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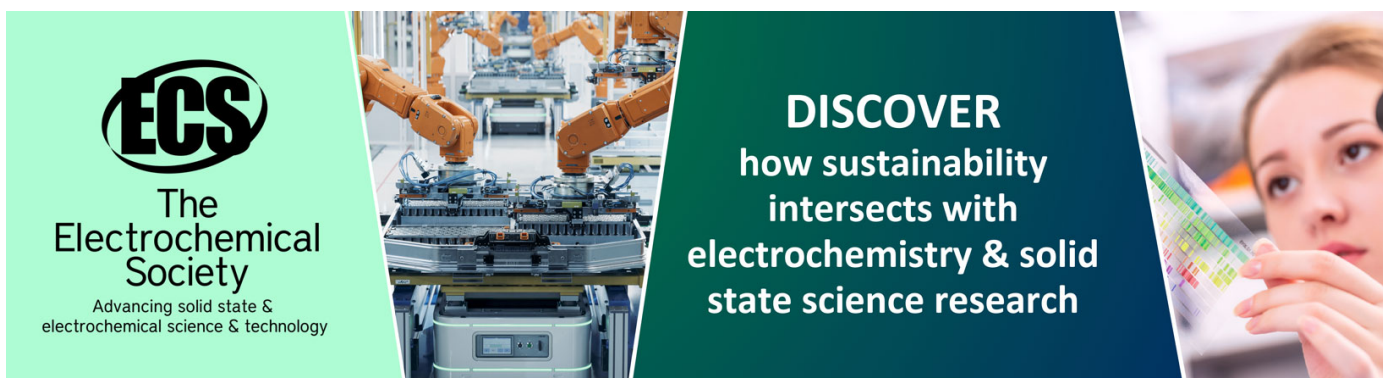
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To cite this article: E Purwaningsih *et al* 2018 *J. Phys.: Conf. Ser.* **997** 012022

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The effectiveness of Concept Mapping Content Representation Lesson Study (ComCoReLS) model to improve skills of Creating Physics Lesson Plan (CPLP) for pre-service physics teacher

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Abstract. This research is aimed to analyse the effectiveness of ComCoReLS (Concept Mapping Content Representation Lesson Study) model towards the improvement skills of Creating Physics Lesson Plan (CPLP) for pre-service physics teacher. This research used one group pre-test and post-test design on 12 pre-service physics teacher at University of Malang State (Indonesia) in academic year 2016/2017. Data collection was conducted through test and interview. Skills of creating physics lesson plan for pre-service physics teacher measurement were conducted through Physics Lesson Plan Evaluation Sheet (PLPES). The data analysis technique was done by using paired t-test and n-gain. The ComCoReLS model consists of 5 phases, including (1) Preparation, (2) Coaching, (3) Guided Practice, (4) Independent Practice, and (5) Evaluation. In the first, second, third and fifth phases are done at University of Malang State, while the fourth phase (Independent Practice) is done in SMAN 1 Singosari, SMAN 2 Malang, SMA Lab UM, MAN 3 Malang. The results showed that there was a significant increase in skills of creating physics lesson plan for pre-service physics teacher at $\alpha = 5\%$ and n-gain average of high category. Thus, the ComCoReLS model is effective for improving skills of creating physics lesson plan for pre-service physics teacher.

1. Introduction

Teachers are the most important factor for learners especially during the learning process [1]. Teachers are the determinants of what is taught in the classroom and how to teach it [2]. The quality of education in schools is determined and accounted for by teachers [3]. The quality of teachers will have a direct impact on student's competence [4,5]. Lesson planning is very important as the main guide or determinant of activities that teachers will do in the classroom during the learning process [6,7]. In accordance with the teacher's understanding of the PCK, the teacher can determine the direction of learning done and can determine the best and fun actions that can be done to help learners achieve



learning objectives [8]. In this study, the indicators of creating physics lesson plan skills include: objectives, learning strategies, physical materials, assessment, instructional media [9-13].

The importance of creating physics lesson plan skills in Indonesia is not realized. The results of previous research studies are as follows. (1) The result of evaluation on education quality trend in Indonesia, it can be concluded that the target of lesson plan has not been reached [14]. (2) Basic concepts (essential material) that learners should learn as vehicles to achieve basic competence demands, taught by teachers are not essential. Consequently the basic competencies that should be achieved by learners cannot be achieved optimally [15]. (3) Teachers tend to teach in the same way as has been taught to them [9]. (4) The quality of education in Indonesia is low [3]. Findings from previous studies of research literature studies are strengthened by preliminary studies by researchers in Physics Education State University of Malang as follows. The difficulties experienced by pre-service physics teacher include: (a) determining the essential material to be taught, (b) creating a learning experience that is varied and meaningful for learners; (c) creating challenging activities to better enable learners; (d) integrating technology in learning, (e) compile an authentic HOTS assessment, (f) develop worksheet that can trace the skills of the science process [15,16]. The results of the study literature and preliminary studies above can be used as the basis that still need innovative physics learning to improve the creating physics lesson plan skills of pre-service physics teacher in Indonesia. The results of this research prove that the awareness (responsibility) of teachers creating physics lesson plan skills is low.

