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PRACTICALITY OF ENRICHMENT ATWI INSTRUCTIONAL DESIGN USING FLIPPED CLASSROOM STRATEGY FOR PIPING INSPECTOR TRAINING

[1]Abdullah Merjani, [2]Muhmaad Giatman, [3]Jalius Jama, [4]Ambiyar, [5]Sukardi

[1]Department of Industrial Engineering, Technical Faculty, Universitas Riau Kepulauan, Jl. Pahlawan No.99, Kota Batam, Kepulauan Riau 29425, Indonesia, E-mail:- a_merjani@yahoo.com
[2]Faculty of Engineering, Universitas Negeri Padang, Jl. Prof. Dr. Hamka, Air Tawar Barat., North Padang Sub-district, Padang, West Sumatera 25132, Indonesia, E-mail:- giaatman@ft.unp.ac.id
[3]Faculty of Engineering, Universitas Negeri Padang, Jl. Prof. Dr. Hamka, Air Tawar Barat., North Padang Sub-district, Padang, West Sumatera 25132, Indonesia, E-mail:- jaliusjama@yahoo.co.id
[4]Faculty of Engineering, Universitas Negeri Padang, Jl. Prof. Dr. Hamka, Air Tawar Barat., North Padang Sub-district, Padang, West Sumatera 25132, Indonesia, E-mail:- ambiyar@ft.unp.ac.id
[5]Faculty of Engineering, Universitas Negeri Padang, Jl. Prof. Dr. Hamka, Air Tawar Barat., North Padang Sub-district, Padang, West Sumatera 25132, Indonesia, E-mail:- sukardiunp@gmail.com

Abstract

The Covid-19 outbreak and the condition of the training participants consisting of adults who are limited in time, cost, and priorities require a different piping inspector training process. The flipped classroom which is a way of learning by reversing taxonomy bloom provides a way how training strategies can be implemented to be more flexible and meet today's online training needs. The development procedure used in this research is the ADDIE research and development model. A need analysis had been conducted as part of preliminary research by a questionnaire to 48 respondents consisting of oil and gas inspection practitioners, alumni of the Training Institute, and training practitioners. Developed Instructional Design based on flipped classroom validated by experts through FGD and continue with field trials and Final Products effectiveness evaluation. Effectiveness test conducted by running control and experiment class with 27 participants for each class. Need analysis concluded that the need for flipped classroom-based instructional design for piping inspector training is necessary. The Instructional Design was declared valid, effective, and practical. Trainee and Vocational Practitioners can easily apply the MPI Atwi's well-established instructional design model with enrichment of instructional strategies with Talberth's flipped classroom design framework.

Keywords: Instructional design, adult training, flipped classroom, piping inspector, Covid-19.

Introduction

Technological developments trigger creativity in all areas of life [1] including in learning. The impact of the Covid-19 pandemic has also penetrated the fields of education and teaching [2]. The internet and the Covid-19 outbreak have made it possible to apply distance learning directly online at all levels of education, both K12 and higher education [3]. Education has been shaken since the COVID-19 pandemic left the global community in the great confusion that developed in the first quarter of this year. 2020. The training sector has also been affected by the Covid-19 outbreak, which has resulted in many training institutions holding face-to-face activities experiencing a shortage of training participants and possibly also stopping some of their training activities. According to the online newspaper [4] Pikiran Rakyat Bandung as of

April 21, 2020, around 85% of the 19,000 training providers are facing financial difficulties due to the impact of the

Covid-19 outbreak due to limited face-to-face meetings.

In the world of the inspector profession, continuing training is a must to compete in work and business. The job as an inspector demands a usually remote location and limited transportation. The training involves adults who have other responsibilities such as family and work. Time constraints, financial problems and family priorities are obstacles for adults in undergoing training [5]. The need for flexible learning strategies with appropriate times and still allows for trainees to interact during the training process with instructors as well as fellow trainees. Distance learning with the flipped classroom method, is an alternative for adult training, although there are still obstacles in distance learning that need to be considered [6]. Flipped classroom which is a way of learning by reversing taxonomy bloom which gives time for participants to know and understand learning materials (LOTs) before further meetings to be able to apply training materials (HOTs)[7].

