

Ika Maryani, Sri Tuter Martaningsih, Caraka Putra Bhakti. (2017). Module Based on Pedagogical Content Knowledge (PCK) to Increase The Engagement and Skills of The Future Teachers in Designing a Lesson Plan. *Journal of Education and Learning*. Vol. 11 (1) pp. 91-102. DOI: 10.11591/edulearn.v11i1.5758

Module Based on Pedagogical Content Knowledge to Increase the Engagement and Skills of the Future Teachers in Designing a Lesson Plan

Ika Maryani*

Elementary School Education, Ahmad Dahlan University

Sri Tuter Martaningsih**

Elementary School Education, Ahmad Dahlan University

Caraka Putra Bhakti***

Guidance and Counseling, Ahmad Dahlan University

Abstract

Lesson plans is the most important component in preparing quality learning. Teachers' low understanding on pedagogical content knowledge affects their skills in designing learning. It needs serious effort to equip future teachers with pedagogical content knowledge to produce professional teachers. The aim of this study is to increase the engagement and skills of future teachers in designing lesson plans using module based on pedagogical content knowledge. College-students engagement indicators are adopted from Students Engagement Instrument (SEI)-Appleton, Christenson, Kim, and Reschly, consisting of affective and cognitive engagement. The skill in question are the ability to writing the subject's identity, writing competencies, formulating indicators, compiling teaching materials, designing media, choosing learning method, compiling learning scenarios, as well as designing assessment. This research is a classroom action research that is designed in two cycles of learning with the number of respondents is 73 college-students. Each learning cycle is consisting of planning, implementation, observation, and reflection. The data collection techniques were self-report, observation, portfolios, interviews, field notes, and study documentation. Descriptive statistics were used to analyse the quantitative data, whereas qualitative data were analysed by qualitative analysis of Miles & Hubberman model. The results showed that the PCK-based module is able to increase college-students engagement and ability in designing a lesson plan. The indexing and abstracting services, in addition to those already present in the title. Judicious use of keywords may increase the ease with which interested parties can locate our article.

Keywords: *Module, Pedagogical Content knowledge, Students engagement, Lesson Plan*

*Ika Maryani, M.Pd, Ahmad Dahlan University, Elementary School Education, Jl.Ki Ageng Pemanahan 19 Sorosutan Yogyakarta, Indonesia, E-mail: ika.maryani@pgsd.uad.ac.id.

**Dra. Sri Tuter Martaningsih, M.Pd, Ahmad Dahlan University, Elementary School Education, Jl.Ki Ageng Pemanahan 19 Sorosutan Yogyakarta, Indonesia, E-mail: smart.ningsih@gmail.com.

***Caraka Putra Bhakti, M.Pd, Ahmad Dahlan University, Guidance and Counseling, Jl.Pramuka 42 Sidikan Yogyakarta, Indonesia, E-mail: raka@gmail.com.

Introduction

Council for the Accreditation of Educator Preparation (CAEP) (2015) formulates 5 standards that must be met to become qualified teacher candidates. The standards are (1) content and pedagogical knowledge, (2) clinical partnerships and practice, (3) candidate quality, recruitment, and selectivity, (4) program impact; and (5) provider quality assurance and continuous improvement. Content knowledge describes the depth of understanding of critical concepts, theories, skills, processes, principles, and structures that connect and organize ideas within a field (Ball, Thames, Phelps, & Ball, 2008). Teachers need to deeply understand the subject matter in order to help students creating cognitive maps, linking one idea to another, and detect misconceptions. Teachers should be able to see how a relationship between one phenomena with other phenomena in the environment and present them in class. Skills such as these require pedagogical content knowledge that could make teachers are able to access these ideas (CAEP, 2015; Shulman, 1987).

Pedagogical content knowledge is a type of knowledge that is unique to teachers, and is based on the manner in which teachers relate their pedagogical knowledge (what they know about teaching) to their subject matter knowledge (what they know about what they teach). It is the integration or the synthesis of teachers' pedagogical knowledge and their subject matter knowledge that comprises pedagogical content knowledge (Cochran, 1997). Both teachers' pedagogical knowledge and teachers' subject matter knowledge are crucial to good science teaching and student understanding (Buchmann, 1982; Garnett, 1988). The previous study on the correlation between PCK with elementary school students' motivation showed a positive relationship between the two. Teachers with high PCK could master the subject matter content and develop effective learning for students. Learning in which suit the subject matter characteristics and students' progress will be more meaningful and easy to understand for students. Therefore, students become more motivated in studying (Maryani & Martaningsih, 2015).

Law of Republic of Indonesia No. 14 year of 2005 states that teachers in Indonesia must have academic qualifications acquired through higher education degree program. Teachers should also have competences includes competence of pedagogical, personality, social, and professional. Teachers have responsibility to educating, teaching, guiding, directing, training, assessing, and evaluating students on formal early childhood education, primary education, secondary education, and highschool education. Based on these criteria, a person who wants to be a teacher should preparing them self as well as possible.

