# TEACHER-BASED SCAFFOLDING: TEACHER PROFESSIONAL DEVELOPMENT IN A DEVELOPING COUNTRY

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This study was devoted to show how scaffolded teachers promote their content knowledge, modify scaffolding model that really fits in teacher's profile in developing countries. A modified scaffolding, teacher-based scaffolding (TBS), has been developed as an alternative for developing countries. The distinction between the TBS and the existing scaffolding relies on teacher's need guided by the assigned expert, group facilitation and peer mentoring, as well as assessment and feedback extension. The result suggests that TBS could promote teachers' content knowledge.

**Keywords**: teacher development; training model; scaffolding; teacher-based scaffolding

## Introduction

The quality of education of a country, in a global sense, can be indicated by Human Development Index (HDI). This index is measured in some ways of a nation's life expectancy, education and income level (UNDP, 2013). Education in developing countries has been placed at front in improving people's life to escape from illiteracy and to be in line with those developed countries. Take as an instance, viewed from the population with at least secondary education index,a country like Thailand has a low score 29 for female and 35.6 for male while Indonesia 33.2 for female and 46.8 for male (UNDP, 2013), to put it in gender perspective as well. In addition, the education profile in developing countries can also be viewed from teacher's perception on their preparedness in teaching. There are still many teachers who have lack of well preparedness in the class room. This

is reflected in a report by Trends in International Mathematics and Science Study (TIMSS), which suggests that only 46% Indonesian science teachers' feels very well prepared in their science teaching while countries like Malaysia and Thailand indicates 68% and 53% respectively. This percentage is, however, still below the international average figure of teacher's feel of preparedness, which is 72% (Martin et al., 2012).

Glewwe & Kremer (2006) suggest that the education system in developing countries, among many others, is in light of the weak management implemented in the education system. Take as an example, many developing countries spends more budget for education, including incentives for teachers, yet it does not in itself enhance the quality of education. To put it simpler, the quality of teachers has become a major problem for developing countries. Relating to endeavor to develop teacher professionalism, the underlining question is on which teacher competence that matters. In line with this idea, Van Driel & Berry (2012) assert that teachers' knowledge on contents is what really matters on teacher professional development.

In several countries, teacher professional development models have been proposed. Kennedy (2005) in his study analyzed several models and found the weakness of those models. However, those models still seem to have some drawbacks such as: top-down approach, placing teachers in a passive role, merely transactional and less self-motivating (pseudo motivating), tend to blame teachers individually, and neglecting other out-teacher variables, unclear result, attitude and value, teachers less involvement in the program design, uneasy achieving comprehensive outputs, neglecting teachers individuals competence, not improving teacher competence directly, very difficult to fit in the appropriate model, and ultimately tend to neglect teachers' basic needs.

Engin's model of scaffolding applied for pre-service teacher training can be an alternative to complete the Kennedy professional development model (Engin, 2014). This research focused on developing scaffolding model for in-service teacher training program. This model is called teacher-

based scaffolding (TBS). The distinction between TBS and Engin model relies on teacher's need guided by the assigned expert, group facilitation and peer mentoring, as well as assessment and feedback extension. This model enables teachers to be more active and encourages them to endeavor to develop content knowledge in a continuous and independent way.

**Professional Development for Teachers**

Several studies have been proposed in addressing the issue of teacher development program. Kennedy (2005) in his study analyzed several models in continuing professional development (CPD) and found the weakness of those models. A number of models were analyzed: the training model, the award-bearing model, the deficit model, the cascade model, the standards-based model, the coaching/mentoring model, the community of practice model, the action research model, and the transformative model. The detailed analysis of the models is illustrated in Table 1.

**[Table 1 is here]**

Kennedy has classified the nine forms of CPD above into three categories; Transmission, Transitional, Transformative, they have been believed to enable increasing the capacity for teachers professional autonomy. These three categories of CPD have been understood to cover the underpinning influences, expectations and possibilities driven by five key questions: the types of knowledge attainment that CPD supports, whether the focus is on individual or collective development, to what extent CPD is used as a form of accountability, in what capacity CPD supports professional autonomy, whether CPD facilitates transformative practice. In addition to this, of the nine models discussed, a greater proportion has also been given to adopt and explore the teachers' content knowledge that can be developed through CPD.

