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# Teachers' Perception as a Crucial Component in the Design of Didactical Design Research-Based Teacher Professional Learning Community in Indonesia

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**Abstract**

Collaborative professional learning community serves as one of teacher professional development forms. In the last few decades, teacher professional learning community has been utilized by the Indonesian government as a model of teacher professional development program. However, several issues are still found in the program. Some of those problematic issues are the design of the activity which has not included teachers' perception and the learning process which has not put enough focus on students. Didactical Design Research (DDR) is a theoretical and methodological framework in teacher professional learning community. DDR has been developed and implemented in several programs of teacher professional development community in Indonesia. This article elaborates teachers' perception on teacher professional learning community and design of DDR-based teacher professional learning community which is developed by referring to teachers' perception. Qualitative and quantitative designs are applied in collecting, cultivating, analyzing the research data. Teachers participated in this research were as many as 145 coming from 9 different provinces in Indonesia. Research findings revealed that majority of teachers generated the following notions; ideal total learning hours were 2-4 lesson hours, meeting was conducted once a month, there should be 10-20 participants involved, and they declared the necessity of involving the government, technology use, and research-based activities. Another idea was the design of the program consisted of 12 meetings which was begun with students' difficulty test and ended by dissemination of the result of the program. Referring to those outcomes, a conclusion can be drawn highlighting that teachers' perception serves as a crucial component in developing the design of DDR-based teacher professional learning community.

**Keywords:** Didactical Design Research, Teachers' Perception, Design of Professional Learning Community

## Introduction

A teacher is demanded to possess sustained competence in completing his professional duties. Therefore, professionalism is a crucial requirement to guarantee that the quality of classroom learning goes along with the developments and demands of the era. Well-maintained competence will certify the realization of education which is consistent in reaching educational goals (Lasauskien et al., 2015). According to Day (1999), professional development serves as a decent learning experience achieved either naturally or consciously through planned activities and it also contributes to the quality improvement of classroom learning. Teacher professional development is one of the most determining factors toward the quality of classroom learning (Harris & Sass, 2011; Timperley et al., 2008).

Since the constitution regarding teacher and lecturer was issued in 2005, Indonesian government has provided facilities for teacher professional development program both for pre-service and in-service teachers. Indonesian government gains a full awareness of the significance of sustainable teacher professional development. Thus, a regulation from the Minister of State Apparatus Empowerment and Bureaucratic Reforms Number 16 Year 2009 was issued which locates sustainable professional development or *pengembangan keprofesian berkelanjutan* (PKB) as a main component in teacher career development. Teacher PKB is an effort to develop teachers' competence carried out based on the needs, by steps, and in sustainable manner to improve their professionalism (Permennegpan RB, 2009). A professional teacher is not only obliged to carry out his duty to teach but also to hold the responsibility of sustainable professional development.

Ministry of Education and Culture who holds the responsibility of national PKB agenda has facilitated the yearly program. The program also includes professional development for Mathematics teachers. Professional development program for in-service mathematics teachers is administrated through Empowerment and Development Center of Education and Education Personnel or *Pusat Pemberdayaan dan Pengembangan Pendidikan dan Tenaga Kependidikan* (PPPPTK) for each subject, Education Quality Assurance Agency or *Lembaga Penjaminan Mutu Pendidikan* (LPMP) in each province, Subject Teacher Organization or *Musyawarah Guru Mata Pelajaran* (MGMP), and Educational Institution for Education Personnel or *Lembaga Pendidikan Tenaga Kependidikan* (LPTK) (Kusumah & Hasanah, 2017).

Ministry of Education and Culture of the Republic of Indonesia does not have a special training institution for teachers. To assure the availability of the venue for learning, teachers have to be initiative to look for a community. This community will be the place for learning as an effort to improve their competence. Community will be the place for a group of teachers who share and develop the quality of the learning to be reflective, collaborative, inclusive, and is oriented to learning and self-development (Mitchell & Sackney, 2006; Toole & Louis,2002).

