EFFECTIVENESS OF SCAFFOLDING TO PROMOTE ACADEMIC SELF-EFFICACY OF PRESERVICE ELEMENTARY TEACHER

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Abstract: The present study aims to analyse the effectiveness of the implementation of scaffolding learning strategy towards the improvement of students' academic self-Efficacy of primary school teacher education. This study employs pre-experiment method by using one group pre-test and post-test design. Twenty seven students of primary school teacher education, who are taking basic concepts of science, are chosen as the participants/subjects of this study. Questionnaires, adopted from academic self-efficacy scale (ASES) which is in line with the self-efficacy dimension proposed by Bandura (1995), are used as the instruments. Seventy two items which consist of positive and negative statements, employed to obtain academic self-efficacy are considered valid and reliable (cronbach's alpha=0.954). Hypothesis testing employs T-Test resulting t value 11.0999 with a significance value 0.000. Therefore, it can be inferred that scaffolding strategy is proven to be effective in improving students' academic self-efficacy with the categories i.e. high (14.8%), medium (66.7%), and low (18.5%).

Keywords: academic self-efficacy, scaffolding, basic concept of science

1. Introduction

Personal belief in achieving the tasks and educational goals will be needed in the mental effort of students related to learning process. The concept of self-efficacy is closely related to academic activities or often reffered to as academic self-efficacy (ASE). Individual's belief in the achievement of educational tasks is defined by Scunk & Pajares [1] as academic self-efficacy. Bandura [2] defines self-efficacy is a major basis of action. People guide their lives by their beliefs of personal efficacy. Self-efficacy refers to beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments. Referring to the limitations given by Bandura, it can be understood that efficacy is a belief that conducting individual to do something.

Athough studies related to self-efficacy is considerable interest to researchers, it appears that no study has been conducted on this topic relating to Biology [3]. Consideration of the level of self-efficacy is important because it based on fact that could help preservice elementary teacher achive better outcomes in basic natural science concept especially in Biology. Biology is one of the significant branches of science that needs close attention because it has unique characteristics that distinguish it from other subject of science. Special characteristic of Biology as a branch of science can be seen from the scope of the material and the nature of the material object [4] In terms of the scope of this study, biology is not limited to scientific facts about concrete natural phenomena, but also related to abstract object such as chemical metabolic processes in the body, hormonal systems, coordination systems, etc. The nature of object material studied in Biology is diverse, both in terms of size (macroscopic and microscopic), affordability (desert, tundra, etc), safety (pathological bacteria/viruses) and language.

Consideration of making effort to enhance preservice teacher academic self-efficacy in mastering the basic science concept especially Biology is based on fact. The preliminary show that most preservice teacher consider science as a difficult and avoidable subject. Additionally, it is also indicate that students have a wrong perception about science. Their perception have an impact to preservice teacher self-efficacy on science learning and it significantly affect their self-efficacy in the future [5]. The real effect of academic self-efficacy (ASE) preservice teacher through self-efficacy on teaching science need to be addressed with effective treatment. Pajares [6] suggested effective steps for preparing preservice teacher ASE, namely training basic science teacher to obtain basic information, skills and competencies to overcome occupational inability for individuals.

Considering the importance of fostering academic self-efficacy in preservice elementary teacher, the series of activities is designed to produce human resources who have high level of self-efficacy. As a professional, teachers have a big role in supporting their professionalism. According to Tutor [7] asserts that teachers have a role to increase academic self-efficacy. The problem is that enhancing academic self-efficacy does not automatically emerge instaneously and spontaneously but requires a long and complex process, therefore the formation of academic self-efficacy in students needs to be done gradually and continuously through the right strategy, one of which is through scaffolding.

The idea of scaffolding strategy was first coined by Lev Vygotsky [8], scaffolding is basically a learning strategy in the form of giving a number of assistance to students during the initial stages of learning, then reducing aid and giving an opportunity to take on greater responsibility after he can do it alone. Based on Vygotsky's theory, it can be said that scaffolding is temporary, meaning that if the ability of students has developed, the scaffolding will gradually be reduced, along with the increased ability of students to complete their tasks independently.