These ideal conditions are certainly not free of problems. One of the Indonesia education problems is teachers' low competencies. Based on data obtained from Quality Assurance of Education Institutions Yogyakarta, Indonesia, the average grade of Elementary Teachers Competency Test in Yogyakarta province in 2012 is only 61.19 out of 100, with an insignificant increase every year. These data indicate that the elementary school teachers' competency, especially in the Yogyakarta province, Indonesia, is yet low. Pedagogical Knowledge and Content Knowledge is the teachers' main asset for them to be able to develop effective learning. However, based on the data, Pedagogical Knowledge of majority teachers in the Yogyakarta province is low. The data could also be used as an evaluation of the education program implementating at the University that provides teacher candidates, so that they could take strategic steps to improve the quality of its graduates, both through lectures, academic activities and non-academic.

There are many documents of research reports about teachers' competency and quality. All documents showed many factors that influence teachers' success in teaching. Teachers' confidence in teaching is one of them. This confidence will arise when teachers make thorough preparation prior learning (Paaso & Korento 2010; Sulisworo, Nasir, and Maryani, 2017). Teaching preparation could be done by creating a lesson plan. This lesson plan could be described as a guide to make an optimal learning, with clear steps and part of a unitary form coverage learning material that has been determined for a specific time period.

Lesson plan is one of the basic skills required by a teacher. Its importance in learning process is like a lesson plan can be described as someone who is on a journey. When people go traveling, it is necessary to know various things concerning their journey: where the destination, how long it take, what thing they will need during the journey. In general, a lesson plan purpose are: (1) To give the lesson a framework, an overall shape; (2) To remind teachers what they intended to do, especially if they get distracted or momentarily forget what they had intended (Graves & Xu, 2000).

The second issue is teachers' ability in designing lesson plans is not yet maximal. Data obtained from interviews with elementary school teachers in Yogyakarta province has been able to localize teachers' difficulties in designing lesson plans. The difficulties include the lack comprehension on concepts about how to: (1) formulating learning indicator, (2) formulating learning purpose, (3) selecting learning model and method based on students characteristics and learning materials, (4)

composing assessment instruments and techniques, and (5) providing learning media that suit the elementary students' need.

Third issue is the lack of college-students engagement in lectures. College-students engagement is a manifestation of motivation, which is shown by their behavior, emotion, and cognitive. These actions displayed by energy action, directed action, ability to survive when in trouble, and college-students' quality while interact with academic tasks. All this time, courses have not been using structured teaching material so that college-students seek their own learning sources. College-students engagement in searching for learning-materials is low, because only a few of them are trying to collect the learning-materials. This study described the results of the development of module based on pedagogical content knowledge to increase the engagement and skills of future elementary teachers in preparing lesson plans.

Method of Writing

This is a class action research that adopts the spiral model of Kemmis and Mc Taggart. Research has been conducted in two cycles each consisting stages of planning, acting, observing, and reflecting. Subjects of this research consisted of 73 college-students which are on their 5th semester at Elementary School Education Department Ahmad Dahlan University, in which they are also future teachers. Primary data were taken from the results of self-report instrument, classroom observation, and the result of lesson plan portfolio assessment created by college-students. Data were analyzed using descriptive statistics and analyzed in depth using qualitative analysis model from Miles and Huberman to obtain correlation between the respective objects.

Literature Review

The core components of education are teachers, students, process, content, and environment. The ideal teacher should have high Pedagogical Content Knowledge to create an effective learning process. An effective learning process would lead to a pleasant learning environment so that students could learn in comfort, later they could provide high engagement. These conditions can not be separated from teachers' skills in planning, designing, and managing a learning.

Pedagogical Content Knowledge (PCK)

As someone who will always learn to teach, teachers should continuously integrates their experience to their knowledge, including their knowledge on teaching. It means that whatever is about teaching known to a teacher, it is an important comprehensive that provide new experiences and effect on the rest of their knowledge. Teachers who want to teach effectively should be more than just knowing the content to be taught and some ways to teach it. The teacher must understand and able to integrate content knowledge into the knowledge of curriculum, learning and students characteristics. That knowledge ultimately could lead teachers to assemble learning situations based on the needs of individual and groups of students. Such knowledge is referred to pedagogical content knowledge (PCK).

There are many research documents propose the concept of pedagogical content knowledge (PCK) (Shulman, 1987; Cochran, 1997). PCK is the blending of content and pedagogical into an understanding of how particular topic, or issues of organized, represent, and adapted to the diverse interest and abilities of learners and presented of instruction. PCK is a blend of teacher understanding about content and how to teach it to students. While Cochran (1991) defines Pedagogical content knowledge as is: "PCK is a type of knowledge that is unique to teacher, and is what teaching is about. It concerns the manner in with teacher relate their pedagogical knowledge (what they know about teaching) to their subject matter knowledge (what they know about what they teach), in the school context, for the teaching of specific students".