Flipped classroom intervention studies were student-centered and the role of the instructor is to facilitate the learning experience. Students participate in flipped classroom pedagogy, where lessons take place via video at home and application of the concepts learned takes place in class. At the end of the intervention, students showed higher academic performance in reverse classroom pedagogy because the flipped class approach provides scaffolding and differentiation; Increased student motivation and commitment [8]. In other research showed that the flipped classroom had a direct impact on student learning (or grades) [9], especially among highly engaged students (with grades about 1.5 points higher). In addition, the grade standard deviation scores are lower (about one point), which ensures a better overall student level. Students are a bit skeptical about this new methodology, but they tend to work more (12% of students work more hours per week), attend more classes (at least 10% more) and attend a higher ratio of exams (approx. 20%).

Application of flipped classrooms in engineering subjects has received less attention and there are currently only a few studies[10]. Research of van Alten and team [11] found a slight positive effect on learning outcomes but no effect on student satisfaction with the learning environment. In addition, they found significant heterogeneity between studies. The research showed that students in the flipped classroom achieved higher learning outcomes when attendance time was not reduced compared to the non-flipped classroom or when quizzes were added to the flipped classroom. They conclude that the flipping-the-classroom (FTC) approach is a promising pedagogical approach when designed properly [11]. Tang et al. [12] in their research results showed that students were generally dissatisfied with online learning, and especially with the mode of communication and question and answer. In addition, combining online learning models with reverse learning improves student learning, attention and course assessment. In his article, Zuber [13] pointed out the need for further research into flipped classrooms and supports the development of educational.

METHOD

Conceptual Framework

Based on the previous explanation on introduction about the theoretical study of flipped classroom-based instructional design, it is necessary to make systematic steps in its implementation. Instructional design begins with an analysis of the instructional design, the implementation process and the final stage of evaluation, as a step to review the processes that have been carried out previously.

The conceptual framework draws a research flow about the main problems that arise in the training of piping inspectors at the training institute. The study of these problems will help realize the necessary solutions in order to solve the piping inspector training problem for which flipped classroom-based instructional designs will be made so that appropriate instructional design development research can be carried out. This research on the development of flipped classroom-based instructional design for piping inspector training was expected to emerge a new instructional design that has been tested validly, effectively and practically in the field, which is stated by increasing the competence of piping inspector trainees at the Training Institute.

The research was carried out in order to develop an appropriate training for piping inspectors. These studies were conducted using the research and development (R&D) model. According to Richey et al. [14] the definition of research and development (R&D) is a systematic process to evaluate the design, evelopment and evaluation of curricula, processes and products that meet the criteria of validity, reliability and effectiveness. Moreover Borg et al. [15] found that educational research and development (R&D) is the process of developing and validating educational products. The development procedure used in this research was the ADDIE research and development model (Analysis, Design, Development, Implementation and Evaluation), refer to Figure 1. The ADDIE process has five phases [16] namely: 1) first step is the researcher performs a needs analysis, 2) the researcher designs a design of competency-based class with a flipped classroom for education by piping inspectors, 3) the researcher develops the teaching project by carrying out validity and feasibility tests with focus group discussion (FGD) in the resulting product model, 4) to conduct limited or field testing of the developed Training Instruction Project, and 5) Evaluation is the fifth step to determine whether the developed Training Instruction Project has been successfully developed according to the research objectives or not. This article will explain the phases of design instructional using flipped classroom that will be required for piping inspector training.

