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Improving the pre-service teachers' academic learning achievement in educational research class and self-regulation with self-assessment approaches

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Abstract

The relationship of self-assessment approaches on academic learning achievement and self-regulation has been extensively explored but the impact for pre-service teachers has not been thoroughly examined, even in research courses where instruction is often neglected. This article reports an empirical investigation of the effectiveness of self-assessment approaches on pre-service teachers' academic learning achievement in educational research class and self-regulation. A quasi-experimental pretest-posttest control group design was adopted in this study. The participants were 43 pre-service teachers enrolled in the first semester of 2018 of an educational research course. Data were collected using a comprehensive research learning test, subsequent tests, and self-regulation questionnaire. Data were analyzed by using arithmetic mean, standard deviation, sample independent t-test, and paired sample t-test. The result revealed that self-assessment approaches have a positive effect on academic learning achievement and self-regulation. The percentage points on quizzes of the experimental group showed an increase in the following quizzes. The results demonstrated the improvement of pre-service teachers who completed the self-assessment training.

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Introduction

The primary purpose of engaging students in self-assessment approaches is to boost learning and achievement. There are a wide variety of strategies for using self-assessment approaches to help produce positive learning outcomes. This study uses metacognitive activities as suggested by Tanner (2012) and exam wrappers as designed by Lovett (2013) to promotes self-assessment approaches. During the past decade, the relationship of metacognitive activities and exam wrappers to academic success and self-regulation for young students has been extensively explored (Brazeal & Couch, 2017; Butzler, 2016; Pintrich, 2002; Thompson, 2012) but the impact for college students has not been thoroughly examined.

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Self-regulation is the ability to plan, guide, monitor one's behavior flexibly in the face of changing circumstances (Zimmerman, 1986). This skill is necessary for pre-service teachers to become expert teachers because teaching will never be complete routine. Students are never the same, subject matter knowledge develops and there are demands from social change, so pre-service teachers must improve over time and seek feedback from various sources to solve problems that arise while continuing to meet the needs of students (Beijaard, Korthagen, & Verloop, 2007; Bolhuis, 2003; Clarke & Hollingsworth, 2002). The programs that offer pre-service teachers to control their learning can develop self-regulation, such as active learning methods (Kramarski & Michalsky, 2009), the mind map (Tanriseven, 2014), and active reflection (Oakley, Pegrum, & Johnson, 2014).

There were very few instances where pre-service teachers had the opportunity to engage in metacognitive activities and exam wrappers of their learning process. Even in research courses, those instructions are often neglected. This study

investigates the effectiveness of metacognitive activities and exam wrappers in enhancing pre-service teachers' academic learning achievement and self-regulation. This present study addresses three research questions: 1) Do self-assessment approaches have a positive effect on pre-service teachers' academic learning achievement? 2) Do pre-service teachers who complete self-assessment approaches show improvement in examination compared to those who do not receive any activity? 3) Can self-assessment approaches affect self-regulation?

Literature Review

Self-Assessment Approaches

Most recently, formative assessment training has been cultivated into a dynamic and reflective approach called assessment for learning, which includes interactive learning. The assessment for learning stream reinforces educators to use assessment data primarily for the formative objective. Self-assessment approaches are a powerful element in formative assessment because they involve students in thinking about the quality of their evidence. Self-assessment can arise when students judge their performance and identify areas that they need to work on to get the desired achievement for their performance (McMillan & Hearn, 2008). Self-assessment is a process in which students reflect on the quality of their work and their learning, judge the level to which they explicitly reflect criteria, identify strengths and weaknesses in their works, and revise accordingly (Andrade & Du, 2007). There is a strong body of research from psychology and education demonstrating the importance of self-assessment approaches to effective student learning. Self-assessment approaches can affect the self-regulation, motivation, and self-esteem of students and consistently endorsed as positive for student learning (Andrade, 2010; Munns & Woodward, 2006; Noonan & Duncan, 2005; William & Black, 2010).