Teacher professional development community has been conducted by Indonesian government. Teacher professional development which is performed through Teacher Work Group or *Kelompok Kerja Guru* (KKG) and MGMP will save budget and is considered effective. Teachers do not need to leave school to join training so that students can still keep learning with the teachers. Teacher professional development through KKG and MGMP is expected to be able to reach all teachers; a condition which is hard to realize by the government thus far. In community-based professional development program, government provides enough facilitation for the main teachers. Those main teachers will facilitate the agenda carried out in KKG and MGMP community.

In 2009, with the assistance from the World Bank and Dutch government, the National Education Ministry established a program called *Better* Education through Reformed Management and Universal Teacher Upgrading (BERMUTU). One of this project programs was teacher professional development through reflective practice in KKG and MGMP community (Yanuarti & Treagust, 2016). The government donated direct fund to KKG and MGMP community to administer classroom action research-based reflective practice.

Teacher professional learning community in Indonesia encounters several problematic issues. A study conducted by Saito et al., (2006) shows that the observation in reflective practice has not yet focused on students learning process, errors, and misunderstanding. Therefore, a reflective practice model which is oriented at overcoming students' learning difficulties is needed. Besides, there are a number of approaches in collaborative teacher professional development practice.

Didactical design research (DDR) is a theoretical, conceptual, and methodological framework in developing learning material design to deal with students' learning obstacles (Suryadi,

2010). Besides, DDR is a theoretical, conceptual, and methodological framework in the implementation of reflective practice (Suryadi, 2017). DDR-based Mathematics teachers professional learning community has been developed by Indonesia University of Education or *Universitas Pendidikan Indonesia*. Nevertheless, no article has elaborated the design of DDR-based professional learning community (PLC). Hence, this article attempts to elaborate the process of the program design carried out by the research team of Indonesia University of Education in developing DDR-based PLC program.

The effectiveness of teacher professional learning community is highly affected by several aspects such as the types of the activities and duration (Stewart,2009; Graham, 2014; Bates & Morgan, 2018). One consequence of the ineffectiveness of professional learning community is discontinuity of the program (Servage, 2009). Another existing problem is program discontinuity. It means that the existing professional learning design has not yet been effective. Rooting from this fact, a program design which considers teachers' perceptions and needs is needed.

Teachers' perception is an essential aspect in developing the design of professional learning community program. A number of literatures have investigated teachers' perception on teacher professional learning some of which are conducted by Huffman and Jacobson (2003), Wyler (2008), and Stollar (2014). However, those studies have not yet taken teachers' perception into account within the context of professional learning community development. This article is expected to be a literature for the developers of teacher professional learning community.

There are two main purposes of this article as stated below.

1. Elaborating teachers' perception on the ideal design of professional learning community. This perception covers ideal total hours in each meeting, ideal meeting intensity, ideal number of participants, and ideal strategy to be applied to reach a more effective professional learning community for teachers.
2. Elaborating the design of time, selection of participants and materials used in developing DDR-based professional learning community for teachers in Indonesia.

## Literature Review

### *Didactical Design Research: A Framework for Teacher Professional Learning Community Practice*

Didactical Design Research (DDR) is a theoretical, conceptual, and methodological framework in developing the design of learning material based on students' learning obstacles and trajectory (Suryadi, 2010). Besides, DDR also functions as a theoretical, conceptual, and methodological framework in teachers' professional learning community practice (Suryadi, 2017).

DDR which serves as a methodological basis in this research is a type of didactical design research developed by Suryadi and was first introduced in 2010 in Mathematics Education Conference in Malang State University, Indonesia. This DDR developed by Suryadi is highly influenced by theory of didactical situations progressing in Europe and professional learning practice model of lesson study progressing in Japan (Suryadi, 2015).