In the previous research, ComCoReLS (Concept Mapping Content Representation Lesson Study) model has been developed to improve Pedagogic Content Knowledge (PCK) for pre-service physics teacher. The CoMCoReLS model has been specially designed to increase the skills of creating physics lesson plan for pre-service physics teacher. The CoMCoReLS model consists of 5 phases, including (1) Preparation, (2) Coaching, (3) Guided Practice, (4) Independent Practice, and (5) Evaluation. The previous research developed a device of learning physics as an operational form of ComCoReLS model developed. Actually, the implementation of the ComCoReLS model that has been developed quality of pre-service physics teacher.

A model is said to be of high quality when it fulfill the criteria of validity, practicality, and effectiveness [17]. Indicators of creating physics lesson plan skills include: objectives, learning strategies, physical materials, assessment, instructional media [9-13]. The purpose of this research is to analyse the effectiveness of CoMCoReLS model to improve the skills of creating physics lesson plan skills for pre-service physics teacher. The focus of the problem in this study included: (1) whether there was a significant increase (statistically) of skills of creating physics lesson plan skills for pre-service physics teacher before and after the CoMCoReLS model was applied, (2) how much level of skills of creating physics lesson plan skills for pre-service physics teacher increased before and after applied CoMCoReLS model.

2. Methodology of Research

2.1. General Background of Research

This research was conducted at Malang State University (Indonesia), SMAN 1 Singosari, SMAN 2 Malang, SMA Lab UM, MAN 3 Malang. The scope of this research is on pre-service physics teacher in academic year 2016/2017. This research is emphasized on the analysis of the fulfillment of the effectiveness of CoMCoReLS model by analyzing the improvement of creating physics lesson plan skills for pre-service physics teacher before and after following the CoMCoReLS model. The effectiveness of the CoMCoReLS model was determined based on a significant increase in scores (statistically) between pre-test and post-test of creating physics lesson plan skills for pre-service physics teacher, as well as the mean of n-gain determined by criteria: low, medium and high.

2.2 Sample of Research

The samples in this study were 12 pre-service physics teacher of Malang State University, Indonesia. Pre-service physics teacher in academic year 2016/2017 take the Study and Field Practice course in physics education.

2.3 Instrument and Procedures

Creating physics lesson plan for pre-service physics teacher measurement were conducted through Physics Lesson Plan Evaluation Sheet (PLPES) [10]. PLPES includes objectives, learning strategies, physical materials, assessment, instructional media [9-13]. In this study, the indicators of Creating Physics Lesson Plan (CPLP) skills include: objectives, learning strategies, physical materials, assessment, instructional media [9-13]. Study and Field Practice course used in physics learning. This research uses one group pretest-posttest design, which is O1 X O2 [18]. The learning process begins by giving pre-test (O1). Each pre-service physics teacher is required to complete the PLPES. After the pre-test, the lecturer applies the CoMCoReLS model and learning tool in each group (X). Physics learning is consisting of: CPLP skills include: objectives, learning strategies, physical materials, assessment, and instructional media at each learning phase. The process of physics learning ends with post-test (O2). Every pre-service physics teacher is required to post-test of CPLP skills by PLPES.

2.4 Data Analysis

Creating physics lesson plan skills of pre-service physics teacher is analyzed based on the assessments obtained by pre-service physics teacher before and after learning using the CoMCoReLS model. The pre-test, post-test, and n-gain data of CPLP skills of pre-service physics teacher were further analyzed using inferential statistical tests with the help of SPSS and supported by qualitative descriptive analysis. The score level for CPLP is based on indicators of objectives, learning strategies, physical materials, assessment, and instructional media [9-13]. The n-gain value is determined by the equation: $n\text{-gain} = (\text{score post-test} - \text{score pre-test}) / (\text{maximum score} - \text{pre-test score})$ [19]. According to the following criteria: (1) if $n\text{-gain} \geq .7$ (high), (2) if $.3 < n\text{-gain} < .7$ (moderate), and (3) if $n\text{-gain} \leq .3$ (low).