In the context of learning support for students in completing the learning process can take the form of student activity in the learning process, learning strategies, diversity of learning models, guidance of experience from the teacher, learning facilities, and learning climate of students from parents at home and teachers at school. The support implemented in this study is designed in the form of questions that direct students when reading textbooks. Chin [9] noted that teacher questioning can serve to scaffold and advance student thinking.Scaffolding questioning enabled the teacher to guide and facilitate students during reading comprehension as they progress through sections of text [10]. The question are given according to the Bloom's revised Taxonomy framework [11] that organizes

thinking into six levels (remembering, understanding, applying, analyzing, evaluating, and creating. The multilevel of questions that refers to Bloom's revised taxonomy framework is providing an important framework that allows students and teachers to use verbs to actively identify diverse forms of thinking. Multilevel questions represented a pragmatic way to design high-level thinking tasks through scaffolding techniques [10]. The use of a framework of questions such as Bloom's taxonomy promote longer and more articulated student responses to questions and promotes higher-level student thinking. Consequently, the purpose of this study was to investigate the impact of scaffolding the development of questions to increase academic self-efficacy.

2. Literature Review

Self-efficacy concept was first formulated by Albert Bandura [12] as an individual's personal belief in his own capacities in order to produce given attainments. Bandura argues that self-efficacy is a four general ability consisting of cognitive, social, emotional and behavioral aspects of individuals who need processing among these four aspect to achieve certain goals. In relation to the affective aspect, Tuckman & Monetti [13] emphasized the existence of relationship between the affective dimensions and academic self-efficacy. Self-efficacy produces feelings or emotions that are built before displaying a certain achievement or task. Trust to be succeesful in dealing with something tends to cause positive feelings, while failure produces negative emotions. In additions, academic self-efficacy make students feel motivated and have an interest in doing assignments or avoiding certain tasks that they are not confident [14]. Thus, self-efficacy gives students confidence to control different academic situations. Controlling the academic situation will certainly have an impact on the use of time that students need to do each academic task. Students who have high academic self-efficacy will use more cognitive strategies that are useful in learning, managing time and organize their own effort in completing the task.

Efficacy beliefs differ in generality, strength and level [15]. *Generality* is related to how strong beliefs generalize all tasks and situations [16]. This dimension related to the transfer of students' academic beliefs in all activities (Zimmerman, 200. Strength which is related to the certainty of succees in carrying out a task with a certain level of difficulty. Level or magnitude, is related to the degree of difficulty in doing individual tasks [16]. In this study the three dimensions were used as indicators to measure the level of academic self-efficacy by developing a scale of academic self-efficacy perceptions which is included the level of difficulty of the task, stability of generality and level of strength.

Scaffolding is a technique to change the level of support from expert [18]. During the learning process, teacher or students who are more capable adjust the amount of guidance with the level of student performance that has been achieved. When the assignment given to students is a new task, the teacher will apply direct instruction through a more intensive mentoring process. The intencity of guidance will be reduced when the ability of students increases. According to Commercial Scaffolding Inc. [19], the purpose of scaffolding is to make students independent and able to manage their own learning. Activities that teachers can apply to learning through scaffolding strategies as suggested by National Research Council [20], 1) motivate or explore students' interest related to the task; 2) simplifying tasks so that they are easier to do and achieve by students; 3) give direction to help students focus on achieving goals; 4) shows the difference between student work and the expected standard of solving; 5) reduce confusion and 6) clearly define the expectations of the activities carried out.

To support students' learning, there are various types of scaffolding suggested by many educators, but there are no consensus in regard to scaffolding models [21]. Many different characterizations of scaffolding, each study offers its own intervention and unit of analysis. Some studies focus on the behavior of teacher whereas other studies focus on the role of the student. The present study operationalized scaffolding by building on a teacher's intentionality while consciously applying scaffolding for students to learn. Wells [22] classified scaffolding into macro and micro levels. The macro level or "designed in" scaffolding is related to large issues such as a program goals and the selection and seguencing of task in order to students progress step by step and manage their understanding systematically [23]. The micro level is part of the macro level, that occur when students

interact with the teacher. The micro level can implementation by giving examples, explanations, feedback, modelling, hints, prompts, etc. to assist the student to learn and practice academic task.

