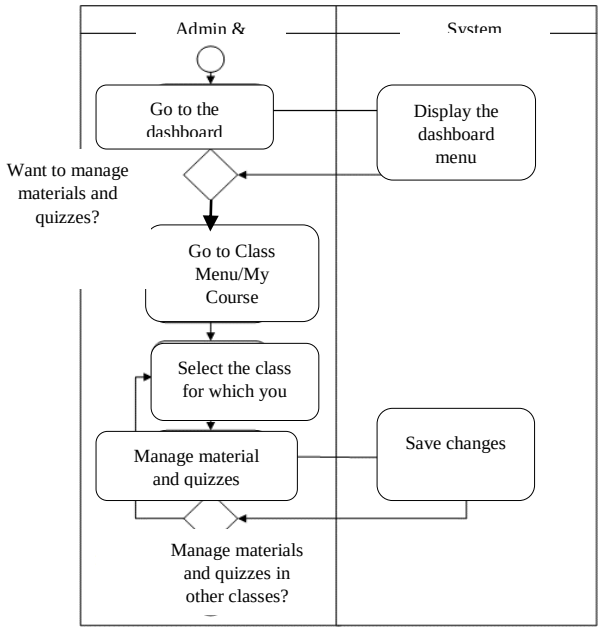

Figure 8. Activity diagrams for admins and instructors managing materials and quizzes

This activity applies to the admin and instructor roles. In Figure 8, it is explained that when accessing the dashboard, the system will display the dashboard of each role. To manage the material, both roles must go to the Class Menu/ My Course, then select the class to manage the material and quizzes, such as adding, changing, deleting, and viewing material and quizzes in each class. Then, after managing, the system willve changes.

d. *Activity diagrams for admin and instructor managing discussion forums*

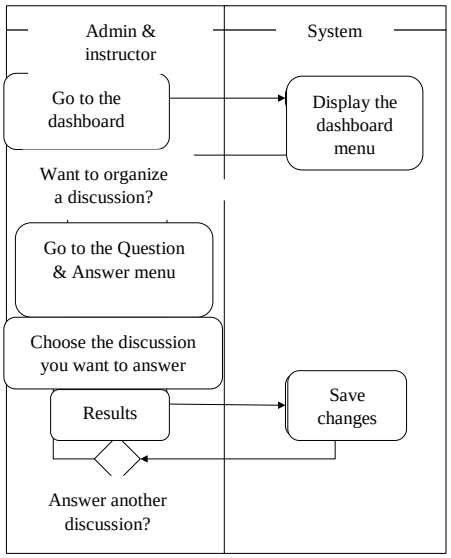

Figure 9. Activity diagrams for admin and instructor managing the discussion forum

This activity applies to training admin and instructor. Figure 9 explains that when accessing the dashboard, the system will display the dashboard of each role. To manage discussions, both roles must go to the Question & Answer menu, then select the discussion forum to manage. Managing discussion forums include asking, changing, deleting, and answering questions from participants in each class, specifically on the learning panel. Then, after managing, the system will save changes.

e. *Activity diagram for participants attending class*

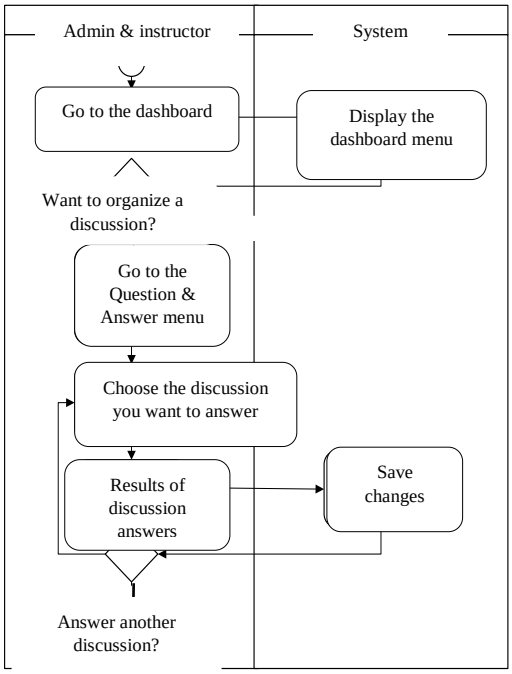

Figure 10. Activity diagram for participants joining the class

The activity in Figure 10 applies to the role of the participants. This activity explains that when accessing the main page, the application will display class choices followed by participants. To join one of the classes, participants must enroll or enter the class. Then, after enrolling, participants can start the selected class. The system will display a learning panel containing materials, quizzes, and a discussion forum according to the selected class.

