

修士論文

Implementation and Evaluation of e-Learning Safety Course
at Industrial Vocational Training Center
in Indonesia

インドネシアの職業訓練センターにおける安全コースの
e ラーニングの実施と評価

社会文化科学研究科博士前期課程教授システム学専攻

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Master's Thesis

**Implementation and Evaluation of
e-Learning Safety Course
at Industrial Vocational Training Center in Indonesia**

**Master's Program
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修士論文（又は特定課題研究）要旨 （日本語）

題 目

インドネシアの職業訓練センターにおける安全コースの e ラーニングの実施と評価

要 旨

途上国として、インドネシアでは職能別訓練方式を採用し、有能な労働力となる人材の資質向上に努めてきた。しかし、この方式の実施においては依然、教室で行われる教師中心の授業という従来の方法が採られている。本研究では、特にインドネシア産業職業訓練センターにおける職能別 e ラーニングの実施とともに、いかにすれば e ラーニングが訓練プロセスを学習者中心システムに向上させることができるかについての評価に努めた。対象は e ラーニング方式訓練に参加した 2 クラス（32 名の訓練生）、訓練教材はインストラクショナル・システム・デザインに基づく e ラーニング教材「安全性コース」であった。事後テストの結果、参加者全員がこの e ラーニングコースを平均得点率 87.62～93.12%（合格基準は 80%）でパスした。訓練生たちの全体的な感想もアンケートにより得られ、e ラーニングシステムに対し肯定的な態度が示された。結論として、e ラーニングはインドネシア産業職業訓練センターにおいて実施されるべき効果的な方法であると考えられる。

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修士論文（又は特定課題研究）要旨 （英語）

題 目

Implementation and Evaluation of e-Learning Safety Course at Industrial Vocational Training Center in Indonesia

要 旨

Indonesia as a developing country has been trying to adopt the Competency-Based Training method to improve the quality of human resource as competitive work labor. However, the implementation of this method is still using the old traditional way of classroom teaching which is teacher centered training. This research tried to implement e-learning in the competency-based training especially in Industrial Vocational Training Centre in Indonesia and to evaluate on how e-learning can improve the training process to a learner centered system. The subject was 2 classes (32 trainees) which attended e-learning methods of training. The material of the training was Safety Course which was presented as e-learning material based on instructional system design. The post test result showed that all the participants passed e-learning course with average score 87.62% and 93.12% (passing grade is 80%). The general impression of the trainees was also obtained by questionnaire and showed a positive attitude toward e-learning system. It can be concluded that e-learning is an effective method to be implemented in the Industrial Vocational Training Center in Indonesia.

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Chapter 1

Background of Research

1.1 Training in Indonesia

Indonesia has different approach on education and training. The government of Indonesia distinctively differentiates between education and training. Education is referred as formal education (6 years of elementary school, 3 years of junior high school, 3 years of senior high school, and higher education in universities or colleges) while training is referred to informal training process without any diploma or degree acquired. Education is the responsibility of Department of National Education (Departemen Pendidikan Nasional) and training is the responsibility of Department of Manpower and Transmigration (Departemen Tenaga Kerja dan Transmigrasi). Other differences between education and training in Indonesia can be seen on table 1.

Table 1. *Differences between education and training in Indonesia*

	Education	Training
<i>Department in Government</i>	Department of National Education	Department of Manpower and Transmigration
<i>Social status</i>	Formal	Informal
<i>The end result</i>	Degree / Diploma	Certification
<i>Length of the program</i>	Long term program (years)	Short courses (months or less)
<i>Emphasis</i>	Emphasize on Knowledge	Emphasize on Skill
<i>Government's policy</i>	Compulsory (9 years of lower education)	Optional

The training in Indonesia is under the responsibility of Department of Manpower and Transmigration because its main objective is to provide a skillful manpower for the industry with limited time. Unlike education sector who maybe take years to produce the result, the training sector need a relatively quick process to produce the result. That is why training in Indonesia is usually aim for the non working class who didn't continue their education. The non working class mostly consists of high school graduates (junior and senior) who didn't have any financial support to

continue to the next level of education. Therefore they choose to work on industrial sector instead. These graduates however, didn't have enough skill to work on the industrial sector because the formal education in Indonesia didn't aim to produce ready-to-work graduates. So the government decided to overcome this problem of unemployment and at the same time fulfill the demand for skillful manpower by the industrial sector by developing industrial training programs.

As a form of responsibilities of the government and with many aids from foreign countries, Indonesia builds many Industrial Vocational Training Centers (Balai Latihan Kerja Industri) all over Indonesia. These training centers not only act as the training place for people on that area, but also have many functions, such as forming plans, program, evaluation and report of the training; developing program, system and method of training as well as training equipments and infrastructures; conducting competency based training and competency test for the trainees; providing custom training services for companies; etc (Balai Latihan Kerja Industri Samarinda, n.d.). In the last few years, government's industrial vocational training centers are developed to provide 3 in 1 service; not only as a training place, but also as a place for certification centers and employment centers where the potential workers (especially the trainees) can meet with the future employee in a one place. For this purpose, the department has designed a website (Kios 3 in 1 Departemen Tenaga Kerja dan Transmigrasi, n.d.) to accommodate those functions. This website acts as an information center for the potential trainees to gain information and sign up for training process.

1.2 Industrial Vocational Training Center in Indonesia

Industrial vocational training centre in Indonesia is the training center owned by the Department of Manpower and Transmigration with the purpose of providing training for Indonesian people (manpower) with correlation with industrial sector as the main users of the manpower.

Industrial Vocational Training Centers around Indonesia were established approximately around 1980s. Before year 2000, there are more than 100 training centers under the management of Department of Manpower and Transmigration, but after the regional autonomy on year 2000 only about 10 training centers are under direct management of Department of Manpower and Transmigration. The rest of the training centers are under the management of regional government

although until present day the Department of Manpower and Transmigration still provides technical assistance to those training centers.

Two Industrial Vocational Training Centers in Indonesia is being used as the sample of the training centers managed by the Department of Manpower and Transmigration. Those training centers are:

- Institution for Manpower Training and Development of Overseas Employment Bekasi, West Java (near Jakarta, the capital of Indonesia)
- Industrial Vocational Training Center Samarinda, East Kalimantan (on Borneo Island)

Institution for Manpower Training and Development of Overseas Employment Bekasi

In 1985 was officially established by Japan Prime Minister Mr. Zenko Suzuki, Indonesian Minister of Manpower, Mr. Soedomo and Industry Minister, Mr. Hartarto, as a token of friendship between the Japan Government and Indonesia Government to develop Indonesia Human Resources (instructor training and small enterprise guidance) in the ASEAN region with the name of The Centre For Vocational and Extension Service Training (CEVEST).

In 1986 the name was The Centre for Instructor Training CEVEST (DIKLATIN-CEVEST)

In 1990 became Instructor Training and Development Institution (BLIP)

In 2001 became the Centre Development Training of Labor Service Industries (P3TKIJ)

In 2002 became the Centre for Manpower Training of Overseas Employment (Puslatker TKLN)

In 2006 became the Institution for Manpower Training and Development of Overseas Employment (B2PLKLN)

B2PLKLN is obligated to and responsible for enhancing the quality of HRD and encourages other training institution to prepare competent and professional manpower so as to be competitive in the Global Labor Market.

The role of B2PLKLN in the enhancement of human resources quality is aimed at the effort of setting up productivity through competency based training and competency test which are oriented on overseas labor market.

In enhancing the quality of employment, B2PLKLN always be oriented by efficiencies, effectiveness, as well as transparencies in accordance with the national policies and strategies.

The organization has always expected close collaboration with industries, training institutions, government institutions both domestic and overseas ones as well as society.

B2PLKLN's missions are:

- To improve manpower quality and productivity
- To develop Indonesian human resources, training program, and management
- To conduct training based on competency and competency test
- To enlarge employment network with other training institution and overseas employment placement institutions

Industrial Vocational Training Center Samarinda

For approximately two decades the Industrial Vocational Training Center Samarinda had undergone several structural changes of organization as the logical consequence of the development of manpower in Indonesia.

Industrial Vocational Training Center Samarinda first was named Centre of Industrial Vocational Training and Forest Management (PLKIMK). Then changed into Industrial Vocational Training Center (BLKI), then changed into Vocational Training Center (BLK) and now return to Industrial Vocational Training Center Samarinda (BLKI) Samarinda.

Industrial Vocational Training Center Samarinda is one of the Central Government's Technical Operational Unit (UPT) in the field of manpower training on the industrial sector under the Directorate General of Productivity and Training Development which held responsibility to Department of Manpower and Transmigration Republic of Indonesia.

Industrial Vocational Training Center Samarinda consists of 59 personnel (for January 1st 2006) who consist of 1 Head of the Training Centre, 3 Officers, 33 Instructors, and 22 administration staff.

The main functions of Industrial Vocational Training Center Samarinda are:

1. Management of planning and program, evaluation and report
2. Conducting intermediate level training of manpower, instructor, and trainers
3. Development of training program, system and method, and training infrastructure
4. Development of productivity program, system and method
5. Conducting trial test for competency standard, competency test, and certification after accreditation from the proper institution
6. Promotion of programs, facilities, services, products, and training outcomes
7. Provide information services
8. Development and conducting cooperation with other parties (government and private sectors)
9. Conducting administrative businesses

1.3 Competency Based Training (CBT) in Indonesia

In some countries such as Australia, Philippine, Singapore and Malaysia, the Competency Based Training (CBT) system has been implemented since 10 - 15 years ago. In Australia, the application of the CBT system which is managed by the institutional Anta (Australian National Training Authority), has given results and positive impacts on the quality of employment and national economic performance. Similarly, Philippine's experiences with TESDA (Technical Education and Skill Development Authority) and with NVTC Malaysia (National Vocational Training Council) has also proven the benefit from this CBT system. If Indonesia does not immediately change the paradigm of human resource development with the preparation of this CBT system, then the Indonesian workers will be left behind and lose the competition with manpower from other countries, particularly in Southeast Asia. If this happens, not only Indonesia will lose market share abroad, but also the market share in the homeland will be seized by foreign workers from other countries.

The idea to develop a CBT system in Indonesia began nationally since the endorsement of a joint decree (SKB) between the General Chairman of the Indonesian Trade and Industrial Chamber, Minister of Manpower and Transmigration, Minister of National Education and Minister of Trade and Industry in April 2000.

In that decree, said that it is in agreement to develop a training system based on the "demand driven" principle which is a system of training that is based on the needs of users (industry). A Working Committee is formed with members of all the relevant elements. During the period 2000-2002 the working committee makes the concept of the training system. In the process of conception, the working committee obtains inputs from various numbers of sources such as seminars activities which include industrial associations and professional associations and some study trip to other countries, including Australia, the Philippines, Singapore and Malaysia (Abdurrahman, S.F, n.d.).

The concept of the training system developed by the working committee is CBT system. Then they convey it into the draft law of manpower. At the beginning of the year 2003 the draft is passed into Law no. 23 year 2003 on manpower. In the law explicitly stated that the training should be competency-based, manpower must have a certificate of competence, and competency certification is being done by the National Board of Professional Certification (Badan Nasional Sertifikasi Profesi, n.d.). The formulation of National Board of Professional Certification then put in the Government Regulation (Peraturan Pemerintah) no. 23 year 2004 about the National Board of Professional Certification (BNSP).

So what is CBT anyway? Competency Based Training (CBT) is training that is based on what people are expected to be able to do in the workplace. It is widely accepted internationally, and is a way of making training more relevant to the world of work. CBT emphasizes what a person can actually do as a result of the training (the output). This is different to the more traditional approach which emphasizes the amount of training that has been attended (the input) (Bali Tourism Institute – Sekolah Tinggi Pariwisata Bali, n.d.).

So, the advantages of CBT are:

For Trainees, CBT can:

- Allow trainees to study at different rates.
- Increase the motivation of trainees.
- Allow trainees to take more responsibility for their own learning.
- Keep trainees task-oriented and active

For Trainers, CBT can:

- Match training to required job competencies.
- Allow open-entry, open-exit and self-paced training programs.
- Simplify assessment procedures.

For Employers, CBT can:

- Certify the competence of an employee.
- Allow staff to obtain credit for what they already know and can do.
- Reduce the training time for some employees.

In the CBT system, there is a term called Competency Standard. Competency Standards are simply worded statements about the performance in the workplace that describe in output terms: What the employee expected to do; how well the employee is expected to perform; and how to tell when the employee's performance is at the expected level. The benefits of Competency Standards include:

At the National Level

- More cost efficient and relevant vocational education and training.
- Better skill formation to compare internationally.
- More consistent assessment.
- Better linking of training, assessment and certification.
- Possibility of recognition of prior learning arrangements.

At the Industry and Company Level

- Better identification of skill needs.
- Better understanding of course outcomes.
- Less duplication of training efforts.
- Improved recruitment.
- More reliable and consistent assessment of training.

- More accurate identification of workforce competencies.

A Competency Standard Unit covers a key role in the workplace and consists of four components:

- Competency Elements which outline the key activities included in the role.
- Performance Criteria which detail what people must do to display competence.
- Range of Variables which describe the contexts and conditions relevant to the unit.
- Evidence Guide which describes how competence will be recognized.

So this is what a Competency Standard for Industrial Safety (specific for mechanical technology course) looks like:

UNIT TITLE: Applying safety and work health in the working environment

	COMPETENCY ELEMENTS:	PERFORMANCE CRITERIA
1.	General Safety	Accident prevention in working environment Personal discipline of the workers Lighting in working area or workshop
2.	Work Safety Activities	Analysis of the causes of working accidents Workers' responsibility towards safety and work health Understanding safety and work health in fire hazard
3.	Evaluation in Working Environment	Area and type of the operating machinery Personal safety gears How to operate the machinery

RANGE OF VARIABLES

this unit applies to working environment.

EVIDENCE GUIDE

to demonstrate competence, evidence of skills and knowledge in the following areas is required:

Knowledge of safety regulations, procedures, and personal safety gears.

Be able to analyze and determine the probable causes of working accidents and making evaluation to minimize the risk.

Be able to use personal safety gears and safety equipments in working area correctly.

Be able to operate the machinery safely using the proper working procedures.

The evidence guide is connected to other competency unit such as perform lathe machines, drilling, grinding, etc. So the practical skill cannot be assessed immediately, but will be shown in the later work of the trainees. The only assessment that can be done is knowledge assessment of the trainees to see the comprehension of the trainees about work safety.

In Industrial Vocational Training Centers all around Indonesia, the guidelines of conducting CBT is the same. This is designed in order to produce the same quality standard of the manpower after using CBT as the learning system.

The learning strategy of CBT is quite different with the traditional class room learning which the teacher (or instructor) teach all the material to the students (trainees). In CBT, the trainees have their own responsibility to their own study progress, making plan with the instructor, and execute the plan diligently.

Planning / Preparation steps (Department of Manpower and Transmigration Republic of Indonesia, n.d.):

- a. Read the learning material on each learning stage in order to understand the content of the learning process.
- b. Make notes on what that has been read.
- c. Think on how the knowledge that has just been received is connected with the previous knowledge and experiences that the trainee's had.
- d. Planning practical application of the new knowledge and skill.

The beginning of the learning process:

- a. Trying to answer all the questions and do the practical assignments in the learning stage.
- b. Revise and review learning material so the trainees can combine their knowledge altogether.

Observation of the practical assignment

- a. Observe the practical skill that has been demonstrated by instructor or other experienced individuals.
- b. Ask questions to the instructor about difficult concept that the trainees have found.

Implementation:

- a. Apply safety working training.
- b. Monitor the personal improvement indicator through practical activity.
- c. Practice the new skill that had been received.

Assessment

Perform the assessment to finish the learning process.

Training method

There are three training methods that can be used. In several cases, the combination of those training methods can be used.

- a. Self learning

Self learning let the trainees to learn individually by their own learning pace. Although it is freely conducted learning process, the trainees have been advised to consult to the instructor anytime to confirm the progress of the learning process and to overcome learning difficulties.

- b. Study group

Study group is enabling the trainees to come together regularly and participate in study group sessions. Although the learning process have the same principle of different learning pace among the trainees, this study group sessions give interaction among the trainees, instructors, and subject matter experts from the workplace.

- c. Structured learning

Structured learning consists of formal class room meeting conducted by instructors or other experts. This particular learning session is generally regarding a certain topic / theme of learning process.

1.4 Problems in Current Traditional Method

Although the system and procedure of CBT have been improved by the government, there are still many weaknesses, problems or challenges in the real application of CBT in Industrial

Vocational Training Centers in Indonesia. These problems must be identified in order to have the right solutions for future improvement of the system itself. The problems are explained in table 2. These are based on CBT training in Industrial Vocational Training Centers in Samarinda, East Kalimantan, Indonesia.