PCK composed of several components, there are: (1) knowledge of the conceptual and procedural knowledge that students bring to the learning of a topic, (2) the misconceptions about the topic that they may have developed, (3) the stages of understanding that they are likely to pass through in moving from a state of having little understanding of the topic to mastery of it, (4) knowledge of techniques for assessing students' understanding and diagnosing their misconceptions, (5) knowledge of instructional strategies that can be used to enable students to connect what they are learning to the knowledge they already possess, (6) knowledge of instructional strategies that can be used to enable students to connect what they are learning to the knowledge they already possess, and (7) knowledge of instructional strategies to eliminate the misconceptions they may have developed (Carpenter, et al., 1988).

Akhyak & Bakar (2013) divide pedagogical knowledge into three components: (1) the ability to plan a learning, (2) the ability to implement learning strategi, and (3) the ability to assess the process and result of learning. In this study, PCK serve as an approach to develop a lectures module for college-students of Elementary School Teacher Education. The contents in the module tailored to the standard content of National Education Standards on primary education. PCK-based module was implemented through lectures centered on the college-students. Meanwhile, researchers expect an increase on the college-students engagement and skills on designing a lesson plan. The main focus of the module is to train college-students to developed science learning in elementary school, where one of the stage is to design a lesson plan. Through this module, researchers also expect an increase to the college-students' skills in designing lesson plan, especially for science learning in elementary school.

Students Engagement

According to The Glossary of Education Reform (2016), student engagement refers to the degree of attention, curiosity, interest, optimism, and passion that students show when they are learning or being taught, which extends to the level of motivation they have to learn and progress in their education. There are many definitions of student engagement use das reference by educators, one of them is Axelson and Flick (2010), student engagement has come to refer to how involved or interested students appear to be in their learning and how connected they are to their classes, their institutions, and each other.

There are many results of student engagement measurement that illustrate positive correlation to the learning outcomes such as critical thinking and grades, although these correlations varied from weak to strong (Carini et al., 2006; Trowler, 2010). Some research also examines various learning methods and media to increase student engagement (Addison, Wright, and Rachel, 2009; Zepke & Linda, 2010; Hong & Masood, 2014). Students engagement is students' important internal modalities which is very important to support successful learning.

In this study, measurement of student engagement is focused on the 5th semester of college-students whom in the future will be elementary school teachers. Skinner, Wellborn, and Connell (1990) said that students who have high student engagement will participate in learning activities, have a positive emotional, and they could survive facing challenge. On the contrary, students who have low student engagement will be a passive student, do not want to try hard, bored, give up easily, and display negative emotions, such as anger, blame and denial.

In this study, Measurement of student engagement adopts from student engagement instrument (SEI) of Appleton, Christenson, Kim, & Reschly. The Student Engagement Instrument (SEI) (Appleton, Christenson, Kim, & Reschly, 2006) (Appleton, Christenson, Kim, & Reschly, 2006) was developed to measure the two higher-inference types of student engagement--affective and cognitive--via student self-report. The SEI focuses on affective and cognitive engagement because data supporting inferences on student levels of behavioral and academic engagement are readily available within most schools' existing data systems. Measurement of affective engagement and cognitive engagement in this research using six subscales and break it down to 35 questions items. 6 subscales are (1) Family Support for Learning; (2) Teacher-Student Relationships; and (3) Peer Support for Learning of affective engagement, whereas cognitive engagement consist of (1) Extrinsic Motivation; (2)Control and Relevance of School Work; dan (3) Future Goals and Aspirations.

Lesson Plan

Lesson plan is complete and detailed description of the learning process created by an educator before starting the lesson. Lesson plans are generally made on a daily basis according to the meetings schedule in each class. Lesson plan's content depends on teachers, learners' needs, and the lesson material to be covered. A lesson plan is the teacher's guide for running a particular lesson, and it includes the goal (what the students are supposed to learn), how the goal will be reached (the method, procedure) and a way of measuring how well the goal was reached.

In general, lesson plan could be defined as a set of lesson program that directs teachers to what lesson material to teach and how to teach it (Spratt, Mary, Pulverness, Williams, & Melanie, 2011). A lesson plan is regarded as the mindset of how a teacher knows the needs of their students and how the planning was effectively used in the classroom. Before preparing a lesson plan, first teachers must identify the lesson materials at each meeting. Then, teachers could design proper learning activities and develop strategies to obtain students feedback. A good lesson plan at least have the following three components: (1) the purpose of learning, (2) learning activities, and (3) strategy to determine students' understanding (Milkova, 2016).

