



Innovation of a Model of Field Experience Practice-Based Lesson Study (THLS) to Enhance Pre-Service Science Teacher Research Skills

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ABSTRAK

Lembaga Pendidikan Keguruan (LPTK) menjadi salah satu bidang perhatian dalam menyusun calon guru yang profesional dan memiliki daya saing tinggi untuk mencapai tujuan pembangunan berkelanjutan (SDGs) 2030. Dalam kaitan ini, calon guru akan melakukan Praktek Pengalaman Lapangan (PPL) untuk mengimplementasikan teori. pemahaman dengan pengalaman praktis untuk memperkuat kompetensi. Penelitian ini dilakukan untuk menganalisis validitas, kepraktisan, dan keefektifan model Triple Helix Based Lesson Study (THLS) PPL. Subyek penelitian terdiri dari dosen, guru, mahasiswa, dan pengelola PPL di universitas tersebut. Penelitian ini dilakukan dengan model pengembangan Plomp, instrumen penelitian berupa angket, tes, dan lembar observasi. Data dianalisis dengan menggunakan model analisis miles-huberman. Hasil penelitian menunjukkan bahwa tingkat validitas dan kepraktisan model PPL dinilai sangat baik dengan persentase 92%. Keefektifan model menunjukkan adanya perbedaan kemampuan penelitian antara calon guru IPA yang mengikuti model PPL THLS dengan model PPL biasa. Model PPL THLS dinilai cocok untuk penggunaan teknis guna meningkatkan keterampilan penelitian calon guru.

ABSTRACT

Teacher Training Institutions (LPTK) have emerged as an area for attention in arranging professional teacher candidates and possess high competitiveness for achieving the Sustainable Development Goals (SDGs) 2030. In this regard, teacher candidates will conduct Field Experience Practice (PPL) to implement theoretical understanding with practical experience to strengthen competences. This study was carried out to analyze the validity, practicality, and effectiveness of the Triple Helix model-Based Lesson Study (THLS) of PPL. Research subjects consisted of lecturers, teachers, students, and PPL managers at the university. This study conducted through the Plomp development model, the research instrument included a questionnaire, test, and observation sheet. Data were analyzed using the miles-huberman analysis model. The results showed that the level of validity and practicality of PPL model is considered very good with the percentage 92%. The model is effective showed there is a difference in the research skills between pre service science teacher who followed the THLS PPL model and the common PPL model. The THLS PPL model is considered suitable for technical use to enhance the research skills of prospective teachers.

1. INTRODUCTION

Twenty-first-century learning requires prospective teachers to have new competencies to deal with real-life situations such as critical thinking, problem solving, collaboration and lifelong learning (Garzon Artacho et al., 2020; Ilhami et al., 2021). Students are required to implement knowledge, analyze information and make decisions in everyday life. Basically, these formulated skills are known as research skills, namely the skills to critically investigate a problem, collect data, evaluate data, and produce a conclusion (Barutchu, 2017; Prosekov et al., 2020; Widya et al., 2021). Teachers are professional educators with the primary task of educating, teaching, guiding, directing, training, assessing, and evaluating students. The demand for the teaching profession is always there and tends to increase along with the increasing population in Indonesia. The teaching profession is one of the professions that will experience challenges in this era (Agustini et al., 2019; Handrianto et al., 2021). Thus, improving the

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quality of educators that is inclusive and equitable is definitely essential quality human resources (HR). Prospective teachers are necessary to equip with qualified skills in order to survive in the era of the Industrial Revolution 4.0 of professional teachers must be prepared starting from the academic level both at the academic level on campus and in the field introduction as early as possible (Astuti et al., 2019; Robandi et al., 2019; Wagiran et al., 2019). Such premise is considerably intended thus prospective educators understand, recognize, appreciate, animate, and have critical and analytical abilities towards their future career.

