

The Effectiveness of E-Learning-Based Instruction in Increasing College Students Learning Independence

Mawardi^{a,1,2*}, Haris Mudjiman^b, Sri Anitah^c, Asrowi^d

^{a,1} Postgraduate Program in Education Science, Faculty of Teacher Training and Education, University of Sebelas Maret, Surakarta, Indonesia

^{a,2} Department of Primary Teacher Training, Faculty of Teacher Training and Education, Satya Wacana Christian University, Indonesia

^b Postgraduate Program in Education Science, Faculty of Teacher Training and Education, University of Sebelas Maret, Surakarta, Indonesia

^c Postgraduate Program in Education Science, Faculty of Teacher Training and Education, University of Sebelas Maret, Surakarta, Indonesia

^d Postgraduate Program in Education Science, Faculty of Teacher Training and Education, University of Sebelas Maret, Surakarta, Indonesia

*Corresponding author: Mawardi

Abstract

This research aimed to describe the effectiveness of Moodle e-learning based instruction in increasing college students' learning independence, and also to discover the effectiveness of the instruction in improving students learning competence facilitated by their independence in learning. The experiment used the matching-only pretest-posttest control group design. There were 76 participants of 36 college students in the experiment group, and 36 college students in the control group. The experiment group was given the Moodle e-learning, while the control group was given e-learning instruction using CD-ROM and email. This research used test to measure students' learning outcome and rubric scale for learning independence. The analysis used the Independent Sample t-Test and ANCOVA technique. The result stated that: 1) the Moodle e-learning based instruction increased learning independence in high category, and significantly higher compared to the instruction with CD-ROM and email; 2) the Moodle e-learning effectively increased the learning outcome competence facilitated by the students own learning independence in higher level compared to the instruction using CD-ROM and email.

KEYWORDS: e-learning, learning independence, Moodle.

1. INTRODUCTION

The important requirement of pedagogy competence for professional lecturers is the ability to design a decent instruction. A well-constructed instruction will be effective to reach the goals. The lecturer's ability determines the quality of the instructional design to prepare for the components of instruction based on the theory of learning (Clark & Mayer, 2008: 7). The main components of pedagogy competence cover the ability of planning the goals, materials, strategies, media, and the evaluation. In order to give guidelines for lecturers to design learning instruction, the General Director of Higher Education (2010) provided a guideline of Quality Control System for Higher Education. There are reflective questions in the guideline to help lecturers designing the instruction. The questions are: what are the expected learning outcomes?; How far is the complexity of the learning goal?; Does it require special skill?; Are the materials in a form of facts, concepts, laws, or certain theories?; Does it require

certain prerequisite?; Is one strategy and media enough to achieve the learning result?; Is the strategy and media effective and efficient?

Practically, there are indications showing that the lecturers are not doing these planning of learning components based on the reflective guideline well. The preliminary studies in this research, showed a phenomenon that only 25% of the lecturers used the instructional model in designing the learning activity. The questionnaire result was related to the students' statement about the average of learning independence level that reached to 51%. This number was relatively similar with the lecturers' statement that the students' learning independence in sending emails increased to 50%. The learning outcomes competence reached the mean score of 58, with the minimum score of 33 and maximum of 82. Moreover, the average learning result was 58 that also did not reach the minimum standard of 60. The study on learning outcome competence in every basic competence also revealed the high gap among three basic competences that did not reach the minimum standard score. The three basic competences were: 1) understanding the concept of human rights in Indonesia, 2) specifying the basic concept of globalization, and 3) describing the basic concept of international relationship.

The low achievement phenomenon of participation, independence, and competence learning outcome as described above is predicted to happen because of the instructional design made by the lecturer that requires less students' independence, motivation, and joy in learning. Several researches showed the gap in the Citizenship course practice that brought the effect to the low quality of the instructional. The tracer study research by the researcher (Mawardi, 2011:76) found that the gap of competency needed to be improved through planning and execution from Primary School Teacher Education and Training curriculum, consisted of the competence of choosing and organizing the materials and problem solving. A research by Zuriah (2009) found the phenomena that the instruction of Citizenship course needed to be innovative-collaborative, varied, and interesting.

