The effect of vocational learning strategy and knowledge of sustainable development in increasing traditional cattlemen’s skill in making bio-digester

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Abstract. The objective of this research is to find out the effect of vocational learning strategy and knowledge about sustainable development to increase traditional cattlemen skills in making Bio-digester. The research design used experiment of 2 x 2 factorial design. The sample were 80 traditional cattlemen at District Sukawangi who were divided in two groups. The result showed as follows 1) There is significant difference on the cattlemen group who was taught with vocational learning strategy between school based and work place based; 2) There were interactions found between two factors there are vocational learning strategy and knowledge about sustainable development; 3) The cattlemen group who have high knowledge about sustainable development and taught with work place-based strategy, the skill in making Bio-digester was higher than the group who taught with school-based strategy; 4) The cattlemen group who had low knowledge about sustainable development and taught with work place-based strategy, the skill in making Bio-digester was higher than the group who taught using school-based strategy. Vocational learning strategy using work place based can be more effective to increase the level skill of cattlemen in making Bio-digester by considering their knowledge about sustainable development.

1. Introduction
The ability of Indonesia produces renewable energy from different types of Biomass of no more than 1 percent of the potential of 49,810 MW. Tropical Indonesia, with fertile soil and the agrarian society should be able to answer the challenges the needs of the energy in the future. The potential of energy from Biomass is very large, Deublein states: “In theory all the amount of space, including the surface of the water can be used to produce biomass” [1].

Human factors have a great influence towards the application of alternative energy production in addition to natural resource and technology factors. The ability of human resources, lack of education and training (training and education), as well as the lack of information on Renewable Energy devoted to the community is the key to answer the challenges of meeting the energy needs for Indonesia in the future [2].

The Skill of making simple Biogas is attempted because it is in line with the interests of society in Indonesia in fulfilment of environmentally friendly energy. The fact that energy is increasingly expensive in the future as well as the efforts of fostering self-reliance and improved the welfare of society, especially society in the sector of household which is far from the energy access.
The population of Indonesia 60 percent resides in rural areas, therefore energy self-reliance in rural areas becomes top priority. The program of Energy Independent Village (EIV) has proven to be able to improve the welfare of poor villagers/isolated/border through the provision of energy access independently developed by utilizing energy for productive activity. Although it has been a priority, yet the utilization of Biogas as an energy source remains still feels a little bit. From 633 EIV which had formed by the end of 2009, spread all over in 27 provinces only 14 EIV using Biogas.

The skills of a person will be different to each other. This is because of the Cognitive Performance. Cognitive performance is the ability/achievements of someone who can clearly visible running cognitive tasks. The cognitive performance influenced by genes, general ability, experience (life experiences) as well as knowledge they have learned.

Richard E. Mayer [3] defines the ability as a potential person in learning gain knowledge. Experience is defined as a person’s interactions with the environment and one of the factors that greatly affect the experience is the presence of specialization/specificity of an exercise. Where the existence of special exercises then formed a specialized expertise.

Skills according to John R Schermerhorn, Jr. [4], is the ability of a person in translating the knowledge into a real action as well as indicated by performance. Skills must be poured into a work or act that gives more value or achievement.

Someone who has a particular skill, will look into the personality obviously eager to obtain the knowledge. This opinion was expressed by Philip L. Ackerman [5]. Added that to form a capable private can only be obtained through investments in the form of business throughout a certain period of time.

Bio Digester is a tool that is designed to serve as the digest organic materials by bacteria parser with airtight conditions (anaerobic). The result of the decomposition of organic material it is a gas that is generally called Biogas. Biogas is a gas that is produced from the anaerobic biological processes in the form of the ingredient composition of Methane gas (CH₄), carbon dioxide (CO₂), water (H₂O) in the form of steam, Nitrogen (N₂) a little Hydrogen Sulfid (H₂S). Literacy in Biogas is a gas formed from living beings. The bacteria produce biogas just do in the absence of air (an means no, aerobic means air) [5].

Mazumdar mentions that Biogas is a gas composed of methane, carbon dioxide, hydrogen sulfide and some other gases produced by anaerobic fermentation of organic material such as animal and human feces, foliage, grasses. The presence of methane gas in the biogas gives the ability as a fuel suitable for cooking and lighting [6].

Deublin explains that the formation of methane gas is the biological processes which form when organic material (biomass) decomposes in airtight conditions helped by a kind of microorganisms (methane bacteria) [1]. Naturally this methane gas can form in the stomach or digestive tract of herbivore animals, wet plants experience the compost process and rice paddies inundated. All organic materials (biomass) which can be fermented is called the substrate. This several process of making bio digester also same with previous research held in Kenya and Rwanda [7].

The skills of making Bio Digester is a person’s ability to work to produce a Bio Digester tool coupled with knowledge and experience in its making so that one has special skills that is recognized by the community.