Table 2. *Problems on the implementation of CBT in Indonesia*

Problems	Explanation
Learning material	CBT provides three books: information book, work book, and assessment book. These books are supposed to become a self learning system, however the content of the books somehow is not enough for self-learning process and there are some unnecessary information has been repeated on those books. The books are also didn't give enough instructions for the trainees to do self learning process. The work book and assessment book is not user friendly, the trainees usually didn't able to do the work book or do the self assessment process without the proper guidance of the instructor. The content of the information book is not adequate to fulfill the practical skill of the competency unit. The instructors must provide additional information so that the trainees can understand the learning subject more clearly.
Learning method	The three methods that have been explained are not well utilized. Self learning and study group are basically impossible to do in previous learning environment. The learning process is based on the method of classroom meeting where the instructor taught most of the new knowledge that have been provided in the book with some extra information.
Learning motivation	The trainees are likely having high motivation to join the training because the reason they join the training is to improve their skills in order to have a better job in industrial sector. The real challenge is how to maintain the high initial motivation level during the whole process of training. Especially on the theory sessions which is not involving any physical activities in the workshop.
Learning environment	The trainees usually learn on two places: classroom and workshop. On the workshop, because it is involving many physical activities, the learning environment is quite lively. However in the classroom, the learning environment is quite uninteresting. It is instructors' responsibility to keep the learning environment is attractive and interactive enough for the trainees.
Trainees condition	Government's training is aiming for the unemployed. Mostly consists of junior and senior high school graduates who didn't have the opportunity to continue to the higher education. This is also a challenge to the CBT system. On the high school, the learning method is classroom meeting where the teachers give all the knowledge and the students receive all those knowledge and try to memorize or understand the knowledge in order to answer the questions (pass the final examination). Without fostering information utilization skill, the trainees are having difficulties to use CBT method who actually using self learning system. The changing of the learning method in such drastic way sometimes leads the trainees into confusion. The instructions provided in the book didn't help much because it is usually mentioned in a general concept, not applied practically in the learning content itself. Another problem is the computer literacy among those high school

	graduates. Because computer course is still an optional subject in our educational system, many high schools (especially on the remote areas) didn't introduce computer skills to their students. This condition is also another challenge in introducing a computerized system that should be solved immediately.
Learning pace	There are some difficulties in learning pace. In the nature of CBT, because it is self learning, the learning pace should differ on each trainee. When the trainees feel that they have acquired the required knowledge and skill, they can proceed to the competency test. However, because the method is still classroom meeting, the learning pace is forced in the same speed on every trainee. This will cause problem if some of the trainees didn't understand the learning material, but they are forced to continue the learning progress. The instructor also determines when the trainees can have the competency test. In the end, the trainees have difficulties on the competency test and must do the test again to pass the competency unit.

E-learning is the new method that will be tried to be implemented in the CBT learning system. The e-learning will be conducted in computer laboratory in Industrial Vocational Training Center. Using computer as the media of delivering the learning material to fully acquire the self learning method of CBT system as the original concept, e-learning should be the solution to answer the practical problems on the current implementation of CBT. The learning material should be analyzed and improved using instructional design system with many viewpoints that can increase the quality of learning process. Analysis of viewpoints of motivation, input and output of learning process, strategies for effective learning, etc., can be very useful tools to improve the learning content.

This research will mainly observes the efficacy of the new e-learning system, which can be derived from the output of the learning process (post test), whether fulfill the passing criteria or not (80% passing grade). If the participants who are using this system can pass the passing grade, it can be concluded that the system is effective to be implemented in the Industrial Vocational Training Centre. The research will also evaluate the other aspects of the new e-learning process using the questionnaire to obtain the impression data of the participants.

Chapter 2

Theory and Literature Review

2.1 Instructional Design

Instructional design is not common term in daily use. Many people didn't know about what is instructional design about. However, many people in fact have already implemented instructional design, especially in educational sector, but didn't realize that what they are doing is instructional design.

2.1.1 What is instructional design?

So what is instructional design? First of all, we must define what instruction is. Instruction is a human undertaking whose purpose is to help people learn. It is a set of events that affect learners in such a way that learning is facilitated (Gagne, Briggs, & Wager, 1992). So instruction is not learning process but a way to help the learning process. What is the difference with teaching? Teaching is one form of instruction because mostly teaching is conducted from a teacher to a student. Instruction has a much wider scope, because instruction will include all of the events that may have a direct effect on the learning of a human being, not just those set in motion by an individual who is a teacher. The instruction may be partly internal when there is a learner activity called "self-instruction."

In order to produce such effective and efficient instruction, the instruction itself needed to be well planned, so it is must be designed in some systematic way. So instructional design is a design of the instruction in a systematic method in order to activate and support the learning of the individual student.

2.1.2 Instructional design and instructional system design

There is another term that maybe common to use, instructional system design. Instructional system is an arrangement of resources and procedures used to promote learning (Gagne, Briggs, & Wager, 1992). This term is mainly used for a wide range level where the whole resources in the

system are utilized at planning and developing instructional system. Instructional system design is the systematic process of planning instructional system, and instructional development is the process of implementing the plans. However, for smaller instructional system design, sometimes it can be called instructional design. So instructional system design of the smaller components is simply referred to as instructional design since the focus is the piece of instruction itself, rather than the total instructional system.

2.1.3 Instructional design model

The general form of instructional design model is commonly known as ADDIE model. ADDIE stands for Analysis, Design, Development, Implementation, and Evaluation. These are the steps of the instructional design process flow chart as shown in figure 1.

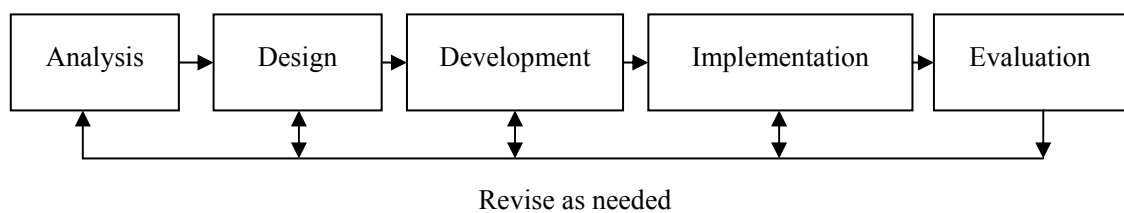


Figure 1. ADDIE model (general form of the ID process model) (Suzuki, 2004)

On the general form, it is shown that in order to achieve a good instructional design, the process can be revised as many as needed. This is the approach of “feedback and self-correction” in order to improve the quality of the instruction.

The ADDIE model is the general form of instructional design model. The more detailed model can be seen in one of the model, such as Dick and Carey (1990) model of system approach model for designing instruction in figure 2.

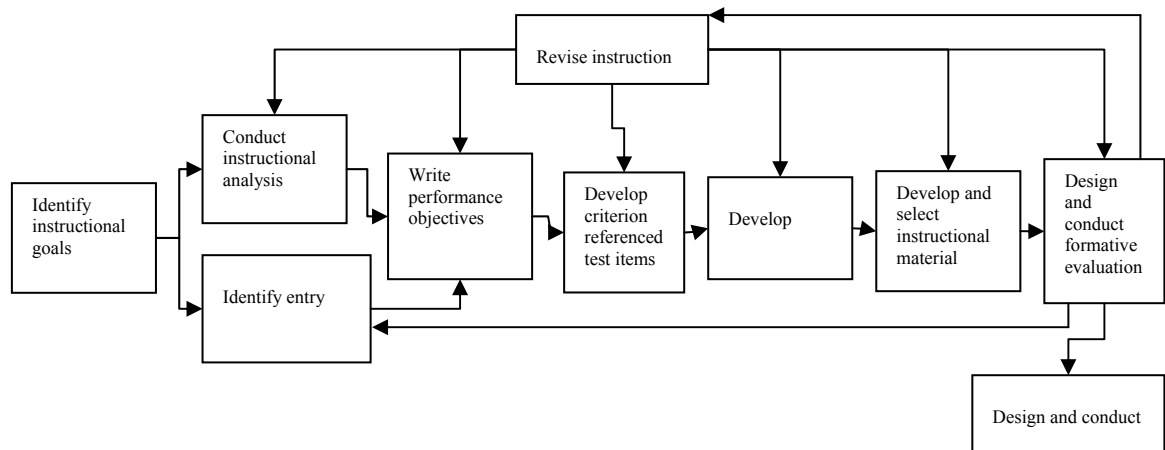


Figure 2 Dick and Carey ID process model (Gagne, Briggs, & Wager, 1992)

Looking through Dick and Carey instructional design process model, it can be seen that the first step is to identify the instructional goals, or in the educational term, define the learning objectives. Then the analysis about the entry behaviors and characteristics of the learners, in order to see the actual learning gap prior to learning process so the instructional can be designed to overcome this gap. The next step is to develop the instructional strategy referring to the previous analysis about the learning objectives and the characteristic of the learners and select the proper instructional material for each learning objective. The important part is formative evaluation which will be the tool to check the efficacy of the new instruction prior to the real usage of the instructional design. The formative evaluation results will be the base of the revision process, before finally move to the summative evaluation which will check the efficacy of the instructional design in the real life condition.

2.1.4 Instructional events

In developing instructional strategy, the core process is the instruction itself. One of the ways to develop an instructional event is the Gagne's nine events of instruction which will guide the step by step process of providing an instruction. Instruction consists of a set of events external to the learner designed to support the internal process of learning (Gagne, Briggs, & Wager, 1992). Therefore these events are external factors which will improve the learning process of a learner. The nine events and the sample of arithmetic calculation of a rectangle area can be seen on table 3.

Table 3. Gagne's nine events of instruction:

An example of arithmetic: "area of a rectangle" (Suzuki, 2004)

Event	Sample of arithmetic calculation
1. Gaining attention	Show pupils two comic books of different sizes and ask which one is bigger
2. Informing the learner of the objective	Make the pupils realize that both books are rectangular, and inform them that the aim of the lesson is to learn how to calculate the area of a rectangle.
3. Stimulating recall of prerequisite learning	Assist the pupils to understand that the opposing sides of a rectangle run parallel and that the sides cross at right angles. Also remind them of the way to calculate the area of a square.
4. Presenting the stimulus material	Show the pupils the rule for calculating area (area = length x width) and use some examples to show the way to apply the rule.
5. Providing learning guidance	Let the pupils compare the rule for calculating the area of a square and the rule for a rectangle, also let them think of the differences between them. Encourage them to apply the rule by focusing on the similarities and differences.
6. Eliciting the performance	Let the pupils calculate the areas of rectangles by themselves providing numbers that have not been used in previous examples.
7. Providing feedback about performance correctness	Write down the correct answers on the blackboard and let the pupils mark their own answers. If there are pupils who gave wrong answers, explain the reasons according to the types of their mistakes.
8. Assessing the performance	Conduct a simple test and check the progress of the pupils. If there are pupils who could not reach the target, give them some advice. Use the result for the preparation of the next lesson.
9. Enhancing retention and transfer	When their memories may have faded, ask them to explain the rule for calculating the area of a rectangle and remind them of the rule. Let them think of how to calculate the area of a parallelogram and the area of a trapezoid.

2.2 Motivation

The motivation is very important especially in the self learning / learner centered learning environment. The motivation of the learners (trainees) must be in a high level to ensure that the trainees are willingly to continue learning in the e-learning environment without any influence from the instructor. This is very important to foster the information utilization skill that will lead to the trainees' ability of actively finding and using the correct information to solve the problem.

There is a motivational strategy known as ARCS model: Attention, Relevance, Confidence, and Satisfaction which have been developed by John M. Keller. This model is the motivations of learning model which can be explain as in the figure 3.

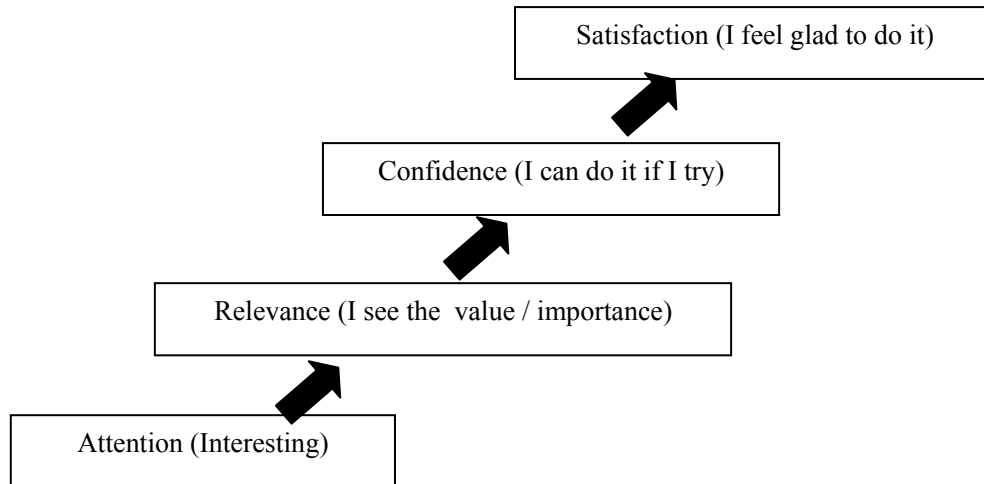


Figure 3 Four Factors in ARCS models (Suzuki, 2004)

The figure is shown that the learners' motivation will start in the learning process through the first stage which is the learners are attracted to an aspect that there seems to be something (Attention). Then, the learners will see the learning objectives and notice the importance and the related value of the learning process (Relevance). To realize only the meaning of the learning it is not enough. The learners should know that it is possible to achieve the learning objectives and if the learners can attribute the achievement as his / her own efforts, it will stimulate the aspect of confidence that the learners can do the learning process to achieve learning objectives (Confidence). If the learners are satisfied to the learning process and feel glad to do the learning process, the learners will be motivated to continue to the next learning process (Satisfaction).

The ARCS model has three major subcategories of strategies under each of the four major categories which can be seen in table 4.

Table 4. *ARCS Strategy categories* (Reigeluth, 1987)

Strategy	Explanation
Attention A.1 Perceptual Arousal A.2 Inquiry Arousal	Gain and maintain student (trainees) attention by the use of novel, surprising, incongruous, or uncertain events in instruction. Stimulate information-seeking behavior by posing, or having the learner generate, questions or a problem to solve.

A.3 Variability	Maintain student interest by varying the elements of instruction
Relevance R.1 Familiarity R.2 Goal Orientation R.3 Motive Matching	Use concrete language, and use examples and concepts that are related to the learner's experience and values Provide statements or examples that present the objectives and utility of the instruction, and either present goal for accomplishment or have the learner define them. Use teaching strategies that match the motive profiles of the students.
Confidence C.1 Expectancy of Success C.2 Challenge Setting C.3 Attribution Molding	Make learners aware of performance requirements and evaluative criteria. Provide multiple achievement levels that allow learners to set personal standards of accomplishment, and performance opportunities that allow them to experience success. Provide feedback that supports student ability and effort as the determinants of success.
Satisfaction S.1 Natural Consequences S.2 Positive Consequences S.3 Equity	Provide opportunities to use newly acquired knowledge or skill in a real or simulated setting Provide feedback and reinforcements that will sustain the desired behavior Maintain consistent standards and consequences for task accomplishment.

These strategies can be applied in the learning content in order to motivate the learners on every instructional events / stages.

2.3 Evaluation

The research will be conducted in a small group formative evaluation. First of all, let's check the definition of formative evaluation and its differences with summative evaluation.

Formative evaluation is the evaluation of instructional materials (not the evaluation of the learners) where the designer evaluates the materials to determine the weakness in the instruction so that revisions can be made to make them more effective and efficient.

On the other hand, summative evaluation is evaluation of the material in terms of their effectiveness in order to provide data for decision makers who may adopt or continue to use the materials (Smith & Ragan, 1999).

The functions of formative evaluation are determines learning progress, provides feedback to reinforce learning, and correct learning errors. The functions of summative evaluation are

determines end-of-course achievement for assigning grades or certifying mastery of objectives (Gronlund, 1985).

It is appeared that the main difference between the two kinds of evaluation is the function of the evaluation. Formative evaluation has the function of improve the learning material itself, while summative evaluation is to measure the achievement of the users.

There are some stages of formative evaluation:

- Design reviews
- Expert reviews
- Learner validation
- Ongoing evaluation

Design reviews and expert reviews are the reviews prior the development of the instructional design and prior to the actual use with the learners respectively. Learner validation and ongoing evaluation is involving the use of the actual instructional materials with learners who represent the target audience.

Learner validation is how to use the instructional material (e-learning) to the representatives learners to see how well they can do learn and what kinds of problems arise as actual learners go through the instruction. This consists of:

- One-on-one evaluation
- Small-group evaluation
- Fields trial

This research will be mainly focus on small group formative evaluation because the time limitation of the research, so instead of measuring the result of the learning process as a final achievement of the learners (trainees), but the result will become a guidance to further revising the learning material (in this case e-learning environment). So hopefully after revising using formative evaluation, we will manage to see whether e-learning can be well implemented in Industrial Vocational Training Centre as an alternative of learning process in training environment. If the result shows significant improvement, not only we can assure that the e-learning is applicable, but also e-learning is the better way to convey theoretical knowledge portion of the whole training process.

The purposes of this particular stage of formative evaluation are:

1. To check the efficacy of the revisions based on one-to-one data (which in this case is not being conducted because the lack of time and trainees at the current research time).
2. To ascertain how well the instruction works with more varied learners
3. To see how well the instruction teaches without the designer's intervention (Smith & Ragan, 1999)

The diagram for the small group formative evaluation process can be seen in figure 4.