f. *Activity diagram for participants getting a certificate*

activity in Figure 11 applies to the role of the training participants. This activity explains that when participants complete the material and quizzes, then the system shows that the progress has been completed, and the quiz reaches the passing grade determined by the instructor; participants will get a certificate of the results of the learning process according to the selected class.

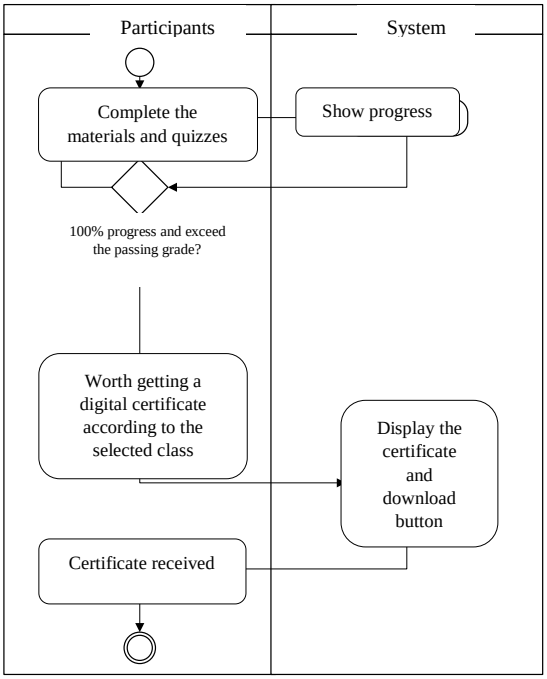

Figure 11. Activity diagram for participants getting certificates

g. Activity diagram to l*og out*

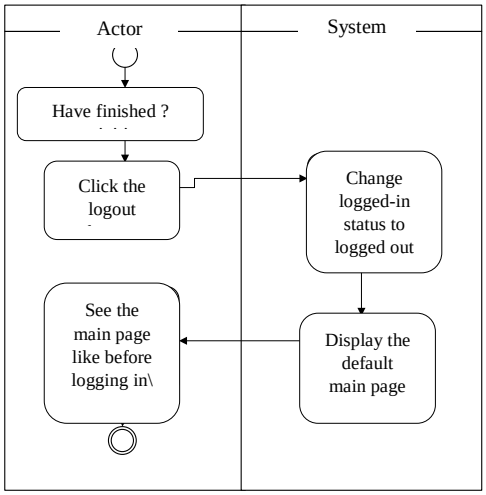

Figure 12. Activity diagram to log out

Activity in figure 12 applies to all roles. This activity explains that when the actor or role has finished carrying out activities, the actor can log out to end the session. Then, the actor will exit the account, and the system changes the account status from logged in to logged out.

3. RESULTS AND DISCUSSION

3.1. Needs Analysis Stage

The needs analysis stage was the initial stage carried out in this development process. Based on the results of literature studies and discussions with two psychiatrists, namely Shanti Wardaningsih, Ns., M.Kep., Sp.Kep.J., Ph.D. and Dr.dr. Warih Andan Puspitasari, M.Sc., Sp.KJ (K), the training process in the realm of emergency psychiatry has never been done online. The problem found in this research and development is that there was no online development of emergency psychiatric training[13]. However, nurses and doctors also have relatively busy jobs, so they cannot attend training if it is done face-to-face. For this reason, the authors developed a psychiatric emergency online training system for doctors and nurses. This system can be used as a training medium that provides materials, interactive quizzes, interactive media (videos, images, and presentation slides), discussion forums, and certificates after participants attend the training.