The kind of support that used in this study consist of giving examples, feedback and modelling. Giving examples is type of scaffolding used to show or represent a subject matter to implement or enhance student's understanding [23]. Feedback is a response provided could include answer key or commentaries to follow on students' effort or performance. Modelling is different from giving example, modelling focus on process whereas giving examples focus on context. Map of question scaffolding in Figure 1 illustrates teacher step to scaffold student ASE adapted from Fisher & Frey [21]. Map of question scaffolding identified scaffolding moves to explicitly scaffold and prompt student understanding through inquiry such as asking clarifying questions followed by prompts and cues whenever misconceptions students arose.

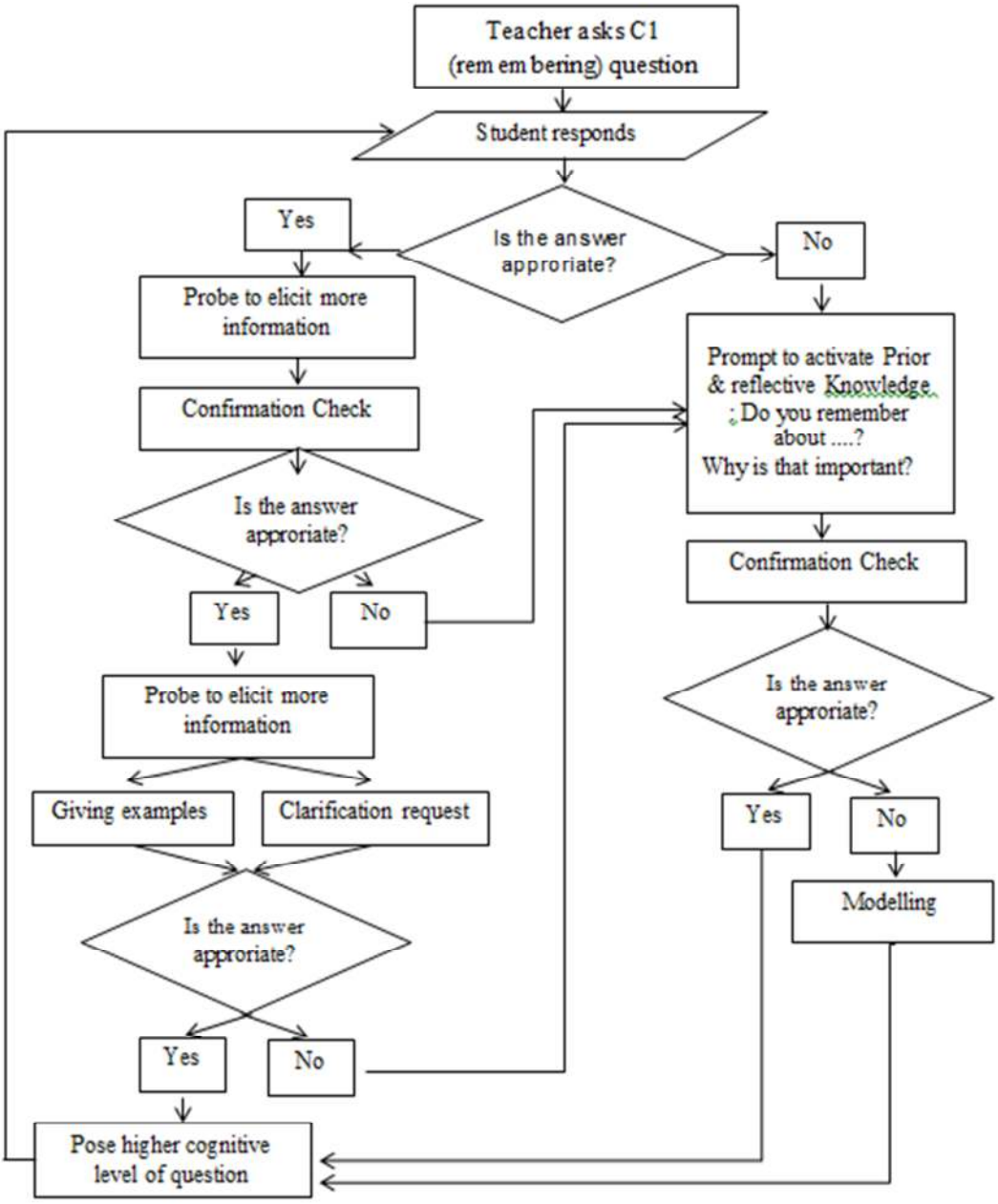

Figure 1. Map of Question Scaffolding adapted from Fisher & Frey [21]

