

Development Of A Blended Learning Training Model For Reducing Non Revenue Water In The Regional Drinking Water Companies (Pdam) Environment

Rama Boedi¹, Robinson Situmorang², Etin Solihatin³

^{1,2,3}Program Doktor Teknologi Pendidikan Sekolah Pascasarjana Universitas Negeri Jakarta

Email: ramaboedi_9902923025@mhs.unj.ac.id ¹, rsitumorang@unj.ac.id ², Etin_solihatin@unj.ac.id ³

ABSTRACT

The reduction of Non-Revenue Water (NRW) is an important performance indicator for Regional Drinking Water Companies (PDAM) in Indonesia. However, many PDAMs struggle to address water leakage issues due to a lack of competent human resources. This dissertation aims to develop a Blended Learning training model to effectively and efficiently enhance the technical skills of NRW reduction personnel across Indonesia. The study employs a research and development method using the Dick & Carey instructional design model, encompassing needs analysis, design, LMS module development, and formative and summative evaluations with experts. The results show that the training model is effective in improving participants' knowledge and skills, particularly regarding technical procedures, the use of leakage detection instruments, and case-based problem-solving. This Blended Learning model integrates online learning, field practice, interactive simulations, tutorial videos, and digital assessments, making it more flexible, accessible, and capable of reaching participants in various regions. The research contributes to strengthening strategies for improving technical competencies in the drinking water sector and serves as a foundation for PDAM training institutions to adopt adaptive learning methods that directly impact operational performance. This dissertation underscores the importance of investing in human resource development based on educational technology to ensure the sustainability of drinking water services in Indonesia.

Keywords: Blended Learning, Non-Revenue Water, PDAM, Model Pelatihan

INTRODUCTION

Human resources in every field of work within an organization or company are one of the essential factors that determine success. As stated by Elnaga, a company's success or failure depends on the performance of its employees. Therefore, companies need to adopt a learning model that focuses on improving employee performance through training and development, effective management support, and an objective performance measurement system (Purwanto & Sugiarto, 2022).

Human resources are often associated with performance aspects that impact the quality or advancement of a company. This is in line with Lena's opinion, which states that fundamental shifts in the business environment have created a transition towards the importance of human resource management and its functions. Human resources functions have been transformed into a significant management function within companies. In other words, human assets can become a source of sustainable competitive advantage because they involve social complexities that are difficult for competitors to imitate. The importance of human resources in a company, as described above, generally applies to every organization or enterprise. Hence, it is no surprise that many companies implement procedures where new employees are required to undergo education and training before being entrusted with responsibilities and tasks within the organization.

Drinking water management is a complex process involving various aspects such as production, distribution, and quality control. In managing drinking water, competent and trained human resources play a very important role. Without reliable and skilled personnel, the management of drinking water will not be effective or efficient. High-quality human resources are crucial in managing drinking water systems (Herman, 2021).

Qualified human resources in the field of drinking water management have a significant role. They are responsible for ensuring that public demand for clean, safe drinking water is met. In addition, skilled and competent personnel in water management can identify problems, develop innovative solutions,

and carry out routine maintenance to safeguard the infrastructure used in delivering drinking water (Wijayanti et al., 2021).

Training Concept

Basic Concept of Training

This discussion outlines the main goals and objectives of the training program, as well as the target audience and the expected outcomes. The training program aims to improve skills, productivity, discipline, work attitude, international language proficiency, and work ethic of the workforce at specific skill levels based on particular job requirements (Dewi et al., 2024).

The implementation of this program prioritizes practical training over theoretical knowledge, focusing on providing hands-on experience and direct practice. The program also includes job training sessions conducted regularly in accordance with vocational fields, levels, and training standards. It incorporates various training delivery methods and techniques such as demonstrations, simulations, role-playing, and on-the-job training. Overall, the document on the Basic Concept and Training Methods provides a comprehensive training approach by including a clear introduction, specific objectives, considerations of the target audience, and a variety of training methods that accommodate different learning styles and job requirements.

All of these elements are incorporated into the program to ensure effective learning and development for participants (Turwelis & Kurniadi, 2019).