3. Result of Research

The learning outcomes of all groups related to the creating physics lesson plan skills (CPLP) of pre-service physics teacher are presented in Figures 1 and Table 1. Shape bar represent the mean of pre-test, black bars scores represent the mean post-test scores, and Vertical bar scores represent the n-gain scores. Figure 1 shows the average post-test scores of CPLP skills of pre-service physics teacher for all groups is greater than the pre-test score. The average pre-test, post-test, and n-gain scores associated with CPLP skills of pre-service physics teacher indicators for all groups are presented in detail in Table 1. Figure 1 show the average n-gain value of CPLP skills for SMAN 1 Singosari; SMAN 2 Malang; SMA Lab UM; MAN 3 Malang is respectively .72; .76; .73; and .72. The average n-gain value of CPLP skills of pre-service physics teacher for all groups is in the high category.

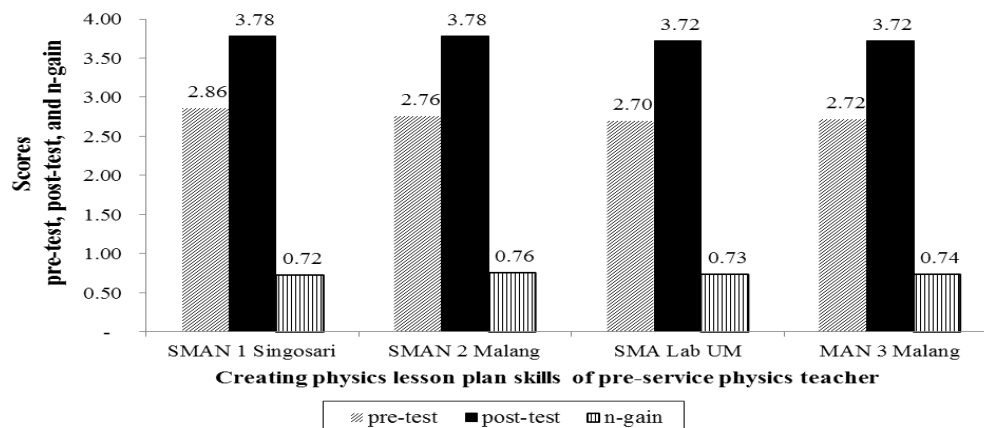


Figure 1. The average pre-test, post-test, and n-gain scores of creating physics lesson plan skills of pre-service physics teacher in all groups.

Table 1. The average score of pre-test, post-test and n-gain of creating physics lesson plan skills of pre-service physics teacher in all groups.

Groups	Scores	Indicator of Creating Physics Lesson Plan (CPLP) Skills				
		Objectives	Learning Strategies	Physical Materials	Assessment	Instructional Media
SMAN 1 Singosari	Pre-test	2.40	2.60	3.50	2.30	3.50
	Post-test	3.70	3.80	3.80	3.90	3.70
	n-gain	.81	.86	.60	.94	.40
SMAN 2 Malang	Pre-test	2.30	2.50	3.40	2.20	3.40
	Post-test	3.70	3.80	3.80	3.90	3.70
	n-gain	.82	.87	.67	.94	.50
SMA Lab UM	Pre-test	2.40	2.40	3.30	2.10	3.30
	Post-test	3.70	3.70	3.70	3.80	3.70
	n-gain	.81	.81	.57	.89	.57
MAN 3 Malang	Pre-test	2.30	2.60	3.20	2.30	3.20
	Post-test	3.60	3.80	3.60	3.90	3.70
	n-gain	.76	.86	.50	.94	.63

Table 1 shows that the CPLP skills test scores of each indicator include: objectives, learning strategies, physical materials, assessment, and instructional media are moderate for all groups and the post-test score CPLP skills in each indicator is high for all groups. The n-gain of CPLP skills score of each indicator includes: objectives, learning strategies, physical materials, assessment, and instructional media in all groups are moderate/high.

Table 2. Paired test result of creating physics lesson plan skills for all groups.

Implementation	Inferential Statistics Test	Data	Asymp. Sig. (p)
SMAN 1 Singosari; SMAN 2 Malang; SMA Lab UM; MAN 3 Malang	Paired t-test	Pretest Posttest	.00

p < .05 (2-tailed)

Table 2 shows the improving in pre-test and post-test of CPLP skills tested using Paired t-test. The p score gives a value of .01 for SMAN 1 Singosari; SMAN 2 Malang; SMA Lab UM; MAN 3 Malang. Each score is considered significant, because p < .05. Because Z the result of the calculation is negative so it shows that there is an increase of creating physics lesson plan skills of pre-service physics teacher after applied learning with CoMCoReLS model for all groups.