Considering the gap of learning in the basic concept of Citizenship course, there is a need to choose a pedagogy model that is appropriate for students' characteristics and the course materials so that the problem can be solved. The alternative design that is potential to fulfill the need for the course is the design of Moodle e-learning based instruction.

2. MATERIALS

Moodle (Modular Object Oriented Dynamic Learning Environment) is a web-based learning software in e-learning system. As Moodle is a subsystem of e-learning, it will be explained at first-hand about e-learning. According to Clark & Meyer (2008:10), e-learning is an instruction delivered through computer, using the CD-ROM, internet, or intranet. Smaldino, Lowther & Russell (2005: 25) stated that e-learning is the delivery of learning contents or learning experience electronically using the computer and computer-based media. E-learning instructional is a design based on the integration of the pedagogy model, learning strategy, and selected delivery technology. Related to the pedagogy, Pujiriyanto (2012:201) pointed out that pedagogy model is a theoretical construction, based on learning theory that supports learning strategy and learning. Pedagogy model has an instructional prescript view (how to teach) and description of the learning process (how to learn) that are applied in the instruction.

Moodle is the name of computer software that is able to convert a learning media into a web. Moodle software always gets updated according to the education world demand. Until present, the latest Moodle is 2.72+ version. Limongelli, Sciarrone & Vaste (2011: 2) describing that it is a software learning content & management system (LCMS) designed using the principal of pedagogy, to help educators create an effective and fun online learning community. Sujono (2010:6) described Moodle as software to make online materials, manage learning activities, and facilitate interaction, communication, cooperation between lecturers and students. Moodle supports various instructional administrative activities, materials delivery, assessment (assignment, quizzes), tracking & monitoring, collaboration, and communication/interaction.

The considerations of choosing Moodle e-learning as model of instruction are: 1) Moodle is familiar among institution in Indonesia, 2) it is available in Indonesian language that makes the lecturers, students, and administration staff easier to access and manage, 3) it is easy to customize even if the users do not have good programming skill, 4) it has adequate templates and themes, 5) practical reason that it is less expensive since it is an open source, 6) it is empirically proven as excellent LCMS. After choosing LCMS, the next important thing is to design the e-learning. Effendi and Zhuang (2005:94) explained some things to be considered in designing an e-learning, including the display, access, interaction instructional design, and control or navigation. The features should be able to facilitate various online activities. Those features include: materials management, content/ course management, user management, assignment, quiz, communication tool of asynchronous as well as synchronous one. Dietinger (2003:23) mentioned that the Moodle e-learning based instruction has several benefits so that it supports the independence in the learning process, could be done everywhere in different places, was a fast distribution of information as it was a digital technology, enabled students to learn accordingly to their own learning pace and style, also motivated them in learning.

Moodle e-learning also has some weaknesses, mentioning, the unavailability of direct physical contacts between the educator and the students as well as among the students, that working on monitors could cause tired eyes, the difficulty to learn materials from computer, only small number of learners who complete their learning, and complicated instructional system. However, considering the strengths, there are two important things for designing e-learning based instructional, which are the enforcement of independence in the learning process and the opportunity to learn accordingly to the students learning style so they can reach the expected competences. As an educator, how can we detect how far have the students reached their independence? Can the level of learning independence be used to predict students learning outcome? A research by Zimmerman (2008) concluded the level of students independence measured by questionnaire could be used to predict students learning outcome. Some other researchers also found out that the learning independence played a role to students achievement (Stewart, 2007; Dabbagh & Bannan-Ritland, 2005).

Related to the instrument to measure the level of students learning independence, Cleary, Callan, & Zimmerman (2012) stated the instrument of Self-Regulate Learning Microanalytic Assessment is ideal to measure students learning independence. However, the instrument such as self-assess scale, online questionnaire, direct observation, including teachers and parents assessment scale are also used. Based on Cleary, Callan,

& Zimmerman point of view, it is understood that the instrument of self-assess can be done online and offline.

Mudjiman (2011: 8) explained that learning independence can be measured from the actualization of every independent learning component. Those components are: a) motivation to learning, b) interest to master or own certain competence, c) active learning to reach the competence by controlling behavior, and d) having the competence (constructivism). Holt & Singh (2012) reported a research result that an interesting e-learning planning affected the decision to learn. The implication for designing instruction is that the designer needs to identify the characteristics of e-learning based instruction and putting it down into an instructional design.