By providing training opportunities, companies can increase employee job satisfaction while also reducing turnover rates. Training also contributes to minimizing waste and improving work methods and systems, which ultimately has a positive impact on the company's productivity and revenue. Additionally, training programs play a vital role in reducing absenteeism, employee complaints, workplace accidents, and overtime costs. Overall, training becomes a crucial element in enhancing performance, job satisfaction, and the overall success of the organization. In short, the source emphasizes that training is a key factor for organizations to develop employee skills and knowledge, meet various job requirements, boost productivity, reduce employee turnover, and improve overall company performance.

Concept of the Training Model to Be Developed

The learning model to be developed in this study is a training model for water loss reduction participants within the PDAM (Regional Drinking Water Company) environment, utilizing technology to support the teaching and learning process. The use of technology will follow a Blended Learning approach for delivering material and facilitating interaction between trainees and trainers or instructors.

The model developed in this study refers to the concept of training as a short-term educational program aimed at increasing the knowledge and technical skills of PDAM employees in the field of Non-Revenue Water (NRW). Thus, the learning model designed in this research is intended to be implemented within a relatively short period.

In addition, this study also adopts the concept of adult learning, which emphasizes self-directed and continuous learning by utilizing various resources available in the participants' surroundings. The application of this concept is intended to build the character of trainees who are highly motivated to learn independently. This concept-based learning system will be learner-centered, making the participants' active involvement in the learning process crucial. Therefore, the design of the learning model in this study is more focused on facilitating various activities of participants that support the development of skills and knowledge throughout the training.

In terms of implementation methods, a hybrid learning approach is used—combining face-to-face (offline) methods with online (digital) methods in the learning process. The hybrid concept was chosen because the NRW training material cannot be delivered entirely online; therefore, face-to-face sessions are necessary for delivering certain content or handling specific cases.

Theoretical Framework

1. Study

Learning is a complex process that involves mental and behavioral activities such as setting goals, solving problems, thinking critically, and engaging in reflection. To assess learning, effective evaluation is required to continuously monitor the progress of learners. Additionally, learning must be continuously

developed and updated to remain relevant and capable of optimally meeting students' needs. In order to measure the learning process, it is important to create effective assessments of students' efforts and track their progress over time. Furthermore, it is essential to develop and innovate teaching and learning processes so that education remains relevant and effective in fulfilling learners' needs.

2. Learning

Learning is defined as anything done intentionally to facilitate learning. According to Dick and Carey, learning is the organization and provision of a series of information, examples, experiences, and activities that guide, support, and enhance the internal mental processes of learners (Reigeluth & Carr-Chellman, 2009).

The definition of learning is inseparable from the concept of learning. Learning and teaching are an inseparable series of activities. The results of learning become capital in the subsequent learning process. Learning refers to the learning activities carried out by training participants and trainers. The learning process is part of the learning system. The Dick Carey model is a systems approach or procedural approach developed by Walter Dick, Lou Carey, dan James O. Carey in *The Systematic Design of Instruction* 7th Edition 2009 (Durrotul Masrurroh, 2023).

Teaching and learning has several important characteristics according to Edi Suardi:

- a) This process has a clear objective, namely to help trainees develop according to specific targets, by placing them at the center of attention.
- b) Systematically designed procedures or steps are required to optimally achieve these objectives. Each objective may require a different method.
- c) Learning materials must be prepared and designed specifically to suit the objectives, taking into account the characteristics of the trainees.
- d) Trainees must be active, both physically and mentally, as learning will not be effective if they remain passive.
- e) The trainer acts as a guide who motivates, facilitates interaction, and serves as a role model. The trainer also leads the design of learning activities with the trainees.
- f) Learning requires discipline, namely a pattern of behavior agreed upon and adhered to by both the trainer and trainees. Deviations from procedures indicate a violation of discipline.
- g) A specific time limit is set for achieving each learning objective.
- h) Evaluation must be conducted to assess whether the learning objectives have been achieved.

3. Blended Learning

Blended learning is an innovative educational approach that combines online learning with traditional classroom instruction. Blended learning combines online and face-to-face methods, providing students with the flexibility to learn at their own pace and easily access materials. This approach enables a more personalized learning experience, increases engagement, and supports optimal academic achievement (Kumar et al., 2021).

