THE DEVELOPMENT OF PRIMARY SCHOOL STUDENT TEACHERS' SELF-EFFICACY THROUGH BLENDED LEARNING

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Abstract: The problem of a self confidence crisis often occurs among beginner teachers in a science class and is often influenced by their limited knowledge on the content and science teaching pedagogy. A science comprehension programme based on blended learning can be an alternative solution to overcome this problem because it can accommodate their needs to better comprehend science class content and pedagogy for non-science primary school student teachers. Therefore, this research is aimed to develop primary school student teachers' self efficacy through further comprehension and training of science content by means of blended learning. This research involved 31 primary school student teachers at Universitas Pendidikan Indonesia (Indonesian Education University), Purwakarta Campus. The instrument used in this research was a survey to measure student teachers' self confidence. The results of this research show a significant development in student teachers' self efficacy before and after further comprehension and training of science content.

Keywords: Citizenship Moral Values, Ethos, Artefact, Babasan, Paribasa, Uga, Caturrangga, Pancacuriga: Silib-Sindir-Sampir-Siloka-Sasmita.

INTRODUCTION

Primary school teachers' need to have a certain level of understanding of the subject content to support their ability to carry out science teaching effectively, covering science content, scientific processes, and good class management (Jarret, 1998). Watters & Ginns (1995) stated that the way teachers present science teaching in primary schools is influenced by the teachers' knowledge on science content and issues in teaching science. Teachers and student teachers studying at universities will have to be able to understand the purposes of studying science and integrate the scientific attitudes towards learning science which can result in citizens who have science literacy in order to apply basic concepts of science in their daily life or are able to coordinate science concepts, technology, and sense of community in their life. (National Research Council, 1996; Turkmen, 2008; Turkmen, 2013). This statement confirms the fact that teachers teaching at primary school are required to comprehend the science content and pedagogy, as it will affect the quality of science teaching and learning.

Science is often considered the most difficult and boring subject. Vaidya (1993), Riggs & Enoch (1990) and Young (2008) explained that science is the least favourable subject for teachers and primary school student teachers, which will lead to difficulties in helping students to achieve maximum results in learning. Primary school student teachers' low self efficacy is one of the factors that can cause this situation. Pandergast, Garvis, Keogh (2011) elaborated that the most important

motivation that supports teachers' effectiveness in planning the lessons is their *self efficacy*. Additionally, Coladarci (1992) verified that teachers who possess high *efficacy* will show satisfactory professional performance.

According to social cognitive theory, *self efficacy* can be defined as one's confidence with his or her capability in producing a series of attitudes formed by repeated events to influence someone's attitudes and behaviours in the daily life. (Bandura, 1977). Based on the academic context, *self efficacy* has a strong influence on academic achievements, choices of subject, and career (Britner& Pajares, 2006) and if that statement is connected to teachers' *self efficacy*, it means that *science teachers' efficacy* is a teacher's confidence with his or her capability in planning, organizing, and managing lessons effectively which will result in his or her students' satisfactory academic achievement. (Gassert, Shroyer, & Staver, 1996; Skaalvik & Skaalvik, 2010).

Smolleck and Mongan (2011) described the effect of teachers' lack of *self efficacy* that leads to teachers' low attention towards the learning process at primary schools. If teachers have low confidence in teaching science, they tend to avoid it. However, teachers with high confidence will choose to teach science to students through a series of meaningful and interesting interactions (Joseph, 2010).

A number of pieces of research have been conducted regarding the relations between teachers' *self efficacy* and students' academic achievement. Based on research conducted by White (2009) that involved teachers and year four students of primary school in Virginia, it was discovered that there is a positive relation between teachers' *efficacy with* students' mathematics test results. Mojavezi and Tamiz (2012) conducted research that involved 80 teachers and 150 senior high school students and concluded that teachers' *efficacy* has a positive influence on students' motivation and academic achievement. It can be inferred that *self efficacy* influences the quality of learning which will affect students' success in learning. Hence, the development of student teachers' *self efficacy* requires serious attention in teacher training programmes. Bandura (1986) expressed the important factors that influence the development of student teachers' *self-efficacy* are mastery in concepts, pedagogical methodology, and simulated teaching models. Teacher training programmes are important in producing professional teachers and need to focus on factors presented by Bandura above to produce student teachers who fully understand the content, pedagogical methodology, and are able to implement them well in science teaching.