According to the authors, instructional design is a systematically structured educational and training project aimed at achieving high-quality learning and training in all aspects, thereby increasing the competence of the trainees. Atwi [17] proposed to divide the comparative analysis of the results of different teaching models into three phases: the definition phase, the system analysis and development phase, and the evaluation phase. It was also found that the differences between the two models are: purpose/level of use (institution or agency), use of terms at each level, number of levels or stages, completeness of concepts and principles used. Based on the above analysis, Atwi Suparman developed an Instructional Project Development Model (MPI).

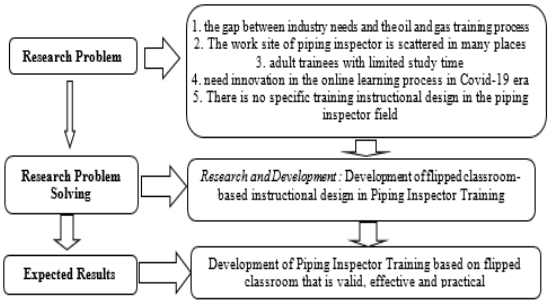

Figure 1. Research conceptual framework

Atwi Suparman developed [17] framework for design instructional with 10 step as follows, (1) Identify instructional needs and write general instructional objectives, (2) Conducting instructional analysis, (3) Identify the behavior and initial characteristics of learners, (4) Write specific instructional goals, (5) Analysis of equipment and material requirements of the product to be made, (6) Develop Instructional Strategies, (7) Develop instructional materials, (8) Evaluation by 1-3 students and revision, (9) Trial on a limited scale and revision, and (10) Field trials involving all components in the real system. An established instructional design developed by Atwi shall be used to develop instructional design enhancement with flipped classroom method.

Instructional Design based on Flipped Classroom

The best idea for success in flipped classroom in higher education is the unique blend of e-Learning and face-to-face offerings across all content and curriculum which aims to (1) promote and build the 4Cs of student engagement namely “Curiosity, Challenge, Context and Control” [18], (2) facilitates what is known as cognitive exercise, (3) encourages the idea of disaggregating the value of teaching materials into high, medium , and not valuable, (4) validates the value of past learning that is very important to, (5) supports the presentation of some material to encourage deeper understanding, (6) innovates around existing face-to-face and online pedagogical practices; (7) ensuring round-the-clock access (24 hours/7 days) to learning materials and (8) imparting flexibility with respect to curriculum development, content delivery and evaluation. The above is important in the application of the flipped classroom in further education [19].

According to Talbert, the flipped classroom design for higher education is as follows: "Flipped learning is all about providing structure, and to provide some structure around the professional practice of teaching in a flipped learning environment, we introduce here a seven-step process for building a single instructional unit in a flipped learning environment". The framework proposed by Talbert [20] can be detailed as follows (1) Make a short but complete list of learning objectives for the training or course that will be covered, (2) Combining learning objectives so that they appear in order of cognitive complexity, (3) Make a preliminary design of the group room activities that will be carried out by the trainees or students, (4) Go back to the list of learning objectives and break them down into basic and advanced goals, (5) Complete the design of group room activities, (6) Design and build individual space activities, (7) Design and construct any post-group room activities that the trainees or students will undertake.

From the description of each of Atwi Suparman's instructional design frameworks and the flipped classroom design in further education by Talbert, it can be concluded that there are similarities between each framework described from the beginning and the end of the framework. The combination of the two frameworks presented in Table 1, resulted in a flipped classroom-based instructional design that combines the instructional design and the flipped classroom framework design. Flipped classroom based instructional design development design for piping inspector training refer to Figure 2.

Preliminary Analysis of Instructional Design Development

Instructional design analysis and CPU/CPK determination

Based on the needs analysis, it was developed with the level of needs identification, namely by defining and describing general learning outcomes (CPU) and specific learning outcomes (CPK) and becoming sub-competencies or basic competencies that are more detailed and logical. Based on the determination of the CPU/CPK, then an analysis is carried out using a hierarchical method for each competency to be achieved so that the beginning and end of learning that will be delivered in the teaching and learning process can be determined. Hierarchical analysis by considering general and specific cognitive needs based on needs analysis.