Blended learning is a method that combines face-to-face instruction with online learning. This approach provides a more flexible and personalized learning experience, as students can access materials and interact with instructors and peers anytime and anywhere. This combination creates a learning process that is convenient, accessible, and tailored to students' needs.

E.Design of the developed model

1. Conceptual Model

The learning model developed for this drinking water training will utilize the blended learning method. This method was chosen because the training participants come from various regions across the provinces and districts. Competency development is often hampered by high development costs, so companies need to consider their budgets when sending employees to training to enhance their knowledge and job skills. With a hybrid training system, implementation costs are expected to be reduced, thus reducing the training burden on companies.

2. Procedural Model

Kemp, Dick, and Carey (1985) argue that a learning strategy is a set of materials and procedures used together to achieve learning outcomes. In general, procedural models are divided into two types: online and offline procedures.

1. Online Procedure:

a. Online Training Registration

Participants register through the digital platform by filling out a form and completing the required payment or verification.

b. Pre-Test:

Participants took a pre-test to determine their initial knowledge level. The results were used as a basis for developing appropriate training materials.

c. Post-test

After completing the training module, participants took a post-test to measure their understanding of the material. The post-test results were used to assess participant progress and the effectiveness of the training.

d. Three Module Online Training

Participants study three main modules online covering theory, case studies and practical examples of water meter districts.

e. Take a Proficiency Certificate

Participants who successfully complete the training and obtain the minimum required score are eligible to receive a certificate of proficiency. This certificate reflects the level of skill and knowledge acquired during the training.

f. Carry out Stage Two Registration

For participants who want to continue to the advanced stage, they can register for the second stage of training or the TamModule course.

2. Offline Procedure

A. Practice of Making and Monitoring Water Meter Districts

Participants undertake field practice to design and build a water meter district, and apply the knowledge they have learned directly to design and build a water meter district, and apply the knowledge they have learned directly.

B. Report Preparation

Participants are asked to prepare a report summarizing the results of the practice, the challenges faced, and the solutions proposed.

C. NRW Certification Exam

Participants take a certification exam that assesses their theoretical and practical skills. The results of this exam demonstrate their competence in planning and implementing water meter district projects.

3. Physical Model

The physical model in this design is in the form of digital material stored in the form of a web Learning Management System and printed learning modules based on the scheme or competency units being taught.

A. RESEARCH METHODS

This study aims to develop a learning model to reduce the level of water leakage in the Malang City Water Company (PDAM). The method used is Research and Development (R&D), which focuses on the creation of a Blended Learning model. R&D begins with conceptual and theoretical studies, then continues with research stages until a product is ready for use. Gall, in his book *Applying Educational Research*, adapted the Systematic Design of Instruction Model by Dick and Carey (2007) as an R&D framework. R&D is industry-based applied research, where the design and testing processes are carried out systematically to ensure the developed product meets effectiveness and quality standards.

RESULTS AND DISCUSSION

1. Identifying Learning Objectives

Determining learning objectives is a crucial step in instructional design, as it ensures that all activities, materials, and evaluations align with the desired outcomes. In this case, the instructional objective of the Non-Revenue Water (NRW) reduction module focuses on improving participants' understanding and implementing effective methods for reducing NRW, a common challenge for water companies in Indonesia and globally. Learning objectives must be able to produce real change so that education can

be distributed equitably and with quality throughout the community. This aligns with Law of the Republic of Indonesia Number 20 of 2003 concerning the National Education System, which defines education as a conscious and planned effort to create a learning process that encourages students to actively develop their potential, encompassing spiritual aspects, self-control, personality, intelligence, morals, and necessary skills. This principle is also important in technical training such as NRW reduction, where learning objectives must be relevant, measurable, and focused on the technical skills to be achieved.

2. Conduct Learning Analysis

After establishing learning objectives, the next step in the Dick and Carey model is to conduct a learning analysis. This analysis aims to identify the specific skills, knowledge, and steps required by participants to achieve the stated learning objectives. Learning analysis is a systematic process that outlines the steps and skills required, starting from the participants' basic abilities to the skills they should master by the end of the module. In the context of the Non-Revenue Water (NRW) reduction module, learning analysis helps identify the technical skills needed to conduct water audits, understand the causes of leaks, and design effective strategies to reduce NRW.