As a professional teacher, we have to be careful in selecting and organizing learning activities that will have an impact on desired outcomes on students learning. Only through careful planning, we could determine whether all required information is included in the learning that we serve. In general, lesson plan preparation steps are as follows: (1) learning objective, (2) Research the topic as defined by the objective (3) select appropriate teaching methods (4) identifies the format of lesson approved plan (5) decide how to organize the lesson (6) selecting supporting teaching materials (7) prepare the learning activities from beginning to end (8) set up a scoring system.

Here are the criteria for a good lesson plan:

1. Needs, capabilities, interest of the learner should be considered.
2. Prepared on the sound psychological knowledge of the learner.
3. Provide a new learning experience; systematic but flexible.
4. Sustain the attention of the learner till the end.
5. Related to social and Physical environment of the learner.
6. Development of learner's personality.

It is important to note that lesson planning is a thinking process, not the filling in of a lesson plan template. Lesson plan envisaged s a blue print, guide map for action, a comprehensive chart of classroom teaching-learning activities, an elastic but systematic approach for the teaching of concepts, skills and attitudes.

Discussion

Before conducting the research, researchers conducted initial data collection through documentation study and interviews. Documentation obtained from the college-students quiz grades. Based on study of the documents, from 73 college-students, about 32 people or 43.84% college-students have under the average grade. The questionnaire data of college-students' initial capability shows that 46 people or 63.01% college-students have difficulties in designing learning. Based on these data, the researchers obtained preliminary picture that Elementary Teacher Education students' ability to develop learning, especially at the stage of designing the lesson plan, is still low.

The data of interviews and discussions with the college-lecturers shows that the cause of college-students difficulties in designing learning are the lack of college-students engagement, the lack of understanding to the lesson plan concept, and college-students' low capacity to understand each concept characteristics. Generally, college-students only understand that the concept development of learning and teaching materials are two different things. When college-students develop learning design, generally they only develop a lesson plan that filled with learning materials concept, without attention to the relevance of each component. Yet the fact is, the learning development is the integration between the concept of learning materials with the concept of pedagogy that teachers should pay attention to the characteristics of material, learners, and approach appropriate to the lesson material, as well as evaluation systems that also must be adapted to both.

These problems certainly disrupt the learning process and make the pedagogy and professional ability of future teachers far from expectations. To overcome these problems, researchers attempted to analyse college-students needs that later developed into an alternative solution to solving problems. Researchers then developed self-instructional materials in the form of lectures module-based on PCK which aims to improve college-students understanding to the lesson plan concept and improve college-students ability in designing lesson plan. The research was conducted through three stages: (1) pre-research, (2) first cycle research, and (3) second cycle research. Explanations of each stage are described as follows.

The Result of Pre-Research

The stage of pre-research is the development of PCK based module. At this stage, researchers have conducted analysis of curriculum, college-students needs, and college-students characteristics. Explanation of each stage is as follows. First of all, analysing the graduates' profile of Undergraduate Elementary School Teacher Education Program, analysing the learning outcomes, study materials, studying the curriculum structure (matrix) to obtained expected mapping competencies. Further is the development of Semester Plan and Weekly Plan as a team with cluster lecturers. Based on Semester Plan and Weekly Plan that has been prepared, obtained sequence materials that become main components of PCK based module. The order of these materials are (1) an Analysis of Elementary School Science Curriculum, Learning Difficulties, and Misconception on Elementary School Science Lesson-Material; (2) Planning Elementary School Science Lesson; (3) Elementary School Science

Learning Model; (4) Elementary School Science Learning Assessment; and (5) Elementary School Science Practicum.

In addition to determining the main lesson-material in the module, the researchers also put procedures to use the module, measurement instruments to determine the college-students ability before and after using the module, so the module effectiveness as a standalone teaching materials can be measured. College-students could independently learn anywhere without their lecturers and could measure the results of their study through existing measurement tools. It have positive influence to the college-students' learning engagement.

1. The Results of the Research and Discussion of Cycle 1

a. Planning Cycle 1

The first cycle starting from the research planning, by preparing a lesson plan instruments, designed for four sessions. Lesson-material covered in cycle 1 are: (1) lesson-material analysis on the standard content of elementary school science; (2) the characteristics of elementary school students, learning difficulties and misconceptions of elementary school science; (3) the planning concept of elementary school science lesson; (4) the formulation Standard Competencies, Basic Competencies, learning indicators, and the purpose of learning. Researchers classify college-students into several groups, pay attention to the heterogeneity of the college-students, organize college-students worksheet, prepare research instruments, and set up the necessary equipment for data collection and documentation tools.