Primary school teacher training programmes in Indonesia still need to be developed further, as the teacher candidates who have completed the programmes are still unable to implement their knowledge on science in primary school teaching and learning. The division of student teachers into four concentration programmes which are science, social science, mathematics, and language, will impact on their limited knowledge in one certain or just a few subjects. Regarding the science teaching

in primary schools, student teachers who have chosen non-science concentration programme will have difficulties in planning and executing science lessons because of their limited understanding of science content and teaching. Consequently, some action is necessary in order to develop student teachers' self-*efficacy* through activities oriented towards teaching content and learning.

One possible action will be *blended learning* teacher training programmes for further comprehension of science content for primary school student teachers who do not come from science concentration programme. Singh (2003) described that *blended learning* combines different media or teaching instruments such as real time virtual/collaboration software, face to face in-class sessions, web-based classes, electronic performance support system (EPSS) integrated into job-task environment and knowledge management system designed to complement each other. Marsh (2012) stated that *blended learning* is a combination of different learning methods, learning environments, and learning styles. Smilanich & Wilson (2005) explained that *blended learning* is a combination between *e-learning* (*electronic learning*) with teaching programmes such as training or mentoring conducted through face-to-face in-class sessions.

Researchers have conducted various research on *blended learning,* linked to *self efficacy*. Orhan (2007) applied *blended learning environment* (BLE) in teaching materials and technology subject that involved 74 university students from the education concentration programme at Yildiz University of Technology in Turkey and showed that students' *self efficacy* to learn and perform well improved significantly after they learned their class materials *online* for the first half a semester, which was then followed by presentations of lesson plans and evaluations of teaching materials designed in every in-class session for half a semester. Furthermore, Shea and Bidjerano (2010) verified that integrating traditional in-class session strategy in a form of direct face-to-face in-class session with *blended learning* environment can influence students' *self efficacy* because they are facilitated with teaching and social activities that influence students' motivation and *self efficacy* in the end.

Based on the above explanations, it can be concluded that *blended learning* has the potential to overcome problems related to non-science primary school student teachers' *self efficacy* crisis. The *Blended learning* that will be designed will have to consist of a combination of interactive multimedia, online and in-class sessions aimed to help student teachers to gain better understanding of science materials and teaching which will affect their *self-efficacy*. As a result, the essence of this research objective is to develop non-science student teachers' *self-efficacy* through a science comprehension training programme, based on *blended learning*.

RESEARCH METHOD

The research method used is *pre-experimental research* with *one group designed pre-test* and *post-test* (Fraenkel, Wallen, Hyun, 2012). This design is chosen

because of the limited number of samples which will make it difficult to apply a control class. Hence, student teachers who do not come from science concentration programme as the participants of this programme have their *self efficacy* measured before and after the teacher training conducted to identify its effectiveness. Sampling technique utilized is *purposive sampling* that involved 31 non-science primary school student teachers who take the Professional Training Programme subject in the Primary School study programme at Universitas Pendidikan Indonesia in 2004. The research instrument employed is a survey to measure student teachers' *self efficacy* that refers to *Science Teaching Efficacy Belief Instrument* (STEBI) survey formulated by Riggs and Enoch (1990). This survey contains 23 statements related to *self efficacy* sub-indicators, which are *personal self efficacy* (13 questions) and *outcome efficacy* (10 questions). The instrument of this research is employed to measure non-science primary school student teachers' *self-efficacy* before and after the science comprehension training programme which is based on *blended learning*. The *blended learning* based science comprehension training programme covers four blended activities carried out for two months and each activity contained an independent learning process using interactive multimedia, question and answer forum, and *online* assignments as well as activities to generate, analyze, and evaluate science subject syllabus in every in-class session. Science topics covered in this blended programme are Human and Animal Parts of Body System, Lights, Sounds, and Their Relations to Hearing Organs, Physiological Anatomy of Plants, and Earth and Outer Space. S*elf-efficacy* data obtained will be analyzed qualitatively using the Likert scale and Wilcoxon test through SPSS version 21 programme. The Wilcoxon test is chosen because the data obtained from the survey cannot be processed using a parametric difference test. Survey data analysis will be supported by more descriptive narration analysis regarding the conducted teacher training programme activities.