Engin (2014), on the other hand, studied on contextual factors that scaffold pre-service trainees for effective teachings. A good teaching should be initiated with the conventions of expectations and roles of trainer and trainee or teacher and learner. This way would help building a scaffold for the teaching practice, planning, and preparation, including the development content knowledge. The scaffolding model discussed in Engin was done in three steps; modeling, demonstrations and possible frameworks facilitated by the teacher/mentor. Although these steps has also been modified with lesson planning, lesson execution and discussions on teaching, the feedback sessions were not well implemented, as learners did not really understand their own roles whereas it is necessary for the teacher and learners to share expectations and have a mutual understanding of roles and responsibilities. A scaffolding model is actually meant to facilitate learning in a way that this could reduce the learner's or participant difficulty in learning. Yet, again, between teacher and learner need to fully understand their own roles, which underpin successful scaffolding. Effective communication, critical, as well as interactive setting needs to be considered in implementing good scaffolding.

Smit et al. (2013) model's of scaffolding was set up in a training program that was categorized into three characteristics: diagnosis, responsiveness, and hand over to independence. In the diagnosis step, scaffolding requires explicit attention from both parties before each step of scaffolding is implemented in the classroom. This diagnosis activity does not have to initiate the actual adaptive response and needs not be confused with the term responsiveness. However, explicit distinction o f the two terms needs to be noted. The responsiveness, also known as contingency, has been used widely in the discussion of scaffolding. While the handover to independence step has been considered as the ultimate aim of scaffolding.

## Method

### Subject

There were 147 teachers who participated in this study from senior high schools whose students have lower national examination score. All teachers have a minimum of five years teaching experience as a requirement to be eligible for professional development program in enhancing students' achievement. All teachers as the sample in this study are working in senior high school in Sumatra Island, Indonesia. The participants are categorized into three groups; the first group consists of 49 teachers, the second consists of 51 teachers and the third group consists of 47 teachers. The first group of teachers was given treatments with the training model (Kennedy, 2005), the second received scaffolding treatments (Smit et al., 2013), while the third group was given treatment under TBS proposed in this paper.

### Data Collection

This study was conducted in anon-equivalent pretest-posttest group design (Fraenkel & Wallen, 2008). Using this design, the participants (senior high school teacher) were, in cluster, assigned to three experimental groups based on subject background. Pretest and posttest were administered to the groups. Data collection was initiated with a pretest using Content Knowledge Competence Test (CKCT) developed in the form of multiple choice pattern test, which was adopted form the National Standard Test by the Ministry of Education and Culture. The test was reviewed again by two senior colleagues in our research education center, expertise in Education Evaluation, to ascertain the instrument validity. Try out test was administered to ensure that only the recommended items were used to meet the reliability test criteria. As for the reliability of the instruments, the researcher used the test-retest method, using Pearson-product moment correlation coefficient (r). The result of the

Cronbach Alpha was 0.745 on average (all of CKCT test part had Cronbach Alpha more than 0.700). This implied that the score was highly correlated and the items were reliable.

Three groups of teachers were employed in different conditions and treatments. The first group, which received regular training model, and the classroom was designed in five steps; (1) becoming a learning group,(2) discovering needs, (3) choosing and using methods and materials, (4) evaluating impact and results, and (5) planning and field-testing participatory learning activities. The scaffolding that was implemented in the second group of teachers were trained with a model that was developed and modified from Kennedy (2005), Engin (2014) and Smit et al. (2013).

In this research, scaffolding refers to support that is designed to provide the assistance necessary to enable learners to accomplish tasks and develop understandings that they would not be able to manage on their own. Instructor (Researcher), through sequencing activities and through the quality support and guidance, are able to challenge and extend what participants are able to do. It is by participating in such activities that teachers are pushed beyond their current abilities and levels of understanding, and this is when learning occurs and teachers are able to 'internalize' new understandings through scaffolding context. In brief the description of the scaffolding steps in our program is elaborated Table 2.

**[Table 2 is here]**

**Data analysis**

The CKCT test was analyzed to generate pre and post instruction profiles of participants' views of content knowledge in the workshop sections. Moreover, analyses pre and post profiles for all group teacherswere compared to assess changes in teachers' content knowledge. Data collected were analyzed using the statistical package for social sciences (SPSS) software (version 15.0). The raw

data from the respondents were summarized using mean (M) and standard deviation (SD). The difference between two means was calculated using t-test and ANOVA and the significance level was set at alpha 0.05.