Starting from Holt & Singh research report and the components of independent learning as explained above, it can be concluded that the success of e-learning instruction design can be assessed from the actualization of these components as follows: a) there is an active learning. Mudjiman (2011: 9) had the view toward active learning as the activity in learning with some characteristics, which are: systematic in learning, goal-oriented, continuing evaluation (including self-assess), having a view of learning for life and clear follow-up, creative, and innovative to reach the goal. Nodoushan (2012) added the points with the self-monitor characteristics, that is defined as behavioral control, such as monitoring, arranging, controlling the mind, willingness, and behavior to reach the goal. Hiemstra (1998) clarified that active learning in independent learning had several ways to be done, for instance independent reading, group discussion, exercises, electronic dialogue, and correspondence activity.

Build upon theoretical orientation of Dick, Carey and Carey's instructional design (2009:1), the independent learning strategy theory from Mudjiman (2011:198), and the use of LCMS Moodle as learning media, the steps of instructional design and implementation of Moodle e-learning were created as follows: 1) identification of the general instructional goals based on the competence, 2) analysis of instructions to determine the basic competence, 3) formulation of focused instructional goals, 4) the development of program mapping and learning object materials (LOM). Program mapping in Moodle based learning is equivalent with the syllabus. LOM is a material planning in a form of a text, pictures, audio, video, etc., in various digital forms (doc, pdf, txt, gif, jpg, AVI, html, and etc.), also covers the assessment planning, interaction and learning activity, source for learning, and time allocation. The steps of the learning implementation start from pre-activity, main activity, and post-activity. Pre-activity consists of: a) course orientation by comprehending the Moodle guidelines, b) motivation for the students that Moodle learning offers an exciting learning experience without decreasing the quality of the course, c) explanation of the course goals, d) course mechanism, e) assessment system, and wrap it up by giving a pre-test with an online quiz. In the main-activity part, the course begins by initiating the students to access materials of Topic 1, topic 2, and so on. Then, they need to do the individual assignment and upload the result. Next, there online discussion or online chatting will be held. To enrich the course materials, teacher will ask the students to surf the enrichment materials by clicking the icon link to certain websites. In post-activity, students will send the result of the discussion / chatting and reflect on the process and product of their learning. Finally, an online quiz for formative test is given.

3. METHOD

This experiment research uses the model of matching-only, pretest-posttest control group design and the factorial design. The participants in the effectiveness test were 76 people of 36 college students in the experiment group, and 36 students in the control group. Tests were used as the research instruments to measure the learning results competence variable, as well as rubric of learning independence that was used to measure learning independence covariant. The instruments had undergone the reliability test, validity test, and normality test. The hypothesis test technique took on the independent t-Test for Hypothesis 1, where H_0 was: the Moodle e-learning instructional design increase students learning independence higher than the instructional that used the CD-ROM and email". ANCOVA technique was to test Hypothesis 2 and 3. Hypothesis 2 stated the H_0 that: the Moodle e-learning instructional design does not give higher result towards the competence of the students' learning outcome that is facilitated by their learning independence, compared to the instructional with CD-ROM and email". Hypothesis 3 stated the H_0 that "There is no significant linear impact between learning independence and the competence of the students' learning outcome".

4. RESULTS AND DISCUSSIONS

The essence of an experiment research is to test the effectiveness of a treatment in the instructional in order to reach the goal. The treatment is definitely different from the other instructional execution. In the context of this experiment, the researcher tested the Moodle e-learning instructional in increasing students learning independence and learning outcome, which is compared to e-learning with CD-ROM and email. The data of the treatment effectiveness based on Moodle e-learning in increasing students learning independence is shown in Table 1 below.

Table 1 .The Level of Students Learning Independence

Measurement level	<i>Independence Mean Learning Independence</i>		Score difference
	Group		
	Experiment	Control	
Beginning	69,81	68,53	1,28
End	73,86	69,53	4,33

In the first measurement of the experiment group, the score mean was only 69,81. In the last measurement, it went up to 73,86. The increase was also shown in control group, that showed the mean of 8,83 into 69,53.