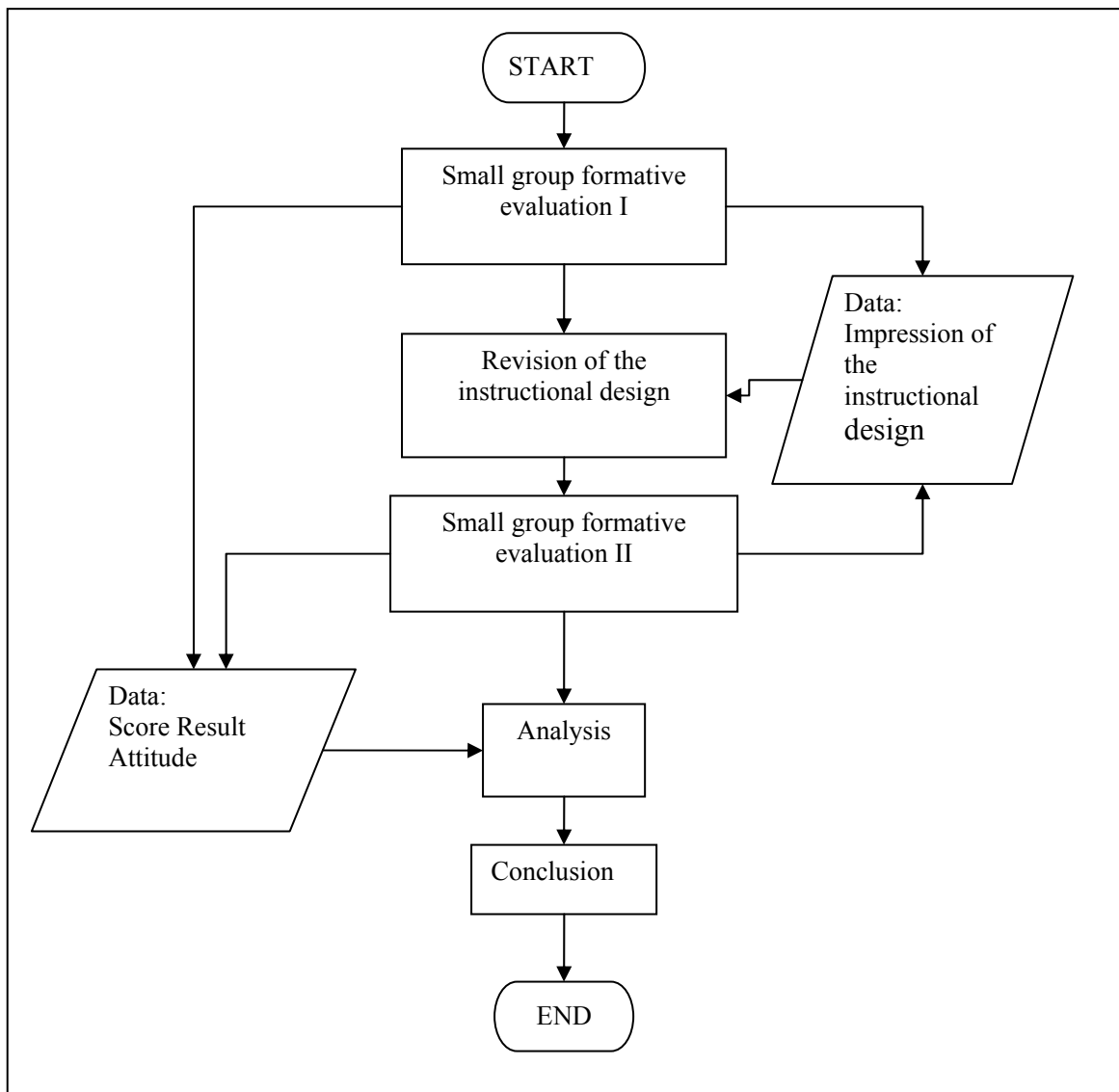


Figure 4. The diagram of the flowchart of small group formative evaluation process

Because in the small group formative evaluation the instructor (or designer) can not interfere with the learners, the evaluation can be seen through the evaluation tools inside the learning system, such as:

- Pre test (to measure the initial knowledge of the learners prior the learning process)
- Post test (quizzes and assignments on each session and final examination at the end of the course to measure the efficacy of the learning system)
- Questionnaire (to measure the attitude towards learning system and learning content and improvement for the instructional system)

The explanation for the evaluation tools can be seen on table 5.

Table 5. *Characteristic of Test*

Test	Function	Explanation
Pre test	To measure the qualification / initial knowledge of the potential learner	Base on criterion reference* with strict criteria (such as 80%, or 90 of 100), the learners who fail the test is eligible to conduct the learning process, while the one who pass the test shouldn't take the learning process because the learner has mastered the learning objectives.
Exercise	To help the learner understanding the learning content and practice the gained knowledge and skills	This test is mistake-free test where the learner can do the test without any concern of being wrong. The important thing is to provide feedback to the learner so that they know why they had made the mistake and how to resolve it. Although this is not counted as assessment process, but it is very important for the learner to actually conduct this exercise test in order to secure the gained knowledge and skill.
Quiz	To assess the learner on a specific chunk / part of the learning content	This test is a small assessment test to measure the learners' achievements on a specific part of the learning content. Usually it is placed on the end of each session or each block (several sessions). Not only to assess the learner, but also this test serves as a tool for the lecturer / instructor to identify each individual learning progress and determine on which part does the learner has some difficulties. The grading for this type of test usually is combined to achieve average score of the learner and also determine the final result of the learning process.
Post test	To measure the final result of the learner whether he/she can achieve the learning objectives or not	This is the final test of the whole learning process. Usually is the same standard with the pretest, but the outcome is the contrary. For instance, in the pretest the learner who scored <i>less than</i> 80% should conduct the learning process, but on the posttest the learner must scored <i>more than</i> 80% to pass the test. This is also criterion reference with strict scoring rule which of course must refer to learning objectives.
Questionnaire	To measure the impression of the learners and any feedback regarding the	The questionnaire usually use gauge type indication test to measure the satisfactory level of the learners or the general impression. Text written test can also be used to obtain more detailed feedback from the

	learning system and content	learners. This kind of evaluation usually only measures the 1 st level of Kirkpatrick 4 level of evaluation**
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*Criterion reference is describing pupil performance according to clearly defined and delimited domain of learning task. The opposite is norm reference which is describing pupil performance according to relative position held in some known group (Gronlund, 1985).

**Kirkpatrick 4 Levels of Evaluation are: Reactions, Learning, Transfer/Attitude, Results. Questionnaire can only provide the reactions of the learners, therefore falls on the 1st level of evaluation. However, comparison between pre test and post test can be considered as the 2nd level of evaluation (Rosenberg, 2001).

2.4 E-Learning and Self Learning

2.4.1 E-Learning

a. e-learning in general terms

The definition of e-learning according to Rosenberg (2001) is referring to the use of internet technologies to deliver a broad array of solutions that enhance knowledge and performance. It is based on three fundamental criteria:

1. E-learning is networked, which makes it capable of instant updating, storage/retrieval, distribution and sharing of instruction or information.
2. It is delivered to the end-user via a computer using standard internet technology.
3. It focuses on the broadest view of learning--learning solutions that go beyond the traditional paradigms of training.

Based on Rosenberg's definition, e-learning must have a system of networking and data storage and must be conducted through computer with internet technology (web browser, TCP/IP protocol and so on). However, he also mentioned that e-learning must focus on the broadest view of learning that goes beyond the traditional paradigms of training. Building a web based training (which of course fulfill the first and second fundamental criteria) not automatically become an e-learning. It must extend the paradigms of old training. This is quite hard because it is difficult to decide whether the training has achieved the learning process beyond the old paradigms. However, the definition could fit in this particular training case perfectly because this is the transformation of the old method of training to the e-learning system and hopefully will improve the old paradigms of training program in Industrial Vocational Training Centers in Indonesia.

There are many benefits of e-learning. Rosenberg listed these benefits as 11 major benefits of e-learning. Table 6 is the list of these benefits and some explanations about these benefits related to the training program.

Table 6. *Benefits of e-learning* (Rosenberg, 2001)

Benefits	Explanation
e-learning lower costs	The important point is that using e-learning; it will cut some other expenses such as travel expenses, classroom/instructor infrastructure, reduce the time of training, etc. The startup investment of e-learning can be quickly recovered through delivery savings.
e-learning enhances business responsiveness	E-learning can reach an unlimited number of people virtually simultaneously. This can be critical when business practices and capabilities have to change fast.
Messages are consistent or customized, depending on need	Everyone gets the same content, presented in the same way, yet the programs can also be customized for different learning needs or different groups of people.
Content is more timely and dependable	Because it is web-enabled, e-learning can be updated instantaneously and can be distributed immediately.
Learning is 24/7	This is the characteristic of e-learning, anytime anywhere, make learning operation truly global.
No user “ramp-up” time	With so many people are familiar with internet and computer, learning on how to use e-learning is not a big issue.
Universality	E-learning is now developed on mostly the same internet protocols and browser. Concern over differences platforms and operating system is rapidly fading.
Builds community	Internet enables people to build enduring communities of practice where the sharing information among the learners even after the training program is over. This is a tremendous motivator for organizational learning.
Scalability	E-learning solutions are highly scalable. Programs can move from 10 to 10,000 people with a little effort or incremental cost.
Leverages the corporate investment in the web	Executives are increasingly looking for ways to leverage their huge investment in corporate intranets. E-learning is emerging as one of those applications.
Provides an increasingly valuable customer service	Business e-commerce effort can be enhanced through the effective and engaging use of e-learning that help customers derived increased benefit from the site.

b. e-learning in training program and its limitations

Training program in Industrial Vocational Training Centers in Indonesia is quite unique. The purpose of this training is to improve the skill of the unemployed in order to give them opportunities of employment in industrial sector. The emphasis is on skill improvement of the people (although the two other factors which are knowledge and attitude also play important role for the trainees). Therefore mostly the skill is psychomotor skill. Psychomotor learning is the development of muscles to work in organized patterns guided by signals from the environment. It is the relationship between

cognitive functions and physical movement in education. Psychomotor learning is demonstrated by physical skills such as movement, coordination, manipulation, dexterity, grace, strength, speed; actions which demonstrate the fine motor skills such as use of precision instruments or tools, or actions which evidence gross motor skills such as the use of the body in dance, musical or athletic performance (Psychomotor Learning, n.d.). This kind of psychomotor training is involved a lot of physical activities in the workshop. Whether is mechanical technology, automotives, construction, even computer training courses (the computer courses are mostly about the skill to use office-related programs such as word processor programs, spreadsheet, photo editor, etc) those skills need many real time practices under the surveillance of an instructor (especially which involves heavy machinery because of the safety precautions). That is why implemented e-learning 100% to industrial training is not possible yet.

For trainings which involve heavy machinery or hazardous material (such as chemical, electrical, flammable gases, etc.), the presence of the instructor is a necessity. The e-learning can provide many information and instruction, but the real practice cannot be handled by e-learning.

So there are some limitations of the usage of e-learning in the competency-based training in Industrial Vocational Training Centers in Indonesia. Table 7 is the explanation of these limitations.

Table 7. *Limitation of e-learning in Industrial Vocational Training Centers in Indonesia*

Limitation	Explanation
Practical skill	In a training environment where practical skill is essential, e-learning has its limitation for this particular part. E-learning may be not the best method to conduct the psychomotor skill (Allen, 2003) and developing simulators with interface devices and sensors will be very expensive.
Surveillance	One of the most important parts of practical skill training is the surveillance or supervision from the instructor. This is quite essential because it is not only to transfer the skill (sometimes demonstration from the instructor is needed) but also to guide the trainees on how to perform the correct procedure of a psychomotor activity. Another important part of the instructor in the surveillance is to keep safety precautions to prevent any accident in the workshop. Although the trainees have been accomplished industrial safety competency unit, but the instructors still have to remind the trainees over and over again on how to prevent work accidents. This is important because not only work accidents can damage the training facilities (machinery, tools, materials, etc.) but mostly because it can do serious harm to the trainees.
Attitude	Although e-learning can provide questionnaire to measure the responses from the trainees, it can not measure the difference in the attitude of the trainees before and after the training. The attitude in this training is the working attitude that the trainees should have in order to become a dedicated employee. Attitude such as self-discipline and time punctuality, obeying the rules and procedures in workplace, even working diligently and thoroughly are parts of a good attitude in a work place. E-learning

	can provide information / knowledge about attitudes, but to really change the attitude of the trainees, the instructor must lead by example and continuously infuse these behavioral changes to the trainees.
Competency test	As it was explained previously, in competency-based training, the competency of the trainees is measured by competency test which involve many performance criteria. The performance is basically the workplace performance (although some competency units didn't have any practical performance criteria) which can be judged during the time when the trainees are working in the workshop by the instructor. E-learning cannot provide such feature to record the physical performances of the trainees.
Infrastructure	E-learning needs some relatively expensive equipment, such as computers and internet connection. It is quite problematic for remote areas with low infrastructure available.

2.4.2 Self Learning

In the new education system in many countries, there is a change of the learning system from the previous teacher centered to the learner / student centered. Teacher centered is the teaching method where the teacher acts as the centre of the activity. The teacher will do the majority of the learning process and the student will act as the object of the learning process passively. The teacher actively teaches the material to the student, and the student passively receives the knowledge. Nowadays it changes into learner centered where the student actively learning the knowledge. The teacher acts only as the facilitator, information source and guide to lead the student on the learning activities. The student must 'find' the knowledge in order to solve problems.

The differences of teacher centered and student centered can be seen in table 8.

Table 8. *Differences in teacher centered and learner centered*

(Adapted from National Capital Language Resource Centre, n.d.)

Teacher-Centered	Learner-Centered
Focus is on instructor	Focus is on both students and instructor
Instructor talks; students listen	Instructor models; students interact with instructor and one another
Students work alone	Students work in pairs, in groups, or alone depending on the purpose of the activity
Instructor monitors and corrects every student utterance	Students talk without constant instructor monitoring; instructor provides feedback/correction when questions arise
Instructor answers students' questions	Students answer each other's questions, using instructor as an information resource
Instructor chooses topics	Students have some choice of topics
Instructor evaluates student learning	Students evaluate their own learning; instructor also evaluates
Classroom is quiet	Classroom is often noisy and busy

Learner centered learning can also mean that the learner have the control of the learning process. It is a learner controlled self regulating learning process. The learner has the ability to decide how to

conduct the learning process but still with some basic rules or guidance such as learning objectives, curriculum, reference materials, etc., that should be followed.

Self learning means that the learner learns by himself, using their own learning pace. Usually the learners have different learning paces. With self learning, the learning process will be conducted in different individual learning paces which can lead to a better result. The learner must understand each part of the learning activity individually, not as a group of classroom. This will give an opportunity to the learner to deepen his/her understanding on a specific part of the learning process without bothering/stalling other learner.

From those explanations it can be seen that learner centered and self learning have many common grounds. Especially the main part where the students are the active element of the learning process. The teacher (or instructor) plays supporting role of the learning process, not as the focus of the learning activities.

Competency based training (CBT) in Indonesia actually encourage the trainees to do self learning method as mentioned in the information book:

a. Self learning

Self learning let the trainees to learn individually by their own learning pace. Although it is freely conducted learning process, the trainees have been advised to consult to the instructor anytime to confirm the progress of the learning process and to overcome learning difficulties.

b. Study group

Study group is enabling the trainees to come together regularly and participate in study group sessions. Although the learning process have the same principle of different learning pace among the trainees, this study group sessions give interaction among the trainees, instructors, and subject matter experts from the workplace.

c. Structured learning

Structured learning consists of formal class room meeting conducted by instructors or other experts. This particular learning session is generally regarding a certain topic / theme of learning process (Department of Manpower and Transmigration Republic of Indonesia, n.d.).

In CBT, the trainees have their own responsibility to their own study progress, making plan with the instructor, and execute the plan diligently. However, the current application of CBT is likely on the structured learning which is actually a teacher centered learning process.

E-learning as the new method of learning is expected to be able to promote the self learning environment. Using computer as the mean of conducting learning activities in a LMS, the trainees can learn on their own learning pace without bothering other trainees working on the same course on the same LMS. The computer and internet technology enable the instructor to conduct individually learning process. Of course because it still blended technique where the self learning is mixed with the workshop practice of psychomotor skill, it cannot be 100% of self learning. The role of the instructor is still very essential especially in workshop practice to demonstrate and guide the trainees on how to perform the psychomotor skills.

Using e-learning as the method of self learning, also has another benefit: promote learner centered learning where the trainees have the responsibility of their own learning progress. The trainees should actively learn and seek information whether through internet (online) or ask the instructor as the information source. This eventually will lead to the fostering of information utilization skill which enables the trainees to seek, process, and use the information they need to overcome problems they will face in the real life working environment.

Chapter 3

Implementation of e-Learning

3.1 E-Learning System

E-Learning system is about the delivery system of learning process and all the management process of developing e-learning such as creating and designing learning material. There are many alternatives to conduct the e-learning. In this research plan, the e-learning will be implemented using internet technology. This will be a bit difficult because the trainees are not well literate with computer and internet skills. The design of the delivery system will be as simple as possible with still maintain the important aspects of e-learning and learning management system. The explanation of this delivery system can be divided into sub points as follows:

1. Content creator
2. Learning Management System

1. Content creator

The content is basically consisted of text, images, and audio visual (video) when it is necessary. Because the e-learning is based on internet environment, the best way to create the content is in web pages, whether HTML (client side) or PHP (server side). Using web pages it is easier to put text, modify the text, put images, put video (video on demand), and even put links to other website in order to deliver the learning material. Another benefits of using web pages, it is the ability to use PHP, JavaScript, action script, MySQL, and many other program to support the content of the learning material. Although it is not advisable to use many features because it can easily distract the trainees from the actual content of the learning material, it is still nice if we know that we have many options to develop and improve our learning material.

However, developing such web pages need some skills on computer programming. In this research, Adobe Dreamweaver is used as the tools to develop the learning material which is more users friendly compared to the other open source program.

To have simple JavaScript application, free JavaScript source codes in the internet (<http://javascript.internet.com/>) are used. This free source website provides many simple JavaScript codes that can be easily put in the HTML or PHP. These simple JavaScript applications can be useful to improve learning content with some features such as open-close statement (a statement block that can be opened and closed using a button), mini quizzes (for small exercises), mini calculator, etc.

In this research, there are some improvements of the learning content from the previous face-to-face learning material (information books). These improvements and their rationale can be seen on table 9.