**Result and Discussion**

The conceptualization of scaffolding theories has been aforementioned referring to Kennedy (2005), Smit et al. (2013), as well as Engin (2014) as a compass to adjust theoretical and empirical research ground in addressing scaffolding issues. This aims to be in line with the existing concepts of scaffolding, even though we finally modify them into TBS. The TBS model can be distinguished from the afore discussed scaffoldings in terms of *orientation and induction, identify key concepts and focus group discussions for understanding, group facilitation and peer mentoring, and Assessment and feedback extending.*

Empirically, the implementation of TBS can be portrayed by spotting the teachers' increased score from pretest to posttest scores. The data of pretest and posttest of the three experiment groups indicates that there is a significant increase of teachers content knowledge having the given treatments. This significance can be seen from the T Test analysis in which its *p* value is less than 0.05 (Table3).

**[Table 3 is here]**

Even though Table 3 suggests that the treatments in each group could increase teachers' content knowledge, once we look at each gain increase, the three groups show different gain value significantly. The difference in gained scores indicates that from the three treatments, the increased

posttest score with TBS treatment poses the highest gain. On other words, this suggests that TBS could advocate teachers to upgrade their content knowledge.

This difference in gain value is best captured in the ANOVA test shown in Table 4.We can spot that professional development with the extended scaffolding, *i.e.* TBS, seems to better and more effective in increasing teachers content knowledge in comparison to the two other groups of teachers with different treatment for each whereas the table 3 analysis indicates that the TBS group attained the lowest pretest of the two others. In other words, the teachers given treatment with the TBS could attain the highest gain increase after the treatment.

**[Table 4 is here]**

As a training or learning model, which has been long developed and applied, the training model can have a significant effect on the teachers training performance. However, this type of training still has some drawbacks. *Firstly*, Kennedy (2005) argued that new knowledge can be effectively introduced with this type of "regular" training, yet at some points, this will set some decontextualization in the training program. In addition, this training is good to the extent of "what" knowledge is acquired, not "how" the knowledge is acquired. Through this training model, teachers' creativity cannot grow optimally in that the training organizer controls in a rigid way and restricts the training agenda. This results in teachers role to become more passive, as they are placed as the object of the training.

In addition, this model still has a not so good impact on teachers profile such as a teacher became less focused, low creativity; classroom networking did not work well. This is further strengthened by Kelly & Williamson (2002) who suggest that in the Training Paradigm (model), professional development activities characterized by external presenters/experts delivering their

'expertise' in the form of decontextualized generic strategies to classroom teachers in a passive method disconnected from teachers' daily work. *Secondly*, this so-called "regular scaffolding" in our term, could also increase teachers' content knowledge significantly. However, it is necessary that this model should be adjusted to fit in teachers' character in developing country. Sari (2012) indicates that the drawbacks of teacher trainings in Indonesia is that most of them are still organized conventionally, therefore the trainings cannot be able to help the trainees to prepare themselves in more global challenges in the twenty first century. The teacher pedagogical improvement can be set up through professional development that really accommodates teacher's need and character.

**Teacher Based Scaffolding (TBS)**

The teacher development model we proposed here could not only accommodate teachers' characteristics in Indonesia in general, yet this can bean alternative model of professional development for teachers in developing countries. The underlining key concepts of the TBS is the necessity for the training program to guide or mentor teachers from the need analysis to the assessment and feedback extension steps. As for teachers level of understanding on content knowledge varied at the initial step of the training program, it was necessary for the trainer or expert to facilitate the trainees to analyze their strengths and weaknesses in order for the training program to be adjustable at their level of understanding. Variations and gaps in the existing knowledge level were very well facilitated in the group work and peer-mentoring step where each shared knowledge and concepts within groups. Subsequently, the results of the peer mentoring activity would become the group consensus. At the final stage, the trainer and the trainees discussed the each group's consensus and feedback session was extended not only from the trainer to trainees, but also trainees to the other trainees.

The TBS has been designed by modifying the existing scaffolding in three ways of difference, teacher's need guided by the assigned expert, group facilitation and peer mentoring, as well as assessment and feedback extension. This prototype of scaffolding is discussed as follows.

**Orientation and Induction**

One of the appealing characters of Indonesian teachers could be that they are not really close to the expertise in professional development or those who have higher rank in professional development program. Whereas, in a previous study, it was revealed that a socio-cultural theory of learning places importance on the social and cultural context of the learning as well as the interaction between a more expert and the learner (Engin, 2014). This explicitly advocates the importance for teachers in developing country like Indonesia to build linkages to professional networks. TBS has been done in the spirit of building linkages for Indonesian teachers to professional networks.