3.2. Application Development Results Stage

After designing and analyzing, the next stage is implementing the developed application. To implement application development, the authors used WordPress Content Management System (CMS)[14] [15].

1. Admin login page

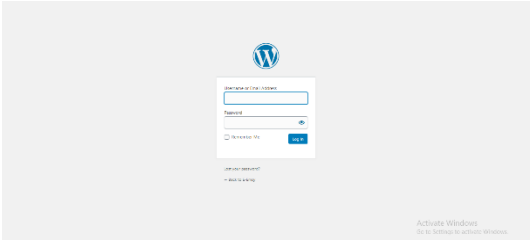

Figure 13. Admin login page

The admin login page is displayed in Figure 13. Admin must enter a username and password before accessing the features provided by WordPress[16].

2. Admin dashboard page

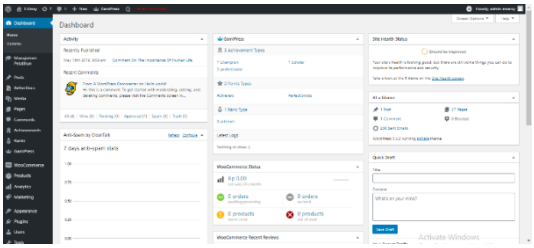

Figure 14. Admin dashboard page

The admin dashboard page exhibited in Figure 14 is a page for managing all of the contents of the psychiatric emergency online training application.

3. Participants and instructor login page

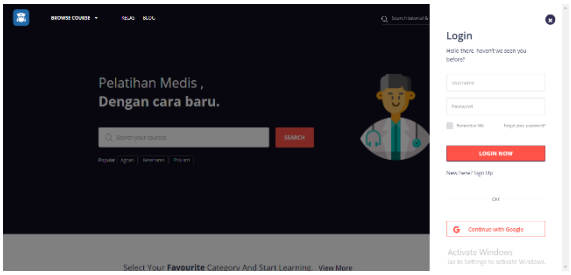

Figure 15. Participants and instructor login page

The login page for the participants and the instructor is shown in Figure 15. Participants and instructor log in to the same login panel. If they enter the wrong username and password, a warning will appear as displayed in Figure 16.

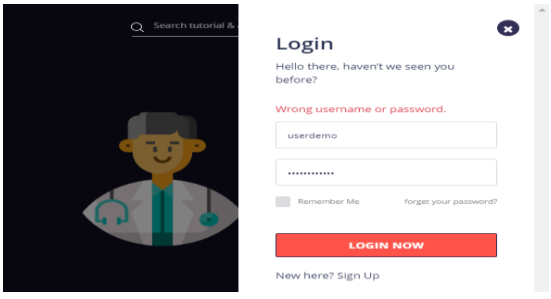

Figure 16. Warning for username and password errors

4. Participant dashboard page

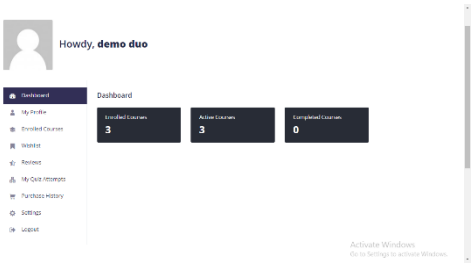

Figure 17. Participant dashboard

As exhibited in Figure 17, on the participant dashboard page participants can check which classes are being attended and which have been completed. Participants can also check what quizzes have been done. The display for checking what classes are being attended and which have been completed can be seen in Figure 18.

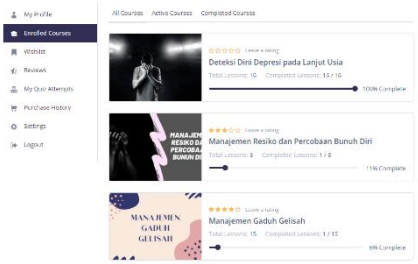

Figure 18. Display of the classes that have been followed

5. Instructor dashboard page

The instructor dashboard page display can be seen in Figure 19. The instructor can see what classes have been created. In addition, the instructor can create other classes. The instructor can also check the results of the quiz in the form of an essay or descriptive question.