Table 9. *Improvement of Learning Content and Rationale*

Before	After	Intention	Rationale
The usage of pictures in the form of manual drawing (black and white sketches)	Pictures are real objects, colorful, taken from the latest information in the internet	To show the trainees the 'real' objects of the lesson, rather than to describe the object or using rough sketches	This is one way to improve the trainee's motivation and understanding. With the real object pictures, the trainees will be able to identify the proper equipment in the real life situation. The trainees will be attracted by the colorful pictures and want to continue the learning process
The explanation is uncompleted, many explanation text is useless because it is not comprehensive explanation	The explanation is much more complete, with many references to provide additional (newest) information in the internet	To provide to the trainees explanation of the lesson as complete and comprehensive as possible	By providing complete and comprehensive explanation, the learning quality can be improved and the trainees can learn much more effectively
The references are only noted in the last part of the book, without further explanation about the references themselves	The references are provided throughout the learning process, using links to the internet websites.	To show the trainees about the reference material that being used in the learning content through internet and hopefully the trainees	In the e-learning process, the self-learning ability and skill utilization skill is essential for the trainees. With this online references (using links) the trainees can develop the attitude of utilize the information in the internet
The language and terminologies that being used are not communicative	The language and terminologies are communicative and up-to-date terms, sometimes using international terms	To be able to deliver the learning content much more effective	According to ARCS model by Keller, Attention is one of the factors in increasing the motivation level of the trainees. By using more communicative language

			(conversational type) and up-to-date terminologies, the trainees will be attracted to use the e-learning process.
The arrangement of the lesson is disordered	Lessons are arranged in ordered manner according to the learning objectives	To make the learning process more structured	Structured learning process can help the trainees to easily learn the content according to the learning objectives on the 'proper' sequence.

2. Learning Management System

The importance of using learning management system rather than plain website is that the LMS have two major benefits: content control and learner control. Content control means that the administrator (in this case, the instructor) can easily manage the content of the website, when did the course can be opened, easily activate and deactivate some courses, quizzes, assignments, without have to re-do the whole website. Learner control means that the administrator can easily manage the learner, when they will study the learning material, who will study what and how, and many other things. With LMS, it is possible to give different courses to different trainees at the same system. The ability to record data whether is quiz result, learning progress, assignment, even time elapsed for learning is also one of great advantages of learning management system.

Although there are many LMS free software such as Moodle or Claroline as, this software are too complicated for beginner users. Research experiment will try to use simple platform with PHP and MySQL based program so it is easy to use for administrator (to develop the content using html and convert it to PHP), and for trainees as user because it will only provide the most basic features for the learning process.

The comparison between self-made platform and pre-existing LMS can be seen in table 10.

Table 10. *Comparison of LMS*

Points	Self-made Platform LMS	Pre-existing LMS (ex: Moodle)
User friendly	It is very user friendly, it can be designed only to fulfill specific necessity of the training process	It is user friendly, but the user still have to have some knowledge about the learning environment
Administrator	It is very hard to develop such platform / system. The administrator who create the platform must have high skill of IT and programming language	It is very easy for the administrator because it is already been developed. The administrator didn't have to be able to use any programming language
Features	Can be adjusted by the administrator (with high skill of	The features are already fixed. The administrator can only activate and

	IT)	deactivate the features
Content	Using simple web pages. Platform can be developed to make the upload of the content much easier	Using simple web pages. Very easy to upload learning content with already existed feature
Quiz / assignments	Platform can be developed to make the creation of quiz much simpler	Quiz feature have already there, it can be used very easily
Localization	Language can be changed easily because we have access to the source code	To change language it is difficult because we didn't have the source code. Indonesian language is an option, but it turn out that in Moodle is not fully compatible in Indonesian language
Database system	It is on MySQL, the administrator should need other software (or platform) to retrieve the data	Already implemented in the LMS, the administrator can retrieve the data very easy
Appearance	Can be adjusted completely because we have the source code	Although there are some themes, the basic appearance of the LMS still very much the same
Complexity	Very simple, only necessary features can be inputted in the LMS	Quite complicated, many unused features are still inside the learning content

Base on the comparison on table 10, it is easier to use pre-existed LMS such as Moodle. But on the other side, the complexity of the LMS will be a major de-motivation factor of the trainees especially the beginner users with very low ability of computer operation. Many features in the LMS that is not suitable yet for early e-learning users. It is much better to use a simple LMS for the new users, and move to more sophisticated LMS such as Moodle when they have familiarized with computer usage. The nice thing about these LMS is that because the system is the same (web based pages), the content can be easily moved out to one LMS to the other LMS with minor adjustment.

Language is also another big issue. Indonesia is not using English as secondary language, so the level of English literacy is quite low. Using Moodle with so little language translation (in Moodle, only few items are translated in Indonesian, many basic features are still using English) will cause negative effect where the trainees feel reluctant to use the e-learning because they can not read the features in the LMS.

The customized LMS that is used for this particular research experiment on Industrial Vocational Training Centre in Indonesia consists of three types of users:

- Administrator

- Teacher
- Student

The differences of the users can be seen on figure 5.

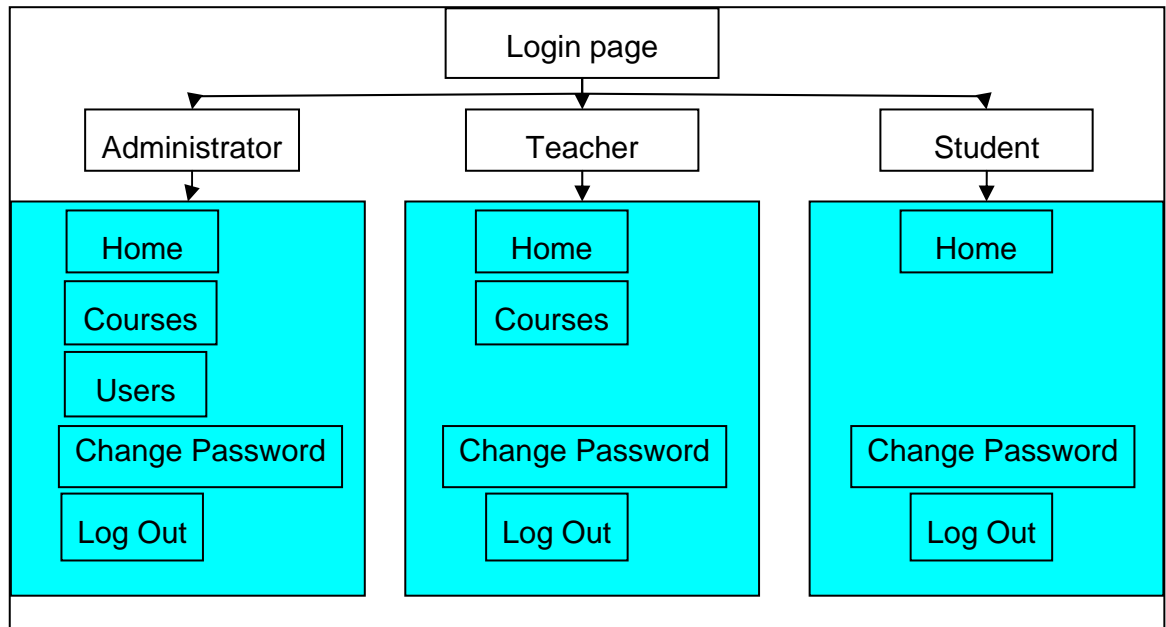


Figure 5. Structure of LMS

The features of administrator are the complete features in the LMS, including the most important part of administrator: the sign up of the users (teacher and student). Teacher has the feature of creating courses, and the student can only use the learning material. The common feature of changing password is available for every user.

This LMS has some advantages and limitation, as explained on table 11.

Table 11. *Advantages and Limitation of LMS*

Advantages	Limitations
<ul style="list-style-type: none"> - Simple features for beginner in e-learning - Easy to use (and develop) for teacher and student - Controlled navigation of the learning - Randomization of questions and questions type - Can be easily modified (customization) 	<ul style="list-style-type: none"> - No feature of discussion board for teacher / student - No time limitation or time record feature for learning and test - The contents appearance depend entirely on the skill of the content creator (developer)

The LMS is uploaded in a free server provider in the internet (www.freehostia.com) and can be accessed through web address:

<http://fanina.freehostia.com> (English version)

<http://blki.freehostia.com> (Indonesian version)

During the research experiment, the users will use the Indonesian version because of the language challenge. However, the content of both web addresses are similar.

The flowchart of the e-learning structure can be seen on diagram on figure 6.

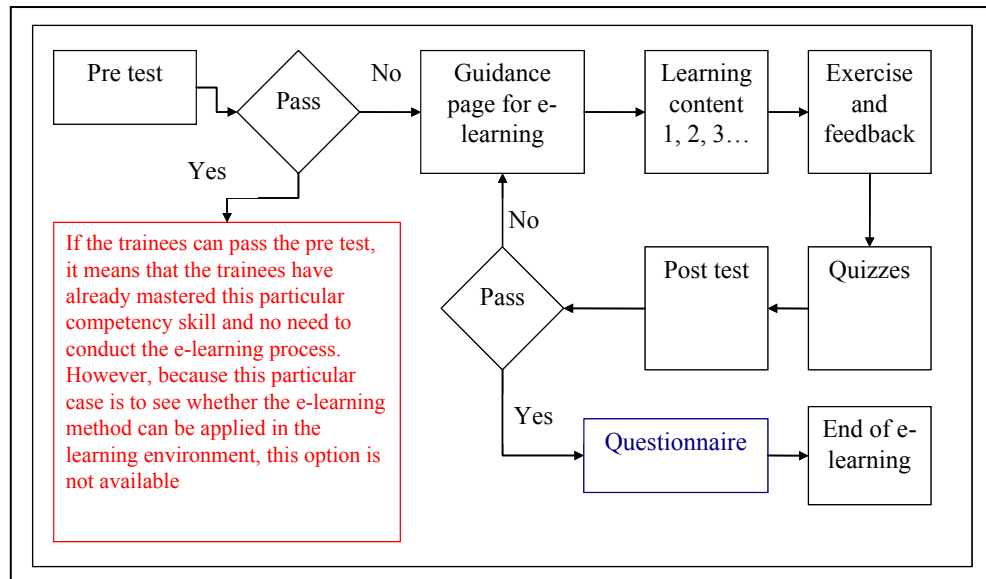


Figure 6. Flowchart diagram of e-learning

The e-learning system starts with log in page (as student users) and continues with pre test. If the student failed the pre test (which means that he/she needs the e-learning process), he/she can continue to use e-learning system.

The system consists of:

- Pre Test and Post Test

The system will record the result of pre test and post test so the result of the training can be compared before and after the e-learning process. The tests are the same, consists of multiple choices and essay questions. Instructors must check the result of the essay questions manually and also grade the test manually.

- Learning pages

Learning pages based on PHP files. Using text, pictures, and video (using YouTube.com as the video streaming server) on a web page to explain the learning material. Simple JavaScript programming is also embedded in the learning pages to increase the interactivity of the learners / students. Another unique feature is the learning pages can only be accessed in a sequence order where one page cannot be opened before the users opened the previous page.

- Exercise and Feedback

Exercise and feedback is a feature where the users can freely exercise the knowledge that has been learnt on that particular session. This is free-mistake exercise, where the feedback will provide explanation to the users about the correct answers. Randomization is implemented in this exercise and feedback, so the users can use the exercise again and find new questions on the same session.

- Quizzes

Quizzes are located on the end of each block. The quizzes' results are not counted as the final output; however, the quizzes have a certain passing grade, which the users should pass. If the users cannot pass the quizzes, he/she cannot continue to the next block. So this is a way to ensure that the users have mastered the knowledge of that particular block. Randomization of questions is also implemented here to make sure that the users are really learning, not only remembering the answers for the quiz.

- Questionnaire

The questionnaire is the tool to acquire the impression of the users after using the system. The questions are presented in rating multiple choices and open format essay where the users can freely express their impression of the system.

The Screen Transition Diagram for the LMS is showed in figure 7. This Screen Transition Diagram shows the pages where of the student users should proceed in order to use the learning management system for e-learning process.

Structure of the whole system

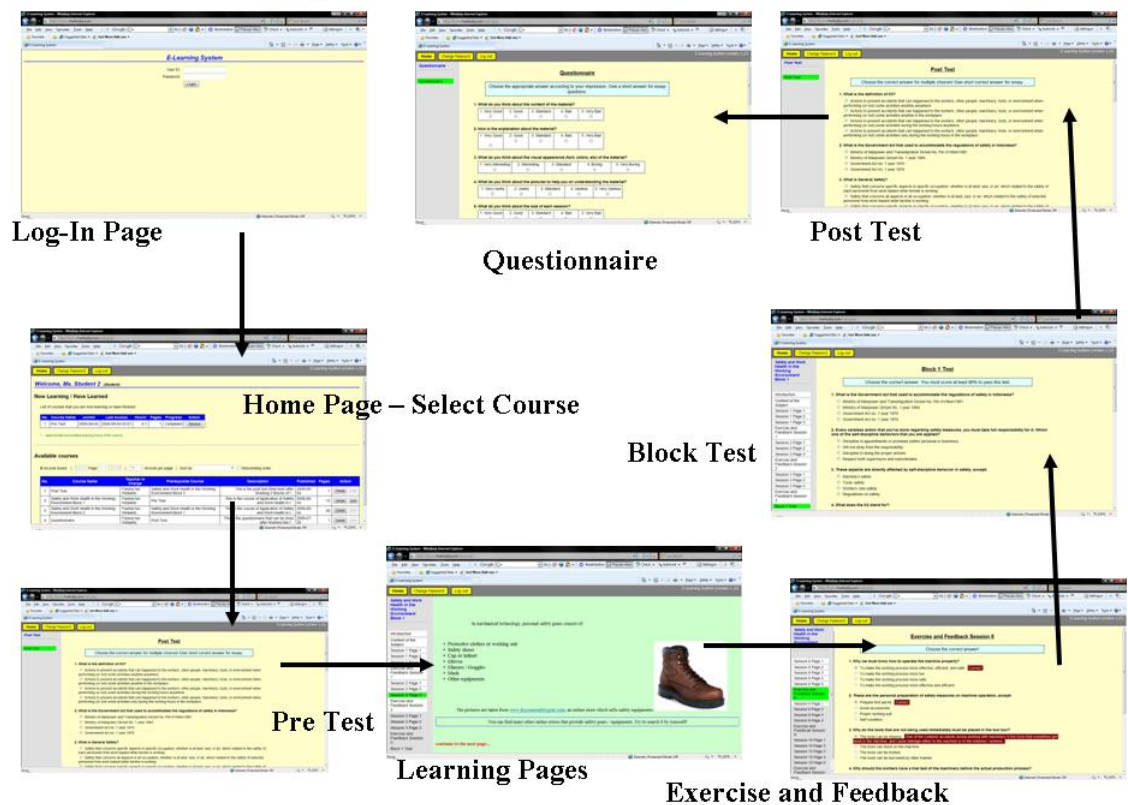


Figure 7. Screen Transition Diagram of the LMS

Screen transition diagram displays the same flowchart of the LMS structure. This transition diagram is for student users who follow the learning process step by step. The screenshots of the Learning Management System can be seen on Appendix A.

3.2 Implementation in the Industrial Vocational Training Center in Indonesia

The implementation of e-learning system is conducted in two different places in Indonesia. First it is in CEVEST Bekasi (Center for Vocational and Extension Service Training Bekasi but nowadays becoming the Institution for Manpower Training and Development of Overseas Employment or B2PLKLN). Second implementation it is Industrial Vocational Training Centre (BLKI) Samarinda, East Kalimantan. Basically, the implementation is similar. However because of different condition and circumstances, there are slight differences on the operational technicality.

The two implementations have several detail information which differ from each other. This information is summarized in this explanation.

3.2.1 Implementation in CEVEST / B2PLKLN Bekasi

The implementation in CEVEST / B2PLKLN Bekasi is conducted on 17 and 24 October 2009. The actual plan is to conduct within three days consecutively, however because there are technical difficulties where the computer laboratory and the students are not available for three days in a row, the implementation is shifted into two days on Saturdays where the computer laboratory and the students are available. This shortcoming is turned out to become useful, because with this separation time, the e-learning system is also tested in a real life condition with no supervision from the instructor. The explanation of the result will be described in the next section of this chapter. Figure 8 shows the CEVEST / B2PLKLN front view.



Figure 8. CEVEST / B2PLKLN

The Participants

The participants are the undergraduate program students of Jakarta State Polytechnic which have joint cooperation with B2PLKLN. The students are in the first year of study, with average age 19-20 years old (average age of high school graduates). The students mostly live in Bekasi area which is very near to capital city, Jakarta. It means that those students are familiar with technology such as computer and internet (and also internet connectivity through mobile phones). There are 18 students who are enlisted to the system, however because of the limitation of the computer laboratory; only 16 students are allowed to join the LMS. Most of the students are familiar with internet technology, and most of them have email addresses.

The Infrastructure

The infrastructure is about the computer for accessing the LMS and also the internet connection. In B2PLKLN, the computer is desktop style with Microsoft Windows XP operating system. On one computer laboratory (B2PLKLN has several computer laboratories) there are 16 computers, but sadly not every computer is on top condition. Pictures of the computers that are used in the e-learning system implementation can be seen on Figure 9.



Figure 9. Computer laboratory at B2PLKLN; one computer with windows XP operating system (left); computers which are ready to use (right)

Internet connection is surprisingly quite slow. This maybe happened because the internet system in B2PLKLN is connected through a very complicated Local Area Network (LAN) not only for computer laboratories, but also for instructor's (and administrative) rooms. It means a single line is divided into tens of computers resulting in slow connection. The attempt to use the LMS on LAN is impossible for that particular time because of the complexity of the LAN itself and there is no IT specialist to assist on connecting the LMS through LAN.

The Implementation Process

The implementation is quite successful with some challenges. One of the major challenges is the change of the schedule from three days consecutively into two days on separated weeks. This is because the schedule for implementation cannot be forced upon the normal schedule of training process in B2PLKLN. The process started with the distribution of instruction manual for the system (paper based manual as can be seen on Appendix B) and a brief explanation about the overall

experiment and the system, the purpose of the e-learning system, how to use the LMS (explanation about the instruction manual) and all the related issues regarding the implementation of the LMS.

The e-learning process on the computer laboratory starts at 08.00 am. Initial check on the computers showed that only 14 of 16 computers are operational.

The initial participants only came 11 of 16 students' names on the list. However, there are 2 other unlisted participants who want to joint the e-learning process, so eventually the total number of trainees is 13 of the initial 16 trainees. This number fully reaches 16 on the second appointment with the exception of 2 listed participants which have been replaced by the two unlisted participants.