Field Experience Practice (PPL) is a compulsory course in the Study Program that shall be completed by all students of the Tarbiyah and Teacher Training Faculty at State Islamic Universities in Indonesia. Students are guided by both a teacher and a lecturer. This activity is in the form of implementing theoretical understanding with practical experience in the field to strengthen the competence of prospective teachers. Moreover, the program is also based on the demand to link and match between educational institutions and the business world. Basically, LPTKs design PPL to prepare students to be qualified teacher. And thus, the assessment and process have similar standards with ordinary courses. Pre-service teacher take part in the PPL program to build teacher competence. This teacher competency standard was developed from four main competencies, namely pedagogic, personality, social, and professional competencies. An educator can be reflective and critical of the learning process in the classroom. Teachers must be able to solve problems that occur in their class because not all students do not find difficulties (Coenders & Verhoef, 2018; Lin et al., 2018). One of the teacher's efforts in solving problems is by researching so that teachers must be able to identify problems, develop problem-solving plans, apply treatments and communicate in the form of works (Rokhman et al., 2019; Yue, 2019). And therefore, the collaboration among lecturers, teachers and students in the PPL program delivers an opportunity to stimulate an increase in research publications in Indonesia through lesson study.

Lesson study is a form of activity conducted by a group of educators in designing, observing and revising learning. In this regard, lesson study characteristics include student learning, practice, collaboration and research (Hart et al., 2011; Vermunt et al., 2019). Lesson study can be conducted through three stages of activities, namely planning, action learning, and observation and reflection learning (Lewis et al., 2016; Rosdiana et al., 2020). Lesson study is a model for fostering the teaching profession through collaborative and sustainable learning assessments based on the principles of collegiality and mutual learning to build a learning community. Such illustration demonstrates the importance of collaboration among the fellow teachers, between teachers and lecturers in improving the quality of learning.

Based on the results of a systematic literature review on the development of the PPL model, it shows that no one has developed a model from research-based with PPL lesson study. Current study developed is an international-based PPL model; Indonesian National Qualifications Framework (KKNI) based on PPL model (Junika et al., 2020); PPL model based on lesson study (Sadiqin & Santoso, 2017). Based on this, the research team developed a research-based PPL lesson study model that emphasizes the collaboration among the students, teachers and lecturers in conducting classroom action research and thus it has the potential to encourage increased publications. To address issues, we develop the PPL with lesson study that requires teachers to conduct classroom action research, called Triple Helix based Lesson Study (THLS model) (Carayannis & Campbell, 2010; Etzkowitz & Leydesdorff, 1995). The development of a research-based PPL guidance model is in line with the mission of the Ministry of Education and Culture in an effort to improve the quality and quantity of publications in Indonesia. This development research is also in line with the mission of the Tanoto Foundation to develop transformative quality educational learning. Based on this background, the research team is interested in conducting research on the development of a Lesson Study-Based PPL on Triple Helix Guidance Model to Improve Research Skills of Prospective Teachers. This study was carried out to analyze the validity, practicality, and effectiveness of the Triple Helix model-Based Lesson Study (THLS) of PPL.

2. METHODS

The research used design research approach with Plomp Model. The Plomp development model consists of three main stages, namely front-end analysis, prototyping (product development) and assessment (Plomp & Nieveen, 2007). In the front-end analysis phase, research tools and instruments are determined. Furthermore, at the proto-typing stage, the PPL model was developed with a lesson study approach including planning, action, observation and reflection. The development of the THLS PPL model generally refers to three criteria of quality; validity, practicality and effectiveness. The assessment stage,

the final prototype is used in classroom. At this stage, two groups were carried out, namely the experimental group and the control group. The research design is presented in the following **Figure 1**.