3. Material & Methodology

This study utilized a pre-experimental design with one group pre-test and post-test. The sample for this study were pre-service elementary teacher who enrolled in basic concept of science course. 27 preservice elementary teacher responded on their academic self-efficacy to study at basic concept of science course. As a research variable, ASE is translated into a variable indicator whose development refers to a scale to measure student perceptions or beliefs according to the dimensions of efficacy by Bandura. The subject were asked to complete the questionnaire prior to participate in the course. The instrument modification is adjusted in terms of language and content. The data colletion used was a Likert scale, with 4 representing very confident and 0 not at all confident. Seventy two items which consist of positive and negative statements, employed to obtain academic self-efficacy are considered valid and reliable (alpha cronbach's = 0.954). Therefore, the research instrument was reliably addressed because Cronbach's Alpha was greater than 0.05. This means that all statements have 95% reliability with excellent internal consistency ($\alpha \geq 0.9$). The effectiveness measurement of learning strategy in this study refers to the result of achieving the average score of pretest compared to the posttest score. When students completed each test, data were automatically stored and later exported to Excel. Once collected, the first step was to visually screen the data for missing values and determine if these values were legitimate and reasonable.

4. Results and Discussion

a. Result

All students completed pretest and posttest questionnaire for academic self-efficacy through scaffolding strategy. The survey instrument consisted of 72 statements that used a four-point Likert scale, where indicated strongly disagree to strongly agree. Figure 2. show the posttest's student (Mean=209.93; SD=37.01) have greater score than pretest (Mean=156.9; SD=53.25). Both of data are normal has tested with Kolmogorov-Smirnov test.

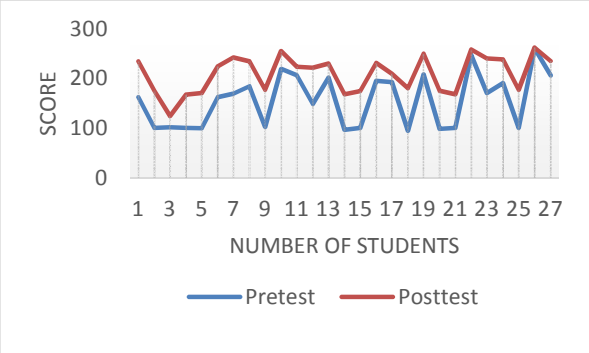

Figure 2. Comparison Pretest-Posttest Score of ASE

The correlation between pretest and posttest results shows as Table 1. Paired samples correlations show the correlation value of 0.911 with significance 0.000. It means that there was a high correlation between pretest and posttest in academic self-efficacy results. The correlation value affirms contribution of scaffolding strategy to improve academic self-efficacy is 83%; 17% because another factors.

TABLE 1. Paired Samples Correlations

	N	Correlation	Sig.
Posttest & Pretest	27	.911	.000

The significant difference between the results of the pretest and posttest determined whether there was an effect in academic self-efficacy using scaffolding strategy. It can be inffered that computed t-value of 11.099 ($\alpha = 0.05$) with a significance value 0.000 means that there was a significant difference in the pretest and posttest score in academic self-efficacy. It shows that grade of academic self-efficacy have significantly improved using scaffolding strategy. This results affirms that scaffolding strategy is effective on academic self-efficacy.

TABLE 2. Paired Samples Test

	Mean	Std Deviation	Std. Error mean	95% Confidence Interval of Difference		t	df	Sig. (2-tailed)
				Lower	Upper			
Posttest - Pretest	209.93	27	37.009	43.215	62.859	11.099	26	.000

The result showed the academic self-efficacy level improved during use scaffolding strategy. In posttest found 14.8% students with high level, 66.7% students with medium level, and 18.5% students with low level. In pretest found 11.1% students with high level, 48.2% students with medium level, and 40.7% students with low level. The trend of data show that at high level, there is an increase of 3.7%; at medium level, there is an increase of 18.5%; while at low level there is decrease of 22.2%.