The learning process is carried out smoothly without any major problems. Minor problems mostly technical difficulties such as the computer are unable to play video from YouTube and other minor problem. The role of the instructor is only to explain (and solve) those minor technical difficulties such as on how to play video, the instructor can install flash player or even show the video on other computer. Figure 10 shows the e-learning process is on the way.



Figure 10. e-learning process at B2PLKLN Bekasi

3.2.2 Implementation in BLKI Samarinda

The implementation in BLKI Samarinda is conducted from 27 until 29 October 2009. The implementation has been done according to the original plan which is three days consecutively. This is possible because at that time the computer laboratory is available for a week (before other course took place) and the students are available because they have finished their original course. With help from IT instructor and automotive instructor, the implementation of e-learning can be conducted smoothly in BLKI Samarinda. Figure 11 shows the picture of Industrial Vocational Training Centre (BLKI) Samarinda which is still under renovation construction process.



Figure 11. BLKI Samarinda is still under renovation program (taken on October 2009)

The Participants

The participants for this e-learning implementation are regular government program trainees from automotive course. The trainees are mostly high school graduates who have the same average age about 19-20 years old but cannot afford to continue to study at universities or colleges.

There are 16 trainees that joined the e-learning implementation program. Most of them came from remote area around Samarinda, so computer and internet are something new for them. However this is another advantage for the program because all the participants are anxious to use computer and internet as a new way of learning.

None of the participants have any e-mail addresses. This is the indication of the low level of internet technology knowledge among the participants.

The Infrastructure

The computer and the internet connection are surprisingly adequate for this implementation program. It turned out that the computer laboratory is quite new from government funding and the internet connection is quite fast. This internet connection is fast maybe because the internet connection is used only for several computers on the training centre (unlike on B2PLKLN, BLKI Samarinda only have one functional computer laboratory). However, in spite of the new computers, lack of maintenance is also happened at BLKI Samarinda. From 16 computers, only about 11 which are fully operational. The other 5 computers are in bad condition and still waiting for maintenance funding. The common operating system is Windows XP but some computers have already used Windows Vista. Because mostly the program was using internet explorer (other internet browsing

program is also occasionally used), the different operating system is not a big problem. Figure 12 shows the computers that being used for the implementation program.



Figure 12. Computer Laboratory at BLKI Samarinda. A single unit computer consists of monitor, CPU, voltage-stabilizer, and UPS (left); the computer laboratory class room (right)

The Implementation Process

The implementation process is conducted with some challenges. One of the big challenges is the computer problem where there are only 11 fully functional computers. There are 5 participants that must share computers with their friends in order to follow the e-learning process continuously. In spite of this condition, the implementation is successfully done within 3 days consecutively.

The e-learning process starts at 08.00 am. All the participants (16 trainees) are on time to conduct the e-learning process. The first 30 minutes was spent to distribute the instruction manual and give explanation about the instruction manual and also give a short course on how to use internet browsing to access e-learning LMS.

The learning process was conducted smoothly in spite of the previous explained condition about sharing computers. Again, the role of instructor was to explain technical difficulties to the participants and also arrange the computers for the participants because the previous problem of computer malfunctions. Figure 13 shows the condition of the e-learning implementation where some participants must share the computer in order to follow the e-learning process.



Figure 13. Implementation of e-learning system at BLKI Samarinda

3.3 Result and Analysis

The result of the implementation of e-learning system in the Industrial Vocational Training Center in Indonesia consists of two major things. One is the result of tests (which consists of pre and post test) and the other is questionnaire. Those evaluation tools fall under the category of 2nd and 1st level of Kirkpatrick's 4 levels of evaluation respectively (Winfrey, 1999). From these results we can see the reaction of the learners (1st level of evaluation) and the learning result of the learning process (2nd level). The reaction can be achieved by questionnaire form, where the form is divided into two types: gauge questions where the learners choose which one that indicated the most satisfactory level, and open essay questions where the learners can freely express their impression towards the e-learning system. The learning result can be achieved by using pre test and post test. As mentioned before, there is a specific criterion on pre and post test which the learners should achieve. In this e-learning system the criteria for such thing is set up to 80%. It means that the learners should achieve 80% or more to be considered pass the post test and competent for that specific competency unit. The learning result will not only indicate that the learners are competent, but mostly will show whether the e-learning system is effective enough to be used to deliver the learning material. The pre and post test consists of two types of questions, multiple choices and essay. Therefore the role of instructor is also to check the answer of the learners (and provide feedback individually if necessary), not merely rely on the learning management system.

In the system, there are also quizzes between sections. However these quizzes will not be used as evaluation tools, but rather than tools to ensure that the learners are mastered one section of the material (which consists of three sections) before continuing to the next section. Although there are also passing mark for this quizzes, but again this is not a proper evaluation tool because the learners can re-do the quizzes as much as they like until they pass the quizzes (although there is a randomization method to ensure that the learners are not just memorizing the correct answers again and again), unlike the test (pre and post) where the involvement of instructor is inevitable (because the essay test need to be checked and graded manually by the instructor), the instructor can manually observe the result of the test and give limitation to the participants / learner (three times of test as mentioned in the Competency Based Training Guidance on the previous CBT learning system in Indonesia).

3.3.1 The Test

The test consists of pre and post test. The result of the test can be seen on table 12 for B2PLKLN Bekasi participants and on table 13 for BLKI Samarinda participants.

Table 12. *The result of pre and post test of B2PLKLN Bekasi participants*

No	Name	Pre Test	Post Test
1	Student 1	29%	92%
2	Student 2	15%	88%
3	Student 3	23%	84%
4	Student 4	47%	87%
5	Student 5	43%	83%
6	Student 6	27%	87%
7	Student 7	37%	84%
8	Student 8	39%	91%
9	Student 9	36%	85%
10	Student 10	31%	83%
11	Student 11	56%	83%
12	Student 12	43%	87%
13	Student 13	42%	94%
14	Student 14	35%	95%
15	Student 15	61%	85%
16	Student 16	39%	94%
Average		37.69%	87.62%
Standard Deviation		11.60	4.25

Table 13. *The result of pre and post test of BLKI Samarinda participants*

No	Name	Pre Test	Post Test
1	Student 1	49%	85%
2	Student 2	35%	100%
3	Student 3	15%	93%

4	Student 4	31%	92%
5	Student 5	44%	91%
6	Student 6	34%	92%
7	Student 7	64%	93%
8	Student 8	53%	90%
9	Student 9	30%	99%
10	Student 10	27%	96%
11	Student 11	38%	89%
12	Student 12	47%	96%
13	Student 13	52%	92%
14	Student 14	26%	93%
15	Student 15	25%	92%
16	Student 16	48%	97%
Average		38.62%	93.12%
Standard Deviation		12.98	3.79

As we can see from the table 12 and 13 there are average points of pre test in B2PLKLN Bekasi of 37.69% (with standard deviation 11.60) and in BLKI Samarinda of 38.62% (with standard deviation 12.98). It shows that in the average the participants have the knowledge of the competency unit of safety course less than 40%. It indicates that all the participants are feasible (Suzuki, 2008) to use the learning material (all individual participants have less than 80%).

After using the learning management system, the average result of post test (with three times maximum tryout of the test) of BLKI Samarinda was 93.12% (standard deviation 3.79) and 87.62% (standard deviation 4.25) for B2PLKLN Bekasi.

The dependent t-test (within subject repeated measures) result indicates that for B2PLKLN Bekasi $t(15) = 15.45$, $p < 0.01$. For BLKI Samarinda t-test indicates $t(15) = 15.19$, $p < 0.01$ with $df = 15$ (The calculation for the dependent t-test can be seen on appendix C).

From these results can be drawn some conclusion such as:

- The system can be implemented well because the post test indicates that both in average and in individual score the participants from both experimental sites have more than 80% (passing criteria of the post test to be declared competent).
- There is improvement of knowledge from 37.69% to 87.62% for B2PLKLN Bekasi (increasing about 49.93% of knowledge in average) and improvement from 38.62% to 93.12% for BLKI Samarinda (increasing about 54.5% of knowledge in average).
- From t-test result it can be derived that the pre and post test has a significant difference with probability less than 1% of no significant difference. Therefore the learning process to improve the knowledge has a significant result in this research.

As for the record, the pre and post test consists of the same type and item of questions. This is a form of verbal information test where the participants reproduce the same information from the learning material (in congruence with the initial learning objectives of cognitive domain). The same type and item of questions of pre and post test means that the participants only need to recollect the information from the learning material or memorizing the information taught in the material and to reproduce it in a test (Suzuki, 2008).

There is different result from post test of both experimental sites. It appears that BLKI Samarinda has higher score of average 93.12% compared to B2PLKLN Bekasi of average 87.62% (difference of 5.5%). The highest individual score (100%) is also in BLKI Samarinda. The rationale for this occurrence is because in BLKI Samarinda, the experiment implementation is conducted three days consecutively with full supervision of instructor, where the instructor can give direct feedback to the specific participant after the unsuccessful post test (the post test can be taken up until three times). While in B2PLKLN Bekasi where the experiment implementation is conducted only two days on different weeks, and the learning process is unsupervised by the instructor (which means no direct feedback to participant from the supervisor about the post test) and fully handed to the participants on their own ability to access internet. This leads to better achievement by the participants from BLKI Samarinda. It indirectly indicates another important role of the instructor.

3.3.2 The Questionnaire

The questionnaire consists of 17 gauge type multiple choices and 3 essay type questions (the actual result of the questionnaire can be seen on Appendix D in Indonesian language). The original questionnaire is using Indonesian language; table 14 is summary of the questionnaire in English translation of the original questionnaire given in the system. The questionnaire summary is compiled from both of the experimental sites which consist of 32 participants. For the essay questions, because there are many similarities, the table will only show the common summary of the participants' impression.

Table 14. *The Questionnaire Results*

No	Question	Gauge Type				
1	What do you think about the content of the material?	<i>Very Bad</i>	<i>Bad</i>	<i>Standard</i>	<i>Good</i>	<i>Very Good</i>
	<i>Number of participants</i>	0	0	3	24	5
2	How is the explanation about the material?	<i>Very Unclear</i>	<i>Unclear</i>	<i>Standard</i>	<i>Clear</i>	<i>Very Clear</i>

	<i>Number of participants</i>	0	0	3	26	3
3	What do you think about the visual appearance (font, colors, etc) of the material?	<i>Very Unattractive</i>	<i>Unattractive</i>	<i>Standard</i>	<i>Attractive</i>	<i>Very Attractive</i>
	<i>Number of participants</i>	0	0	9	21	2
4	What do you think about the pictures to help you on understanding the material?	<i>Very Unhelpful</i>	<i>Unhelpful</i>	<i>Standard</i>	<i>Helpful</i>	<i>Very Helpful</i>
	<i>Number of participants</i>	0	0	7	20	5
5	What do you think about the size of each session?	<i>Very Inappropriate</i>	<i>Inappropriate</i>	<i>Standard</i>	<i>Appropriate</i>	<i>Very Appropriate</i>
	<i>Number of participants</i>	0	1	8	22	1
6	What do you think about the pre test of the material before starting the learning process?	<i>Very Unhelpful</i>	<i>Unhelpful</i>	<i>Standard</i>	<i>Helpful</i>	<i>Very Helpful</i>
	<i>Number of participants</i>	0	0	5	20	7
7	What do you think about the post test of the material in correlation with the learning objectives?	<i>Very Uncorrelated</i>	<i>Uncorrelated</i>	<i>Standard</i>	<i>Correlated</i>	<i>Very Correlated</i>
	<i>Number of participants</i>	0	0	4	19	9
8	How does the exercise and feedback help you on learning the material?	<i>Very Unhelpful</i>	<i>Unhelpful</i>	<i>Standard</i>	<i>Helpful</i>	<i>Very Helpful</i>
	<i>Number of participants</i>	0	1	2	24	5
9	What do you think about the block test between block 1, 2 and 3?	<i>Very Unhelpful</i>	<i>Unhelpful</i>	<i>Standard</i>	<i>Helpful</i>	<i>Very Helpful</i>
	<i>Number of participants</i>	0	0	6	23	8
10	What do you think about the instructions on how to use e-learning in the system?	<i>Very Unclear</i>	<i>Unclear</i>	<i>Standard</i>	<i>Clear</i>	<i>Very Clear</i>
	<i>Number of participants</i>	0	0	5	19	8
11	What do you think of the usage of video to help learning the material?	<i>Very Unhelpful</i>	<i>Unhelpful</i>	<i>Standard</i>	<i>Helpful</i>	<i>Very Helpful</i>
	<i>Number of participants</i>	0	1	8	20	3
12	What do you think of the usage of links in the learning content? Is it helpful?	<i>Very Unhelpful</i>	<i>Unhelpful</i>	<i>Standard</i>	<i>Helpful</i>	<i>Very Helpful</i>
	<i>Number of participants</i>	0	1	8	20	3
13	What do you think about the learning instruction on the learning material?	<i>Very Unclear</i>	<i>Unclear</i>	<i>Standard</i>	<i>Clear</i>	<i>Very Clear</i>
	<i>Number of participants</i>	0	0	9	22	1
14	What do you think about the navigation system in the e-learning?	<i>Very Bad</i>	<i>Bad</i>	<i>Standard</i>	<i>Good</i>	<i>Very Good</i>
	<i>Number of participants</i>	0	0	7	24	1
15	How does this material help you to learn by yourself?	<i>Very Unhelpful</i>	<i>Unhelpful</i>	<i>Standard</i>	<i>Helpful</i>	<i>Very Helpful</i>
	<i>Number of participants</i>	0	0	2	28	2
16	How does this material help you to understand the safety measures in industry?	<i>Very Unhelpful</i>	<i>Unhelpful</i>	<i>Standard</i>	<i>Helpful</i>	<i>Very Helpful</i>
	<i>Number of participants</i>	0	0	1	28	3
17	How does this material motivate you to continue to further study safety measures in industry?	<i>Very Unhelpful</i>	<i>Unhelpful</i>	<i>Standard</i>	<i>Helpful</i>	<i>Very Helpful</i>
	<i>Number of participants</i>	0	0	3	25	4
18	Please write down your like and dislike about this e-learning system and learning material	Like: <ul style="list-style-type: none"> - the material is delivered in interesting way - give knowledge about safety measures - this e-learning is very useful and helpful to understand the learning material 				

		<ul style="list-style-type: none"> - new way to study - the learning material is complete - the e-learning system is helping to expand the knowledge - I can study by myself - Easy to use and effective - Use computer and internet - Learning material content - Can expand my knowledge with online network - Studying without using books - Can be opened anywhere - I can study anytime <p>Dislike:</p> <ul style="list-style-type: none"> - cannot play video - only specific time to be able to study using e-learning system - it's hard to have internet access - it's hard if something is difficult to understand, nobody to ask - too much questions - too much learning material and time consuming - takes time to open a webpage (loading time) - don't like the interactive windows, sometimes unable to be used - it's hard to read on monitor screen - don't like the visual appearance - too noisy - difficult to use - slow internet
19	Please write down your suggestion about the e-learning system and learning material.	<ul style="list-style-type: none"> - develop the learning material especially for violation of safety measures - some revision about filing method, whether using safety gloves or not - if possible all the other learning material are delivered through e-learning system - add some background to become more attractive - compile all the material so it will not complicated - broaden and develop the e-learning system to all around Indonesia - develop the system - more clear on delivering learning material - increase the internet speed - add more learning material to become more complete - visual appearance should be improved - increase the computer number - explain the detail of the system - add more pictures, video and animation
20	What is your general impression of the e-learning system and learning material?	<ul style="list-style-type: none"> - Very happy and excited of the new system - E-learning is very nice and helping us to understand about learning material - The system can motivate the learners - Very helpful - Modern and sophisticated - Enlightening and improve knowledge - Very happy and want to understand more about e-learning system - New system, the learning material is the same with the usual material - Very good, attractive and fun - Easy and practical - Nice and interesting, a new way to study - Out of ordinary, different from the previous system - Challenging

From table 14, the majority of the participants have a positive attitude toward the e-learning system. This is indicated in most answers for the gauge choices are in favor for good, helpful, clear, attractive, correlated and appropriate (and addition of “very” as superlative form of approval). This gauge type is around 23-31 of 32 participants. It means about 71.87% until 96.87% of the

participants in favor for the system and all the features of the system. Generally it can be assumed that most of the participants feel satisfied with the e-learning system.

The items that indicated disapprove of the participants are in:

- size of each session (inappropriate)
- exercise and feedback help to learn the material (unhelpful)
- usage of video helps to learn the material (unhelpful)
- usage of links helps to learn the material (unhelpful)

These items indicated that the participants are unsatisfied by some of the features of the e-learning system. Initial presumption this is related to the ability to access internet where most of the features need fast internet connection and ability to load certain software such flash program and JavaScript enabled computers.

In essay type questions (questions number 18 until 20) table 14 shows summary of comments of the participants. Because the questionnaire is designed to gather the impression of the participants, there are some contradictive comments from one participant with another. For instance, some participants like the e-learning system and learning material (question 18) because it is easy to use. However other participants dislike the system because it is difficult to use. So it is quite difficult to achieve objective comment from the questionnaire. However there are some interesting points to be taken notes such as in suggestion for the system (question 19), most of the participants suggest improvement in technical issues rather than learning content issues (improving the visual performance; add more video, picture, and animation; increase internet speed; etc.) and in general impression of the system (question 20), most of the participants like the system (fun, good, attractive, challenging, modern, sophisticated, etc).

Chapter 4

Evaluation and Conclusion

4.1 Problems

There are several problems that occurred during the experimental implementation of e-learning system in the Industrial Vocational Training Center in Indonesia. It is important to be able to identify these problems in order to find solutions for future planning and development. The identification (and also finding solution) of these problems is part of the “see” or evaluation of the overall system of Plan-Do-See (Suzuki, 2008) as shown on figure 14 where from those steps, the evaluation step will become the base for the future improvement (planning).