The data related to the effectiveness of the Moodle e-learning in increasing students' competence of the learning outcome can be seen through Table 2.

Table 2.The Level of Students Learning Outcome Competence

Stage Measurement	<i>Mean score of learning competence</i>		Notes
	Group		
	Experiment	Control	
Pretest	56,39	51,44	4,95
Posttest	72,92	63,14	9,78

In pretest, the mean score from the experiment group was only 56,39 that increased to 72,92 in posttest. The control group also had an increased from the pretest result of 51,44 to 63,14 in posttest. If the data of learning independence is compared to learning outcome competence based on the high and low level of the learning independence, the it can be seen as in Table 3 below.

Table 3.The Comparison of The Level of Students Learning Independence and Learning Outcome

Level of Learning Independence	<i>Mean, SD and Variance</i>	Learning Competence			
		<i>Moodle (experiment)</i>		<i>CD-ROM + e- Mail (control)</i>	
		Pretest	Posttest	Pretest	Posttest
High	<i>Mean</i>	58,10	76,44	54,55	66,44
	<i>SD</i>	8,167	12,123	9,739	6,972
	<i>Variance</i>	66,693	146,967	94,850	48,614
Low	<i>Mean</i>	54,70	69,39	48,33	59,83
	<i>SD</i>	9,701	14,013	9,905	10,977
	<i>Variance</i>	94,118	196,369	98,118	120,500

There were three hypotheses tested to reveal the effectiveness of this model. The result of Hypothesis 1 (H_0) stating “the Moodle e-learning instructional design increases the learning independence higher compared to the model using CD-ROM and email” apparently was refused and H_a was accepted. This meant the instructional using the Moodle e-learning definitely increases the students learning independence higher than the instruction with CD-ROM and email did. The significance of this treatment is based on the findings of T score of 3,970, $p=0,000$ ($p=0,002 < \alpha = 0,050$) and the mean score of learning independence level from experiment group reached until 73,86, and from control group reached until 69,53.

The effectiveness of the model in increasing the learning independence came from a factor of instructional design that could improve motivation as a basic component in learning independence. The motivation arouse because learning from this online learning portal was fun, also because of the guidance and the reinforcement from the facilitator to use the chatting feature, message to link to a certain URL to find sources or information related to the material. This empirical phenomenon is in line with the

viewpoint from Mudjiman (2011:4), that the ability of independent learning in education is related to the willingness to learn and improvement of learning techniques. This goes in the same page as Song & Hill (2007) stated that the effectiveness of independence learning depends on the learner's self direction (personal attribute).

The willingness to learn was by giving the joy of learning. The improvement of learning technique was done by training and technical counseling by the teacher, including to show the way to find necessary sources. The learning independence is enforced by the awareness of lifelong learning, which is needed since the problem will always be present in every person's life. In this matter, problem solving experience in a formal education will help. This problem solving needs learning activity built upon the willingness to learn and the experience of learning skills owned by one self (Mudjiman, 2011:5). This research findings correspond to the research findings by Usta (2011) that revealed there was a positive and significant correlation ($r = 0,207$) between attitude to online learning and independent learning skills.

The result of the Hypothesis test 2, where (H_0) stated "the Moodle e-learning based instructional design does not give higher effect toward students learning outcome competence facilitated by their independent learning compared to the instructional using CD-ROM and email" is rejected, and the H_a is accepted. This describes that the experiment model gave higher impact to the learning outcome competence facilitated by the students' independent learning compared to the instruction using the CD-ROM and email.

The significance of the treatment results was from the instructional design variant with the F score of 10,296, where $p = 0,002$ ($p = 0,002 < \alpha = 0,050$), and the difference of the adjusted mean score (μ -adj) was from the competence of learning outcome from both students with high and low learning independence in experiment group receiving the instruction using Moodle, and also control group receiving the instruction using CD-ROM and email. The average or (μ -adj) of the competence of students with high learning independence in experiment group reached 73,862, whereas those with low learning independence reached to 72,583. In control group, the μ -adj of the competence from students with high learning independence reached to 64,130, whereas those with low learning independence reaches to 61,536. It is clear that the experiment group had higher score than the control group for students with high and low learning independence ($73,862 > 64,130$; $72,583 > 61,536$).