b. The Implementation of Cycle 1

First cycle consists of four meetings. The first meeting starts with initial capability tests to measure college-students initial understanding on concept of science lesson plan. Initial ability test is a checklist consisting of 4 (four) indicators and each indicator consists of two statements. The data of initial capability test showed that 55 college-students (75.42%) had difficulty choosing learning strategies appropriate to the material characteristics, 49 college-students (67,12%) find difficulty to design an assessment system to measure learning outcomes, and 62 college-students (84.93%) are not yet skilled to adjust among the basic competencies, indicators, and break it down into learning purpose. After pretest is complete, then proceed to the implementation using PCK-based module. The first meeting is discussing the analysis of elementary school science standard content that occur in Curriculum 2013. This lesson-material aim to train college-students analytical skills on standard content of elementary school science subject. The analysis process carried out in groups and produce a matrix analysis of the standard content of elementary school science subject as a product. The analysis focused on Science lesson-material content learned in grade 4 to grade 6 elementary school. Classes are divided into six (6) groups and every 2 (two) groups working on standard content for the class with the agreed share. The analysis results of each group presented to the the class and collected into one as a class product. Each college-student received a document of matrix analysis on standard content of elementary school science subject and used for further development.

The second meeting of cycle 1 discusses the characteristics of elementary school students grades 4, 5, and 6. In this meeting, the lecturers provide information about the characteristics of elementary school students and then give examples of cases to the college-students to be solved in groups. Examples of cases is associated to the elementary school students cognitive development and how elementary students learn science. At this meeting also discussed about the difficulties of learning science and misconceptions that often occurs in the science lesson-material at elementary schools. College-students are given the opportunity to learn independently through the assignment in the module about the identification of misconceptions in the science lesson-material of grades 4, 5, 6 elementary school. This assignment aims to equip college-students to be precise in choosing the lesson-material and learning strategies that will not lead to further misconceptions and that the college-students (future teachers) could help their students to construct back the knowledge previously gained. The success of this action was the discovery of the lesson-material misconception profile of elementary school science subject on grades 4, 5, and 6 and the correction. At this second meeting, some of the college-students were participate actively in discussions and presentations. Further action is taken at the third meeting. The third meeting of the cycle I discuss the concept of preparing a lesson plan, lesson plan components, lesson plan preparation principle and lesson plan preparation step. Lecturers give information about the discussed subject then followed by a group discussion by college-students.

The fourth meeting of cycle 1 discuss the formulation of Standard Competencies, Basic Competencies, learning indicators , and the learning purpose. College-student discussion conducted to practice formulating indicators and learning purpose in accordance to the guidance of lecturer and the

procedures included in the module. The stages of indicator and learning purpose formulation and its principles have been listed in the module and all the difficulties in the process could be discussed within the group. standard content of elementary school science subject matrix could be used to view the Core Competencies/Basic Competencies required by college-students.

c. Observation of Cycle 1

Based on the results of the implementation on the first cycle achieved college-students engagement and ability in designing the lesson plan. Explanation on the results of data analysis are:

1) College-Students Engagement

Observation sheet used as an instrument to determine the level of college-students engagement at the cycle implementation, and then the data obtained is calculated and searched the percentage. Data in the form of percentages then qualified based on pre-defined criteria, there are low, medium, and high.

From the results the college-students engagement bestows after 73 college-students on the first cycle, college-student engagement is outlined in Table 1 below.

Table 1. The Distribution of College-Students Engagement at Each Meeting in Cycle1.

Meeting	High engagement		Average engagement		Low engagement	
	Total	%	Total	%	Total	%
1	11	15,07	49	67,12	13	17,81
2	21	28,77	34	46,58	18	24,66
3	25	34,25	33	45,21	15	20,55
4	33	45,21	31	42,47	9	12,33
Mean		30,83%		50,35%		18,84%

2) College-Students ability in Designing Lesson Plan

From the results of data, the ability of 73 college-students in designing lesson plan on the first cycle is 31 college-students (42.47%) has high capability, 35 college-students (47.95%) have moderate capability, and 7 college-students (9.58%) have low capability. The chart of the college-students' ability percentage in cycle 1 is shown in Figure 2:

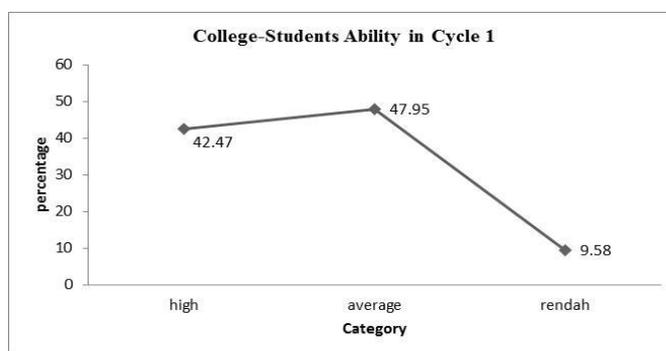


Figure 2. Percentage of College-Students' ability in Cycle 1

After the first cycle is completed, then will do reflection and follow-up to determine the shortcomings inherent in cycle 1 so that it can be improved in the next cycle.