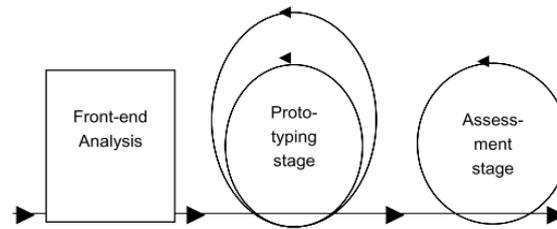


Figure 1. Plomp Development Design

The research instruments used in this study were questionnaires, observation sheets, test questions and interview guidelines. The types of data collected in the study consisted of qualitative data and quantitative data. Qualitative data are the results of interviews and quantitative data through questionnaires and tests. The types of data collected in this service consisted of quantitative and qualitative data through research skills questionnaires, participant response questionnaires, observation sheets and interviews. Quantitative data were analyzed using descriptive statistics in Ms. Excell while the qualitative data were analyzed using the miles-huberman analysis model (Miles et al., 2014).

Research subjects consisted of lecturers, teachers, students, and PPL managers at the university. We used two PPL supervisors, two lecturers, two teachers, and five students at UIN SUSKA Riau and Pattimura University in the front-end analysis stage. We interviewed the participants to determine experiences with previous PPL implementations. Then, at the prototyping stage, there were three experts to validate the book of the THLS PPL model. We also employed one lecturer and one student of UIN SUSKA Riau, and one teacher of secondary school number 23 Pekanbaru teacher as the executor of the THLS PPL model trial. In the assessment stage, we applied a quasi-experimental design involving two teachers and lecture students each, and those were divided into control and experimental groups.

The implementation of the current research consisted of the stages of preparation, implementation and analysis. Researchers conducted a literature review and preliminary research to evaluate the implementation of PPL at Sultan Syarif Kasim State Islamic University in Riau (UIN SUSKA) to receive initial information. The initial stage was the preparation of the PPL Triple Helix Guidance model manual based on lesson study. Moreover, the guidelines were carried out with the self-obvious error stage and the validity test of the expert judgment. And thus, the research, the team conducted revision based on the evaluation results. The next stage was model development (prototyping) at SMPN 23 Kota Pekanbaru. At this stage, it involved one teacher, lecturer and student. The next stage, the researchers implemented the model implementation of SMPN 25 Kota Pekanbaru. At this stage, two groups were carried out, namely the experimental group and the control group. In the control group, the PPL was implemented conventionally, while in the experimental group the THLS PPL model was implemented; Students in the control class compiled reports on PPL activities that have been carried out, while students in the experimental class compiled research articles.

3. RESULT AND DISCUSSION

Results

Results are the main part of scientific articles, containing: final results without data analysis process, hypothesis testing results. Results can be presented with tables or graphs, to clarify the results verbally. The current research is divided into three stages: front-end analysis, prototyping, and assessment. The approach in research used a cumulative cycle in which development actions are carried out based on the study results of the previous step. Then the implementation of research, data collection techniques, and research results at each stage will be explained as follows.

Front-end analysis

The objective of the front-end analysis is to get an initial picture of the PPL program. This stage includes context and problem analysis, literature review, and analysis of relevant previous research. The context and problem analysis was carried out by carrying out several activities such as reviewing PPL guidelines at several universities, interviews with elements involved in the implementation of PPL, lecturers, civil servants and students of UIN Sultan Syarif Kasim Riau. The results of the study of the PPL implementation guide documents from LPTKs in Indonesia show that there has not been any research-

based PPL implementation policies. This is because there are also no demands in the PPL manual published by the Ministry of Education and Culture. Researchers use LPTKs in Indonesia including Malang State, Padang State University, UIN Sultan Syarif Kasim. University selection criteria are based on grade and coordination of ministries (Ministry of Religion and Ministry of Education and Culture). The procedure for implementing PPL at several universities in Indonesia is show in [Table 1](#).