3. Identifying Early Behavior and Characteristics of Students

Identifying students' baseline behaviors and characteristics is a crucial step in designing effective learning. The goal is to ensure that the material aligns with the students' current knowledge, skills, and abilities. This understanding helps develop more relevant, targeted, and appropriately challenging learning. In the Non-Revenue Water (NRW) reduction module, this step is crucial because participants have varying operational backgrounds and levels of technical understanding, such as in water auditing, distribution network management, or leak control. With early identification, the material can be tailored to the participants' experience, thus optimizing learning.

4. Writing Performance Goals

Once the initial behavior and characteristics of the learners are identified, the next step in the Dick and Carey model is to formulate performance objectives. Performance objectives describe specific outcomes that participants should achieve upon completion of the learning process. The Dick and Carey model, with its systematic design, is highly suitable for application, including in Islamic Religious Education learning, which requires a comprehensive process. In the Non-Revenue Water (NRW) reduction module, performance objectives should focus on mastering technical skills such as conducting water audits, detecting leaks, and designing and implementing effective NRW control strategies.

5. Developing Assessment Instruments

The next step in the Dick and Carey model is to develop an assessment instrument to measure the extent to which participants have achieved the established performance objectives. This assessment is crucial for the learning process to be effective and for the results to meet expectations. According to Rufman Iman Akbar (2020), assessment also serves to evaluate service quality based on consumer perceptions of performance and the importance of each attribute. In the Non-Revenue Water (NRW) reduction module, the assessment instrument must be able to measure participants' understanding of the NRW concept, their skills in conducting water audits, and other practical skills related to leak control. Assessments are designed in various formats, including formative and summative assessments that align with the objectives of each learning stage.

Instructional design experts are experts with a background in educational technology and experience in learning development. The instructional design experts who assessed this learning material are Dr. Surono, M.Phil. and Dr. Anita Wijaya, M.Ed. The validation results from both experts are as follows:

1. Learning Content and Materials Expert

The material expert who evaluated this learning material was Prof. Dr. Ir. Djoko M. Hartono, SE., M.Eng. The evaluation process involved providing the learning module and showing the supporting videos that had been developed. The expert provided input in the form of revisions needed to improve the learning material. The evaluation results showed that the learning material received a "Very Good" rating with an average score of 4.73.

No	Indicator	Statement	Expert1	Expert 2	Average
1	Accuracy of Formulating General Instructional Objectives	The formulation of General Learning Objectives (TIU) refers to the learning objectives of the Basic Programming course.	4	5	4,5
2		Writing the TIU formulation contains objects that students must master after completing the learning.	5	5	5
3	Learning competencies	Learning competencies are relevant to the general objectives to be achieved	4	5	4,5
4		The competencies formulated are sufficient to achieve the general objectives set.	4	5	4,5
5	Relevance of ICT to TIU	The formulation of ICT is relevant to the formulation of TIU	5	5	5
6		The formulation of Specific Instructional Objectives (TIU) refers to TIU	5	5	5
7	Relevance of the test to learning objectives	Test items relevant to ICT	5	5	5
8		The type of test used is relevant to the competency to be measured.	4	5	4,5

9	Relevance of learning strategies including content to learning objectives	The title and subtitle of the learning content refer to the learning objectives.	4	5	4,5
10	Presentation	All materials are well organized and managed.	5	5	5
11		The content (explanations, illustrations, diagrams, demonstrations, solution models, and performance examples) provided is in accordance with the learning objectives.	4	4	4
12		The content delivered connects to new skills	4	4	4
13		The examples given are clear for the students' experience.	4	5	4,5
14	Completeness of learning strategies	The learning strategies used are in accordance with the learning material	5	5	5
15	Completeness of learning materials	Learning materials are equipped with descriptions of learning materials.	4	5	4,5
16		Learning materials are equipped with relevant learning materials	4	5	4,5
17		Learning materials are equipped with a glossary	5	5	5
18	Relevance to the material	The videos shown are relevant to the topic of discussion.	5	5	5
19		The material in video form is useful for increasing insight and concepts.	5	5	5