Although didactical situations theory and lesson study have different origins, the combination of both ideas produces a new development in Mathematics education (Clivas, 2015). Through combination with lesson study, didactical situations theory results in a new shape which orients more on didactical technique practice. Furthermore, through lesson study, didactical situations theory can serve as a tool to evaluate teachers in a more explicit manner regarding their principles for learning, which is frequently implicitly discussed in lesson study. This combination also affects lesson study practice as it gives a contribution to the lesson study theoretical framework. Combination of didactical situations theory and lesson study aims at developing a research that is dialectical-

ly oriented at both practice and theory so that it as well influences the theoretical development in learning.

Learning obstacles which appear during the learning process can be overcome by developing the design of learning material. DDR is a research activity to develop a design of learning material to cope with learning obstacles. Design development in DDR utilizes didactical situation analysis by Broessau. According to Suryadi (2010), DDR serves as a research activity constructed from teachers' thinking process which consists of three phases called as: (1) Didactical situation analysis before learning (prospective analysis) in the form of hypothesis didactical design including pedagogical didactical anticipation or *Antisipasi Didaktis Pedagogies* (ADP), (2) metapedadidactic analysis, and (3) retrospective analysis, which is an analysis which connects the result of hypothesis didactical situation analysis with metapedadidactic analysis. Those three stages will result in empirical didactical design which can still possibly be perfectionized through the three phases of didactical design research.

**Methodology**

Data on teachers' perception were collected by the use of questionnaire distributed electronically (Whitehead et al., 1993). Research participants were those teachers who had ever participated in teacher professional learning community. The participants came from various regions in Indonesia and were selected purposively by considering the geographical distribution of participants' schools. There were as many as 145 participants. They were Mathematics teachers from various education levels which include junior high school and senior or vocational high school, and from both private and public schools. Data on teachers' perception were also collected through interview in network. Teacher participants who had filled in the survey were then given open questions. The data which had been gathered were analyzed using four data analysis stages by Miles Huberman.

Open answers were analyzed qualitatively. The technique was interactive qualitative analysis through stages of data collection, data reduction, data presentation, and conclusion (Miles Huberman, 1994). Data analysis process was begun by reading participants' open answers on the electronic survey related to Mathematics teachers' perception on professional learning community. Coding was then carried out to classify the data into several theme categories. Restricted interview was conducted to several participants as the representatives of each theme category. Description of the research findings is the result of synthesis between quantitative and qualitative data.

Data on the design of DDR-based teacher professional learning community were collected through observation and documentation. Data were gathered during the process of developing and implementing the design. The respective data were then analyzed qualitatively to generate research findings.

**Results**

Research findings are divided into two sections namely teachers' perception on teacher professional learning community and design of DDR-based teacher professional learning community.

***1. Teachers' Perception on Teacher Professional Learning Community***

Research findings regarding teachers' perception on teacher professional learning community cover teachers' perception on ideal learning hours in each meeting, ideal total umber of teachers involved, and ideal regular meeting intensity. Meanwhile, data from interview comprise ideal strategy to attain a more effective teacher professional learning community.

Table 1 shows that as much as 64% of participants believed that ideal total learning hour in each meeting of professional learning community was 2 up to 4 lesson hours. Meanwhile, those who

agreed that the ideal total learning hour was less than 2 was as much as 11 %. Thus, the 75% of participants believed that ideal total learning hour was not more than 4. The finding of this preliminary study serves as the basis in determining the total lesson hour or *jam pelajaran* (JP) per meeting.

**Table 1. Teachers' Perception on Ideal Total Learning Hours per Meeting**

| No | Total ideal learning hours per regular meeting | Total |
|---|---|---|
| **1** | Less than 2 lesson hours | 16 (11 %) |
| **2** | 2 – 4 lesson hours | 93 (64 %) |
| **3** | 4 – 8 lesson hours | 29 (20 %) |
| **4** | More than 8 lesson hours | 7 (5 %) |

**Table 2. Teachers' Perception on Ideal Number of Teachers Involved**

| No | Ideal Number of Teachers Involved | Total |
|---|---|---|
| **1** | Less than 10 teachers | 57 (39%) |
| **2** | 10 – 20 teachers | 53 (37%) |
| **3** | 20 – 40 teachers | 23(16 %) |
| **4** | 40 – 50 teachers | 3 (2%) |
| **5** | More than 50 teachers | 9 (6%) |

Table 2 shows that 39% of teachers believed that the ideal number of teacher participants was less than 10. Meanwhile, 37% of respondents thought that ideal total teachers involved were between 10-20. This perception has become the basic consideration which results in the program not involving all MGMP members which reaches 75 people.