The learning process in the development of flipped classroom-based instructional design in the piping inspector training is carried out by synergizing the needs of the National Oil and Gas industry through

Table 1 Enrichment Instructional Design Framework Atwi with Framework Flipped Classroom Talbert

Atwi Suparman (2018) Instructional Design Framework	*Framework Flipped Classroom* Talbert (2017)	*Enrichment Instructional Design Framework* Atwi Suparman by Abdullah Merjani
1. Identify instructional needs and write general instructional objectives 2. Conducting instructional analysis 3. Identify the behavior and initial characteristics of learners 4. Write specific instructional goals 5. Analysis of equipment and material requirements of the product to be made 6. Develop Instructional Strategies 7. Develop instructional materials 8. Evaluation by 1-3 students and revision 9. Trial on a limited scale and revision 10. Field trials involving all components in the real system	1. Make a short but complete list of learning objectives for the training or course that will be covered, 2. Combining learning objectives so that they appear in order of cognitive complexity, 3. Make a preliminary design of the group room activities that will be carried out by the trainees or students, 4. Go back to the list of learning objectives and break them down into basic and advanced goals, 5. Complete the design of group room activities, 6. Design and build individual space activities, 7. Design and construct any post-group room activities that the trainees or students will undertake	1. Identify instructional needs and write general instructional objectives 2. Conducting instructional analysis 3. Identify the behavior and initial characteristics of learners 4. Write specific instructional goals 5. Analysis of equipment and material requirements of the product to be made 6. Develop Instructional Strategies a. Complete the design of group room activities, b. Design and build individual space activities, c. Design and construct any post-group room activities that the trainees or students will undertake 7. Develop instructional materials 8. Evaluation by 1-3 students and revision 9. Trial on a limited scale and revision 10. Field trials involving all components in the real system

SKKNI No. 234 Year 2017 [21] concerning Indonesian National Work Competency Standards in the Piping Process. During the training process, participants will receive direct learning based on the needs of National and International competencies. The learning strategy used in this training uses the flipped classroom strategy, where the trainees follow the work steps and instructions of the instructor that must be done before face-to-face meetings. In this way, it is hoped that participants will already have initial knowledge which will be continued by the instructor at the time of face to face.

Develop a competency assessment instrument

The assessment was carried out by the instructor and the team from the training provider using an assessment quiz and a final assessment that had been specially prepared in stages to carry out an assessment by observing the competence of the piping inspector that has been determined. Assessment of learning outcomes is determined based on the achievement of predetermined assessment competencies. The level of competency achievement of participants is based on the minimum criteria for completeness

that has been determined. Participants are declared competent if the scores obtained are equal to or more than the limit of the minimum completeness criteria that have been set.

Selection and development of instructional design media

The selection of instructional design media in the piping inspector training is adjusted to the flipped classroom method and to the competencies to be achieved in each stage of learning. The media needed in this case are (a) videos or simulation films taken from several sources that can provide an overview of the documentation materials are provided in stages according to the learning stages, (c) learning video recordings that can be played back as needed, (d) online quizzes prepared at each stage of learning as a pre-test before face-to-face learning which must be done as an independent task and also as a posttest after a face-to-face meeting, and (e) work instructions on what to do before a face-to-face meeting and filling out a diary of online learning stages. Face-to-face meetings using online media using applications such as Google Meet and ZOOM according to training conditions and needs.

Develop guidelines for instructors and training participants

Guidelines for training participants are given to participants as a direction to take part in piping inspector training. The training participants guide by paying attention to the instructions written in the piping inspector training learning material book. These guidelines are provided in softcopy form of Video Links using Gmail and Google Classroom facilities. The instructor's guide aims to provide guidance and direction that will be carried out in fostering training participants so that they can participate in flipped classroom activities optimally by doing independent work and assignments both before face to face and after face-to-face meetings.