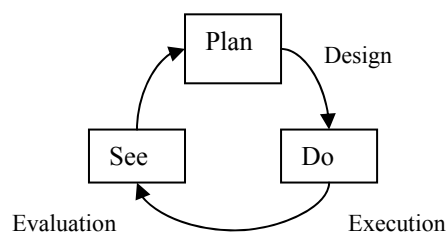


Figure 14. The circle of “Plan-Do-See” (Suzuki, 2008)

Problems in the experimental implementation are not necessary indication of flaw. A principle of the system approach is that flawless plan cannot be developed at the first attempt (Suzuki, 2008). With this identification of problems, future plan of implementing e-learning system in Industrial Vocational Training Center will become more perfect time by time, not on a single attempt. However the record for these problems is extremely important so that future instructional designers can learn from the previous work of other instructional designers on the same matter.

On this particular experimental implementation of e-learning, the problems can be categorized as: technical problems, instructional design problems, learning content problems.

- Technical Problems

Technical problems are problems that related to technical difficulties regarding the operational of the experiment implementation of e-learning. It is related to mostly hardware and software problems of e-learning system.

- Instructional Design Problems

Instructional design problems are problems that related to the instruction design of the learning material. These problems are related to the method of delivery of the e-learning material, including all the aspect of learning material design. This is the instructional designer's problem on how to develop a good instruction for the learning material.

- Learning Content Problems

Learning content problems are problems that related to the content of the learning material itself. It is related to the learning material that has been used in the e-learning system. It is basically subject matter experts' problems which related to the content of the material.

Technical Problems

Technical problems that took place during the experimental implementation both in B2PLKLN Bekasi and BLKI Samarinda are:

1. Power failure

On experimental / research implementation in BLKI Samarinda, there was one occasion where the electricity was off. The power failure happened for a few hours, so at that time the e-learning process completely shut off. This is already suspected condition especially on remote areas such Samarinda where the electricity supply is not stable yet.

2. No internet connection / Slow internet connection

Internet connection is essential for this e-learning system because the learning management system is placed on a free internet server (www.freehostia.com). On both experimental implementation sites, the problem of internet connection is happened. On B2PLKLN Bekasi, there was one occasion that internet connection was totally shut down. On BLKI Samarinda,

surprisingly, the internet was stable although the connection speed is quite slow therefore the learning process was slow too.

3. Computer malfunction

Computer malfunction unfortunately happened on both sites. Not every computer on computer laboratory is fully operational. Some of them were unable to be used properly. Many of the computer malfunction happened because of lack of maintenance from the institution itself. On B2PLKLN Bekasi only 14 of 16 computers are on operational condition. On BLKI Samarinda there are only 11 of 16 computers are on operational condition.

4. Software requirements

Software requirements are important so that the learning management system can be fully used as intended to be used. The main problem of the software requirements are the ability to play YouTube video (www.youtube.com) and the ability to open JavaScript program. Many computers on the experiment implementation didn't have those kinds of abilities because those computers didn't have the necessary updates and additional programs such as flash player program or Java Runtime Environment.

5. LAN set up

Local Area Network is a secondary or backup plan in case of internet failure. The idea is to use the instructor laptop as a portable server and connect it with local area network so that the participants can access the e-learning system through the server from instructor's laptop. This occasion is actually happened once during implementation on B2PLKLN Bekasi. However there was a problem of connecting the portable server through the LAN. The local area network on B2PLKLN Bekasi is too complicated because it connected all the computers in many computer laboratories on that institution. So it is impossible to easily connect the portable server to LAN.

Instructional Design Problem

Instructional design problem that took place during the experimental implementation both in B2PLKLN Bekasi and BLKI Samarinda are:

1. Manual instruction to access the LMS

Before using the learning management system, the participants were given a manual instruction (paper-based). However it turned out that another explanation is needed to the participants so that they can understand the instruction manual completely. Especially for participants without any previous computer knowledge (computer illiterate), this occurred a lot on BLKI Samarinda.

2. Instruction for home page, pre test, exercise and feedback, quizzes, and post test

The instruction for web pages of home page, pre and post test, exercise and feedback, and quizzes seems inadequate indicated by many participants who asked for more explanation on how to continue using those pages.

3. Chunk of the session

Chunk is the length of each session. It means how many pages are in one session (this e-learning system consists of three sections and 10 sessions in overall). It turned out that there are some sessions which have more pages compared with other sessions. It seems that some participants complain that on some particular session, the learning material is too much.

4. Visual aid for the learning process

Visual aid consists of pictures and video. There are some important pictures and video which is crucial on the learning process. However these pictures and video may not be appeared correctly (technical problems) which may interfere with the learning process. So this visual aid problem can be also regarded as a problem for instructional design because it affects the way of the material is delivered to the participants.

Learning Content Problem

Learning Content Problem that took place during the experimental implementation both in B2PLKLN Bekasi and BLKI Samarinda are:

1. Visualization

Visualization is about the appearance of the learning material. Some participants feel that the appearance seems dull, lack of interesting pictures, videos, and animations which are the advantage features of computer based learning process.

2. Text information

Most of the learning material is delivered through text information. However there is limitation of how long the participants can read text information on a computer screen. Another problem is that some text information seems a slightly different from the explanation of the previous instructor.

3. Links

Links provide additional information needed to enhance the knowledge of the participants. However it seemed that the participants didn't use any of the links that are provided in the learning material.

4.2 Solution and Improvement

The problems which have been indicated on previous sub-chapter can only be meaningful if we can analyze them and came up with a better solution to overcome the problems. So after the real situation of the e-learning system implementation and face the problems, it is time to make judgments from the actual result (Suzuki, 2008).

As already been classified, the problems can be separated into three categories of problems: technical problems, instructional design problems, and learning content problems.

Technical Problems

1. Power failure

Solutions:

This is a very difficult problem to solve because it is concerned about the infrastructure of the institution itself. For remote areas in Indonesia, power cut off is a common occasion which cannot be controlled by the training provider. The most common solution of this problem is to prepare alternative electricity resource. BLKI Samarinda for instance, has a diesel powered generator set. However to utilize this generator, it required a lot of money for the fuel. So it is a quite expensive alternative.

2. No internet connection / Slow internet connection

Solutions:

This problem is the most common problem of implementing e-learning system. Internet connection is the backbone of the entire e-learning system. Without internet connection it is almost impossible to develop learning management system. Fortunately in Indonesia with multiple telecommunication providers, internet connection establishment is affordable. However the problem is still about the internet speed. The internet connection speed is very slow; therefore the e-learning cannot be used smoothly like intended to be. This problem cannot be solved immediately because the internet connection depends entirely to the telecommunication providers. Hopefully for future years, the internet connection speed can be improved so that the participants can get a cheap and fast internet connection speed.

Other solution is to utilize the local area network and a local server so that the participants can access the learning management system (LMS) in a higher speed. However this solution cannot be used for remote participants because the participants must be on the same location with the local server to be able to access local area network.

3. Computer malfunction

Solutions:

Computer malfunctions actually can be avoided if the maintenance of the computers is regularly done. However in many institutions in Indonesia, this problem always happened. For e-learning system, computer is essential because it is the main equipment or tool for the learning process. The computer should be always in top condition with regular maintenance either hardware or software. This is the responsibility of the technician / IT specialist which should be available on

every computer laboratory in training centers. So the role for technician / IT specialist is very important for e-learning system based training program.

4. Software requirements

Solutions:

The software requirements problem actually can be easily solved as long as the technician or IT specialist or even the instructors can spare their time to update the software of the computer. Nowadays mostly software updates or plug-in are available free on the internet. Downloading and installing updates (or free software) may take some time, but it is necessary so that the learning process can be done smoothly.

5. LAN set up

Solutions:

Local Area Network as an alternative in case of internet failure is a very good plan. However to be used properly, again this LAN set up needs an IT specialist so that the connection can be established smoothly. Using PHP server in instructor's computer so that other computer can access it through LAN will increase the speed of learning process on a computer laboratory. However for distance participants, this LAN method cannot be used except the instructor's computer is available and connected to the internet for 24 hours 7 days a week.

Instructional Design Problem

1. Manual instruction to access the LMS

Solutions:

Revision of the paper based instruction manual is needed. The explanation needs to be added is the introduction of computer operation especially for the computer illiterate participants. The instruction manual should not only consist of the e-learning system instruction manual, but also how to use computer such as how to use the current operating system (Windows) and a brief introduction of the internet too (for instance how to use search engine). Instruction manual is an easy-to-use, brief explanation of the learning system, so the role of instructor as a "consumer service officer" to answer all the participants' questions is inevitable whether face to face (in a computer

laboratory) or online support for distance participants. Another solution is to modify the e-learning system so it becomes more user-friendly. Instead of providing extra manual to read, improving the system to become more user-friendly will have double effects. One side is the ability to provide easy-to-use LMS (thus solving the instruction manual problem), and on the other side is the ability to motivate the participants because the participants will feel comfortable and confident on using the user-friendly LMS.

2. Instruction for home page, pre test, exercise and feedback, quizzes, and post test

Solutions:

Another revision of the instruction for learning pages such as home page, pre and post test, exercise and feedback, and quizzes is needed. This revision should be done continuously in order to establish the proper instruction for the participants. A link to directly contact the instructor online can also be placed on those pages so that the participants can easily contact the instructor if they are having some difficulties on how to proceed with the learning process. Another solution is to put the common questions raised by the participants in a specific section called FAQ (Frequently Asked Questions). This FAQ is one of the resources that the participants can look into if they have any problem regarding the e-learning instruction. This method will also promote self learning (or self problem solving) where the participants will try to find the answers for their problems by themselves before contacting the instructor in charge.

3. Chunk of the session

Solutions:

Rearrangement of the chunk of the session is needed in order to ensure the balance of each session. The session which has too many learning pages can be divided into two separated sessions. This will help the participants to learn each session easier and quicker.

4. Visual aid for the learning process

Solutions:

Another way to deliver the pictures and videos are needed. Instead of relying on free streaming video server such as YouTube, it is necessary to provide the video (if it is very crucial) in

other format which can be downloaded by the participants and can be played with common media player. The size of the video is also considered because the internet connection is still slow. The waiting time to download the video before the participants can proceed to the next learning material will definitely de-motivate the participants. The video size should be small enough for the participants to download quickly but not too small so the quality is still adequate. Another solution is to provide media and other necessary support files (documents, diagram, video, pictures, animation, audio recording, etc.) in a physical format such as CD or DVD discs and delivered to the participants through postage so that the participants can obtain these files off line. This is very helpful for the participants who have a very limited internet connection (low bandwidth).

Learning Content Problem

1. Visualization

Solutions:

Improving the learning content by adding pictures, videos, and animations which are related to the learning material. However it also needs to be considered about the internet connection ability. Too much pictures, videos, and animations on the other hand can lower the internet connection speed and may distract the participants from the learning content and learning process itself. There is also a novelty effect that needs to be considered. Novelty effect is the tendency for performance to initially improve when new technology is instituted, not because of any actual improvement in learning or achievement, but in response to increased interest in the new technology (Novelty Effect, n.d.). Therefore initially it seems motivate the learners by using visual aids, but actually it is a novelty effect of using new technology (video, animation, and pictures).

2. Text information

Solutions:

Check and re-check the text information provided in the learning material. The usage of reference is important so that the participants can check the information in the e-learning system with the reference material so that the validity of the learning content is secured. To avoid the fatigue of the participants from reading text information, other visual aids is needed to be implemented in the learning content. The decision of font type, font color, font size, and background color of the

pages is essential because it will reduce the weariness of the participants while reading the learning content.

3. Links

Solutions:

The links in the learning material can be distinguished into two categories: as references for an explanation in the learning material and as learning resources. As references, the links will not be considered as crucial parts in the learning process but only as a support for the learning material. However if the links are considered as learning sources, it is important to include them as learning process that the participants should have done. The links will have crucial parts in the learning process therefore some assignments should be designed so that the participants must utilize the links provided in the learning pages in order to obtain the information needed for further learning process. If the information utilizing ability is one of the learning objectives, the links should be considered as learning resources and the participants should be encouraged to use the links as the means to solve the problem.

Learning content and instructional design problems actually can be solved during one-on-one formative evaluation because the purpose of one-on-one formative evaluation is to check these following factors (Suzuki, 2008):

- What is wrong
- Where the material is difficult to understand
- Which explanation is insufficient in the material

Using one-on-one formative evaluation, the instructional designer can eliminate the early problems of learning material which are indicated in previous explanation (subchapter 4.1) and can revise the learning material and instructional design of the material prior to the small group formative evaluation. However, because of the time limitation of the research as mentioned in subchapter 2.3, the one-on-one formative evaluation can not be done in this particular research.

The problems that can actually be found and solved during the one-on-one formative evaluation are:

1. Instructional Design problems :

- Manual Instruction to access the LMS
- Chunk of the session
- Visual aid for the learning process

2. Learning Content problems :

- Visualization
- Text information
- Links

However, technical problems can only be found in the small group formative evaluation where the physical environment of the evaluation process is similar with the real training process (the same computers and other infrastructures). Those problems are:

- Power failure
- No / Slow internet connection
- Computer malfunction
- Software requirements
- LAN set up

4.3 Conclusion

From the result of the e-learning implementation in Industrial Vocational Training Centers in Indonesia (both in BLKI Samarinda and B2PLKLN Bekasi), it can be concluded as following statements:

1. The result of the learning process is in satisfactory level where the participants can pass the post test (with passing grade minimum of 80%; where BLKI Samarinda participants and B2PLKLN Bekasi participants achieved 93.12% and 87.62% passing grade respectively) indicated that this system is effective to be used in Industrial Vocational Training Center in terms of being able to achieve the learning objectives (also indicated by significant difference from t-test results: $t(15) = 15.45$ $p < 0.01$; $t(15) = 15.19$ $p < 0.01$ for B2PLKLN Bekasi and BLKI Samarinda respectively).

2. The usage of learning management system showed that the participants can learn by themselves through the internet. In other words the self-learning system indicated in the original Competency-Based Training can be implemented using this learning management system. In broader scale, theoretically it means that the participants can access the learning system anywhere anytime which indicated the time efficiency of the learning process in the training centers.
3. There is a positive attitude from the participants (trainees) towards the e-learning system (indicated by 71.87% until 96.87% of approval in questionnaire). There are many positive feedbacks and impressions from the questionnaire that indicate approval of the new system and a high expectation from this e-learning system.
4. There are some problems especially technical issues that need to be considered while implementing the e-learning system. The problem mostly about the infrastructure of the e-learning such as electricity and internet connection establishment particularly on remote areas in Indonesia.
5. Revision of learning delivery (instructional design) and learning content should always be conducted continuously in order to improve the learning process. Feedbacks from participants are crucial in this process of improvement as the resource for future planning of the e-learning system. The instructional design problems (manual instructions, LMS instructions, chunk of the session, visual aid) and learning content problems (visualization, text information, links) that have been identified in the research are valuable input for future improvement of the e-learning system.
6. Support by the institution is indicated from the endorsement of both training centers where the research implementation is being held. The head of the training centers (or the officer in charge) appreciated this new method of training using internet and eager to see the outcomes of the research. Other instructors are also eager to know this e-learning system. Many instructors asked a lot of questions regarding the e-learning system and how to implement it

for their own learning material / course. This indicated that the institution in general has a positive attitude toward the e-learning system and eager to see the full scale implementation of the e-learning in training centers.

From those statements it can be generally concluded that e-learning system is an effective method of training and has a promising prospect to be implemented in the Industrial Vocational Training Centers in Indonesia.

4.4 Future Planning of the e-Learning

Future planning involves the planning to overcome the problems that have been mentioned before and also strengthening the instructor not only with IT skills as a part of requirements for e-learning system, but also instructional system design in order to develop a proper and effective learning method. On the national wide and institutional level, certain rules and supports from the government is desperately needed. Rules for implementing e-learning in training centers under Department of Manpower and Transmigration Republic of Indonesia need to be established for legal guidance of implementing the e-learning system as well as support for better infrastructure mostly for remote areas concerning electricity and internet connection procurement. The research indicated that the theoretical part of the training can be replaced by e-learning, while the instructors are still needed for practical psychomotor training in workshop. It means that the Indonesian government should establish a regulation to fully implement the theoretical part of training into e-learning while still utilizing the skill of the instructors for practical skill training.

The following steps should be considered as the future planning in order to establish e-learning system in Industrial Vocational Training Centers in Indonesia:

1. Legal regulation regarding implementation of e-learning is needed. Therefore the system can be fully supported by the government as an official program of the training centers.
2. Improvement of infrastructure especially in remote areas where electricity and internet connection are still very limited.

3. Computer procurement and maintenance should be one of the main obligations for training centers around Indonesia.
4. Improvement of instructor's skill and IT specialist in order to be able to establish a proper e-learning system.
5. Standardization of the learning material using e-learning system so that all around Indonesia, the result for competency-based training will be the same.
6. Implementing instructional design in developing learning material so that the learning process will become more effective and efficient.
7. Promotion to the public regarding the new system so that not only the trainees but the industrial sector will be familiarize with this new system and able to support the new method to create a competent workers.

With these steps, the e-learning method will be easier to be implemented and will achieve a better result in Industrial Vocational Training Centers in Indonesia.