A Vocational learning referred as the vocational learning is all aspects required by learners in vocational study including socialization theory, activity theory, collective learning, practices learning, organizations learning and the development of psychology. This combination requires an active approach of pupils to learning. Active, in this sense, means pupils have to integrate their knowledge of facts, concepts and procedures with new facts, concepts or procedures in such a way that they construct their own new meaningful knowledge [8].

Benjamin S. Bloom [9] divides the ultimate goal of learning to be 3 (three) domains namely 1) the realm of cognitive, 2) affective and 3) Psychomotor. Cognitive including the activity associated with listening and considering the knowledge, thinking, creating, and solving the problems.

The meaning of sustainable development is a paradigm in optimizing the environment, economic and social aspects to ensure the integrity of the environment, safety, capacity, quality of life and well-
being of the present and future generations by holding on to the values and principles of sustainability [10].

Over the last two decades sustainable development (SD) has become an intensively and widely discussed theoretical concept. The Decade of Education for Sustainable Development (DESD), which was launched by the United Nations in 2005, can therefore be seen as a seminal moment that vividly emphasizes the specific significance that SD bears for the educational sector [11].

Education is a key factor in developing public knowledge and awareness about issues that affect the future of a nation and, subsequently, the world. Environmental problems have become issues of great concern to many parties [12]. A concern for the environment has now become part of the concept of sustainable development, including to make a simple Bio Digester.

Vocational Learning Strategy, one of which is the School Based Course or Training, is a vocational learning strategy-oriented to study reviews of the basic theories, concepts and models related to the world of work which will be learned. The learning strategy of vocational school-based intended in order that theories and concepts related to the world of real work can be transferred to participants well and effectively [13].

Some efforts to improve the skills of making simple Bio Digester using the vocational School-based learning strategy is a strategy of the introduction and transfer of knowledge about the basics of the theory of creation as well as knowledge about Bio Digester theories and concepts of Sustainable development to use the location where the learning tools, supplies, curriculum practice in the classroom [14].

The approach of work based is the vocational learning strategy that creates competence through learning experiences that experienced process of themselves (experience and experimental learning). Pioneer of theories about work-based training expressed by Jacob Mincer and Gary Becker i.e. increased skills can be done either inside or outside of the institution. The process that occurs during the learning done at work is doing the impersonation work (imitation) exemplified by workers who are trained and professional. Learning at work describes the orientation process and lifelong learning which contributes in the development of the individual and the professionalism and support innovation.

A work-based vocational learning strategy in an effort to increase the skill of making Bio Digester is a strategy of approaching participants with the location of the workplace in order to acquire knowledge through the work experience done by themselves, looking at practical examples from professional trainers and learning curriculum oriented work process.

2. Methodology

This research uses Experimental methods by using factorial design 2 x 2. The context of these research studies is traditional cattlemen where the target population is the entire traditional cattlemen in District Sukawangi, County of Bekasi. While the reached population is traditional cattlemen in the village of Setiamekar. It has been chosen the traditional cattlemen as the object of research because traditional cattlemen generally have a number of cows which are not more than 5 cows would utilize directly the Bio Digester being made. Sampling procedure is done with a few steps, namely 1) set District Sukawangi as the area of research, 2) by using cluster random sampling of 8 existing villages in District Sukawangi chosen the village of Setiamekar, 3) selected by random 80 traditional cattlemen in the village of Setiamekar, 4) chosen by random members of the treatment A and B respectively of the Group amount to 40 people, 5) perform the measurement of knowledge about sustainable development using a written test to each member’s treatment A and B. 6) written test results later sorted. The value of the order from the results of researcher taking a 27% of every group of 40 cattlemen, then retrieved each group numbered 11 people who have high knowledge about sustainable development and 11 people who have low knowledge about sustainable development.

2.1. Measurement

2.1.1. The Skills of Making Bio Digester. The instruments used to collect the data of skills of making Bio Digester measured using multilevel scale instrument and three assessments: Skilled (S) is given a
score of 3, Skilled Enough (SE) is given a score of 2, Less Skilled (LS) is given a score of 1. The highest score for the assessment of skills is 90 and the lowest score is 30.

2.1.2. Knowledge about Sustainable Development. The instrument test of knowledge about sustainable development is used in the form of reserved option is true (T) and false (F) that add up to 30 items. If the correct answer is given a score of 1 and if one is given a score of 0, so that the highest score is 30 and lowest score is 0. The reason the use of test True and False selection because of the goal of the test is the average cattlemen accustomed to thinking of practical, so the revelation of problems is made as simple as possible, the process of score and results more modest correction, and time worked on the test is relatively short.

2.2. Treatment

2.2.1. Vocational School Based Learning Strategy. Coach reveals the basic theoretical studies that describe the functions of Bio typical analysis for digester, recognize the basic concept of the formation of bio gas, individual practice with existing equipment assisted with explanation and demonstration by coaches, and then shows the results of the utilization of gas from the typical analysis for Bio digester.