Metacognitive Activities

Metacognitive activities can also be an influential tool in assessment, not in the sense of assessing for metacognition, but rather assessing with metacognition, so it is used to facilitate learning (Pintrich, 2002; White & Fredericksen, 2005). Questioning is the key metacognitive activity in which learners are asked to promote metacognitive awareness, including questions related to planning, monitoring, and evaluating. Planning involves identification and selection of appropriate strategies and allocation of resources, and goal setting, budgeting time, activating prior knowledge, prompting the learners to think about what they already know that is related to the content of that day and what relevant knowledge they lack. The questions were about the students' goals of the class session, what they already knew about the topic, how they could best prepare for the class session and what questions they already had about the topic. Monitoring involves attending to and being aware of comprehension and task performance. The questions were about their understanding during teaching activities, what is most challenging or confusing about the task, what learning strategies are working well or not working well, what questions arise during the class session. Finally, evaluation includes appraising products, regulatory learning processes, and revisiting and revising the goals (Schraw, Crippen & Hartley, 2006).

Table 1 Design activities to promote self-assessment approaches

	Weeks	Activities
1	An introduction to research methods	Metacognitive activities
2	Selecting a problem	Metacognitive activities
3	Reviewing literature	Metacognitive activities
4	Quiz 1	Exam wrappers
5	Defining variables	Metacognitive activities
6	Scales of measurement	Metacognitive activities
7	Data collection	Metacognitive activities
8	Quiz 2	Exam wrappers
9	Organizing data	Metacognitive activities
10	Descriptive statistics	Metacognitive activities
11	Quiz 3	Exam wrappers
12	Hypothesis testing	Metacognitive activities
13	Hypothesis testing	Metacognitive activities
14	Quiz 4	Exam wrappers

Exam Wrappers

Exam wrappers were questions about examination preparation, what kinds of failures students made on the examination, and what they might do differently to arrange for the next examination. This structured reflection arouses students to work through metacognition by considering their planning, assessing their achievement, and adapting their plan (Tanner, 2012; Siegesmund, 2017). Students with higher metacognitive skills might be implementing an effective reflection. Therefore, the exam wrappers were instruments for students to make associations between their behaviors and outcomes, identify specific strategies to increase their learning more effectively for forthcoming exams. Exam wrappers are easy to apply for several reasons. First, they are short-answer questions so they do not need much student time to complete or instructors time to assess. Second, instructors can easily adapt exam wrappers to the different types of learning or assessment tasks. Finally, they are repetitive for subsequent exams (Lovett, 2013).

Methodology

A quasi-experimental pretest-posttest control group design was adopted in this study. During the 14 weeks experimental process, pre-service teachers from two classes were taught educational research by the same teacher with the same book. The pre-service teachers in the experimental and control groups were given an hour to complete a pretest before the study. In addition, pre-service teachers in the experimental group were given metacognitive activities within class activities and exam wrappers were utilized after the four subsequent quizzes. The pre-service teachers participated in these activities for four hours daily for one day a week. Pre-service teachers in the control group did not receive any additional activity. The experimental and control groups were given an hour to complete the posttest at the end of the study.

Intervention

The metacognition model of Ambrose, Bridges, Lovett, DiPietro, and Norman, (2010) that describes the processes and activities of metacognition was incorporated for the experimental group. These activities were practiced within class activities that use questions to stimulate learning. The metacognitive questions, offered before, during and at the end of a lesson, were designed to give students a chance to reflect on their knowledge and skills within the classroom. The activities shown in Table 2 promote activities and questions to raise metacognitive awareness for the experimental group.

The exam wrappers of Lovett (2013), that describe the self-assessment activity on three areas related to exam performance: (1) their preparation prior to the exam, (2) the mistakes they made on the exam, and (3) what changes they should make before the next exam, were used for all four exams for the experimental group. The four questions were designed to give students a chance to reflect on their exam: (1) How did you prepare for this exam? (2) Approximately, how much time did you spend preparing for this exam? (3) What kinds of errors did you make on the exam? and (4) What changes to your study habits do you plan to make when preparing for the next exam? For feedback, an instructor asks the entire class what they have discovered from the exam wrappers and shares the students' strategies to prepare for the exam.

Participants

The participants were 43 pre-service teachers enrolled across two sections of an educational research course in the first semester of 2018 on the Faculty of Education of Nakhon Ratchasima Rajabhat University. The two sections were randomly assigned into either the experimental group or the control group. The experimental group contained 17 pre-service teachers and the control group contained 26 pre-service teachers.