d. Reflection on Cycle 1

Reflections on the first cycle are done by reviewing the results of the implementation as well as the problems faced during the implementation on the first cycle. There are some issues found in the first cycle, among others: (1) Not all students have the awareness to use the self-learning module. It make variations in student learning strategies and the implications is diversity level of college-students understanding and ability; (2) some science misconceptions that actually happened to the college-students and not yet fully identified caused new concerns for the researchers. This misconceptions potentially passed down to elementary students and pose a bigger problem if not overcome soon, so that in the first cycle college-students are invited to analyze the misconceptions profile that had occurred on

the science lesson-material that comes from teaching materials (books / worksheets) or from additional information that inflict the misconception; (3) the 5th semester college-students are still taking Lesson Plan class which is actually a foundation need be mastered before they take Lesson Development class, so it requires lecturer' serious effort in giving an explanation about the concept of elementary school science lesson plan; (4) generally, college-students are still found difficulties to distinguish between the formulation of basic competence, learning indicators, and the learning purpose that required a lot of practice, both individually and collectively. Based on the analysis and reflection of the first cycle, the next step planning implementation in cycle 2 which could reduce the problems that occur in cycle 1.

To improve activeness and independence in learning, lecturers designing structured individual assignments directed to use the module so that college-students are conditioned to read the module that have been prepared. College-students understanding on concept is enhanced through problem-solving discussion in class. The results of college-students' work always presented and responded classically so that appear the same perception between concept understand by college-students and the expected concept so that it not lead to new misconceptions. To improve the college-students' ability in designing science learning, lecturer give college-students the opportunity to practice immediately so that college-students skilled in designing science learning.

2. The Results of the Research and Discussion of Cycle 2

a. Planning Cycle 2

Cycle 2 starts from planning the implementation. Implementation in cycle 2 held 3 meetings with the lesson-material are: (1) models of elementary school science learning, (2) learning media; (3) assessment system in elementary school science learning. At this stage, researchers used data collecting instruments similar to the cycle 1. However, the learning instruments adapted to the needs of cycle 2 implementation. The learning instruments arranged are college-students worksheets and learning-materials.

b. The Implementation of Cycle 2

Implementation of the second cycle consisted of three meetings. The first meeting is discussing learning model that can be used in teaching science. The meeting is preceded by lesson-material explanation from the lecturer about learning science approach. Then the college-students are conditioned to discuss the kinds of learning models that match the characteristics of science teaching. Each group of college-students asked to draft learning model syntax and present it to the class. During the presentation session, there are questions-answers among college-students, and they require giving input on the syntax presented. When the presentation finished, lecturer provide affirmation on the concept being studied and straighten the erroneous perception in the discussion. Product of the third meeting is learning model syntax designed by college-students and used as a basis for developing learning scenario. Then, college-students are given tasks in groups to practice designing scenario based on the learning syntax utilizing Standard Competencies, Basic Competencies, learning indicators, and the learning purpose arranged on previous cycle. Continuous learning will allow college-students to understand the concept coherently and able to improve students ability.

The second meeting in cycle 2 discusses learning media. At this session, the lecturer presented a challenge to college-students to design learning media based on lesson-materials and methods developed previously. The learning media concept could be explored through PCK based module. Through this strategy, college-students will automatically use the module as a learning resource.

The last meeting in cycle 2 discusses science learning assessment system. At this meeting, college-students were given information about the types of assessment and how to prepare the instrument. After receiving an explanation from the lecturer, college-students design the appropriate instruments needed for each lesson plan. The product of this meeting is a whole lesson plan that is ready to practice during peer teaching.

c. Observation of Cycle 2

Based the implementation in cycle 2, the results of activeness, understanding concepts, and the college-students' ability in designing Science LESSON PLAN are:

1) College-Students engagement

From the results of observation data of college-students' engagement in cycle 2, the percentage of college-students engagement are as Table 2.

Tabel 2. The Distribution of College-Students Engagement at Each Meeting in Cycle 2

Meeting	High engagement		Average engagement		Low engagement	
	Total	%	Total	%	Total	%
1	49	67,12	13	17,81	11	15,07
2	55	75,34	9	12,33	9	12,33
3	53	72,60	15	20,55	5	6,85
Mean		71,68%		16,90%		11,42%

Based on Table 2, obtained the college-students with high engagement in the second cycle is 71,68 %, average engagement is 16,90 %, and low involvement amounted to 11,42 %.