2.2.2. Vocational Work Place Based Learning Strategy. The delivery of the basic theory that describes the functions of this typical analysis for Bio digester done entirely in the work place. Participants will be mentored and monitored in every activity for workplace-based learning takes place. The delivery of the material, ask and discuss fully carried out directly on-site work, including demonstration and manufacture of Bio digester.

3. Results

Validity Test of using the formula of Correlation of Product Moment. After obtained the validity coefficient (r) or r count then compared with the table, n = 30 i.e. 0.312. If r count > r table then the item is said to be valid. On the variable of 30 items of questions submitted to 30 respondents gave the results of the 3 items of questions revealed Drop. The Reliability test to the overall items of instruments expressed to be valid using the formula of α = 0.63.

Independent variables from 30-questions given to 30 respondents gave results 3 items of questions revealed Drop. The Reliability test to the overall items of instruments that expressed to be valid using Kuder-Richardson formula with result = 0.82.

Normality Test of the data in this study using a test of Kolmogorov-Smirnov (K-S) and to test its homogeneity test of population variances using Bartlett both at level of significance α = 0.05.

4. Discussions

The results of ANOVA calculations between groups shows the value of Fcount = 9.46 which turns out to be greater than the value of Ftable = 4.31 on 99 percent significance level. This means that HO denied and accept H1. This indicates there is a significant difference between the application of school based and work place based vocational learning strategies towards the skills of cattlemen to make Bio Digester.

The results of ANOVA calculations about Knowledge of Sustainable Development showed Fcount = 18.49 which turns out to be greater than the value of Ftable = 7.31 on 99 percent significance level. This means that Ho is denied and accept H1. This indicates there is a difference between the level of high and low knowledge about sustainable development towards the skills to make Bio Digester.

The results of ANOVA calculations showed the presence of Interactions shown on Finteraction = 5.2 which turns out to be greater than the value of Ftable = 4.08 on level of significance of 95 percent. This means the interaction between independent and dependent variables have the Interactions, it can be shown in Figure 1.
When the results of the variance analysis showed there were major influences from non-variable against variable and there is an interaction between A and B, then the test is continued with the Tuckey method to know the meaningfulness of such interaction. Tuckey test is used as the number of samples of each cell is the same and the hypothesis testing criteria used in standard significance. Tukey test was used to compare groups of cattlemen who have high knowledge about the Sustainable Development of vocational school based [A1B1] and workplace based [A2B1] learning strategies towards the skills of making Bio Digester results $Q_{count} = 4.64$ which turns out to be greater than the value of $Q_{table} = 4.26$ on significant level $\alpha = 0.05$.

Based on Tukey Test showed that the skills of the cattlemen make a Bio Digester with high knowledge of Sustainable Development learning strategies that follow either a vocational school-based learning strategy or vocational workplace-based have significant differences. The Calculation analysis of variance with Tukey test stage to compare a group of cattlemen who have knowledge of Sustainable Development with vocational School-based learning strategies [A1B2] and workplace-based [A2B2] towards the skills of making a Bio Digester results $Q_{count} = 4.77$ which turns out to be greater than the value of $Q_{table} = 4.26$ on significant level $\alpha = 0.05$. Based on Tukey Test showed that the skills of the cattlemen make a Bio Digester with low knowledge of Sustainable Development following the vocational School-based and workplace-based learning strategies have significant differences.

5. Conclusion
This research uses experimental method that aims to find out whether there is a difference or influence learning strategies implementation i.e. vocational School-based and workplace-based learning strategies towards the skills of cattlemen to make the Bio Digester. Based on the results of hypothesis testing can be summed up as follows:

First, the overall skills of cattlemen making a bio digester was given a treatment of vocational workplace-based learning strategy are higher than the cattlemen who have given the vocational school-based learning strategy. Second, there is an interaction between the factors of vocational learning strategies with the cattlemen’ knowledge about factors of sustainable development towards the skills of cattlemen in making make the bio digester. Third, on a group of cattlemen who have high knowledge about sustainable development, the skills of the cattlemen make a bio digester by applying workplace-based learning strategies are higher than those applying vocational school-based learning strategies.

Fourth, on a group of cattlemen who have low knowledge of sustainable development, the skills of the cattlemen make a bio digester by applying work place-based learning strategies giving a higher value than the school-based learning strategies. Based on the findings above, in this case can be drawn the
conclusion that the vocational learning strategies can effectively improve the skills of the cattlemen to make a bio digester considering of the cattlemen’ knowledge about sustainable development. For a group of cattlemen who have low or high knowledge about the sustainable development will be given effectively about the vocational work place-based learning strategies.

Acknowledgments
We would like to thank the editorial manager of this publication. We are also immensely grateful to the reviewers for their comments on an earlier version of the manuscript.

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