20	The truth and currency of the content according to the field of science and relevance to learning objectives	Learning materials are arranged according to competencies	4	5	4,5
21		The learning material is relevant to the learning objectives that students must achieve.	5	5	5
22		The topic is relevant to the competency map for the Basic Programming course.	5	5	5
23	Relevance of learning materials to learning objectives	Learning materials are relevant to the TIU formulation	5	5	5
24	Technical quality of learning products	The learning material already includes the learning objectives that students must achieve.	4	5	4,5
Overall average			4,54	4,92	4,73
Conclusion			Very good		

2. Media and Learning Technology Expert

This learning material was evaluated by Prof. Dr. R. Eko Indrajit. The evaluation was carried out by submitting the module and demonstrating the Learning Management System (LMS) The experts provided input and revisions to improve the material. The results of the expert assessment questionnaire showed that the learning material received a rating of "Very Good" with an average score of 4.73..

No	Indicator	Statement	Expert 1	Expert 2	Average
1	Technical Criteria	Suitability of packaging for teaching materials.	5	5	4
2		Suitability of graphic design and topography of teaching materials.	5	5	5
3		Audio and video quality.	5	5	5
4		The attractiveness of the interface design	4	5	4,5
5		Clarity of Navigation	5	5	5
6		Functionality Compatibility	4	5	4,5

7	Relevance to the material	The videos shown are relevant to the topic of discussion.	5	5	5
8		The material in video form is useful for increasing insight and concepts.	5	5	5
9	Model U-learning	Learning resources can be obtained and accessed easily.	5	5	5
10		Learning is conducted in / from the real world (work environment).	5	4	4,5
11		The technology (learning management system) used supports learning.	5	5	5
12		The learning process can move places.	4	5	4,5
13		Interaction and communication with lecturers, experts and other students can help learning.	4	5	4,5
14		Learning according to needs.	4	4	4
15		Learning resources can be reused after completing the course.	5	5	5
16		The technology used supports learning.	4	5	4,5

17	Appearance	The display components of the learning materials are clear.	5	5
18		The cover design of the learning material attracts the interest of readers.	5	5
19		The videos shown are relevant to the topic of discussion.	4	4
20		The graphic design in the learning materials meets the requirements.	5	4,5
21		Material in video form is useful for increasing understanding and concepts.	5	5
22		The media used is appropriate technology.	5	5
23		The media used can make it easier for students to understand the learning material.	5	5
24		The media used can facilitate the learning process well.	4	4,5
25	Presentation	The learning materials are equipped with a cover, table of contents, material description, example questions, practice questions, summary, formative evaluation questions, glossary, formative evaluation answers, and bibliography.	4	4,5

26		The use of fonts (typeface) is appropriate.	5	4	4,5
27		LMS contains discussion forums, learning materials, assignments, videos, links to other sources.	5	5	5
28		LMS is easy to use.	5	5	5
29		Interesting color composition.	5	4	4,5
Overall average			4,72	4,75	4,73
Conclusion			Very good		

3. Media and Learning Technology Expert

Instructional design experts are experts with a background in educational technology and experience in learning development. The instructional design experts who assessed this learning material are Dr. Surono, M.Phil. and Dr. Anita Wijaya, M.Ed.

No	Indicator	Statement	Expert 1	Expert r 2	Average
1	Accuracy of TIU Formulation	The formulation of General Learning Objectives (TIU) refers to the learning objectives of the Basic Programming course.	5	5	5
2		Writing using operational terms. TIU word formulation. Writing using operational terms. TIU word formulation. Writing using operational terms. TIU word formulation.	5	5	5
3		The writing of the TIU formulation contains objects that students must master after completing the learning.	5	5	5

4	Learning competencies	Learning competencies are relevant to the general objectives to be achieved.	5	5	5
5		The competencies formulated are sufficient to achieve the general objectives set.	5	5	5
6	Accuracy of ICT Formulation	ICT writing already contains specific behaviors that will be displayed by students after completing the learning process they are participating in.	5	5	5
7	Relevancedwit ICT h TIU	The formulation of Specific Instructional Objectives (TIU) refers to TIU	5	5	5
8	Relevance of the test to Learning objectives	The test items are relevant to ICT.	5	4	5
9		The type of test used is relevant to the competency to be measured.	5	5	5
10		The tests formulated are sufficient to measure the achievement of each learning objective.	5	5	5
11	Student-centered	Assessment is according to student characteristics (age, attention span, ability).	5	5	5
12	Assessment format	All information necessary to answer is provided.	5	5	5
13	Strategy relevance	Relevant learning strategies	5	5	5
	learning with Learning Objectives	with ICT.			
14		The title and subtitle of the learning content refer to the learning objectives.	5	5	5
15		Learning activities are equipped with learning media.	5	5	5
16		Learning activities are equipped with learning time.	5	5	5