In the initial stage of the TBS model, it is done by *Orientation and Induction phase.* In the orientation phase, the class is organized to determine the needs of teachers in professional development, especially in the mastery of teaching materials so that mentors will have a basic consideration of which strategy best applied. This may lead to a harmonious relationship between the experts with the trainees. In induction phase, the expert could explain in brief about the preconceptions built by the teachers as this could promote participant roles and attitudes that must be built by the teachers in order to obtain optimum results, as well as to foster motivation, self-confidence, self-reliance, professionalizing professionally (Engin, 2014).

**Identify Key Concepts and Focus Group Discussions for Understanding**

The atmosphere of the TBS activity should be set up as of enabling them to take part well in the program based on their own needs. Only key concepts and core ideas will be addressed in this phase

before they are really involved in the group discussion phase. Further, expert in this phase helps teachers to identify key concepts of each material for the focused group discussion to achieve the essential key concepts to form a concept map. This concept map will help teachers form a well-organized knowledge done in a structured classroom. Structured classroom talk between teacher and students guides the construction of knowledge (Staarman & Mercer, 2010).

In addition, concept-mapping activities are more effective for attaining knowledge retention and transfer and are found to give merits for learners (teachers) widely (Nesbit & Adesope, 2006). This means that there is a wide range of benefits when teachers' map could be really well developed. At a later stage, teachers' attitude may also be well improved whence concept-mapping strategy has been well identified. This stage of the training would become the basis for the next step; focus group discussion. Discussion within groups could be more focused based on the key concepts identification and hence, teachers understanding would be very well developed. Plus, concept map is actually applicable as well to other subjects or areas (Chiou, 2008).

**Group Facilitation and Peer Mentoring**

It has been widely agreed that facilitating teachers in a group work in teachers' professional development as well as peer mentoring promise many benefits for teachers. In a class of more than 40 participants which is considered a big class. Group and peer mentoring in scaffolding were considered effective to trigger the teachers to share and discuss ideas within the group members as well as their peer. In the training program, the teachers were placed in groups and facilitated by the mentor. This way could help facilitators to enable to easily monitor and to control all the groups by having a group visit one another. In the group visit, some issues in understanding key concepts of the teachers knowledge can be probed well and they could be well encouraged when and where necessary. During the discussion and workgroup session, interactions among teachers in the group

could be well maintained and some major behavioral problems in the workshops such as sleeping, chatting, roaming, and general restlessness could be minimized.

Peer mentoring has also proved to be an effective way in the scaffolding activity. The teachers could have face-to-face thorough discussions each other. Problems in the materials' key concepts could be well addressed in a deeper way. They could provide assistance one another. The more able peer's role is to provide assistance and support which aids learners' knowledge construction (Gibbons, 2006). The mentor role can be assisting peers in strengthening key concept understanding so that each will assist one another.

**Assessment and Feedback Extension**

Assessment and feedback have been understood to have positive effects on teaching or professional development programs. Assessment in the teachers' workshop was carried out based on the training objectives. Teachers, peers, and the researcher were asked in different perspectives in relation tothe outputs or products of the training. Several areas including reasoning, group activities, prior content knowledge, and independent learning ability were assessed. In this session, teachers were facilitated to discuss and identify strengths and weaknesses in developing their content knowledge. They also assess and evaluate how they have interacted each other group activities. At the later stage, they could also identify learning deficiencies they have encountered during the training."For them, the roles they play and the participatory structures they evoke in feedback are normal, unremarkable, and, importantly, natural" (Copland, 2010). Assessment and feedback session were able to stimulate teachers to restructure their level of understanding at the final stage of the scaffolding process besides being able to improve their confidence and better content knowledge development.

## Conclusions

Along the paper section, three models of professional development have been addressed. The so-called regular training, scaffolding, and the TBS model were able to develop teachers' content knowledge significantly. However, the TBS model attained the highest gain in comparison to the other two since the model was conducted on the basis of teacher's need guided by the assigned expert, providing group facilitation and peer mentoring, as well as confirming the existence of assessment and feedback extension. Ultimately, this may be of help for teachers to be more active in developing content knowledge in a continuous and independent way. However, teachers' issue in developing countries has not only been devoted to teachers content knowledge, but also other areas such as their pedagogical content knowledge, government policies in professional development programs, as well as stake holders involvement. In future research, the TBS could be also probed as an alternative and have offered chances overtly to develop teachers' pedagogical content knowledge (PCK).