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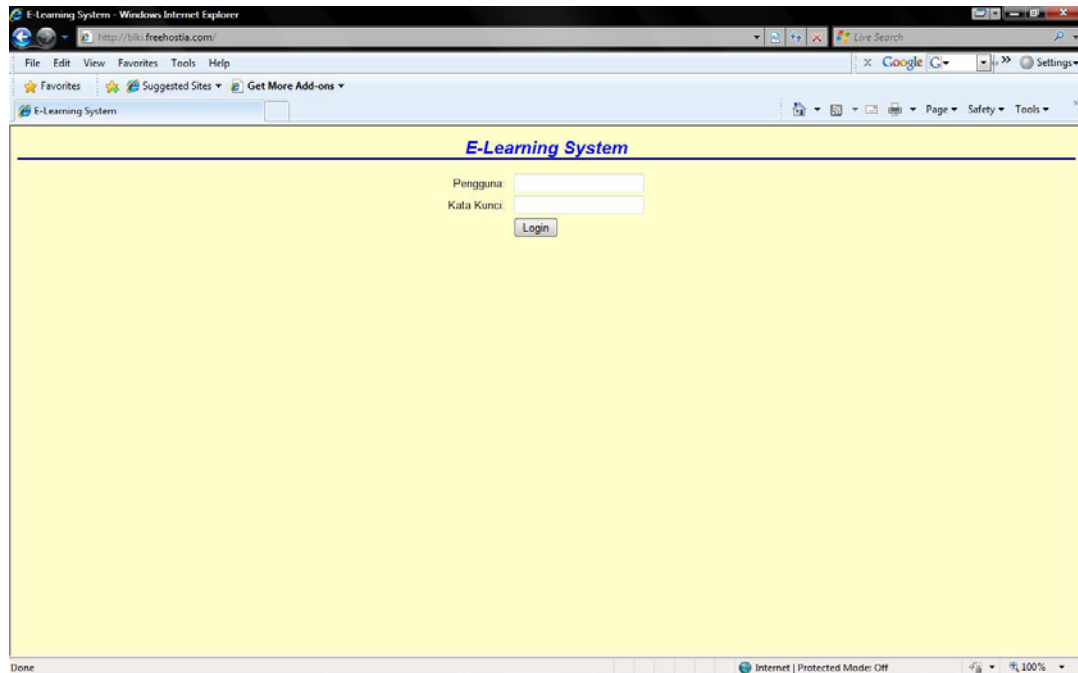
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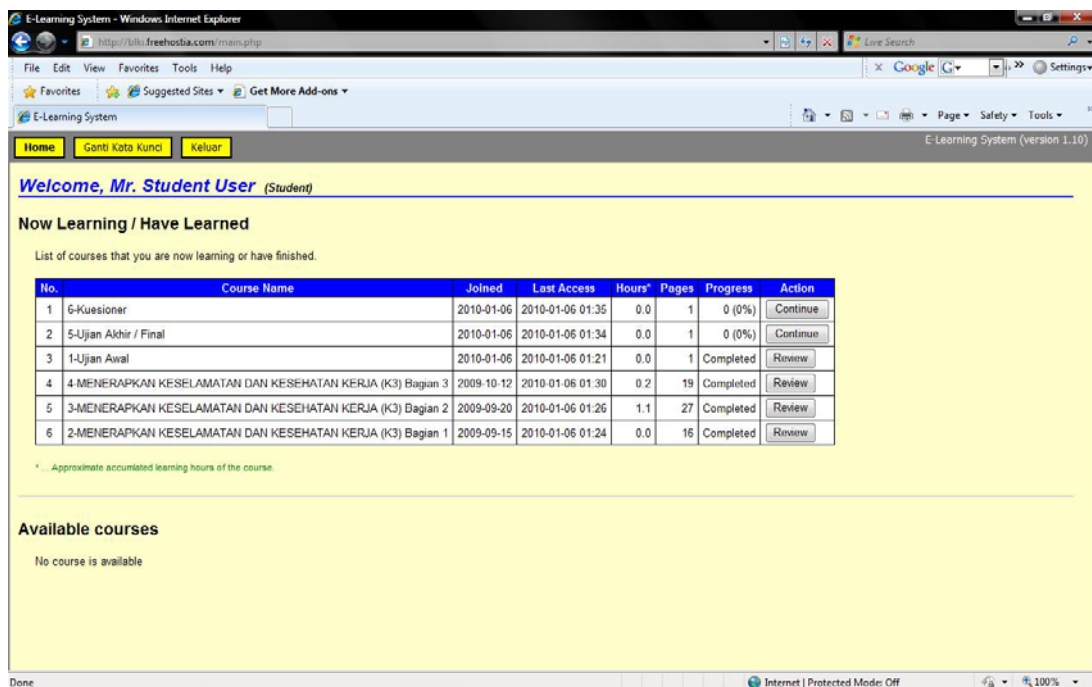
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Appendix A

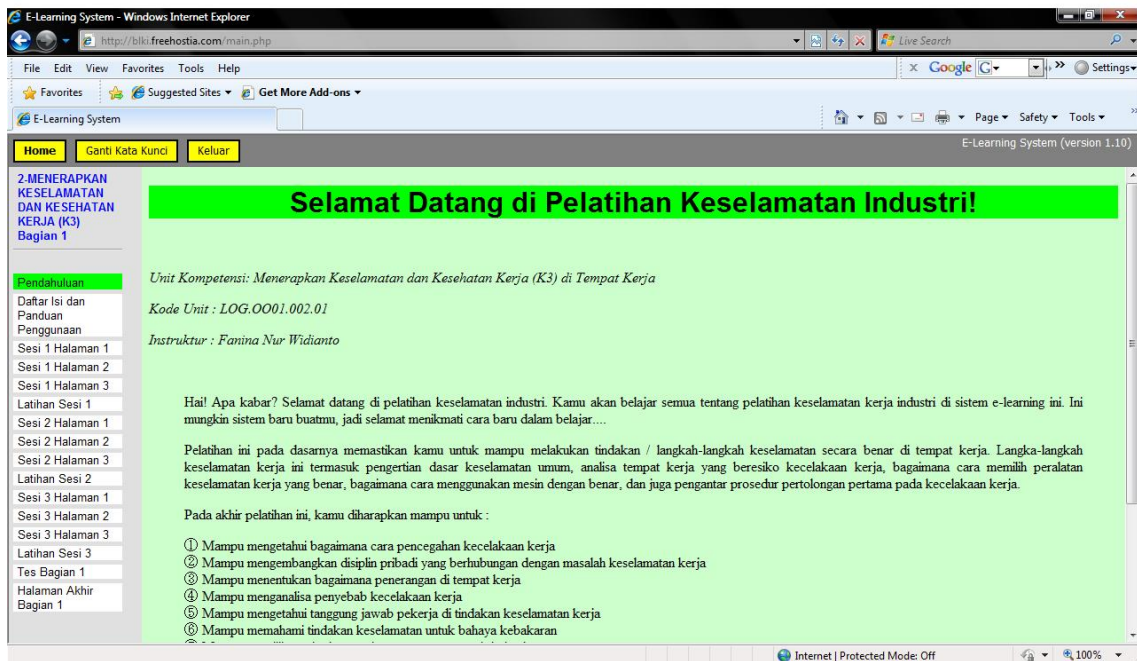
Screenshots of Learning Management System (Indonesian Language)



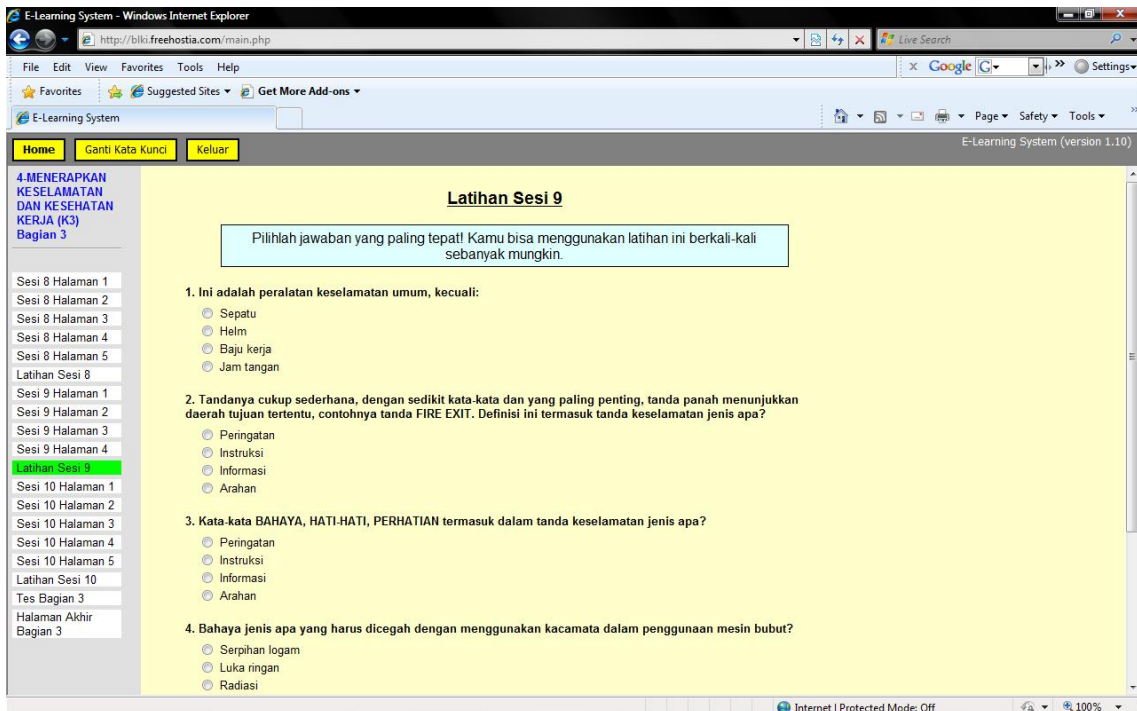
Log In Page



Home Page



Learning Page



Exercise and Feedback Page

E-Learning System - Windows Internet Explorer

http://biki.freehostia.com/main.php

File Edit View Favorites Tools Help

Google Live Search

E-Learning System

Home Ganti Kata Kunci Keluar

E-Learning System (version 1.10)

5-Ujian Akhir / Final

Ujian Akhir

Ujian Akhir

Pilih jawaban yang benar untuk soal pilihan ganda dan tuliskan jawabanmu secara singkat dan jelas untuk soal essay!

1. Apakah definisi dari K3?

- ☐ Tindakan untuk pencegahan supaya tidak terjadi kecelakaan pada waktu melakukan atau tidak suatu kegiatan pekerjaan yang mungkin dapat terjadi kepada si pekerja maupun kepada orang lain, mesin, alat dan lingkungan kapan saja dan dimana saja
- ☐ Tindakan untuk pencegahan supaya tidak terjadi kecelakaan pada waktu melakukan atau tidak suatu kegiatan pekerjaan yang mungkin dapat terjadi kepada si pekerja maupun kepada orang lain, mesin, alat dan lingkungan kapan saja di tempat kerja
- ☐ Tindakan untuk pencegahan supaya tidak terjadi kecelakaan pada waktu melakukan atau tidak suatu kegiatan pekerjaan yang mungkin dapat terjadi kepada si pekerja maupun kepada orang lain, mesin, alat dan lingkungan pada waktu jam kerja dimana saja
- ☐ Tindakan untuk pencegahan supaya tidak terjadi kecelakaan pada waktu melakukan atau tidak suatu kegiatan pekerjaan yang mungkin dapat terjadi kepada si pekerja maupun kepada orang lain, mesin, alat dan lingkungan hanya pada waktu jam kerja di tempat kerja

2. Peraturan pemerintah tentang keselamatan (K3) diatur dalam undang-undang apa?

- ☐ Keputusan Menteri Tenaga Kerja No. Per-01/Men/1981
- ☐ Keputusan Menteri Tenaga Kerja No. 1 tahun 1984
- ☐ Undang-Undang no. 7 tahun 1970
- ☐ Undang-Undang no. 1 tahun 1970

3. Apakah keselamatan umum itu?

- ☐ Keselamatan yang menyangkut aspek tertentu dalam semua pekerjaan, baik itu di darat, laut, ataupun udara, yang kaitannya dengan keselamatan setiap orang dari bahaya pekerjaan selama ia bekerja
- ☐ Keselamatan yang menyangkut semua aspek dalam semua pekerjaan, baik itu di darat, laut, ataupun udara, yang kaitannya dengan keselamatan orang tertentu dari bahaya pekerjaan selama ia bekerja

Done

Internet | Protected Mode: Off

100%

Post Test Page

E-Learning System - Windows Internet Explorer

http://biki.freehostia.com/main.php

File Edit View Favorites Tools Help

Google Live Search

E-Learning System

Home Ganti Kata Kunci Keluar

E-Learning System (version 1.10)

6-Kuesioner

Kuesioner

Kuesioner

Pilih jawaban yang paling sesuai dengan pendapatmu. Berikan jawaban singkat untuk pertanyaan essay.

* 1. Bagaimana menurutmu tentang isi dari materi pelajaran?

1: Sangat Tidak Bagus	2: Tidak Bagus	3: Biasa	4: Bagus	5: Sangat Bagus
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* 2. Bagaimanakah penjelasan tentang materi pelajaran?

1: Sangat Tidak Jelas	2: Tidak Jelas	3: Biasa	4: Jelas	5: Sangat Jelas
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* 3. Bagaimana menurutmu tentang penampakan visual (huruf, warna, dll) dari materi pelajaran?

1: Sangat Tidak Menarik	2: Tidak Menarik	3: Biasa	4: Menarik	5: Sangat Menarik
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* 4. Bagaimana menurutmu tentang gambar-gambar untuk membantumu memahami materi pelajaran?

1: Sangat Tidak Membantu	2: Tidak Membantu	3: Biasa	4: Membantu	5: Sangat Membantu
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* 5. Bagaimana menurutmu mengenai ukuran dari tiap sesi?

1: Sangat Tidak Sesuai	2: Tidak Sesuai	3: Biasa	4: Sesuai	5: Sangat Sesuai
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Done

Internet | Protected Mode: Off

100%

Questionnaire Page

Appendix B

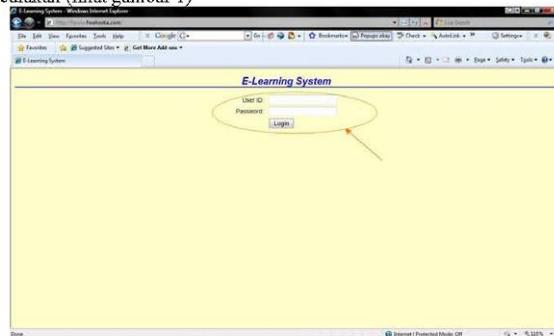
Paper based Instruction Manual

(in Indonesian language)

Username / Nama Pengguna :
Password / Kata Kunci :

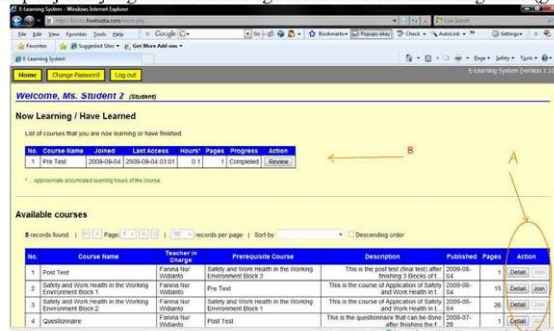
Panduan Penggunaan Sistem e-Learning

1. Pastikan komputermu telah terkoneksi internet dan mempunyai program flash terbaru untuk dapat memainkan video di youtube
2. Akses <http://blki.freehostia.com> dengan menggunakan internet browser seperti internet explorer
3. Masukkan nama pengguna (user ID) dan kata kunci (password) pada tempat yang disediakan (lihat gambar 1)



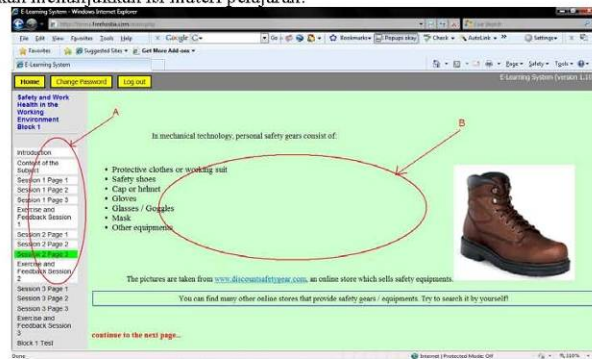
Gambar 1. Halaman muka sistem e-learning

4. Setelah memasuki tampilan HOME, pilih mata pelajaran yang diinginkan (lihat gambar 2). Klik tombol DETAIL untuk melihat penjelasan mengenai mata pelajaran yang akan diambil, dan klik tombol JOIN untuk mengikuti mata pelajaran tersebut (Bagian A)
5. Mata pelajaran yang telah dan sedang diikuti akan terlihat di bagian B (gambar 2)



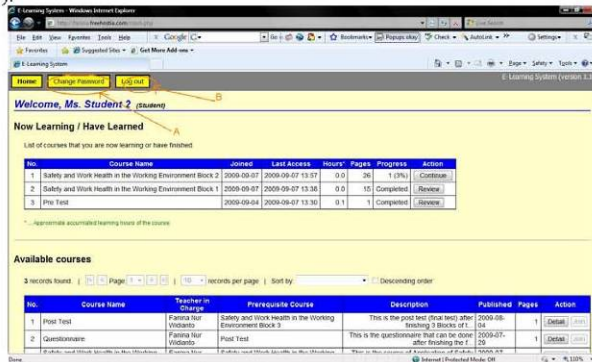
Gambar 2. Halaman HOME dari siswa

6. Ikuti perintah yang tertera di layar computer untuk mengikuti pelajaran. Penggunaan menu navigasi di sebelah kiri untuk belajar halaman demi halaman dalam sistem e-learning (Gambar 3 bagian A). Layar utama (Gambar 3 bagian B) akan menunjukkan isi materi pelajaran.



Gambar 3. Layar Materi Pelajaran

7. Ikuti perintah di layar untuk mengikuti kuis, tes, dan kuesioner.
8. Penggunaan tombol Ganti Kata Kunci (Change password) untuk mengganti kata kunci (Gambar 4 bagian A).
9. Penggunaan tombol Keluar (Log out) untuk keluar dari sistem (Gambar 4 bagian B).



