

# Introducing Outdoor Learning in Science and Mathematics to Elementary School Teachers via Professional Development

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**Abstract**—Integrating outdoor learning into indoor learning experience is excellent way to enrich students learning experiences in science and mathematics. To achieve the objective, professional development (PD) is conducted to 12 elementary school teachers to introduce outdoor learning. Teacher PD program consists of four stages: Workshop, Working in group, Schoolyard activities, Evaluation and Feedback. The effectiveness of PD is evaluated by employing a questionnaire following teacher PD program. The results indicates that (1) in term of lesson plan, teacher knowledge and skills in designing outdoor learning activities into classroom activities are enhancing; and (2) teacher skills in developing lesson plan and student worksheet inserting the outdoor learning activities improve.

**Keywords**—outdoor learning; teacher professional development

## I. INTRODUCTION

There are four expressions attached to outdoor, namely, outdoor education, outdoor teaching, outdoor learning, and outdoor activities [1]. However, the current study prefer to use the expression of 'outdoor learning' as the foci of research. Outdoor learning takes place commonly out of classroom or exposure to the out-of-doors [2]. In contrast, indoor learning can be defined as a learning space where students have the chance to enhance knowledge and skills through teacher-centered learning [3]. Despite the differences outdoor and indoor learning, there are similarities between indoor and outdoor learning [4]. For example, both indoor and outdoor setting have a variety and adaptability of teaching and learning approach to accelerate student's learning process.

Within two decades, the outdoor learning activities in general have been reported to show a number of significant effects on personal and sosial development, physical activity, academic achievement and leadership skills for a wide range of participants and age group [5]. The reasons why many scholars have an increasing attention to outdoor learning environment are the outdoor setting may increase student motivation and enjoyment to learn through their expersession of curiosity which will impact a student's enviromental awareness, science learning, enviromental attitudes and outdoor comfort [2,6,7].

A number of International program is well documented where teachers have been recommended and trained to include outdoor learning within their science and mathematics teaching as a supplement to student's learning process in classroom [8]. A variety of programs are provided for training teachers to transform the outdoor setting such as shoolyard to complement traditional instruction with outdoor learning through professional development program [9], such as *Science in the Schoolyard* in the US, *Learning Grounds* in Canada, *Learning through Landscapes* in England, and *Skolans Uterum* in Sweden [10].

The design and use of outdoor learning as complement to learning science and mathematics in classroom has been given little attention in the Indonesian elementary school. Although, outdoor teaching and learning are mentioned in the document of 2013 National curriculum; Teaching and learning process can be carried out not only in classroom but also in out classroom. Moreover, one of learning principles mentioned in Process Standard states that anyone can be a teacher, every person becomes students, and anyplace can be a classroom.

Providing teacher with Professional Development (PD) experiences is considered by researchers to be key to the enhancement of teaching and student learning [11]. Although, some schoolar argued whether there was a positive correlation between teachers' involvement in PD program and student learning and achievement [12], teachers are encouraged to engage in PD program since they need to become professional teachers [13]. For example, teachers are encouraged can attain new beliefs, knowledge, and skills through PD experiences [12]. These types of experiences should be long-term, ongoing, social, constructivist, and situated in classroom practice [14]. Therefore, PD program is increasingly viewed as a constructive way to facilitate teachers to develop the knowledge and skills to create new beliefs.

Teacher PD program is a comprehensive, ongoing, and intensive approach to improving teachers' effectiveness in raising student achievement [13]. While most teachers take apart in PD program, the impact of the PD in terms of raising students achievement has varied greatly. Like other countries, elementary teachers in Indonesia are provided with

opportunities for engaging in PD program, known as Teacher Working Group (*Kelompok Kerja Guru* or KKG), but they fail significantly to implement their learning experiences in their daily teaching practices after following PD program [15].

In line with background of problem, the aim of this study is to report on outcomes from a PD program in science and mathematics teaching employing outdoor learning as supplement for indoor learning.