The effectiveness in experiment group gave higher impact towards the competency of the students learning outcome, and it is a synergy from the integration of instructional design, the content of the Basic Concept of Citizenship course, and the delivery technology. The instructional design by Dick, Carey & Carey (2009) was adopted as the main model of instructional design. According to Joyoatmojo (2011:66), designing instructional with systemic model had some benefits in creating effective learning for three reasons. First, the clarity of the learning goals as a reference made the steps of learning and the implementation clearer. Second, there was a strong dependency among the system component. Third, the system-based learning process was empirical and able to be replicated.

The effectiveness viewed from the material component planning of the Basic Concept of Citizenship course contributed to a shift of Citizenship instructional tradition

from normative indoctrinated in general into internet-based argumentative (Zuriah, 2005; Narmoatmojo, 2012). The contribution from the synergic independent learning strategy component was to make this experiment model effective in increasing students learning outcome competence since the steps of learning took students to reach their learning competence. This Moodle e-learning research findings paraphrases the findings by Stewart (2007) that revealed there was a linear positive correlation between learning independence and the students GPA to students in Griffith University - Gold Coast, Australia ($r = 0,70$). It implied that the students with high learning independence achieved high GPA, and vice versa.

Dabbagh & Bannan-Ritland (2005:207) viewed the effectiveness of Moodle e-learning to enable students to explore materials from various sources (for instance, from internet access provided by the lecturers, through links to certain portals, or by their own search) and do the problem solving through online discussion. The online dialogue enabled students to do collaborative, interactive, and reflective learning. Whereas the support strategy made them learn through scaffolding technique. The contribution of the material delivery using Moodle toward the effectiveness of the model was viewed from the potential of the Moodle. Potentially, Moodle fulfilled the selection criteria from Koswara N (2008:2) that required a selection based on students need, learning strategy, and the limitation of the execution.

An interesting findings on the high and low learning independence variants said that there was no significant difference in the learning outcome competence between students with high and low level of leaning independence ($F = 0,137$, $p=0,712 > \alpha = 0,050$). It also happened to the interaction of the instructional model variant with insignificant score between high and low level of learning independence (F hitung $0,136$, $p= 0,713 > \alpha = 0,050$). This suggests that there were no difference of the learning outcome competence between students with high and low level of leaning independence. In other words, both groups of students have the same opportunity to reach better learning competence with Moodle instructional. This finding corresponds to an experiment result by Hui & Umar (2011) that found no significant difference of the memorization ability between students with high and low learning independence, in participating a learning treatment of combination of metaphor and pair programming.

In hypothesis 3, the H_0 stated “There is no significant linear correlation between the learning independence and the students learning outcome competence in Moodle learning” is rejected, and the H_a is accepted. This suggests there is a significant linear correlation between learning independence and the learning outcome competence in using Moodle. The significance was from ANCOVA result with F score of $7,435$ with a significance degree of $0,008$. Whereas the regression coefficient was $\beta = 0,689$. Because $\beta = 0,689 > \beta = 0$, and the calculated significance was $0,008 < \alpha = 0,050$, then it became a linear regression. This covariant result portrayed the difference of the impact from the model treatment and information about the linear correlation between learning independence, with the students learning outcome competence as the dependent variable. This research finding is also in line with Arjanggi & Suprihatin (2010) result, reported that there was a positive effect of the peer-tutoring learning method towards the self-regulated learning. The peer-tutoring method contribute $17,4\%$ in increasing learning outcomes based on the self-regulated learning. This is also similar with Hulukati (2011) result that found the andragogy-

based independent learning model in increasing early education teachers' competence was proven to be effective.

5. CONCLUSION

Based on research and discussion, it is concluded that: (1) the Moodle e-learning instructional increases students' learning independence in the high level, and significantly higher compared to the instruction with CD-ROM and email;(2) The effectiveness of Moodle e-learning design increased students' learning outcome competence facilitated by their learning independence with higher score than the instructional using the CD-ROM and email.

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