Data Collection

The comprehensive research learning test

Data were collected using a comprehensive research learning test (CRLT). The CRLT was developed to measure pre-service teachers' academic learning achievement in educational research for both experimental and control groups before and after the training intervention. The researcher used the same pretest and posttest to make certain of the reliability of the test in terms of format, content, and cognitive levels. The test consisted of 60 multiple-choice questions. It represented nine chapters of the text used in the research course. The aim of the test was to capture pre-service teachers' conceptual knowledge of research before and after learning. The reliability scored .83 on the Kuder Richardson coefficient for binary data over three prior administrations of the exam to a total of approximately 73 teacher-students.

The subsequent tests

The subsequent tests consisted of four subtests, which emphasized the conceptual knowledge of educational research after learning. The four subsequent tests consisted of multiple-choice questions, true/false questions, and short answer questions. The details of the four subsequent tests are shown in Table 3.

The self-regulation questionnaire

The self-regulation questionnaire (SRQ) has been adapted to educational contexts from Pichardo, Cano, Garzón-Umerenkova, Fuente, and Peralta-Sánchez (2018). The SRQ consisted of 17 items as the representative for four subscales (Goal setting, Decision making, Learning from mistakes, and Perseverance). Items were rated on the 5-point Likert scale (strongly disagree–strongly agree. The Cronbach's Alphas for four subscales used in the study are 0.76 for goal setting, 0.71 for decision making, 0.69 for learning from mistakes, 0.71 for perseverance, and 0.78 for the full questionnaire.

Data Analysis

The collected data were analysed by using arithmetic mean, standard deviation, sample independent t-test, and paired sample t-test.

Table 3 Details of four subsequent tests

Subtests	Knowledge	Items
1	Research methods, selecting a problem, and reviewing literature.	20
2	Defining variables, scales of measurement, and data collection	30
3	Organizing data and descriptive statistics	40
4	Hypothesis testing	30

Table 2 Design activities and questions raise metacognitive awareness

Prior	Activities	Questions
Start of a lesson	The students write key concepts they remember on a card. For feedback, an instructor asks the entire class what they have discovered from the card and discusses misconceptions.	Questions related to planning 1. What do I already know? 2. What questions do I already have about this topic?
During a lesson	The students working in small groups respond to practices introduced by the instructor during a class lecture or presentation.	Questions related to monitoring 1. What is the task? 2. What do I need to learn? 3. What skills can I use and develop? 4. How will I approach the problem?
End of a lesson	The students assess their success or failure at meeting the goal and adjust accordingly.	Questions related to evaluating 1. What was the thing I learned during this lesson? 2. What question remains unanswered? 3. What strategies work for overcoming these tasks? 4. What should I adjust next time?

Results

The differences in academic learning achievement between pre-service teachers who were given metacognitive activities and exam wrappers and pre-service teachers who did not receive any additional activity are shown in Table 4. The mean comparison of pretest scores revealed that there was no statistically significant difference between participants of experimental and control groups. Therefore, the experimental and control groups were comparable. The mean comparison of posttest scores revealed that there was a difference at the .001 level of significance between experimental and control groups. The posttest scores for both groups showed improvement, but the mean score of academic learning achievement for the experimental group was greater than that for the control group.

The differences in percentage points scores on four subsequent quizzes between the experimental and the control groups are shown in Table 5. The comparison of percentage points on four subsequent quizzes revealed that there was a difference between experimental and control groups at the .01 level of significance on quiz 2 and the .001 level of significance on quiz 3 and quiz 4. The percentage points on four quizzes of the experimental group showed improvement.

The differences in self-regulation of the experimental groups between before and after giving self-assessment activities are shown in Table 6. The mean comparison of self-regulation revealed that there was a difference at the .001 level of significance between before and after giving self-assessment activities. The mean score of self-regulation revealed for the after giving self-assessment activities is greater than before giving self-assessment activities.