## II. METHOD

### A. Participants

The participants of PD program are elementary school teachers teaching from grade 1 through grade 6 at rural school in Bengkulu province, Indonesia. They are 10 female teachers and 2 male teachers ranging from 33 to 58 years old (Mean: 45.7; SD : 8.379) with teaching experiences ranging from 4 to 32 years (Mean: 20.9; SD: 9.974). The majority of participants (83%) holds a Bachelor degree and the rest (17%) holding a Diploma degree.

### B. Stages for Professional Development

The aim of PD was to deepen teachers' understanding of outdoor learning by using schoolyards as learning resources. PD program incorporated active learning and focused on strengthening teacher's understanding of how to identify science and mathematics topic in curriculum related to outdoor and indoor learning and design lesson plans and student worksheets.

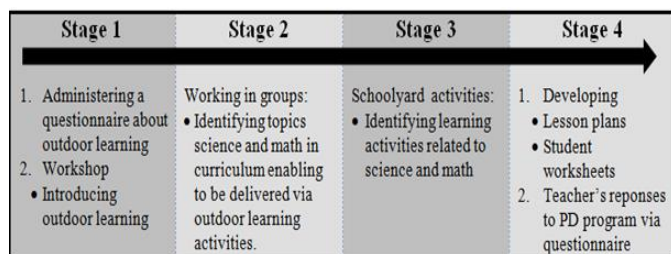


Fig. 1. Stages of conducting professional development.

Figure 1 displays four stages for PD program implemented during this study. In the stage 1, facilitators assess teacher current knowledge related to outdoor learning by administering questionnaire. Teachers are provided with opportunities to construct new knowledge and skills by engaging in workshop. Following stage 1, teachers work in group to analyze national curriculum in order to identify science and math topics that can be learned in the outdoor settings. During stage 3, the use of schoolyard predominantly focuses on collecting learning activities related to specific learning objectives. For instance, participants in group look for the certain things used to deliver mathematical concepts by measuring and calculating the volume of trees, circumference of trees, distance between two trees, and soon. The last stage is aimed to create lesson plans and worksheets. Teachers encourage to transfer their knowledge absorbed during Stage 2 and 3.

### C. Instrument for Collecting Data

The data presented in this study was collected from 12 elementary teachers via questionnaires. The gathered data were coded for analysis employing descriptive statistics. This report draws primarily on data that were gathered from two questionnaires. The first questionnaire is intended to explore teachers' prior knowledge related to using outdoor learning in the classroom learning and teaching process. And, the purposes of second questionnaire is to obtain teachers' responses related to teacher PD program.

## III. RESULT AND DISCUSSION

The qualitative data presented in this part are taken from teachers' responses to survey items prior to and following PD training. In terms of content of the questionnaire items, teachers' responses were divided into (1) teacher's knowledge; (2) teacher's concern; (3) teacher's teaching experience.

When teachers were asked "what you think about the advantages of using outdoor learning in your students?", almost 50% of teachers considered that outdoor learning enhanced student's science achievement, followed by motivating students in learning science (25%), having students think creatively and critically (17%), and promoting to learn directly to environment (6%). However, the most concerns from teachers' views that hindered them to employ outdoor learning in their class is the lack of time; and the need of certain skills and also team teaching to conduct the outdoor learning respectively as presented in table 1.

TABLE I. RESPONSES OF TEACHERS TO THE QUESTIONS ABOUT BARRIERS TO TEACHING OUTDOOR

Questions and Optional Choices to Answers	Frekuensi (%)
What are your concerns that hindered you to employ outdoor learning in your class? (the answers may be selected more than one).	
Need more time to carry out outdoor learning.	12 (100%)
Require certain skills to manage students.	4 (33%)
Need team teaching to guide students.	4 (33%)

The related finding was reported by Blair which indicates that teaching in outdoor settings are influenced by lack of time, support and curriculum, as well as lack of teacher training and experiences [16].

Although, the majority of teachers (92%) did not yet implement the outdoor learning in their class, 83% of teachers preferred to use the schoolyard if they are going to implement the outdoor learning. Furthermore, "when teachers were asked how teachers directed students to carry out their learning tasks?", 50% of teachers asked students to use their time effectively, 25% of them have students work in group and use student worksheets to carry out their tasks. Unfortunately, 33% of teachers perceived that the outdoor learning activity could be considered as a supplement to the indoor learning activities of teaching science and mathematics.