Table 1. PPL at Several Universities in Indonesia

No	LPTK	Description of PPL implementation
1	The State University of Malang	<ol style="list-style-type: none"> 1. PPL is carried out in two phases known as KPL I and KPL II. 2. KPL I addresses for teacher candidates to gain knowledge about the school environment. 3. The activities carried out in KPL I were observations in schools, assignments in the form of preparation of learning tools, peer-teaching practices and discussions with lecturers. 4. KPL II courses aimed at training the teaching skills for prospective teachers. 5. Activities in KPL II included students participating in debriefing organized by the LPTK, students prepare learning tools and carry out teaching practices.
2	The State University of Padang	<ol style="list-style-type: none"> 1. The implementation of PPL is called as PLK 2. PPL aims to train teaching skills of the teachers. 3. PPL activities include guided practice, independent teaching exercises, administering exams and non-teaching activities.
3	Sultan Syarif Kasim State Islamic University in Riau (UIN SUSKA)	<ol style="list-style-type: none"> 1. The Implementation of PPL is only carried out once. 2. PPL seeks to train the teaching skills of prospective teachers. 3. PPL activities include the preparation of learning tools, independent teaching processes and the implementation of exams.
4	Pattimura University	<ol style="list-style-type: none"> 1. PPL is carried out in two stages, PLP 1 and PLP 2 2. PLP 1 aims to introduce the school environment to student teacher candidates. 3. Activities carried out in PLP 1 are school observations related to the school's vision and mission, leadership structure, and also the teaching tools used by teachers when teaching. 4. PLP 2 aims to train the teaching skills of prospective teachers. 5. Activities carried out in PLP 2 are preparing teaching tools and consulting with tutors, teaching exercises in class, administering exams and non-teaching activities.

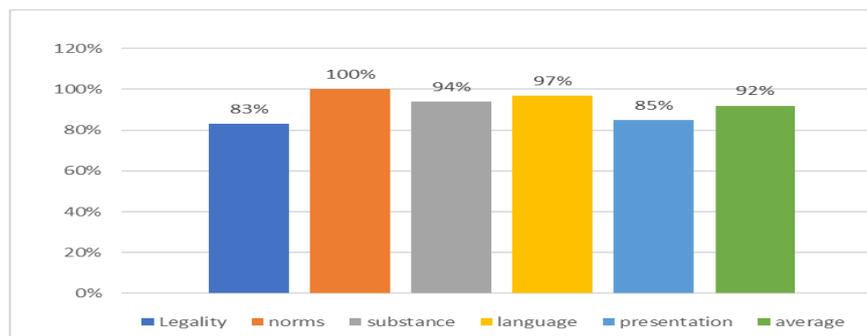


Figure 2. The Validity Results of THLS PPL Guidance Model

Prototyping

Product development refers to the construction of the final prototype which will be fully implemented during practices. The stages of development are the development of the PPL guideline and the trial of the PPL model. At the initial prototyping stage, the validity of the Triple Helix PPL model based on Lesson Study (THLS) was measured. This stage involves four experts. Two experts were in the field of lesson study and the rest two experts were in the field of PPL. There are five aspects that are measured

including aspects of legality, norms, substance, language and presentation. The following are the results of the validation of the THLS PPL Guidance Model Book, which can be seen in the following [Figure 2](#).

Based on the scores obtained from the assessment results as shown in [Figure 2](#), the PPL THLS guidance model book that has been made is considered very good. Thus it is feasible to be used in the PPL student mentoring process. Furthermore, the trial on THLS PPL model was performed after going through the revision process and input from the experts. The model trial aims to measure the practicality of the THLS PPL guidance model. At this stage, it involves PPL implementers including student teacher candidates, civil servant teachers and supervisors. First, they carried out Focus Group Discussion (FGD) related to the learning to perform (plans). Students conduct the learning process in class based on planning (action). During the learning process, the tutor teacher collects data on the learning implementation process (observed). The lecturers, teachers and students evaluate the process of implementing learning (reflection). The research team conducted FGDs to evaluate the implementation of the THLS model and asked the PPL activities implementers to fill out a practicality questionnaire. There are three aspects that are assessed including aspects of attractiveness, convenience and benefits. The following are the results of the practicality assessment of the THLS PPL model, which can be seen in [Figure 3](#).