Determine evaluation and revision

The success of the development of instructional design can be seen from the results of the assessment of each learning stage and also the responses from participants through the WhatsApp Group and also the Google Classroom which was created to facilitate this Piping Inspector training. The evaluation of the instructional design that was carried out was carried out in stages according to the level of the design test and the number of research objects, so that a good instructional design was obtained to be applied in the learning process. To find out the practicality of learning by measuring through a questionnaire/questionnaire given to participants and instructors as the object of research. The practicality of the model had been seen from the perceptions of participants and instructors about this learning.

Need Analyses

The questionnaire instrument was used in the needs assessment as a tool to identify needs [22] related to the flipped classroom-based class design in the training of piping inspectors. The respondents used to complete the questionnaire consisted of trainees and trainers who carried out training activities and were competent in the field of piping inspectors. In this questionnaire there is a choice between “YES” or “NO”, which is an answer to the questions posed with a response weight of 1. Table 2 is a grid of questionnaires used in the assessment of needs. The needs analysis questionnaire has been validated by relevant experts, by looking at the suitability of the indicator coverage and the legibility of the questionnaire or analysis of good and easy-to-understand grammar rules.

Expert validation and revision

Expert validation carried out in development research was related to the instructional design that is being developed and the related product that results from the research [23]. This activity includes 2 parts including (a). FGD (Focus Group Discussion) is an academic discussion class that is used to: 1) explore detailed information about knowledge, attitudes and perceptions, 2) develop research hypotheses, 3) provide qualitative data in research evaluation, planning, implementation processes, monitoring and evaluation of development [24]. FGDs were conducted by presenting experts relevant to the project being developed in a discussion forum. The results of the activities have been summarized in a report and the proposals and inputs for the developed model have been analyzed. The results of the FGD become a benchmark for reviewing the schedule that has been prepared. After the improvement or revision of the didactic project, expert verification of its validity is carried out. (b). Expert validation: Expert validation is the

process of providing validation to the developed learning model and the product of research results. Content validation is the degree that needs to be achieved by a measuring instrument to be able to measure the scope of the substance to be measured, in this validation there are two things that need to be considered, namely: valid for the content and valid sampling technique used. Content validation includes matters relating to items to describe the measurement within the scope to be measured. While the validity of sampling is related to how a sample can represent the total coverage of content. This expert validation is carried out by 7 experts in the relevant field of expertise according to the validation needs.

Validation was done by filling out the questionnaire that had been provided to validate the aspects required in the learning model and the resulting product. Expert validation used an assessment questionnaire using a modified Likert scale, using categories 1 = Very Poor, 2 = Poor, 3 = Good, 4 = Very Good. Aspects assessed in the questionnaire are Needs Analysis, Learning Material Aspects, Presentation Aspects, Language Aspects, Graphic Aspects, (Module Books, Instructor and Participant Guides). The results of the expert assessment ended with a general product assessment with the following selection criteria: A. Can be used without revision, B. Can be used with minor revisions, C. Can be used with major revisions, D. Not yet usable. The results of expert validation are confirmed by quantitative calculations with the validity coefficient and the homogeneity coefficient of reliability Aiken [25]. The instrument is declared valid if the calculation results are in the range 0 to 1, and the Cronbach Alpha reliability 0.6.