2) College-Students' ability in Designing Lesson Plan

From the results of data, the ability of 73 college-students in designing lesson plan on the second cycle is 52 college-students (71,23%) has high capability, 12 college-students (16,44%) have moderate capability, and 9 college-students (12,33%) have low capability. The chart of the college-students' ability percentage in cycle 2 is shown in Figure 2.

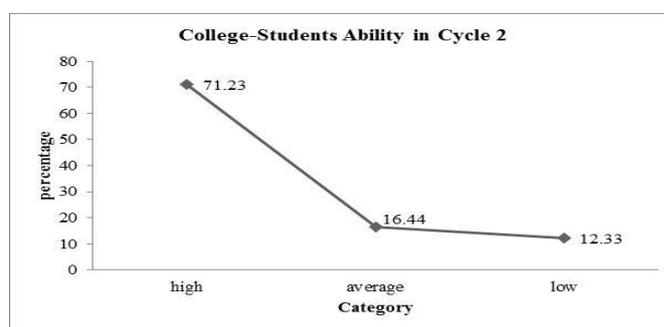


Figure 2. Percentage of College-Students' Ability in Cycle 2

After the first cycle is completed, then will do reflection and follow-up to determine the shortcomings inherent in cycle 1 so that it can be improved in the next cycle.

d. Reflection on Cycle 2

Reflections on the second cycle are done by reviewing the results of implementation and observation in cycle 2. The results of the overall research show the increase of student engagement and ability to designing a lesson plan using the PCK-based module. It could be seen from the college-students 'active participation in each meeting as well as the quality of college-students' works are increasing continuously. The success criteria is fulfilled on the second cycle so that the implementation is ended in the second cycle and not continued to the next cycle.

Based on the results of the implementation during the cycle I and II, it is evident that the use of the PCK-based module is able to increase college-students engagement. This is has implications for the college-students' ability in designing a lesson plan which is increased significantly, as expressed by Baharuddin (2009) that the activeness of each individual determines the success in learning. Metacognitive skills conditions of Elementary Teacher Education's college-students which is 68% are in the category of high and very high is a proponent of the successful use of the module. Lecture module designed for independent learning and aims to make college-students able to do individual learning, implementing the learning styles that suits themselves, as well as able to evaluate the success of their learning method.

The tasks in the module are hierarchical so that it support college-students construct their knowledge in more systematic manner. This has positive impact on college-students' understanding the concept which are also getting better, especially in the planning science learning concepts.

3. Overview of College-Students' PCK Conditions Drawn from the Answers on the CoRes.

In addition to the implementation of cycle 1 and 2, the researchers also conducted a qualitative analysis on PCK criteria based on CoRes method to the lesson-products which have been made by

college-students and during the process of peer teaching. Table 1 shows the college-students' PCK drawn from the answers on the cores.

Table 3. College-Student's PCK Criteria Based on Cores method

No	Aspect	Description of college-students' ability
1.	Objective	College-students write concepts and average concept attributes according to the standard curriculum. There are also college-students who are not associate with curriculum standard
2.	Choosing concept	College-students could identify the concepts that really important to master by elementary students. Prerequisites to understand other concepts, appreciate human existence as the most perfect creature, and essential learning-materials that often appear in National Examination are several strong reasons why a concept have to be taught.
3.	The importance of the concept for students	College-students raise its importance related to further concept and the daily lives of elementary school students.
4.	The extensive and depth of the learning-material	College-students could well determine the extensive and depth limits of the learning-material, with logical reason, such as the ability and conditions of elementary school students.
5.	Predicting misconceptions	College-students could give an explanation about the possible misconceptions or difficulties on elementary school students in understanding a concept, such as concept differences in the different elementary school handbook, the learning-material characteristics which are microscopic and abstract enough.
6.	Teaching consideration	Teaching considerations based on the elementary students' conditions and support facilities.
7.	Teaching strategies	College-students show flexibility in determining learning strategies, adapted to existing conditions, infrastructure, elementary students' intake and initial knowledge they already possessed. College-students using technology in accordance to the method used.
8.	Organizing the learning-material	In presenting the learning-material, college-students are not fixated on the systematic / sequence contained in the student handbook, but adapted to the important idea that is written in the beginning and the methods used in learning.
9.	Measurement of students' abilities	In measuring the students' ability, most college-students use multiple assessments, such as written tests, worksheets, and an oral test. Assessment is used to adjust the teaching methods in the classroom.

Conclusions

Based on the research that has been described, it could be concluded that the PCK-based module is able to increase college-students engagement and ability in designing a lesson plan. The college-students engagement increased as a result of hierarchical and focused task given in the module. The module is integrated with PCK and is designed as a self-instructional material for college-students to organize their learning strategies to mastering the content and implementing module independently.

Acknowledgement

Thanks to the research and development institutions of Ahmad Dahlan University on the financing and support in the implementation of this research.