TABLE 3. Academic Self-Efficacy Level

Level	Pre Test	Post Test
High	11.1%	14.8%
Medium	48.2%	66.7%
Low	40.7%	18.5%

n=27

This study is consistent with the results of Aagard *et al.* [24] their research found that 63,2% students with higher self-efficacy showed that they actually read the textbook when it was assigned. The students with lower self-efficacy were less likely to believe that textbook reading should be required. According to their research, students who have below average academic self-efficacy are significantly less likely to be involved in strategies that can help them to succed in reading books. Chairiyati [25] that self-efficacy contributes positively to academic achievement. According to this study, it can be said that the academic achievement can be predicted with academic self-efficacy.

A higher percentage of students with high self-efficacy indicated they would read the textbook to prepare for an in-class quiz in contrast to low self-efficacy students. The results indicate that question prompts may be considered effective and widely accepted by majorities of students.

b. Discussion

The study was carried out a scaffolding strategy to support academic self-efficacy preservice teacher to learn basic science concept. According to the findings of this study, it is obvious that the provided scaffolding in the course helped the students believe they could do the tasks on their own in many ways. Firstly, giving examples made the content of the text clearly to them. Giving examples of a concept or implement a concept on problems encountered in real life allowing information to be more meaningful and have a greater chance of entering long-term memory (Hikmawati, 2014). Secondly, modeling helped student do the tasks by observing the models. Finally, feedback provided in the reading comprehension could students' belief in their abilities. The teacher feedback helped them review their comprehension of the text content. Students also require positive feedback concerning their success if they are to make judgements concerning self-efficacy beliefs (Bandura, 1977). Therefore, after getting scaffolding in the course, the students realized that they could read the task and thus academic self-efficacy of reading scince textbook increased. Science textbook

escpecially Biology textbook requires students to tend to be focused on understanding meaning in Latin terms, memorizing part of anatomy, identifying and classifying organism based on similarities and differences their characteristics and understanding basic mechanisms in Biology [26]. Self-efficacy is very important motivational processes to obtain a better academic performance such as reading activity in students. Teacher varied their level of scaffolding support depending on student's ability, in this case use of questioning. Question asked to students while reading textbook make students actively involved with the text. Active students involvement with reading provides students with readiness to absorb information more effectively. Feel competent and have full confidence in their own abilities, resulting strengthen the reading strategic control. Therefore, it is essential to encourage students to build and develop cognitive, metacognitive strategies, as well as personal self-regulation and motivational strategies in order to improve the academic performance [14]. Based on this study, it is recommended that scaffolding be explicitly used in classroom to support efective learning. Scaffolding questioning enabled the teacher to guide and facilitate students during reading comprehension as they progress through sections of text. The scaffolding reading experience (Clark & Graves, 2003) assists students in understanding and learning from both narrative and expository texts. This support occurs through various pre-reading, during-reading and post-reading activities designed to scaffold cognitive thought. While the measurement of this task can add value to how teachers formulate questions in the classroom, further measurement of student critical thinking and reader self-efficacy will measure the potential benefits of this approach.

The question used as a scaffolding tools need to be prepared by the teacher. Skills to ask question is very important to supporting cognitive processes and gradually increasing students' self-efficacy. Questions that have been prepared to lead students raise higher cognitive level and engage further in learning process. This process is the core of learning. However, this is not conclusive that increase the posttest scores is only due to strategy presented because external factors such as maturity and even gender.

This research acknowledge limitations to this study. Pre-experiment design does not allow for the random assignment of participant to group and only involved one class non-randomized preservice teacher with different experiential backgorund. Therefore, finding in this study could not be generalized to the large population.

5. Conclusion

This study operationalized scaffolding by making it more explicit and gradually in the classroom activity. The use of Bloom's revised taxonomy operationalized explicit way making it more concrete and clear. The use of scaffolding map identified specific scaffolding moves to explicitly scaffold and guide students to actively involved with the text. The organization of thinking into six levels represent a pragmatic way to design effective instructional tasks. Questioning plays an important role within representing lower to higher level of thinking enables the learner belief to their academic task. It is necessary to indicate one important limitation of the study, the sample of the study consist only one class of preservice elementary teacher. In this respect it would be inconvenient to generalize the study result to all the university students. Future research should be aimed at larger population. Further research requires more variety of scaffolding such us prompts and cue to guide students' use of higher order thinking questions.

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