Gambar 4. Tombol Ganti Kata Kunci dan Tombol Keluar

10. Mintalah bantuan dari instruktur jika membutuhkan bantuan teknis.

Instruktur : Fanina Nur Widiyanto (085715091339); faninanurwidiyanto@yahoo.com

Appendix C

t-Test Calculation

In this research, the statistic analysis of t-test (paired dependent t-test with repeated measures) is used. The formula for dependent t-test is (Fischler School of Education and Human Services, n.d.):

$$t = \frac{\sum D}{\sqrt{\frac{n \sum D^2 - (\sum D)^2}{n-1}}}$$

Where:

t = t-test value

$\sum D$ = sum of all the individuals' pre-post test score differences.

$\sum D^2$ = sum of all the individuals' pre-post test score differences squared.

n = the number of the participants

For B2PLKLN Bekasi pre-post test data can be calculated:

Participant	Pretest	Posttest	D (Differences)	D ²
Student 1	29	92	63	3969
Student 2	15	88	73	5329
Student 3	23	84	61	3721
Student 4	47	87	40	1600
Student 5	43	83	40	1600
Student 6	27	87	60	3600
Student 7	37	84	47	2209
Student 8	39	91	52	2704
Student 9	36	85	49	2401
Student 10	31	83	52	2704
Student 11	56	83	27	729
Student 12	43	87	44	1936
Student 13	42	94	52	2704
Student 14	35	95	60	3600
Student 15	61	85	24	576
Student 16	39	94	55	3025
Σ (Sum)			799	42407

From the data from the table, it can be calculated:

$$t = \frac{799}{\sqrt{\frac{16 \cdot 42407 - (799)^2}{15}}}$$

t = 15.45

For BLKI Samarinda pre-post test data can be calculated:

Participant	Pretest	Posttest	D (Differences)	D ²
Student 1	49	85	36	1296
Student 2	35	100	65	4225
Student 3	15	93	78	6084
Student 4	31	92	61	3721
Student 5	44	91	47	2209
Student 6	34	92	58	3364
Student 7	64	93	29	841
Student 8	53	90	37	1369
Student 9	30	99	69	4761
Student 10	27	96	69	4761
Student 11	38	89	51	2601
Student 12	47	96	49	2401
Student 13	52	92	40	1600
Student 14	26	93	67	4489
Student 15	25	92	67	4489
Student 16	48	97	49	2401
Σ (Sum)			872	50612

From the data from the table, it can be calculated:

$$t = \frac{872}{\sqrt{\frac{16 \cdot 50612 - (872)^2}{15}}}$$

$$t = 15.19$$

From the t value gained on the previous calculations, it can be checked using t-table:

t Score Table

Degree of Freedom (df)	Statistical Significant 5%	Statistical Significant 1%
1	12.706	63.657
2	4.303	9.925
3	3.182	5.841
4	2.776	4.604
5	2.571	4.032
6	2.447	3.707
7	2.365	3.499
8	2.306	3.355
9	2.262	3.25
10	2.226	3.169
11	2.201	3.106
12	2.179	3.055
13	2.16	3.021
14	2.145	2.977
15	2.131	2.947
16	2.12	2.921
17	2.11	2.898
18	2.101	2.878

Degree of freedom can be obtained from $(n-1)$ which n is the number of the participants. So in this research case will be defined $df = 15$.

For B2PLKLN Bekasi, $t = 15.45$ which is larger than 2.947 (threshold of 1% statistical significant).

It means that the difference is significant with error probability less than 1% or $p < 0.01$

For BLKI Samarinda, $t = 15.19$ which is larger than 2.947 (threshold of 1% statistical significant). It

means that the difference is significant with error probability less than 1% or $p < 0.01$

Appendix D

The Questionnaire Results

(in Indonesian language)

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Kuesioner

Pilih jawaban yang paling sesuai dengan pendapatmu. Berikan jawaban singkat untuk pertanyaan essay.

Answered by: (All Students)

* 1. Bagaimana menurutmu tentang isi dari materi pelajaran?

1: Sangat Tidak Bagus 0 marks	2: Tidak Bagus 0 marks	3: Biasa 3 marks	4: Bagus 24 marks	5: Sangat Bagus 5 marks
Average score = 4.1				

* 2. Bagaimanakah penjelasan tentang materi pelajaran?

1: Sangat Tidak Jelas 0 marks	2: Tidak Jelas 0 marks	3: Biasa 3 marks	4: Jelas 26 marks	5: Sangat Jelas 3 marks
Average score = 4.0				

* 3. Bagaimana menurutmu tentang penampakan visual (huruf, warna, dll) dari materi pelajaran?

1: Sangat Tidak Menarik 0 marks	2: Tidak Menarik 0 marks	3: Biasa 9 marks	4: Menarik 21 marks	5: Sangat Menarik 2 marks
Average score = 3.8				

* 4. Bagaimana menurutmu tentang gambar-gambar untuk membantumu memahami materi pelajaran?

1: Sangat Tidak Membantu 0 marks	2: Tidak Membantu 0 marks	3: Biasa 7 marks	4: Membantu 20 marks	5: Sangat Membantu 5 marks
Average score = 3.9				

* 5. Bagaimana menurutmu mengenai ukuran dari tiap sesi?

1: Sangat Tidak Sesuai 0 marks	2: Tidak Sesuai 1 marks	3: Biasa 8 marks	4: Sesuai 22 marks	5: Sangat Sesuai 1 marks
Average score = 3.7				

* 6. Bagaimana menurutmu tentang ujian awal sebelum memulai proses belajar?

1: Sangat Tidak Membantu 0 marks	2: Tidak Membantu 0 marks	3: Biasa 5 marks	4: Membantu 20 marks	5: Sangat Membantu 7 marks
Average score = 4.1				

* 7. Bagaimana menurutmu tentang ujian akhir berhubungan dengan tujuan belajar?

1: Sangat Tidak Berhubungan 0 marks	2: Tidak Berhubungan 0 marks	3: Biasa 4 marks	4: Berhubungan 19 marks	5: Sangat Berhubungan 9 marks
Average score = 4.2				

* 8. Bagaimana menurutmu tentang latihan dan umpan balik membantu kamu dalam proses belajar?

1: Sangat Tidak Membantu 0 marks	2: Tidak Membantu 1 marks	3: Biasa 2 marks	4: Membantu 24 marks	5: Sangat Membantu 5 marks
Average score = 4.0				

* 9. Apa pendapatmu tentang tes bagian diantara bagian 1, 2 dan 3?

1: Sangat Tidak Membantu <input type="radio"/> 0 marks	2: Tidak Membantu <input type="radio"/> 0 marks	3: Biasa <input type="radio"/> 6 marks	4: Membantu <input type="radio"/> 23 marks	5: Sangat Membantu <input type="radio"/> 3 marks
Average score = 3.9				

* 10. Bagaimana menurutmu tentang instruksi penggunaan system e-learning?

1: Sangat Tidak Jelas <input type="radio"/> 0 marks	2: Tidak Jelas <input type="radio"/> 0 marks	3: Biasa <input type="radio"/> 5 marks	4: Jelas <input type="radio"/> 19 marks	5: Sangat Jelas <input type="radio"/> 8 marks
Average score = 4.1				

* 11. Bagaimana menurutmu tentang penggunaan video untuk membantu proses belajar?

1: Sangat Tidak Membantu <input type="radio"/> 0 marks	2: Tidak Membantu <input type="radio"/> 1 marks	3: Biasa <input type="radio"/> 8 marks	4: Membantu <input type="radio"/> 20 marks	5: Sangat Membantu <input type="radio"/> 3 marks
Average score = 3.8				

* 12. Apa pendapatmu tentang penggunaan tautan (links) dalam proses belajar? Apakah membantu dalam proses belajar?

1: Sangat Tidak Membantu <input type="radio"/> 0 marks	2: Tidak Membantu <input type="radio"/> 1 marks	3: Biasa <input type="radio"/> 8 marks	4: Membantu <input type="radio"/> 20 marks	5: Sangat Membantu <input type="radio"/> 3 marks
Average score = 3.8				

* 13. Apa pendapatmu tentang instruksi belajar dalam materi pembelajaran?

1: Sangat Tidak Jelas <input type="radio"/> 0 marks	2: Tidak Jelas <input type="radio"/> 0 marks	3: Biasa <input type="radio"/> 9 marks	4: Jelas <input type="radio"/> 22 marks	5: Sangat Jelas <input type="radio"/> 1 marks
Average score = 3.8				

* 14. Apa pendapatmu tentang system navigasi dalam e-learning?

1: Sangat Tidak Bagus <input type="radio"/> 0 marks	2: Tidak Bagus <input type="radio"/> 0 marks	3: Biasa <input type="radio"/> 7 marks	4: Bagus <input type="radio"/> 24 marks	5: Sangat Bagus <input type="radio"/> 1 marks
Average score = 3.8				

* 15. Bagaimana materi pembelajaran membantumu dalam proses belajar mandiri?

1: Sangat Tidak Membantu <input type="radio"/> 0 marks	2: Tidak Membantu <input type="radio"/> 0 marks	3: Biasa <input type="radio"/> 2 marks	4: Membantu <input type="radio"/> 28 marks	5: Sangat Membantu <input type="radio"/> 2 marks
Average score = 4.0				

* 16. Bagaimana materi ini membantumu dalam memahami mengenai tindakan keselamatan di industri?

1: Sangat Tidak Membantu <input type="radio"/> 0 marks	2: Tidak Membantu <input type="radio"/> 0 marks	3: Biasa <input type="radio"/> 1 marks	4: Membantu <input type="radio"/> 28 marks	5: Sangat Membantu <input type="radio"/> 3 marks
Average score = 4.1				

* 17. Bagaimana materi ini memotivasi kamu untuk melanjutkan belajar lebih lanjut mengenai tindakan keselamatan di industri?

1: Sangat Tidak Membantu <input type="radio"/> 0 marks	2: Tidak Membantu <input type="radio"/> 0 marks	3: Biasa <input type="radio"/> 3 marks	4: Membantu <input type="radio"/> 25 marks	5: Sangat Membantu <input type="radio"/> 4 marks
Average score = 4.0				

* 18. Tulislah apa yang kamu sukai dan tidak kamu sukai tentang sistem e-learning dan materi belajar ini?

Disukai : Materi ini disampaikan dengan cara yang menarik
Tidak disukai : Beberapa video K3 Tidak dapat ditampilkan

saya suka sekali dalam penanganan dalam P3K sebab memberikan saya wawasan mengenai penanggulangan bahaya kecelakaan.hal yang tidak saya sukai bahwa sudah terlihat dalam video tergambar ada seseorang yang mengelap tapi orang tersebut kurang memperhatikan keselamatan pada dirinya

yang saya tidak sukai adalah seperti video yang tidak dapat diakses d setiap pc(komputer)atau hanya pc(komputer) tertentu saja yang memiliki fasilitas youtube yang dapat mengakses'a sehingga menghambat terjadi'a e-learning ini sendiri.

yang saya sukai adalah e-learning ini sangat bermanfaat untuk khususnya diri aya sendiri lebih mengetahui lebih jauh tentang keselamatan&sehatan pekerja.

YANG SAYA SUKA : SISTEM E-LEARNING SANGAT MEMBANTU DALAM MEMAHAMI PELAJARAN TENTANG K3 DAN JUGA PELAJARAN LAIN APABILA MENGGUNAKAN SISTEM E-LEARNING INI.
YANG TIDAK SAYA SUKAI:HANYA WAKTU TERTENTU BISA BELAJAR MENGGUNAKAN SISTEM E-LEARNING

di kampus sulit untuk akses internet

suka,,karna cara baru dalam kuliah,,tdk suka karna klo ada yg tdk kita mengerti,,susah bertanya

suka semua

-materinya lengkap
 -terlalu byk pertanyaan

aku suka tentang sistem e-learning yaitu cara belajarnya lebih membantu dalam menambah wawasan.dan yang tidak sukai yaitu banyaknya materi dan soal yang dikerjakan dan sangat menyita waktu

sangat membantu saya dim pelajaran mekanik dlm sistem online

sukai : bisa belajar sendiri
 tidak sukai : lama untuk membuka halaman

Suka dgn smua materi'a yg lengkap, Tidak Suka dgn Sistem yg di klik muncul materi bahasan, tetapi jarang sekali yg bisa, saya tidak bisa.

bisa online

1.yang saya sukai dari e-learning ini sangat mudah dan efektif
 2.

menggunakan komputer
 susah dalam membaca di layar monitor

suka isi materi pelajaran
 tidak suka penampilan visual

dapat menambah wawasan saya dengan jaringan online

sukai belajar menggunakan komputer
 tidak sukai banyak yang berisik

sangat berguna buat saya

dengan system ini dapat sedikit membantu tentang keselamatan kerja di lapangan kerja

yg saya suka : belajar nya tidak menggunakan buku lagi.

yg tidak saya suka : tidak ada

menambah wawasan tentang k3

menggunakan komputer, materinya sesuai dengan kebutuhan
 agak susah dalam menggunakan

menambah wawasan

dan sistem ini sangat dapat dengan mudah belajar
mendidik dan menambah pengetahuan ttg keselamatan, tidak suka teks yang terlalu panjang
sukai : menggunakan komputer dan internet
tidak disukai : lambat membuka halaman
sukai : cara navigasi di sebelah kiri
tidak : video tidak muncul
menggunakan teknologi komputer dan internet
-loading yang lama
menggunakan internet, bisa dibuka dimana saja
kadang2 tidak bisa dibuka
sukai : bisa belajar kapan saja
tidak disukai : internetnya lambat
sukai : bisa dikerjakan dimana saja
tidak disukai : internetnya lambat

* 19. Tulislah apa saran-saran kamu tentang sistem e-learning dan materi belajar?

Pengembangan edukatif terhadap beberapa materi & kejadian tentang pelanggaran K3
bahwa dalam berbagai macam pekerjaan kita harus benar-benar menguasai pekerjaan kita, dan kita juga harus taati peraturan yang berlaku terutama dalam menghindari bahaya kecelakaan. untuk itu pekerja harus benar-benar memperhatikannya
soal no 4 sesi 8 aga bertentangan dengan apa yang di berikan olah dosen perkakas tangan dimana saat pengikiran manual itu tidak di anjurkan untuk mengakan sarung tangan untuk menghasilkan kerja yang bagus...tapi dalam sal itu d tuliskan bahwa pengikiran menggunakan sarung tangan....thanks for attention
KALAU BISA SEMUA MATA PELAJARAN MENGGUAKAN SISTEM E-LEARNING.
MATERI BELAJAR SUDAH CUKUP BAIK
sebaiknya mata kuliah yang lain juga meneraokan sistem ini
ya...semoga pak fani uang makanny klo bisa di tambah lagi..hehehe
tambah background supaya lebih menarik
Menggabung semua materi agar tidak rumit
saran saya yaitu saya ingin sistem e-learning lebih diperluas dan di kembangkan keseluruh indonesia.
tolong di kembangkan lagi sistem ini
-lebih jelas dalam memberikan materi
-tidak lambat
Perbanyak Materi, contoh'a Materi Praktek T.Mesin / Otomotif, jgn hanya mengenal K3
kurang di kembangkan lagi
sangat bagus dan saya suka tentang sistem e-learning.
lebih dibikin lengkap lagi materi belajarnya
penampilan visual harus ditingkatkan lagi.
di kembangkan ge
tolong di perbanyak lagi komputernya
kurang di kembangkan

harus lebih banyak lagi materi yang diberikan
 kalau bisa materinya di tambah lagi
 tolong di kembangkan lagi
 lebih banyak untuk materi pelajaran yang lain
 tambah ge jaringannya
 sistem ini agar lebih kedepannya dapat di jelaskan lebih rinci lagi
 terus ditingkatkan lagi materinya agar lebih bermutu lagi
 agar sistemnya dipercepat
 perbanyak gambar dan animasi
 lebih banyak materi pelajaran yang lain
 perbanyak video dan gambar2
 perbanyak tampilan yang menarik
 perbanyak gambar animasi

* 20. Apa kesan umum yang kamu peroleh mengenai sistem e-learning dan materi belajar ini?

Saya merasa beruntung mendapatkan kesempatan mengikuti program ini. Dengan ini diharapkan saya dapat meningkatkan sikap safety First saya dalam bekerja
 saya senang sekali dengan pembelajaran seperti ini sebab saya mendapat pengetahuan dan wawasan yang lebih memahami pencegahan bahaya kecelakaan
 dapat belajar lebih dalam tentang keselamatan kerja...
 DALAM MENGENAI SISTEM E-LEARNING INI SANGAT BAGUS DAN MEMBANTU KITA UNTUK LEBIH MENGETI TENTANG PELAJARAN
 dapat memotivasi
 sangat membantu
 Canggih
 Sangat mendidik, dan menambah pengetahuan
 saya sangat senang dan ingin sekali menjadi orang mengetahui segala hal tentang sistem e-learning.
 sangat bagus
 -sistem yang baru, materi belajarnya sama dengan yang biasa
 Pengetahuan Bertambah, bisa merubah sikap ketika di bengkel tuk persiapan pribadi tentang K3
 sangat bagus
 mudah dan praktis.
 bagus, menyenangkan
 sangat membantu dalam memahami tindakan keselamatan di industri
 sangat bagus
 sangat bagus

[REDACTED]
sangat bagus
[REDACTED]
baik dan sangat membantu
[REDACTED]
saya dapat mempelajari sistem ini
[REDACTED]
sangat bagus
[REDACTED]
menyenangkan karena sistem baru
[REDACTED]
sangat bagus
[REDACTED]
sangat membantu dalam pengetahuan tentang keselamatan kerja
[REDACTED]
penambahan wawasan itu penting
[REDACTED]
bagus, menarik, cara yang baru untuk belajar
[REDACTED]
bagus, menarik dan menyenangkan
[REDACTED]
menarik, menyenangkan, cara baru
[REDACTED]
menarik, menantang
[REDACTED]
bagus, menarik, lain dari yang biasanya
[REDACTED]
menyenangkan, cara baru

Close