17	Pre-instructional Activities	Pre-instructional activities motivate students (gain attention, demonstrate relevance).	5	5	5
18		Pre-instructional activities according to student characteristics.	5	5	5
19		Pre-instructional activities inform students about the learning goals and objectives.	5	5	5
20		Pre-instructional activities cause students to recall the required knowledge and skills.	5	5	5
21		Pre-instructional activities inform students about the input needed to complete the required task.	5	5	5
22	Presentation	The division is done proportionally	5	5	5
23		Procedures for activity instructions in a logical and sequential order	5	5	5
24		All materials are well organized and managed.	5	5	5
25		The content (explanations, illustrations, diagrams, demonstrations, solution models, and performance examples) provided is in accordance with the learning objectives.	5	5	5
26		Content delivered	5	5	5
		connecting to new skills.			
27		The examples given are clear for the learner's experience.	5	5	5
28	Participation	The role of students according to the type of learning.	5	5	5

29		Student messages are aligned with the objectives	5	5	5
30		Student messages are in line with student characteristics.	5	5	5
31		The roles and relationships between lecturers and students are well described.	5	5	5
32	Feedback	The feedback provided is appropriate for the type of learning.	5	5	5
33		Feedback aligned with goals.	5	5	5
34		The feedback given is in accordance with the characteristics of the students.	5	5	5
35		The feedback provided is informative, supportive, and corrective..	5	5	5
36	Evaluation	The assessment given is according to the type of learning (objectives, alternatives)	5	5	5
37		The assessment is given according to the characteristics of the students (age, attention span, ability)	5	5	5
38		The information generated is valid and reliable about the status and attitudes of students.	5	5	5
39	Follow-up Activities	The follow-up activities provided help with retention of new information and skills.	5	5	5
40		The follow-up activities provided support the transfer of skills from learning to the work environment.	5	5	5
41	Completeness of Learning Materials	Teaching materials according to the characteristics of the material.	5	5	5
42		Teaching materials are appropriate to the background, experience and environment of the students.	5	5	5

43		Teaching materials are appropriate to students' motivation and interests.	5	5	5
44	Completeness of learning materials	The learning materials are equipped with descriptions of the learning materials.	5	5	5
45		Learning materials are equipped with relevant learning materials.	5	5	5
46		Learning materials can attract interest in learning.	5	5	5
47		Learning materials can increase student activity.	5	5	5
48		Learning materials are equipped with a glossary	5	5	5
Overall average			5	4,98	4,99
Conclusion			Very good		

6. Developing Learning Strategies

Developing a learning strategy is a crucial step in instructional design to ensure that learning objectives are effectively achieved. In the Dick and Carey model, a learning strategy is formulated based on the results of the learning analysis (4.2), identification of initial participant behaviors (4.3), and formulation of performance objectives (4.4). This strategy should include the methods and media used, the sequence of material presentation, and learning techniques that best suit the characteristics of the participants. Learning is a process that combines various methods to achieve learning objectives.

One approach used is blended learning, a learning strategy that combines face-to-face (offline) activities with computer-based (online) learning, either through the internet or mobile learning. In the Non-Revenue Water (NRW) reduction module, the learning strategy is designed by combining theory and practice. Methods used include lectures, group discussions, simulations, and case studies tailored to the participants' operational conditions.

7. Developing and Selecting Learning Materials

After formulating learning objectives (4.4) and developing learning strategies (4.6), the next step in the Dick and Carey model is to develop and select learning materials. Learning materials must align with performance objectives and support the achievement of the formulated learning outcomes. The learning selected or developed must help participants achieve the instructional objectives through the most effective and efficient media and formats. In the context of the Non-Revenue Water (NRW) reduction module, the selected learning materials must support participants' technical skills in conducting water audits, identifying leaks, and designing NRW reduction strategies.