**Table 3. Intensity of Ideal Regular Meeting of Teacher Professional Learning Community**

| No | Ideal Regular Meeting Intensity | Total |
|---|---|---|
| **1** | Once a week | 23 (16 %) |
| **2** | Once in 2 weeks | 24 (17%) |
| **3** | Once a month | 67 (46 %) |
| **4** | Once in 2 months | 4 (3 %) |
| **5** | Once in 3 months | 20 (14 %) |
| **6** | Once a semester | 4 (3 %) |
| **7** | Three times a month | 1 (1 %) |
| **8** | | 1 (1%) |

Table 3 shows that as much as 46 % participants desired professional learning to be conducted once a month, 17 % of participants chose once in 2 weeks, and 16 % of participants viewed that once a week was the ideal one. It can be concluded that the majority of participants agreed that professional learning community should be performed routinely at least once a month.

Referring to the analysis on participants' answers towards the question "What is the ideal strategy to attain a more effective teacher professional learning community?", four distinguished groups of answers were obtained. Those groups were the use of information technology (IT), dissemination of the program outcomes, research-based activity, and involvement of government, supervisor, and principal.

### *2. Design of DDR-Based Teacher Professional Learning Community*

The design of the program covers time design, participants selection, and design of the program materials. This section will elaborate the result of the survey on teachers' perception on the design of the program.

*The Design of Time in DDR-Based Teacher Professional Learning Community*

Time management and types of activity are important aspects in the design of teacher professional learning community. One of characteristics of adult learning is that the learning process should be corresponding to the learners' needs. Thus, design of time and types of activities should be a collective formulation among the teachers involved. Time and venue of the event can change according to the corresponding situation and condition.

The design of time applied in DDR-based teacher professional learning community includes total duration per meeting and meeting intensity. Total duration per meeting was 2 up to 4 lesson hours. 1 lesson hour was equal to 45 minutes. In other words, 2 lesson hours were equal to 90 minutes (1.5 hour) up to 180 minutes (3 hours). Meanwhile, the intensity of routine meeting was once a month. This time design is a kind of progress which is based on teachers' perception on ideal total duration and meeting intensity of professional learning community program.

*Design of Participants Selection in DDR-Based Teacher Professional Learning Community*

Selection of teacher participants was completed before the program was executed. The analysis result on experience and needs of Mathematics teachers stated in the preliminary study reveals that Mathematics teachers in Indonesia believed that the ideal number of teachers involved was 10-20 people.

Referring to the idea above, candidates of teacher participants were then selected and determined. Each candidate should sign a letter of willingness to be participant. 13 teachers were then involved in this research. Those teacher participants came from five schools which were close to each other in a regency in South Sulawesi Province, Indonesia.

The Education Quality Assurance Agency or LPMP asked for the list of the participants to be given to the head of Education Authorities and the head of Ministry of Religious Affairs office to obtain their legal permission for the selected teachers to be the participants. The head of Education Authorities and head of Ministry of Religious Affairs office signed letter of assignment for the teachers to join the program. The letter of assignment was handed in by each participant to their school principals to obtain the permission to join the program.

The design of participants selection was developed by referring to the result of the survey regarding teachers' perception stating their concern on the involvement of the government in teacher professional learning community. Furthermore, the total number of participants in the program was also decided based on the survey on teachers' perception stating that 10-20 participants were ideal during professional learning community practice.

*Design of the Materials in DDR-Based Teacher Professional Learning Community*

The design of the materials was purposively developed for 12 face-to-face meetings. The order of the materials can be seen on the available table. Those materials covered introduction, material reinforcement, analysis on students' learning obstacles, plan of hypothetical learning trajectory, design plan for learning materials, formulation of instructional plan or *rencana pelaksanaan pembelajaran* (RPP), implemetation, reflection, and evaluation of the design, writing article for scientific publication, and dissemination of the program outcomes.