Table 2 Piping inspector training needs analysis grid questionnaire

Aspects observed	Observable indicators	Statement Item No
Perceptions of Participants/Training Instructors	Passion for training, interest in exam methods and online delivery of materials, understanding of training materials and the need for reviews by industry practitioners	A1, A2, A3, A4, A5
Training experience	Experience with training media, training methods, facilities used and difficulties in training	B1, B2, B3, B4, B5, B6, B7, B8, B9, B10
Instructional Design Development Needs with Flipped Classroom in Piping Inspector Training	Instructional design needs based on flipped classroom, interactive media, online tutorials, independence, online materials, individual assignments and expectations of success.	C1, C2, C3, C4, C5, C6, C7, C8, C9

Field Trials and Final Products

The research sample is the piping inspector training participants at the Training Institute. Experimental trials, using the Posttest control group design. This design was chosen because in this experimental study, the researcher could not fully control the variables that also influenced the research results or in other words, the two groups in the experimental study could not be created under the same conditions. The experimental action was carried out by dividing two batches of Piping Inspector trainees. The first batch is called the control group and the second batch is called the experimental group. The actions taken in the control group were the Piping Inspector training participants who had not used the flipped classroom-based instructional design, while the experimental group used the flipped classroom-based instructional design. The training was carried out at different times due to the limitations of the participants as experimental subjects. The flipped classroom method is carried out as the main reference to be able to instill an independent attitude, discipline, learning by doing participatory learning, exemplary, discipline, habituation and contextual teaching learning in carrying out individual tasks as part of the implementation of a flipped classroom.

Activities in individual rooms are an integral part of this flipped classroom-based instructional design, the principle being that participants carry out individual tasks and follow implementation instructions and their compliance had been continuously monitored by the training team and do it themselves as exemplified by the instructor in each learning stage. Actions to monitor compliance with individual tasks through activity diaries, quiz results and responses from training participants. Briefly, it can be stated that the individual task instructions must be followed completely, any deficiencies or incompleteness will be the duty of the training team to remind them.

Prior to the piping inspector training, instructors and management from the Training Institute had conducted socialization to the training team and training participants. During the socialization process, soft copies of the manual for each training participant and training team were also given. This manual is intended as a direction that must be carried out by each component in the implementation of the Piping Inspector Training with Flipped Classroom-based Instructional Design.

The results of the test in the piping inspector training in the form of competence as a piping inspector were taken through the participant's observation process by the instructor during the training period. Competency assessment is also carried out at every stage of training through online quizzes as a control or improvement process if something is found to be inappropriate, this can be referred to as formative evaluation. The results of the control group experiment and the experimental group are referred to as the instructional design effectiveness test based on the flipped classroom in the piping inspector training, while to find out the practicality test of the model developed by filling out a questionnaire filled out by the instructor and participants in the experimental group.

Instructional Design Practical Test

Practicality test is intended to determine the practicality of implementing instructional design. Practicality is seen from the perception of instructors and trainees on the Piping Inspector training held by the Training Institute. The practicality of the model was measured using a questionnaire, which was given to the experimental group participants and the Piping Inspector Training Institute training instructor. Perception is explained by quantitative descriptive based on the processing of the results of the questionnaire given. Perceptions can be expressed in terms of the frequency and degree of achievement of each indicator to determine perceptions of the developed instructional design. Degree of Achievement (DA) is Good if DA 80-89 and Very Good if DA 90-100 [26]. Degree of Achievement can be calculated by the following formula:

$$DA = \frac{\sum X}{n \, x \sum item \, x \, Highest - Scale} x100\% \quad (1)$$

Note: Σx=Total score of the measurement results, n=Number of respondents and item=# Of of Items

RESULTS AND DISCUSSION

Need Analysis Result

The needs analysis in this study was written in the form of the respondent's level of achievement. Needs analysis questionnaires were administered to 48 respondents online. Based on the results of the analysis of piping inspector training needs based on the flipped classroom, 48 respondents consisted of oil and gas inspection practitioners, alumni of Training Institute and training practitioners. As many as 23 respondents from industry practitioners, as many as 20 respondents from alumni, practitioners providing education or course institutions as many as 5respondents. The needs analysis questionnaire uses the "Yes" and "No" response categories.