8. Designing and Conducting Formative Evaluation

Formative evaluation is a crucial step in the Dick and Carey model, which aims to evaluate the effectiveness of learning materials and instructional strategies before full implementation. Formative evaluation is conducted throughout the development process to identify areas that need improvement or adjustment to make instruction more effective in helping participants achieve learning objectives. Formative evaluation focuses on gathering feedback from participants throughout the learning phase to

ensure that instruction meets their needs and facilitates the achievement of optimal learning outcomes. In the context of the Non-Revenue Water (NRW) reduction module, formative evaluation aims to test the effectiveness of the developed learning materials, such as learning videos, simulations, and practical tools, as well as the implemented learning strategies. This evaluation process ensures that the designed learning materials and strategies align with the operational needs of participants and help them achieve their established performance objectives.

9. Revising Learning

Revising learning is the final step in the Dick and Carey model, which aims to refine and perfect the learning process based on the results of formative and summative evaluations conducted to ensure that the learning provided is effective in helping participants achieve the established performance objectives. Revision is a crucial part of the ongoing instructional design cycle, where participant feedback, instrument evaluations, and performance during the module are used to refine the learning design. In the context of the Non-Revenue Water (NRW) reduction module, revisions were conducted following formative and summative evaluations to ensure that the module could be implemented more widely with optimal results. The evaluation results provide valuable information regarding aspects that need improvement, both in terms of learning materials, instructional strategies, and assessment tools.

10. Conduct Summative Evaluation

Summative evaluation is the final stage in the Dick and Carey model. Its purpose is to assess the overall effectiveness of the learning program after its full implementation. This evaluation is used to measure the achievement of instructional objectives by participants and provide comprehensive feedback on the program's success in achieving its stated targets. According to (Shute, 2008), summative evaluation aims to determine the value, effectiveness, and feasibility of a program, as well as to provide information that can be used in decision-making regarding the continuation or dissemination of the program to a wider population. In the context of the Non-Revenue Water (NRW) reduction module, summative evaluation serves to measure the impact of learning on participants' performance in the field, their ability to apply the technical skills learned, and the module's relevance to their work context. This evaluation also assesses whether the module can be expanded to a larger group of participants or whether further revisions are necessary based on the evaluation results

CONCLUSION

Based on the research results, there are several main conclusions regarding the development of a Blended Learning training model for reducing Non-Revenue Water (NRW) at PDAM:

1. The blended learning model successfully combines the advantages of online and face-to-face learning to enhance participants' technical skills in handling water leaks. This approach provides participants with the flexibility to access online materials at their convenience, while providing structured offline practice sessions. Online learning allows participants to learn theory at any time, while face-to-face meetings facilitate hands-on practice and interaction with instructors. This combination of methods helps participants better understand the application of theory in practice, increasing independence, confidence, and the overall effectiveness of the training.
2. This training model has proven effective in improving the competency of PDAM human resources to manage drinking water more efficiently and sustainably. Through a blended learning approach, participants can flexibly learn theory online, while face-to-face sessions support the mastery of practical skills. The results showed a significant increase in participants' understanding of water management techniques and technical skills for reducing NRW, such as detecting leaks, maintaining systems, and monitoring water loss. This progress reflects the improved preparedness of human resources to face challenges in the field, which is expected to positively impact PDAM's performance in providing quality water services to the community.
3. The use of information and communication technology in this training model significantly contributes to interactive and flexible learning, allowing participants to access materials and practices without location constraints. Features such as simulations and virtual laboratories are integrated to provide practical experiences that approximate field conditions, helping participants develop deeper technical skills. This technology allows participants to perform NRW reduction exercises directly and

repeatedly, thus strengthening their understanding of the technical process. With broad access and in-depth interaction, this technological support increases the effectiveness of the training and facilitates the distribution of technical knowledge to PDAM personnel in various regions.

4. The blended learning approach in this training expands access for participants in various regions, enabling equal distribution of PDAM human resources' skills in addressing water leaks across Indonesia. Through the online platform, participants from remote locations can still fully participate in the training without having to physically attend, while the face-to-face sessions provide valuable practical experience. This approach is appropriate because Non-Revenue Water (NRW) issues occur in many regions, making equitable distribution of skills a key factor in improving water management efficiency in PDAM networks nationwide.

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