4. Discussions

The effectiveness of the CoMCoReLS model on increasing Creating Physics Lesson Plan (CPLP) skills of pre-service physics teacher included (1) an increase in pre-test and post-test scores and (2) n-gain CPLP skills value, as shown in Figure 1, Table 1, and Table 2. Before the CoMCoReLS model is applied; pre-service physics teacher moderate mastery the CPLP skills, average score of pre-service physics teacher is under the standard score (minimum score 2.70 in score range 1-4), that is the average score of CPLP skills for SMAN 1 Singosari; SMAN 2 Malang; SMA Lab UM; MAN 3 Malang respectively are 2.86; 2.76; 2.70; 2.72. All this time, pre-service physics teacher are not used to objectives, learning strategies, physical materials, assessment, and instructional media. The result of evaluation on education quality trend in Indonesia, it can be concluded that the target of lesson plan has not been reached [14]. (3) Teachers tend to teach in the same way as has been taught to them (Etkina, 2010). This is supported by [15,16] found that most pre-service physics teacher of physics education program, Malang State University include: (1) determining the essential material to be taught, (2) creating a learning experience that is varied and meaningful for learners; (3) creating challenging activities to better enable learners; (4) integrating technology in learning, (5) compile an authentic HOTs assessment, (6) develop worksheet that can trace the skills of the science process.

After the CoMCoReLS model was applied to the pre-service physics teacher, the mastery of CPLP skills rises above average and becomes high; the average score of creating physics lesson plan skills for SMAN 1 Singosari; SMAN 2 Malang; SMA Lab UM; MAN 3 Malang respectively to 3.78; 3.78; 3.72; and 3.72 (well beyond the minimum score of 3.72 in the 1-4 score range). The increase in CPLP skills is allegedly influenced by design of scenario in phase of the CoMCoReLS model. Each phase emphasizes CPLP skills of the CoMCoReLS model is a combination of Concept Mapping, CoRe and PaP-eR as PCK representations that will be trained on potential physics teachers through Lesson Study. CoRe and PaP-eR can be used as valid methodologies for assessing science teacher's PCK [23]. The CoMCoReLS model will be implemented in the Study and Field Practice courses. The CoMCoReLS model consists of 5 phases, including (1) Preparation, (2) Coaching, (3) Guided Practice, (4) Independent Practice, and (5) Evaluation. Preparing pre-service physics teacher focused on improving the ability to plan and implement learning and self-regulated learning. The ability of pre-service physics teacher in planning and implementing learning is low, experiencing some difficulties especially in determining essential material, creating challenging activities, integrating technology [20,21].

The increase of CPLP skills of pre-service physics teacher score in all groups was significant at the 5% significance level with n-gain of .75 for group-1; .73 for group-2; .73 for group-3; and .72 for group-4. This means that there is an increase in CPLP of pre-service physics teacher after the implemented CoMCoReLS model. Increased CPLP skills is supported by the availability of CPLP skills of pre-service physics teacher learning needs as suggested in phase of the CoMCoReLS model. The principle of reaction of the CoMCoReLS model relates to attitudes, and the response of lecturers in observing and treating pre-service physics teacher including to questions or attitudes proposed by pre-service physics teacher. The CoMCoReLS model, the way teachers' pay attention and treat students should: (1) Lecturers motivate and remind students of pre-service physics teacher to always take responsibility. (2) Lecturers give praise, opportunities for pre-service physics teacher to ask questions, to argue, to criticize the process of physics learning in order to skill planning and skills to implement PCK learning increases. (3) Motivate, guide by guiding it through questions, until the pre-service physics teacher believes that the verdict is correct. (4) Accommodate the suggestion and opinion of the pre-service physics teacher, immediately provide feedback. It is supported by social constructivist theory: pre-service physics teacher will build their knowledge through social interaction with other pre-service physics teacher and with lecturers [22,6]. Cognitive apprenticeship theory, an expert (lecturer) gives an example of problem solving, can be a tutoring [22]. Modelling theory by Bandura: prospective physics teachers can learn through observation and explanation from others [23]. An effective teacher starts his lesson by reviewing, explaining the purpose of learning in a language that is easy to understand, and showing how learning is now related to learning in the past [6].

Feedback given by the teacher can help the development of learning process and the increase of learners' learning performance [23,24]. The results showed that CoRe and Pap-eR can be used as a valid methodology for assessing teacher science PCK [25]. The introduction of CoRe in lectures strengthened awareness about PCK components [26]. Based on the above description, the implementation of CoMCoReLS model is able to develop the role of physics lesson plan skills of pre-service physics teacher.