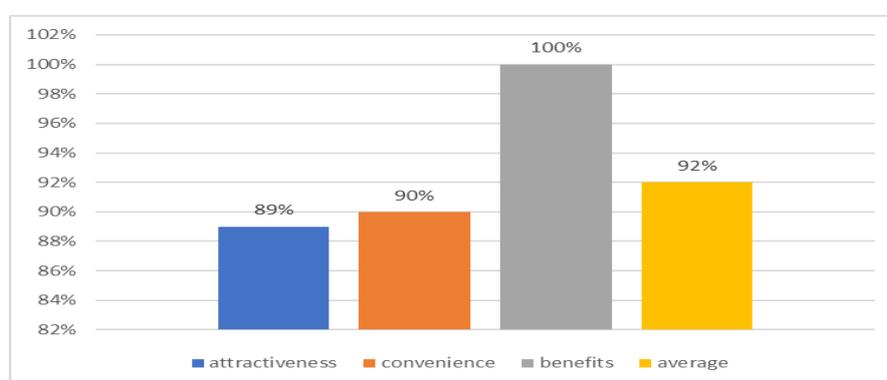


Figure 3. Practicality Test of the THLS PPL Model

Assessment

The assessment stage is a series of activities after the revision process from the previous development. At this stage, two PPL implementing groups were used which acted as control and experimental groups. Student I, lecturer I and teacher I who use the PPL guide from the LPTK are referred to as the control group, while student II, lecturer II and teacher II use the THLS PPL guide that is currently being developed. In the experimental group, the team conducts FGDs related to the formulated lesson plan. Both teachers and lecturers play a crucial role in observing the learning process performed by students and accompanied by data collection (observed). At the end, there is a joint evaluation of the implementation of the learning (reflection). Researchers used a questionnaire to collect data on research skills from students. The skills include identifying problems, planning ideas, designing research designs, designing data analysis, controlling variables, processing data, communicating research results. The average achievement between the control and experimental groups is shown in [Figure 4](#).

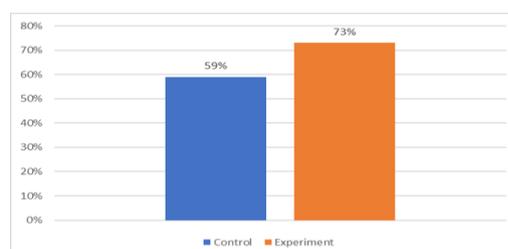


Figure 4. Achievement of Pre-Service Science Teacher Research Skill

Discussion

The implementation of PPL in Indonesian LPTKs has not explicitly emphasized collaboration among the teacher candidates, teachers and supervisors. The mentoring process is still partial, such as students and teachers or students and lecturers. The implementation of PPL at LPTKs Indonesia are still

partial. For example, based on table 1. the LPTKs does not show technical instructions for integrated collaboration between teacher, lecture and students. Then students are only required to make PPL reports as evidence of documentation of the implementation of activities at school (Aminah & Ummah, 2019; Purwanti & Yusuf, 2018). PPL should be carried out in collaboration between teacher, lecturer and pre-service teacher in learning. Based on the results of interviews with students, teachers and lecturers who have been involved in the implementation of PPL at UIN SUSKA and Pattimura University, it shows that the role of supervisors, civil servants and students is not optimal in terms of evaluating the implementation of learning. The supervising lecturer is only tasked with dropping off, assessing and picking up PPL students at the designated school. NIE, which is a teacher education institution in Singapore, can be used as a role model for coaching preservice teachers. In producing superior quality teachers, NIE builds strong and sustainable partnerships with MoE (Ministry of education) and schools. This collaborative model is known as the Enhanced Partnership Model which aims to provide the necessary collaborative framework of aligned shared values and goals towards integrated outcomes (Loh & Hu, 2019; Tan & Soo, 2019). In this model, the process of recruitment, education, and continuing professional teacher development always involves a third party. In particular, cooperation with schools is primarily to bridge the tension between theoretical practice in teacher education. This is NIE's key to success in designing effective teaching practice activities for pre service teachers.