The first meeting discussed introduction. The facilitator introduced main components in didactical design research. This meeting aimed at convincing teachers that didactical design research (DDR) served as an alternative to improve students' capability and enhance teachers' competency.

One activity affected two aspects at once for both students and teachers. The topics of discussion in meeting one included the significance of enhancing the quality of learning through learning obstacles analysis, the role of pedagogical didactic anticipation or *antisipasi didaktis pedagogis* (ADP), reflective practice as a form of teacher professional development, and classroom action research and its corresponding issues.

The second meeting discussed the reinforcement on substantial materials. Content knowledge or the knowledge related to the subject that teachers teach is a main component of knowledge that teachers must possess. Content knowledge is divided into common content knowledge, horizon content knowledge, and specialized content knowledge. This meeting aimed at providing teachers with content knowledge as a prerequisite in developing didactical design.

The third meeting discussed the analysis on students' learning obstacles. In this meeting, teacher participants were learning theories about learning errors, difficulties, and obstacles. Teacher participants then practised analyzing students' learning errors, difficulties, and obstacles. This material was developed based on learning obstacles theory by Broessau. Moreover, the material was created by referring to the result of the analysis on teachers' knowledge. Materials in this meeting were formed based on the result of review and development from DDR program stages.

Meeting four focused on the analysis of students' learning trajectory. In this meeting, teachers were learning theories about students' hypothetical learning trajectory. Teachers then practised arranging students' hypothetical learning trajectory within the topic of Pythagorean theorem. Knowledge on hypothetical learning trajectory was one aspect teachers had to achieve as a prerequisite material in developing design research. Hypothetical learning trajectory also served as a stage which needed to be completed before planning a didactical design.

Meeting five concentrated on the development of didactical design based on students' learning obstacles and students' hypothetical learning trajectory. In DDR phases, this meeting was called prospective analysis phase. This meeting aimed at enabling teacher participants to develop a didactical design by referring to students' learning obstacles and students' hypothetical learning trajectory. Teacher participants planned didactical situation, prediction of students' responses, and prediction of teachers' anticipation and follow-up. The design of this meeting was created by referring to the result of review and development of DDR program stages.

The sixth meeting discussed designing learning media. In this meeting, teacher participants attempted to study the technical skills in creating learning multimedia. This meeting aimed at providing teachers with skills to develop learning multimedia based on the didactical design formulation in the previous meeting. Types of media which were developed were determined by referring to the didactical design resulted from the previous meeting. This material was a design which considered the result of the survey regarding teachers' perception on technology use duriing learning.

In the seventh meeting, teacher participants made prepraration for instructional plan or *Rencana Pelaksanaan Pembelajaran* (RPP) as the main theme. In this meeting, teacher participants were facilitated to create RPP based on didactical design they figured out in the previous meeting. This meeting aimed at enabling teachers to formulate simple RPP by referring to didactical design formulation. This served as a prerequisite phase on the Indonesian curriculum which was called as formulating instructional plan.

Meeting eight, nine, and ten contained topics on the implementation of didactical design, reflection, and learning evaluation. In this meeting, a model teacher was chosen to perform instructional process using didactical design which had been developed and other teacher participants played role as observers. Following the practice, a discussion regarding the result of the observation, reflection, and evaluation was carried out. This meeting aimed at providing the teacher

participants with the skills to implement and observe instructional process and perform reflection and evaluation. This stage belongs to one phase in didactical design research called metapedadidactic and retrospective analysis. The design of this meeting was made based on the result of review and development of DDR program phases.

Meeting eleven focused on writing scientific article. The goal of this meeting was that teacher participants could write scientific work using the data of didactical design research. In this meeting, teacher participants were facilitated with data which had been gathered on previous meetings. This topic was developed based on the analysis result of Mathematics teachers' needs completed several months before. Scientific writing skill is one of the most necessary aspect for teachers. It is related to the fact that scientific work is a form of teacher professional development. Each teacher is obliged to perform professional development action as a requirement for promotion. The design of this meeting was formulated by referring to the result of the survey on teachers' perception on the strategy of research-based teacher professional learning community.