5. Conclusions

The CoMCoReLS model consists of 5 phases, including (1) Preparation, (2) Coaching, (3) Guided Practice, (4) Independent Practice, and (5) Evaluation. In the first, second, third and fifth phases are done at University of Malang State, while the fourth phase (Independent Practice) is done in SMAN 1 Singosari, SMAN 2 Malang, SMA Lab UM, MAN 3 Malang. The results showed that there was a significant increase in skills of creating physics lesson plan for pre-service physics teacher at $\alpha = 5\%$ and n-gain average of high category. Thus, the ComCoReLS model is effective for improving skills of creating physics lesson plan for pre-service physics teacher. The implication of this research is that CoMCoReLS model can be used as an alternative to overcome the low of creating physics lesson plan skills for pre-service physics teacher. To improve the result of this research, it is necessary to do further generalizations in various education levels and countries.

6. Acknowledgements

The author's gratitude goes to the Ministry of Research, Technology and Higher Education who has funded the Research. Likewise, the author's gratitude goes to the Malang State University, SMAN 1 Singosari, SMAN 2 Malang, SMA Lab UM, and MAN 3 Malang that has provided research opportunities.

References

- [1] Blanton L P, Sindelar P T and Correa V I 2006 *J. Spec. Educ.* **40** 115
- [2] Abell S K 2007 *Handbook of Research on Science Education* (NJ: Lawrence Erlbaum)
- [3] Hendayana S, Asep S and Imansyah H 2010 *J. Int. Educ. Coop.* **2** 41
- [4] Hammond D L Holtzman D J Gatlin S J and Heilig J V 2005 *Educ. Policy Anal. Arch.* **13** 1
- [5] Rivkin G S, Hanushek E A and Kain J F 2005 *Econometrica* **73** 417
- [6] Arends R I 2012 *Learning to Teach* (New York: McGraw-Hill Companies, Inc)
- [7] Reigeluth C M and Stein F S 1983 *Instructional Design Theories and Models*. Hillsdale (Mahwah, NJ: Erlbaum Associates)
- [8] Rozenszajn R and Yarden A 2014 *Res. Sci. Educ* **44** 189
- [9] Etkina E 2010 *Phys. Rev. ST Phys. Educ. Res.* **6** 020110
- [10] Loughran J J, Mulhal P and Berry A 2011 *Int. J. of Ed.* **30** 1301
- [11] Magnusson S, Krajcik J and Borko H 1999 *Examining Pedagogical Content Knowledge* (Dordrecht: Kluwer Academic Publishers)
- [12] Ertmer P A and Timothy J N 2013 *Performance Improvement Quarterly* **26** 65
- [13] Williams J, Eames C, Hume A and Lockley J 2012 *Res. Sci. Technol. Educ.* **30** 327
- [14] Raharjo S and Budi 2012 *J. Penelit. Eval. Pend.* **16** 298
- [15] Purwaningsih E 2015 *Indonesian J. Applied Phys.* **5** 9
- [16] Purwaningsih E, Nur M and Wasis 2015 The TPACK Model of Prospective Physics Teacher in Universitas Negeri Malang *Proc. Int. Conf. Math. Sci. and Educ.* (Mataram Unram)
- [17] Plomp T and Nieveen N 2013 *Educational Design Research* (Enschede: SLO)
- [18] Fraenkel J R, Wallen N E and Hyun H H 2012 *How to Design and Evaluate Research in Education* (New York: McGraw-Hill)
- [19] Hake R R 1998 *Am. J. Phys.* **66** 64
- [20] Purwaningsih E 2015 Penguatan Pengetahuan Materi Fisika dengan *Content Representation (CoRes)* pada Calon guru Fisika *Semin. Nas. Pend. Sains Pascasarjana Universitas Negeri*

Surabaya (Surabaya: Universitas Negeri Surabaya)

- [21] Purwaningsih E and Yuliati L 2015 Prospective Physics Teacher Ability on Designing Lesson Plan At Senior High School in Terms the TPACK Framework *Proc. Int. Conf. Math. Sci. and Educ.* (Mataram: Unram)
- [22] Santrock J W 2011 *Educational Psychology* (New York: McGraw-Hill)
- [23] Wilbert J, Grosche M Gerdes and Heiki 2010 *Learn. Disabilities: A Contemporary J.* **8** 43
- [24] Lina A and Sunarti T 2017 *J. Penelit. Fis.Apl.* **7** 68
- [25] Bertram A and Loughran 2012 *J. Res. Sci. Educ.* **42** 1027
- [26] Hume A C and Berry A 2011 *Res. Sci. Educ.* **41** 341