RESEARCH RESULTS

Non-science student teachers' *self-efficacy* on *personal science teaching efficacy* indicator and *science teaching outcome expectancy* indicator before the *blended learning* based science comprehension training programme were as follows:
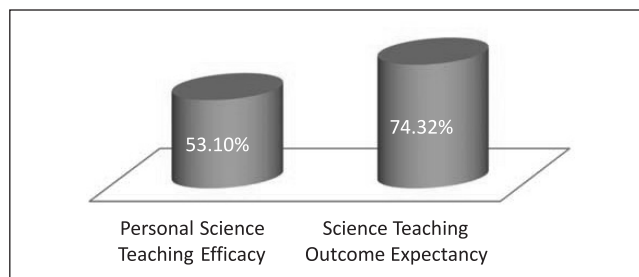

Figure 1: Percentage of *self efficacy* **prior to the commencement of the programme on every indicator**

Based on Likert scale criteria, the percentage of index value on PSTE indicator can be categorized as "in doubt", while the percentage of index value on STOE indicator can be categorized as "confident". This result shows that non-science student teachers are convinced that their personal understanding of the science is still limited, while their confidence level after some actions are taken by teachers has improved.

Non-science student teachers' *self-efficacy* on *personal science teaching efficacy* indicator and *science teaching outcome expectancy* indicator after the *blended learning* based science comprehension training programme are as follows:
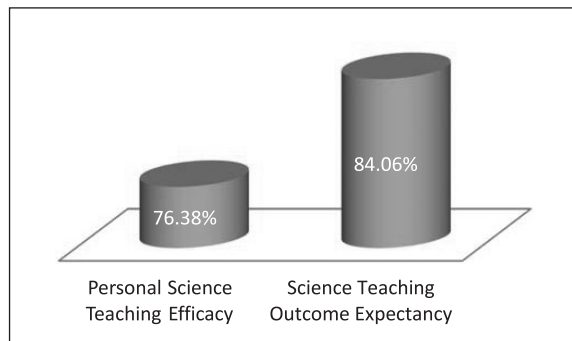

Figure 2: Percentage of *self efficacy* **index post-programme on every indicator**

The percentages index on every indicator of *self efficacy* that consists of *personal science teaching efficacy* (PSTE) and *science teaching outcome efficacy* (STOE) shows certain categories. The percentage of PSTE indicator shows that non-science student teachers' confidence regarding their level of knowledge to teach science is 'confident'. While the percentage of STOE indicator shows that student teachers are in "very confident" category.

Significant difference between student teachers' *self efficacy* before and after *blended learning* based science comprehension training programme

To identify the significant difference between non-science student teachers' *self efficacy* before and after the programme, it is necessary to carry out Wilcoxon non-parametric test and the results shown in table 1 below.

TABLE 1: *SELF EFFICACY* ANALYSIS RESULTS USING NON-PARAMETRIC DIFFERENCE TEST

Self efficacy	p-value	A	Note
PSTE	0.000	0.05	Significant
STOE	0.000		Significant

PSTE and STOE analysis results using *t*-test and Wilcoxon test show that *p* value is < α = 0.05 which means that Ho is declined and Ha is accepted. In other words, there is a significant difference between PSTE and STOE of non-science student teachers before and after *blended learning* based science comprehension training programme.

Analysis

The high non-science student teachers' percentage index on STOE indicator providesma quite significant contribution to student teachers' *self-efficacy* in general. This is caused by student teachers who have non-science background realizing their role to guarantee their students' achievement in learning. The PSTE indicator that indicated 'in doubt' does not hinder them from teaching science confidently. However, the response indicates that non-science student teachers have doubt in their basic science knowledge and science teaching they possess. Steven and Wenner (1996) stated that most teachers have doubt in their capability to teach science effectively and many of them feel uncomfortable and incompetent in teaching science because they do not possess a solid understanding of science content and its pedagogy.