Meeting twelve required teacher participants to disseminate the research findings in front of all teachers of MGMP. This meeting served the purpose to socialize and disseminate research findings to their colleagues. This meeting took place in the office of MGMP and was attended by all members of MGMP, principals, school supervisors, team of experts from *widyaiswara* (civil servants who are appointed as mentors for other civil servants), and lecturers. During the meeting, all attendess could give advices, inputs, and alternative solutions towards the arising problems during the research. The design of this meeting was emerged from the result of the survey on teachers' perception regarding ideal strategy to perform a more effective professional learning community. One of the strategies proposed by teacher participants was dissemination of the program outcome to other teachers who were not involved in the program itself. Design of didactical design development program through teacher community can be seen on Figure 1.

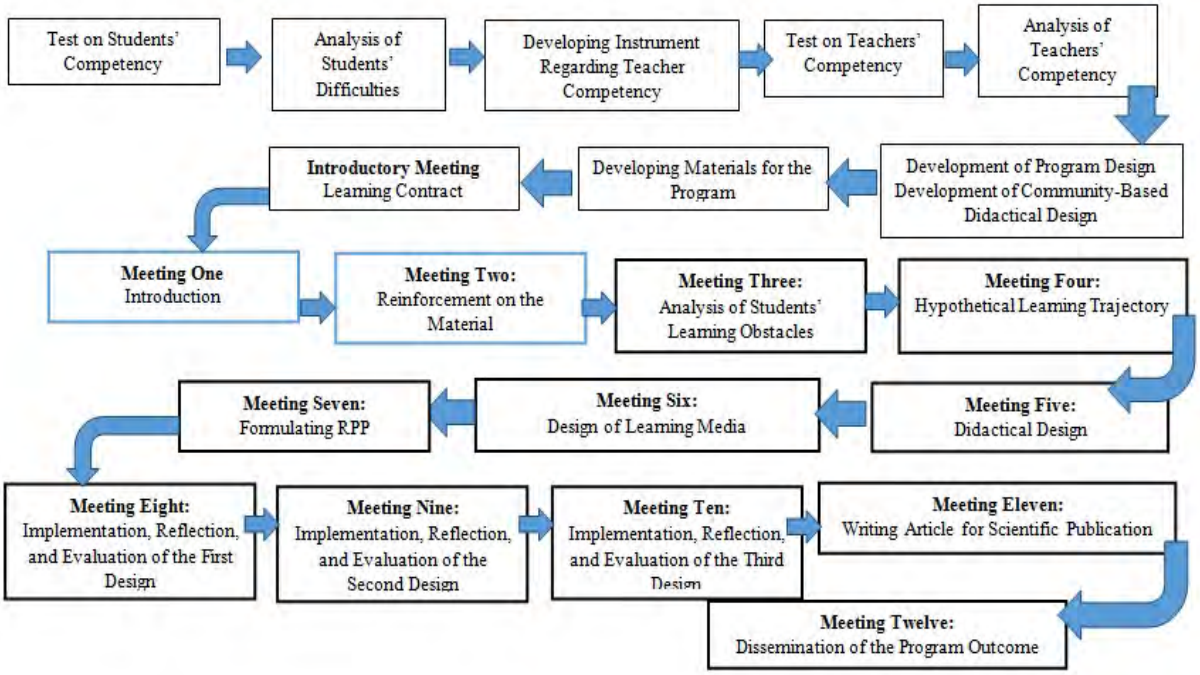


**Figure 1. Plot Diagram of Didactical Design Development through Teacher Community**

**Discussion**

A research-based professional learning community is not a new investigation topic. Some literature has an elaborated model of research-based teacher professional learning community. Holmqvist (2017) explains five existing approach models within the practice of Mathematics teachers' collaborative-based development namely lesson study, educational action research, teaching research group, educational design research, and learning study. DDR is a part of educational design research.