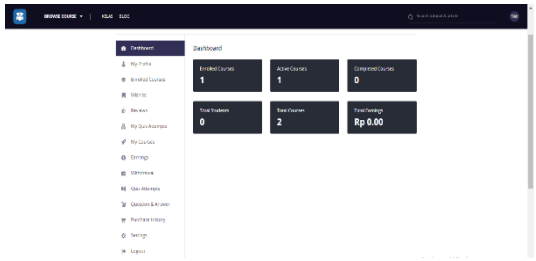

Figure 19. Instructor dashboard display

6. Display when the instructor creates a class

As seen in Figure 20, when the instructor creates a class, a panel filling in class information will appear, such as class titles, class descriptions, class materials, class quizzes, and other information.

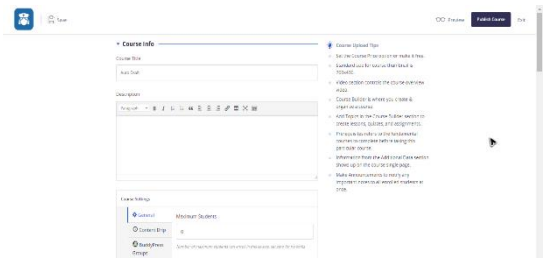

Figure 20. Instructor display while creating a class

7. Class detail page

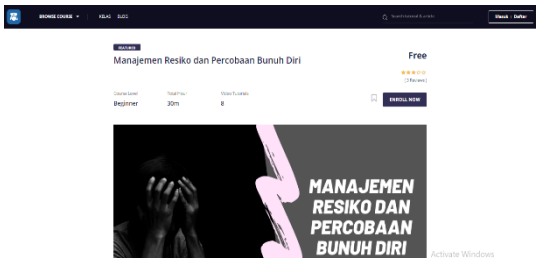

Figure 21. Class detail page

In the picture, there is a display when participants find the class they want and will join that class. Then, class detail will be displayed and provide information related to that class.

8. Participant learning page

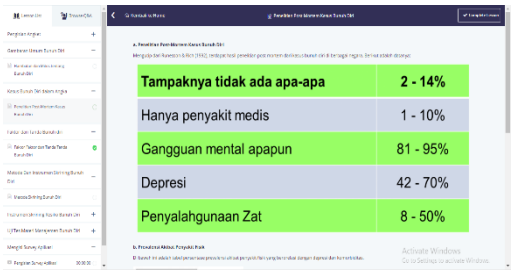

Figure 22. Participant learning page

In figure 22, there is a display of the participant learning panel. This display explains that participants can learn the material that has been prepared by the instructor in sequence.

Participants can also carry out discussions on the learning panel to create a discussion or interactive space between the instructor and participants. The display of the discussion panel can be seen in Figure 23.

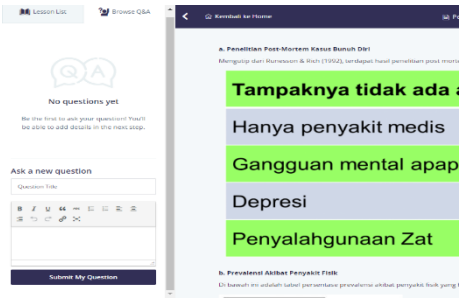

Figure 23. Discussion room display

Of course, the instructor will also give a quiz to see the results of the learning process. The quiz is made together with all the materials in the study panel. Based on Figure 24, the quiz must be done based on the passing grade set by the instructor.

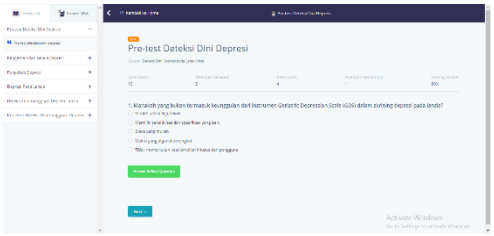

Figure 24. Display of quiz work

After the participants have completed all the material and have exceeded the passing grade of the quiz, they will get a certificate as exhibited in Figure 25. After receiving a certificate, participants can take other classes and gain useful knowledge.