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Table 1. The Nine Teacher Professional Development Models

| Model | Features | Advantages | Disadvantages |
|---|---|---|---|
| The training model | the dominant form of CPD | Improving teaching strategies and introducing new knowledge | Top-down approach and place teachers in a passive role |
| The award-bearing model | relies on, or emphasizes, the completion of award-bearing programs | Stimulating teachers high spirit bearing the given award | Merely transactional and less self-motivating (pseudo motivating) |
| The deficit model | • address a perceived deficit in teacher performance<br>• government intervention | focus on teachers deficit of competence | Tend to blame teachers individually, and neglect other out-teacher variables |
| The cascade model | teachers attending the training program and then, sorting and passing the information to colleagues | knowledge focused, information and experience sharing | Unclear result, neglect attitude and value |
| The standards-based model | • relies heavily on a behaviorists perspective of learning<br>• the standards-based approach | focusing on the standardized competence via scaffold for CPD | top-down program, teachers less involvement in the CPD set up |
| The coaching/mentoring model | one-to-one relationship | focus on teachers individuals trait | uneasy achieving comprehensive CPD outputs |
| The community of practice model | more than two people involved, and not necessarily depend on confidentiality | more efficient | Neglecting teachers individuals competence |
| The action research model, | Teachers well understanding on real situation and finding solutions of the problems | very practical to address learning issues | Not improving teacher competence directly |
| The Transformative Model | Attempt to adapt characteristic models with the proposed CPD | Focus on the CPD needs, involve a number of parties | Very difficult to fit in the "appropriate" model, tend to neglect teachers' basic needs |

Excerpted from Kennedy (2005)

Table 2. Modified Scaffolding Steps and Description

| Steps | Description |
|---|---|
| *Orientation and Induction* | In the orientation phase, the class is organized to determine the needs of teachers in professional development, especially in the mastery of teaching materials so that mentors will have a basic consideration of which strategy best applied. This may lead to a harmonious relationship between the experts with the trainees. In induction phase, the expert could explain in brief about the preconceptions built by the teachers as this could promote participant roles and attitudes that must be built by the teachers in order to obtain optimum results, as well as to foster motivation, self-confidence, self-reliance, professionalizing professionally(Engin, 2014). |
| *Identify key concepts and focus group discussions for understanding* | The atmosphere of the TBS activity should be set up as of enabling them to take part well in the program based on their own needs. Only key concepts and core ideas will be addressed in this phase before they are really involved in the group discussion phase.Further, expert in this phase helps teachers to identify key concepts of each material for the focused group discussion to achieve the essential key concepts to form a concept map. |
| *Group facilitation and peer mentoring* | This study is characterized by large classes, every class more than 40 participants; therefore, teachers group mentor were used as facilitators. They were briefly trained to act as facilitators to enable the researcher monitor and control all the groups, by having a group visit one another, asking probing questions and dropping words of encouragement when and where necessary; interacting directly with teachers who are exhibiting some major behavioral problems that used to take place in the a line workshop such as sleeping, chatting, roaming, and general restlessness. |
| *Assessment and feedback extending* | Following completion of the scaffolding process, the groups were assessed on the program objectives. Feedback was provided by the teachers, peers, and the researcher. Reasoning, group activities, prior content knowledge, and independent learning ability were measured. This will assist learners/participants to be aware of their strengths and weaknesses and later identify learning deficiencies. |

Table 3. Comparison of Pre- and Post-test about Content Knowledge Achievement

| Class | N | Pre | | Post | | Gain | *t-cal* | *t-crit* | *P* (.05) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| | | M | SD | M | SD | | | | | |
| RT* | 49 | 43.27 | 11.16 | 54.90 | 9.40 | 11.63 | -6.78 | 1.67 | 0.000 | significant |
| RS** | 51 | 32.92 | 13.75 | 57.35 | 16.51 | 24.43 | -9.97 | 1.67 | 0.000 | significant |
| TBS*** | 47 | 19.41 | 7.88 | 47.56 | 7.79 | 28.15 | -16.16 | 1.68 | 0.000 | significant |

*Regular Training
**Regular Scaffolding
***Teacher Based Scaffolding

Table 4. ANOVA for the Gain Comparison within Groups

| *Source of Variation* | *SS* | *df* | *MS* | *F* | *P-value* | *F crit* |
|---|---|---|---|---|---|---|
| Between Groups | 5091.035 | 2 | 2545.517 | 10.25344882 | 0.000 | 3.058928001 |
| Within Groups | 35749.39 | 144 | 248.2596 | | | |
| Total | 40840.42 | 146 | | | | |