In this article, not only did it consider the continuity of the program, it also took time design into account including the duration and intensity of routine meeting. By referring to the perception of some teachers, total ideal duration for each meeting was 2-4 lesson hours while the ideal intensity of meeting was once a month. Duration is one of key elements in teacher professional learning program. Regarding this matter, Bates, & Morgan (2018) highlight more on the duration and meeting intensity which are sustainable rather than longer duration and higher meeting intensity.

One of the research findings described in this article is teachers' perception regarding the ideal number of teachers involved in the teacher professional learning community. The teachers believed that the ideal total number of teachers involved was 10-20. This perception became the basis for determining the number of teacher participants in the DDR-based professional learning program. Besides, the government parties consisting of MGMP, Educational Authorities, and Office of Ministry of Religious Affairs of South Sulawesi were involved in the program starting from the phase of participant selection up to the assignment of potential participants.

Several articles have explained the community model within the practice of teacher professional learning. Some of those community models are school-based (Visscher & Witziers, 2004; Dunn et al., 2018), the teacher learning community (Campbell & Lee, 2017; Pop & Goldman, 2018), and subject teacher community (Winingsih et al., 2019; Prawitasari & Suharto, 2020). Since 2005, the professional learning community in Indonesia has implemented a teacher workgroup or *Kelompok Kerja Guru* (KKG) and subject teacher community or *Musyawarah Guru Mata Pelajaran* (MGMP) (Suratno & Iskandar, 2010; Saito et al., 2006).

Another finding of this study is by referring to teachers' perception, some strategies which can be applied in professional learning community are the use of technology, dissemination of program outcome, research-based activity, and involvement of government, supervisor, and principal. Some articles have explained strategies to perform a more effective teacher professional development such as those studies by Garet et al. (2001), Whitehouse (2011), Hefnawi (2017), and Bates et al. (2018). Meanwhile, studies which specifically address the effectiveness of professional learning community have been conducted by Bolam et al. (2005), Timperley (2010), Watson (2014), Labone and Long (2016), and Sweet et al. (2018).

Strategy of technology integration in teacher professional development in Indonesia has been investigated in prior studies. Sari (2014) has examined online-based community learning, Widodo and Riandi (2015) study two models, and Patahuddin and Logan (2018) inspect the use of Facebook as a model of information in teacher professional learning. The study emphasizes the use of technology as the platform of activities. Findings of this research show technology use in the form of multimedia development which is relevant to the learning materials.

This article also elaborates the design of the materials of DDR-based teacher professional learning community. Research findings signify that the design of the materials was based on teachers' perception. The design of the program was begun with analysis on students' difficulties and ended by dissemination of research findings. Some articles have explained models of professional learning community which are developed in Indonesia. Indonesian government through Ministry of Education and Culture has programmed teacher professional learning community in the form of

classroom action research-based lesson study (Djajadi & Mokhtar, 2014). Meanwhile, Suratno (2012) develops a lesson study which is based on learning trajectory concept. An article written by Sari, Suryadi, and Syaodih (2018) describes model of Mathematics teacher professional learning community using the framework of didactical design research.

**Conclusion**

Several aspects serving as the bases of DDR-based teacher professional learning development in Indonesia comprise duration, meeting frequency, number of teacher participants, and the topic of each meeting. This research addresses teacher participants' perceptions within the process of decision making related to duration, meeting frequency, and the number of teacher participants. Referring to the corresponding perception, the ideal duration for each meeting is 2-4 lesson hours per week, the ideal meeting frequency is once a week, and the ideal number of participants is 10-20.

Teachers also perceive that to enable DDR-based teacher professional learning development to run effectively, the inclusion of government, technology use, and research-based activity is necessary. This newly arising idea is set as the basis in developing materials of the DDR-based teacher professional learning community in Indonesia. These research findings signify that teachers' perception is a crucial component in the design of a didactical design research-based teacher professional learning community in Indonesia.

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