Table 4 Mean differences in academic learning achievement between experimental and control groups

Test	Experimental Group		Control Group		*t*	*p*
	M	*SD*	*M*	*SD*		
pretest	9.47	2.98	7.08	4.13	2.062	.165
posttest	51.29	3.69	30.00	8.40	14.681***	.000

***$p < .001$.

Table 5 Mean differences in percentage points on four subsequent quizzes between experimental and control groups

Quiz	Experimental Group		Control Group		*t*	*p*
	M	*SD*	*M*	*SD*		
1	69.41	12.86	61.15	13.88	1.995	.054
2	72.55	10.90	57.43	18.11	3.412	.001**
3	81.47	5.45	65.09	14.10	5.343	.000***
4	86.47	7.02	57.44	15.67	8.264	.000***

** $p < .01$. *** $p < .001$.

Table 6 Mean comparison of self-regulation between before and after giving self-assessment activities

Elements	Before		After		*t*	*p*
	M	*SD*	*M*	*SD*		
Self-regulation	3.21	.13	4.30	.21	19.278***	.000
Goal setting	3.18	.26	4.15	.26	12.781***	.000
Decision making	3.29	.31	4.35	.24	17.599***	.000
Learning from mistakes	3.24	.18	4.35	.23	13.571***	.000
Perseverance	3.20	.21	4.43	.39	11.649***	.000

***$p < .001$.

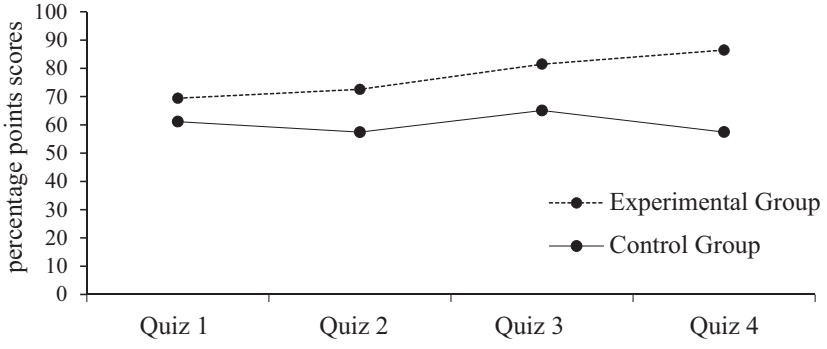


Figure 1 Percentage points scores on 4 subsequent quizzes between experimental and control groups.

Discussion

This study found that self-assessment approaches have a positive effect on pre-service teachers' academic learning achievement and self-regulation. These findings are consistent with previous research which found that there was a positive relationship between students' academic learning achievement and their use of self-assessment approaches (McMillan & Hearn, 2008; Zulkiply, Kabit & Ghani, 2008). Besides, there is evidence that self-assessment approaches can increase self-motivation (McMillan & Hearn, 2008), empowers students to take responsibility for their learning (Bercher, 2012) and leads to increases in the effectiveness and quality of learning (Ibabe & Jauregizar, 2010; Siegesmund, 2016; Topping, 2003). Self-assessment approaches are a core element of self-regulation because they involve awareness of the goals of a task and checking one's progress toward them and can affect the student's confidence and motivation to learn (Schunk, 2003). During self-assessment, students are responsible for interpreting their results, explaining what the results mean, and determining what actions to take to improve their learning. As a result of self-assessment, both achievement and can self-regulation increase (O'Brian, Nocon, & Sands, 2010; William & Black, 2010; Stiggins, 2001).

Conclusion and Recommendation

The study found that academic learning achievement was significantly different between the experimental and control groups. The mean score of academic learning achievement for the experimental group is greater than that for the control group. Therefore, the results demonstrated that self-assessment approaches had a positive effect on pre-service teachers' academic learning achievement. The percentage points on subsequent quizzes were significantly different between the experimental and control groups. The percentage points on quizzes of the experimental group showed an increase in the following quizzes. The results demonstrate that pre-service teachers who complete self-assessment training show improvement. The study found that self-regulation was significantly different between before and after giving self-assessment activities, which demonstrated that self-assessment training has a positive effect on pre-service teachers' self-regulation. Future studies can incorporate a mixed method to study how self-assessment approaches could impact the pre-service teachers' academic learning achievement and self-regulation. Considering the time frame for the study, the fourteen weeks were enough due to the timeliness of the completion of this study.

Conflict of Interest

There is no conflict of interest.

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