References

- Addison S, Wright A, Rachel M. Using clickers to improve student engagement and performance in an introductory biochemistry class. *Biochemistry and Molecular Biology Education*. 2009; 37(2): 84–91.
- Akhyak M Idrus, Bakar YA. Implementation of Teacher pedagogy Competence to Optimizing Learners Development in Public Primary School in Indonesia. *International Journal of Education and Research*. 2013; 1(9).
- Appleton JJ, Christenson SL, Kim D, Reschly AL. Measuring cognitive and psychological engagement: Validation of the Student Engagement Instrument. *Journal of School Psychology*, 2006; 44(5), 427–445.
- Axelson RD, Flick A. Defining Student Engagement. *Change: The Magazine of Higher Learning*. 2010; 43(1): 38–43. <http://doi.org/10.1080/0091383.2011.533096>

- Baharuddin. Pendidikan dan Psikologi Perkembangan. Yogyakarta: Ar-Ruzz Media. 2009.
- Ball DL, Thames MH, Phelps G, Ball DL. What Makes It Special? *Journal of Teacher Education*, 2008; 59(5): 389–407. <http://doi.org/10.1177/0022487108324554>
- Buchmann M. The flight away from content in teacher education and teaching. *Journal of Curriculum Studies*. 1982; 14(1): 61–68.
- Carini MR, Kuh GD, Klein SP. Student engagement and student learning: Testing the linkages. *Research in Higher Education*, 2006; 47(1): 1–32.
- Carpenter TP, Fennema E, Peterson PL, Carey DA. Teachers' pedagogical content knowledge of students' problem solving in elementary arithmetic. *Journal for Research in Mathematics Education*. 1988: 385–401.
- Cochran KF. Pedagogical Content Knowledge: A Tentative Model for Teacher Preparation. In *the Annual Meeting of the American Educational Research Association*. Chicago: ERIC. Retrieved from <http://eric.ed.gov/?id=ED340683>. 1991.
- Cochran KF. Pedagogical Content Knowledge: Teachers' Integration of Subject Matter, Pedagogy, Students, and Learning Environments. Retrieved August 28, 2016, from <https://www.narst.org/publications/research/pck.cfm>. 1997.
- Council for the Accreditation of Educator Preparation. (2015). Caep accreditation standards. Retrieved August 28, 2016, from <http://caepnet.org/standards/introduction>
- Garnett P. Exemplary Practice in Science Classrooms. *Science Education*. 1988; 72(2): 197–208.
- Graves K, Xu S. *Designing language courses: A guide for teachers*. Boston, MA: Heinle & Heinle. 2000.
- Hong G, Masood M. Effects of Gamification on Lower Secondary School Students' Motivation and Engagement. *International Journal of Social, Management, Economics and Business Engineering*. 2014; 8(12): 3448–3455. Retrieved from <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.660.1918&rep=rep1&type=pdf>
- Maryani I, Martaningsih ST. Correlation between Teacher's PCK (Pedagogical Content Knowledge) and Student's Motivation in Primary School. *International Journal of Evaluation and Research in Education*, 2015; 4(1): 38–44.
- Milkova S. Strategies for Effective Lesson Planning. Retrieved September 21, 2016, from http://www.crlt.umich.edu/gsis/p2_5
- Paaso A, Korento, K. (2010). *The Competent Teacher 2010–2020*. Retrieved from http://www.oph.fi/download/122136_The_competent_teacher_2010-2020.pdf
- Shulman L. Knowledge and teaching: Foundations of the new reform. 1987; 57(1): 1–22.
- Shulman LS. Knowledge and teaching: Foundations of the new reform. *Harvard Educational Review*. 1987; 57(1): 1–23.
- Skinner EA, Wellborn JG, Connell JP. What it takes to do well in school and whether I've got it: A process model of perceived control and children's engagement and achievement in school. *Journal of Educational Psychology*. 1990; 82(1): 22.
- Spratt Mary, Pulverness A, Williams, Melanie. *The TKT course*. Ernst Klett Sprachen. 2011.
- Sulisworo D, Nasir R, Maryani I. Identification of teachers' problems in Indonesia on facing global community. *International Journal of Research Studies in Education*, 2017; 6(2): 81–90. Retrieved from <http://consortiacademia.org/index.php/ijrse/article/view/1519/658>
- The Glossary of Education Reform. (2016). Student Engagement. Retrieved September 4, 2016, from <http://edglossary.org/student-engagement/>
- Trowler V. Student engagement literature review. *The Higher Education Academy*, 11(November). 2010: 1–5.
- Zepke N, Linda L. Improving student engagement: Ten proposals for action. *Active Learning in Higher Education*. 2010; 11(3): 167–177.
- Ika Maryani, Sri Tutur Martaningsih, Caraka Putra Bhakti. (2017). Journal of Education and Learning. Vol. 11 (1) pp. 92-102.