Figure 25. Certificate form

3.3. Trial Phase

Researchers conducted trials on 46 nurses and doctors. Researchers gathered nurse and doctor respondents to attend emergency psychiatric training and fill out a user validation survey questionnaire on the E-emsy web application for emergency psychiatry training. Furthermore, the researchers assembled 32 IT expert respondents to fill out a validation survey questionnaire in terms of information media, information technology, and effectiveness in the E-emsy application.

3.4. Validity Test Results

All statement items used for data collection consisting of 12 statements were valid, seen from the R-count value> 0.29. Thus, the statement instrument could be used for further research. As the validity test results on IT expert respondents' data, all statement items employed for data collection consisting of 15 statements were valid, seen from the R-count value> 0.349. Therefore, the statement instrument could be used for further research.

3.5. Reliability Test Results

According to George et.al [17], the instrument's reliability level using the criteria α> 0.9 was satisfactory. Based on the Cronbach Alpha value obtained by nurse and doctor respondents of 0.934 or 93.4%, which signified very high and very reliable, this questionnaire could be used in the long term. Meanwhile, for IT experts, the Cronbach Alpha value was 0.885 or 88.5%, indicating high and reliable so that this questionnaire could be used in the long term.

3.6. Frequency Test

The frequency test result revealed that the lowest statement was in the second statement, "I find it easy to understand when interacting with the online training web application E-emsy FKIK UMY." It denoted that many respondents who used the E-emsy application did not easily understand when interacting with the E-emsy online training web application. For that reason, there is a need for more in-depth education about the features in the E-emsy application. Meanwhile, for the results of the statement, the highest score was in the 12th statement, "I want the online training application E-emsy FKIK UMY to be applied for psychiatric training purposes as soon as possible." It indicated that the E-emsy application could be applied for psychiatric training purposes as soon as possible.

3.7. Gray Clustering Analysis for E-emsy Systems

In this study, the gray clustering analysis was utilized to analyze the criteria for each aspect of the E-emsy system in terms of IT used in data collection for IT experts. Classification validity ( ) was determined by various criteria, where 0 <ηj <1. The closer the value of 1, the more important the criterion is. This research was conducted with two experts. Based on the priority weight, the value of ηj was calculated as shown in Table 5.

Table 5. Results of the priority weight assessment of the IT expert survey statement

j	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
j^1	10	8	10	8	7	8	6	5	7	7	10	10	6	10	10
j^2	8	6	9	9	10	9	8	8	8	8	9	8	9	8	9
nr	9	7	9.5	8.5	8.5	8.5	7	6.5	7.5	7.5	9.5	9	7.5	9	9.5
nj	0.90	0.70	0.95	0.85	0.85	0.85	0.70	0.65	0.75	0.75	0.95	0.90	0.75	0.90	0.95

Description:

j = Statement number

j^1 = Priority weight assessment by the first expert

j^2 = Assessment of priority weight by the second expert

nr = Average value of the two weights

nj = Priority weight figures

Priority weight values were obtained from two IT experts. The researchers then used the formula for gray clustering to determine the class k = 1, k = 2, and k = 3. For the formula for gray clustering, it can be seen in the explanation below:

$$f^{k=1}(xj) =$$

$$f^{k=2}(xj) = \begin{cases} \frac{x}{2.5} & fo \\ \frac{5-x}{2.5} & fc \end{cases}$$

$$f^{k=3}(xj) = \frac{5-x}{5}$$

Description:

F = weight function
k = classification
x = the average of each criteria indicator

Then, the researchers did the calculations according to the formula determined by gray clustering. The results of these calculations can be seen in Table 6.