Low level non-science student teachers' PSTE indicator is triggered by limited understanding of science content and teaching strategy training. Student teachers only learn science content and teaching strategy in the first and fourth semesters. The limited learning experience results in low levels of subject mastery that leads to their confidence level on PSTE level.

The application of *blended learning* to science comprehension can accommodate the student teachers' needs regarding their content and teaching strategy mastery. The science comprehension training programme combines independent *offline* study sessions using interactive and online multimedia and in-class session by analyzing science lesson plan for higher semester. This teacher training programme experience can lead to comprehensive knowledge on science content and pedagogy that will influence their *self efficacy*.

The development of *self-efficacy* is influenced by several factors. Based on research conducted by Aydin and Boz (2010), *self-efficacy* can be influenced by four factors, adapted from research conducted by Bandura (1997), namely: (1) *mastery experience*, (2) *vicarious experience*, (3) *social persuasion*, and (4) *physiological and emotional states*. Regarding the *blended learning* based science comprehension training programme, *experience mastery* is the most dominant factor to develop non-science student teachers' *self efficacy* in science comprehension training programme in which student teachers are facilitated with a variety of intensive activities to stimulate the development of knowledge content and pedagogy in science teaching. Offline learning activities using interactive multimedia during

independent learning sessions enable non-science student teachers to gain additional valuable information regarding basic concepts of science which will be followed up on by online study as a forum or opportunity for non-science student teachers to discuss and ask questions related to science concepts. This face-to-face in-class session which includes science lesson plan evaluation gives the opportunity to understand various science teaching strategies that focus on scientific methods. These activities also support the development *experience mastery* regarding science learning process for non-science primary school student teachers as this is important for their *self-efficacy*.

The development of *self-efficacy* is also affected by *vicarious experience.* Based on a research conducted by Britner and Pajares (2006), *vicarious experience* influence is minor compare to *mastery experience*. However, *vicarious experience* matters more when one feels unconfident and incompetent caused by his or her limited understanding of the science content. In the context of this research, the experience to analyze and evaluate science lesson plans is considered a *vicarious experience* activity. A *vicarious experience* activity gives students the opportunity to conduct a reflection and evaluate science lesson plans that they have completed. This kind of experience can enrich non-science student teachers' awareness regarding innovative science teaching strategies.

Gassert, Shroyer and Staver (1996) confirmed that the development of PSTE indicator is influenced by personal experience related to science, professional development and preparation while the development of STOE indicator is influenced by external variable such as characteristics of school, students, other school communities involved. The absence of external variable affecting STOE indicator of students' various characteristics refer to students' science knowledge background, students' achievement in the science subject and students' motivation to learn science, which can be affected by their level of personal confidence in science. Accordingly, the relevance of this research result is the *blended learning* based science comprehension training programme that is viewed as a professional development programme for primary school student teachers to support their professional competence and pedagogy as an opportunity to enrich the non-science student teachers' experience in learning science resulting in an impact on PSTE indicator and STOE indicator indirectly.

CONCLUSION

The application of *blended learning* based science comprehension training programme can influence non-science student teachers' *personal science teaching efficacy* and *science teaching outcome expectancy* significantly. The development of both *self efficacy* indicators supported by the development of student teachers' understanding of science content and science learning pedagogy. *Blended learning*

based science comprehension training programme includes two learning activities; independent *offline* activities supported by interactive multimedia and *online* learning activities via *edmodo* along with face-to-face in-class sessions to analyze the science subject lesson plans. Those activities are able to enrich non-science student teachers' learning experience to influence the development of PSTE indicator and STOE indicator indirectly. The application of *blended learning* in education has a big potential to develop student teachers' cognitive, affective, and psycho-motor abilities to improve their ability and skills. Furthermore, the application of *blended learning* has the possibilities to raise social awareness among student teachers through collaborative work verbally or non-verbally. Cognitive and communication abilities are crucial in skill development to anticipate the 21st century. Consequently, the application of *blended learning* aimed for improving the 21st century skills is recommended for further study. *Blended learning* can be a learning strategy model which can help develop the quality of education to generate a generation that is able to compete and adapt to the current development of era and technology.

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