The THLS model has been validated by expert and users. Based on Table 2, it is thus feasible to employ within the implementation phase, which is shown based on the results of a good assessment of the attractiveness, convenience, and benefits aspects. Previous study state validation stage aim to the extent that the design of the the model include "state of the art knowledge" (content validity) and the various components of the model (Plomp & Nieveen, 2007). To further address a comprehensive assessment, the research team conducted interviews with students, teachers and lecturers involved in the implementation of PPL. Based on the results of the interviews, all of them thought that the PPL THLS model could be applied further. Students feel helped by the existence of systematic and directed guidance from teachers and lecturers. The teacher gains new insight with the emphasis on research-based PPL, and therefore, there is a mutual relationship in research publications based on the learning conducted.

The PPL-THLS (Triple Helix based Lesson Study) model is an innovative PPL model that uses a Lesson study approach. Lesson study is a form of activity conducted by a group of educators in designing, observing and revising learning (Hutauruk & Simbolon, 2018; Lewis et al., 2016). This model emphasizes the collaboration of teacher, lecturer and pre-service teacher. The implementation of PPL is integrated, programmed, and guided. Then the output of this model is to produce a research report. The characteristics of the PPL-THLS Model are (1) Focusing on learning problems faced by teachers. It aims at how important and urgent the problem needs to be researched; (2) Focusing on student learning activities; (3) Implementation of research-based learning. (4) There is collaboration between students, teachers, and lecturers in the design, implementation, reflection, and publication of research. (5) The existence of a supporting system from stakeholders such as LPTKs and schools. Lesson Study is a model for developing the teaching profession through collaborative and continuous learning. The model is based on the principles of collegiality and mutual learning to build a learning community. There are three main principles in lesson study, namely collegiality, mutual learning, and community learning. The principle of collegiality means that all parties involved have an equal position as learners. While the principle of mutual learning means that the orientation of the activities carried out is mutually beneficial. The last principle is the learning community, which means that the form of engagement between the actors in lesson study interaction is a Continues Professional Development (CPD) effort (Tondeur et al., 2020; Yalcin Arslan, 2019). Teachers in Indonesia must publish research results as an administrative requirement for a higher career path. One of the conditions for promotion to the rank of a teacher is the publication of research. In the PPL THLS model, students and teachers will discuss design learning and identify problems that occur in the classroom. The initial analysis results are used as a benchmark to determine the research variables. Then students make research instruments and will be discussed with teachers and lecturers. Then students carry out learning and data collection and analysis assisted by the teacher. With the collaboration, students and teachers in the classroom, they can produce joint research publications (Aboe et al., 2020; Soto Gómez et al., 2019).

The implications of this study provide an overview of the PPL THLS model affects to enhance the research skills of prospective teachers. There are differences in the scores of the control and experimental groups. Students who implement the THLS PPL model receive guidance in planning research-based learning. Moreover, students also receive technical guidance on writing research results from their supervisors. This can affect the research skills of students who follow the THLS PPL. Research results can contribute to the development of the quality of PPL in Indonesia. The limitation of this research lies in the research subject which only involves one higher education institution. Therefore, it is hoped that future

research will be able to deepen and broaden research related to experience Practice-Based Lesson Study (THLS).

4. CONCLUSION

Based on results obtained in this line of research, it is therefore concluded that the model of field experience Practice-Based Lesson Study (THLS) is a very good level on validity and practicality. There are positive responses among the students, teachers and lecturers. The characteristics of the THLS Model are focusing on learning problem, engaging on student learning activities, research-based, collaboration between students, teachers, and lecturers, and the existence of a supporting system from stakeholders. Moreover, the THLS PPL model is definitely effective in strengthening the research skills of prospective teachers.

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