Table 6. Calculation results of gray clustering classification

j	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
avg	4.09	3.97	4.16	3.67	4.19	3.88	4.19	4.04	4.00	3.91	3.91	3.95	4.06	4.03	4.44
$f^{k=1}$	0.82	0.69	0.83	0.79	0.84	0.78	0.84	0.81	0.80	0.78	0.78	0.71	0.81	0.81	0.89
$f^{k=2}$	0.36	0.61	0.34	0.41	0.33	0.45	0.33	0.39	0.40	0.44	0.44	0.59	0.38	0.39	0.23
$f^{k=3}$	0.18	0.31	0.17	0.21	0.16	0.23	0.16	0.19	0.20	0.22	0.22	0.29	0.19	0.19	0.11

The number *j* is the criteria indicator that refers to Table 3, according to the number. After calculating the *k* classification results in the gray clustering analysis, these results were reprocessed using the following formula:

$$\sigma^k = \sum_{j=1}^{m} f_j^k(xj) \times nj$$

Description:
σ^k = Gray clustering coefficient
m = Total number of statements
j = statement
f_j^k ***(xj)*** = calculation figures for gray clustering classification
nj = expert priority weight figures

The formula above functions to find the results of statements from respondents who were IT experts in the classification class in three parts, namely k = 1, k = 2, and k = 3. After carrying out the calculation process, Table 7 was generated.

Table 7. Final gray clustering calculation results

criteria (j)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
weight (nj)	0.90	0.70	0.95	0.85	0.85	0.85	0.70	0.65	0.75	0.75	0.95	0.90	0.75	0.90	0.95
$f_{k=1}$ xj	0.82	0.69	0.83	0.79	0.84	0.78	0.84	0.81	0.80	0.78	0.78	0.71	0.81	0.81	0.89
$f_{k=2}$ xj	0.36	0.61	0.34	0.41	0.33	0.45	0.33	0.39	0.40	0.44	0.44	0.59	0.38	0.39	0.23
$f_{k=3}$ xj	0.18	0.31	0.17	0.21	0.16	0.23	0.16	0.19	0.20	0.22	0.22	0.29	0.19	0.19	0.11
$f_{k=1}$ xj x(nj)	**0.74**	**0.49**	**0.79**	**0.67**	**0.71**	**0.66**	**0.59**	**0.52**	**0.60**	**0.59**	**0.74**	**0.64**	**0.61**	**0.73**	**0.84**
$f_{k=2}$ xj x(nj)	0.33	0.43	0.32	0.35	0.28	0.38	0.23	0.25	0.30	0.33	0.42	0.53	0.28	0.35	0.21
$f_{k=3}$ xj x(nj)	0.16	0.21	0.16	0.18	0.14	0.19	0.11	0.13	0.15	0.16	0.21	0.26	0.14	0.17	0.11

Table 7 explains that all criteria (j) referred to Table 3 are in the classification number k = 1, which indicated that there is no need for improvement in the web version. It was evidenced by the number of coefficient k, where the final calculation result for each classification number yielded:

σ^1 = 0,74 + 0,49 + 0,79 + 0,67 + 0,71 + 0,66 + 0,59 + 0,52 + 0,60 + 0,59 + 0,74 + 0,64 + 0,61 + 0,73 + 0,84 = **9,91**

σ^2 = 0,33 + 0,43 + 0,32 + 0,35 + 0,28 + 0,38 + 0,23 + 0,25 + 0,30 + 0,33 + 0,42 + 0,53 + 0,28 + 0,35 + 0,21 = **4,98**

σ^3 = 0,16 + 0,21 + 0,16 + 0,18 + 0,14 + 0,19 + 0,11 + 0,13 + 0,15 + 0,16 + 0,21 + 0,26 + 0,14 + 0,17 + 0,11 = **2,49**

In the last step, the gray classification number coefficient produced the maximum value of the gray clustering coefficient, which was calculated according to the following formula.

$$\sigma^{k*} = \max(\sigma^1, \sigma^2, \sigma^3)$$

$$\sigma^{k*} = \max(9.91, 4.98, 2.49) = \mathbf{9.91}$$

In this case, the score for the first class with the highest score was 9.91. The highest coefficient score was in the first class, signifying that there is no need for improvement. With these results, the order of the criteria based on the priority was obtained as that seen in Table 8.