The need for instructional design development showed that trainees agreed 100% to the flipped classroom-based training design. Interactive media, real time and interesting presentations in 'Yes' are almost 100% by respondents. The flipped classroom criteria such as independent study, preparing question materials and proactively seeking references for study materials received more than 90% support. And the belief that the results of the piping inspector training based on the flipped classroom gave good results of more than 90%. In general, it can be said that the respondents agree that it is necessary to develop a new instructional design for the training of piping inspectors.

Product Validity Test

The product validity test was conducted to determine the level of product validity produced in this study. The product in question was a learning instructional design that was developed, namely, a learning instructional design book, an instructor manual, an instructor guidebook and a learning guide book for training participants in the implementation of instructional design trials in the field on a small or large scale. The validity used is content validity using 6 experts as validators. Expert validity using an assessment questionnaire using a modified Likert scale, using categories 1 = Very Poor, 2 = Poor, 3 = Good, 4 = Very Good. Aspects assessed in the questionnaire are Supporting Theory, Instructional Design Structure for Flipped Classroom-based on Piping Inspector Training, Desired learning outcomes, (for instructional design books). Aspects of learning materials, aspects of presentation, aspects of language, aspects of graphics, (instructor manual, instructors and training participants). The results of the expert assessment ended with a general product assessment with the following selection criteria: A. Can be used without revision, B. Can be used

with minor revisions, C. Can be used with major revisions, D. Not yet usable. Based on the validation results from 6 experts who gave assessments, the results of this study were stated with a general assessment of category "A. Can be used without revision", Aiken's and Cronbach Alpha results are in Table 3.

Table 3 Validation result of Research Products by expert's panel

Research Product	Aiken Value Validity *)	Cronbach's Alpha **)
Research Instruments	.85	.65
Design Book	.85	.65
Teaching Module	.84	.63
Instructor Guide	.84	.65
Participant Guide	.84	.66

*) Aiken Value Minimum is 0.6

**) Cronbach's Alpha Minimum 0.6

The Instructional Design Effectiveness Test

This data analysis was the result of a large-scale trial, which was carried out by experimenting with the implementation of flipped classroom-based instructional design for piping inspector training. Piping inspector training was carried out in different batches, the 1st batch was held in January 2022 and the 2nd batch was held in February 2022. The 1st batch was carried out normally without a flipped classroom and in the 2nd Batch the training was carried out on a flipped basis. classroom. The total respondents in this test are 20 trainees in each batch. The process of taking the assessment of the training participants is carried out by the instructor in each batch in the training process. Assessment is carried out in the middle of the training process and at the end of the training process. The main competency assessment is in the final assessment of the training process, while the assessment carried out in the middle of the process is to control the assessment action or as an evaluation in the final assessment process. Instructors carry out piping inspector training according to the flipped classroom principle which was emphasized at the beginning of the training. The following is the result of processing the value data of the piping inspector training participants as the result of the flipped classroom-based instructional design effectiveness test in the piping inspector training.

Table 4 Descriptive Statistic of final examination result

	N	Min	Max	Mean Statistic	Std. Error	Std. Deviation	Var
Control	20	42.67	81.33	64.05	2.41	10.78	116.10
Experiment	20	75.00	96.61	85.63	1.51	6.76	45.68
Valid N (list wise)	20						

Based on the data in the Table 4, the distribution of the instructional design effectiveness test based on the flipped classroom in the piping inspector training, in the control class, the maximum competency value of the trainees was obtained with a value of 81.33 and the minimum score was 42.67 with an average value of 64. Distribution of data for the experimental group, the highest competency value of the trainees was obtained at 96.61 and the minimum competency score at 75, with the achievement of an average competency score of 83. Based on Table 5, both data control and experiment are Normal with significant level > alpha (5% leve

Table 5 Normality Test of final examination result

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Control	.116	20	.200*	.960	20	.549
Experiment	.134	20	.200*	.937	20	.213