Based on this findings, teacher's knowledge pertaining to outdoor learning needed to be enhanced by introducing why and

how to design and to employ outdoor learning as complement in learning science and mathematics in classroom.

The use of outdoor areas for teaching and learning science lessons have been encouraged by science educators and curriculum theories. For instance, a research report indicated that outdoor learning experience could be as an applicable supplement to indoor instruction and had a greater effect than indoor learning, particularly student's environmental knowledge [1]. Furthermore, Spray's report suggested that the schoolyard was used to teach science lessons in order to enhance environmental knowledge and attitudes among fifth grade students [17]. Though, most teachers did not take benefit of opportunities for outdoor science instruction [18], since teachers was lack of skills and knowledge pertaining teaching science lessons in the outdoor setting [19].

#### A. Workshop

The need for training to make teachers convinced that outdoor setting can be a complement to indoor learning is important. The preferences of workshop as an effective method [20] to introduce outdoor learning in science and mathematics lessons was intended to publicise what, why and how was outdoor learning implemented in science and mathematics lessons. Following the 20 minute-powerpoint presentation, the questions and discussion about the topic aimed to stimulate teachers' prior knowledge and experiences which pertained to incorporate outdoor learning activity in lesson plans and student worksheets.

#### B. Schoolyard Activities

Teachers in group explore schoolyard setting to identify and collect the science and math learning activities that enable to insert into lesson plans and student worksheets. Teacher's activities in schoolyard ecosystems, for example, find something living in an area that is always shady and sunny. Furthermore, teachers in schoolyard habitats work in group to identify areas where where students engage in hands-on science inquiries and design investigations into the natural world. Following schoolyard activities, every group is asked to share and discuss what are their findings during schoolyard exploration.

#### C. Evaluation and Feed Back to Teacher PD Program

As published by many literature, although the ultimate aim of teacher PD program is to enhance student learning, the more immediate aim is enhanced teacher knowledge, skills, and practice. Teachers' evaluations to PD program is meant to specify the intended professional learning outcomes and expected outcomes in student learning. During the last stage, a 10-item questionnaire with Likert scale ranging from 5 = Strongly Agree to 1 = Strongly Disagree was used with twelve teachers. Table 2 displays teachers' responses to the questionnaire items.

Providing students with outdoor learning experiences is not a familiar educational practices for most elementary school teachers involved in this study. However, the PD training enable to convince them outdoor learning experiences that can be integrated into classroom learning as indicated in the

teachers' responses to item no. 3. Additionally, item no. 2 ( $M = 4.58$ ;  $SD = 0.49$ ) majority of teachers strongly agree (58%) and agree (42%) that what they have learned in PD program they will implement in their class.

TABLE II. THE MEAN AND STANDARD DEVIATION OF QUESTIONNAIRE ITEMS

No. Item	Statements	Mean	SD
1	I have an opportunity to learn something new during teacher PD program.	4.83	0.37
2	I will able to implement in my class what I have learned in PD training.	4.58	0.49
3	I motivate to integrate outdoor learning into my indoor class.	4.58	0.48
4	I want to involve in another teacher PD program related to outdoor learning.	4.42	0.49
5	I am encouraged to involve actively during the teacher PD program.	4.67	0.47
6	I recommend other teachers to take part in the PD program.	4.75	0.43
7	The PD program enhance my knowledge, skills and teaching practices.	4.17	1.28
8	The content of workshop are valued for me	3.67	1.43
9	I think the teacher PD program succeed to achieve the intended outcomes.	4.58	0.49
10	What I have learned in PD program will be the benefit of students' learning.	3.42	0.76

#### IV. CONCLUSION

The current study is an effort to introduce outdoor learning in science and mathematics to elementary school teachers. The results revealed that teacher's knowledge about outdoor learning, particularly how to design learning activities taken from schoolyard, was enhanced. The main outcomes of teacher PD program is that teacher knowledge and skills enable to develop lesson plan and student worksheet which incorporate outdoor learning activities into lesson plans and student worksheets.

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