In Table 8, the analysis results for each criterion or indicator in the E-emsy system, which showed the product suitability criteria for interactive multimedia characteristics, produced the highest value of 0.84. It denoted that the criterion must be maintained. It was also in the first class, meaning that there was no need for improvement. Meanwhile, the lowest value was generated by the loading speed criteria, which indicated that the criterion must be improved. The loading speed was influenced by the number of plugins installed from WordPress, so that when reading data from the server, it took longer.

Table 8. The order of criteria based on priority

Classification group number	Criteria	Indicators	Value	Priority
1	15	Product suitability for interactive multimedia characteristics	0.84	P1
1	3	Clarity of language	0.79	P2
1	11	Ease of navigation e-learning	0.74	P3
1	1	Effectiveness and efficiency	0.736	P4
1	14	The suitability of e-learning to user characteristics	0.73	P5
1	5	The attractiveness of interface design	0.71	P6
1	4	Neat interface design	0.67	P7
1	6	Neat animation and image layout	0.66	P8

1	12	Ease of understanding the procedure for using e-learning	0.64	P9
1	13	Suitability of selecting symbols, icons, and buttons	0.61	P10
1	9	Font size suitability	0.60	P11
1	7	Color contrast accuracy	0.586	P12
1	10	Accuracy of the size of the image	0.585	P13
1	8	Suitability of font type with target's characteristics	0.52	P14
1	2	Loading speed	0.49	P15

3.8. Gray Clustering Analysis for Material Maturity

In this study, gray clustering analysis was utilized to analyze the criteria for each aspect of the maturity of psychiatric emergency materials in E-emsy in collecting data for the speakers.

The authors tested gray clustering on the maturity of the material. Classification validity (ηj)was determined by various criteria where $0 < \eta j < 1$. The closer the value of 1, the more important the criterion is. This material maturity study was conducted with two psychiatrists. Based on their weighted priority values, the ηj values were calculated as that in Table 9.

Table 9. The results of the psychiatric expert's material maturity priority weight assessment

j	1	2	3	4	5	6	7	8	9	10	11	12	13
j1	9	10	9	10	7	8	7	9	8	8	9	8	9
j2	10	10	9	9	8	8	9	8	8	7	7	8	9
nr	9.5	10	9	9.5	7.5	8	8	8.5	8	7.5	8	8	9
nj	0.95	1	0.9	0.95	0.75	0.8	0.8	0.85	0.8	0.75	0.8	0.8	0.9

Description:

j = Question number

$\boldsymbol{j^1}$ **=** Priority weight assessment by the first expert

$\boldsymbol{j^2}$ = Assessment of priority weight by the second expert

nr = the average value of the two weights

nj = priority weight figures

Number *j* is all the criteria (*j*) referred to Table 5, according to the question number. The two psychiatric experts' priority weight values were obtained to calculate the material maturity weight for each criterion described in Table 5. However, the researchers have not carried out a survey of users regarding material maturity. Therefore, the researchers have not been able to completely process the data and only explain the two psychiatrists' material weight calculations related to material maturity.

4. CONCLUSION

From the results and discussion that have been carried out in the development of the E-emsy online training system application for psychiatric emergencies, the following conclusions were obtained:

1. Development of an E-emsy system for web-based psychiatric emergency training employed the WordPress Content Management System (CMS) as a software to create a website. The process of developing the E-emsy application for web-based psychiatric emergency training has been carried out well as evidenced by the average value of each criterion based on IT experts, that was 4. However, based on the gray clustering analysis, some aspects needed to be improved, that was the criteria for "loading speed"
2. The trial process of the E-emsy emergency psychiatric system on the effect of distance learning or training on increasing access to health education, ease of application, and development of quality and competent health resources for medical personnel in the realm of emergency psychiatry was acceptable, and there was no need for improvements to the E-emsy system and material. It was evidenced by the value of the priority weight value which was approaching 1.

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