*. This is a lower bound of the true significance with alpha = 0.05

a. Lilliefors Significance Correction

Based on the calculations in the Table 6, it was obtained that tcount = 26.58 for the score of the control group trainees, while for the tcount the score of the experimental group trainees is 56.66 and the ttable value with df = 19 at a significance level of 5% is = 1.729. The decision is if the value tcount > ttable, (i.e., 26.58 > 1.729 and 56.66 > 1.729) then Ho is rejected and Ha is accepted. Based on the mean difference in the table for the control group of 64.05 and the experimental group of 85.64, this indicates that there is an increase in the achievement of flipped classroom competencies of trainees between the control group and the experimental group in carrying out flipped classroom learning. Then the application of flipped classroom instructional design is stated to be able to improve flipped classroom learning outcomes for piping inspector training.

Table 6 t-Test of final examination result

	t	df	Sig. (2-tailed)	Mean Difference	95% CI Lower	95% CI Upper
Control	26.58	19	.00	64.05	59.01	69.09
Experiment	56.66	19	.00	85.64	82.47	88.

The Practical Test Results

Practicality test was conducted to determine the practicality of flipped classroom instructional design. To answer research questions, which were explained by descriptive statistics. The practicality test is carried out by knowing the perceptions of the piping inspector training participants at the Training Institute. Practicality test is carried out after the effectiveness test process is carried out. The number of instructor respondents is 11 people who teach at the Training Institute. The number of respondents who participated in the training was 20 people, where the training participants were trainees who were included in the experimental group in the large-scale trial process. This group was chosen because the trainees already understood the principles and concepts carried out in the implementation of learning using flipped classroom-based instructional design in the piping inspector training that had been carried out. There were 30 items questions and scale from 1 to 5 i.e., strongly agree (5), agree (4), neutral between agree and disagree (3), disagree (2) and totally disagree (1). Based on the results of data processing from the questionnaire given to the respondents, the following data were obtained in Table 7 and Table 8. Table 8 shows that the degree of achievement is more than 80 for both Instructors and Trainees, so it can be concluded that the practicality of the piping inspector training with flipped classroom-based instructional design is quite practical

Table: 7 Distribution of Training Instructor and Participants' Perceptions of Practicality

Instructor			Trainees
N	Valid	11	20
	Missing	0	0
Std.Error of Mean		4.20	3.11
Std. Deviation		13.94	13.91
Variance		194.456	193.46
Range		43.00	54.00
Minimum		104.00	96.00
Maximum		147.00	150.00

Table: 8 Distribution of Training Instructor and Participants' Perceptions of Practicality

	Instructor	Trainee
Σx	1390	2475
n	11	20
# Of Items	30	30
Highest Scale	5	5
n x # Of Items x Highest scale	1650	3000
DA	84.24	82.50

CONCLUSION

Based on the result as above, it can be concluded that the training participants need a paradigm shift regarding the independent training process that begins with carrying out individual tasks completely before attending face-to-face meetings in class via online or offline. The essence of the implementation instructional design of the piping inspector training based on the flipped classroom is that participants learn contextual learning, discipline, exemplary and habituation, which will provide real interaction with activities in face-to-face classes and facilitate the absorption of new knowledge and skills.

The needs analysis concluded that the need for a flipped classroom-based instructional design for the training of piping inspectors was necessary. Instructional Design which is declared valid, effective and quite practical. Training participants and practitioners can be quite practical to apply the MPI Atwi instructional design model which was well established using enrichment learning strategies with Talberth's flipped classroom design framework.The research process has been carried out as much as possible by the researcher through the stages in accordance with the research procedure, but there are still some limitations in the process. There are several things that may affect the results of the study that the researcher may not fully control. This is considered as a limitation of the study, including: 1) The perception of flipped classroom-based instructional design as a practical test of learning instructional design cannot be given to the oil and gas industry as a whole, due to limited time and networks owned by researchers, 2) It takes a long time to be able to apply this flipped classroom-based instructional design more broadly in oil and gas training considering the high cost of training that must be borne by the trainees.

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