

How to Enhance Student Teachers' Research Self-Efficacy through Research-Based Learning

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Abstract

If student teachers have higher levels of research self-efficacy, they will have confidence and undertake effective research as part of their professional work. This action research is intended to enhance student teachers' research self-efficacy. The objectives of this classroom action research were 1) to analyze the instructions associated with using research-based learning as part of Research for Learning and Teaching Development course; 2) to analyze and compare the research self-efficacy of student teachers before and after using research-based learning as part of Research for Learning and Teaching Development course; and 3) to analyze and compare the research self-efficacy of student teachers using research-based learning and conventional methods as part of Research for Learning and Teaching Development course. A sample of 56 student teachers was divided into an experimental group and a control group (28 in each group). The experimental group was instructed using research-based learning and the control group was instructed using conventional methods. The research instruments were learning notes and a research self-efficacy scale, which had content validity, internal consistency reliability (Cronbach's α coefficients equal to 0.93) and construct validity. Data were analyzed by content analysis, descriptive statistics and a t-test. The results are presented in this paper.

First, five research-based learning methods in Research for Learning and Teaching Development course were used. These were: 1) focusing on creating knowledge together with using examples or research details; 2) practicing thinking about research examples; 3) simulating activities related to research studies; 4) learning from real situations; and 5) tracking and giving suggestions on researching continuously

Second, after using research-based learning, four components of research self-efficacy in the experimental group were significantly higher than before, at the level of 0.05.

Third, after the experiment, the research self-efficacy in terms of the research design, data collection and data analysis of the experimental group were significantly higher than that of the control group, at the level of 0.05.

1. Introduction

Currently, all programs for student teachers in every university state that during their fifth school year, while doing their professional training, student teachers have to conduct at least one piece of research as part of their training. However, while student teachers are in the teachers' program, there is only one course requiring them to do research. From the researcher's direct experience, after a student teacher completes that course, he/she is equipped to do research, but is not confident that he/she can do it.

The reason may be that courses in the program mainly aim to provide student teachers with knowledge. Research processes are mentioned on some occasions, which is not enough to develop research self-efficacy. One way to solve this problem is to change the learning method to research-based learning. This approach will enhance the research self-efficacy of the student teachers, who will become familiar with research processes and get to study current research results related to their field of competency. As a result, student teachers will be confident, know that they can carry out research, and create quality research because they have knowledge, a positive attitude toward researching, and the skills required to undertake research. They will have a chance to practice doing research and learn from past research studies [4] [6].

Management of research-based learning interpolates research into all stages of the learning activities. Research may be used as examples in the learning while research results may help the learners to study and draw conclusions as the body of knowledge. The learners are also provided with the opportunity to research in the form of small projects or joint research with their advisors, etc. [3] [8].

It can be seen that, in the research-based learning, the learners will get acquainted with various steps of research process as well as get to study findings that are current trends or are related to the science on which the learners focus. As a result, it will inevitably give the learners confidence and sense that they themselves have ability to conduct research. Moreover, the learners will be able to yield quality research results because they will have the knowledge, good attitude towards research and good research skills, acquired both by practice and from past research.

This research aims to develop the research self-efficacy on the part of student teachers and make them feel confident about undertaking research in the future while studying to become teachers, and provide them with knowledge and research skills via research-based learning. This method will expose student teachers to research processes in every step of the learning process and provide them with knowledge related to researching.

2. Scope of the study

Based on the literature review, the research self-efficacy instrument, was adapted from Forester, Kahn, and Hesson-McInnis [2], consisted of 4 components such as, 1) searching and synthesizing research results 2) designing research 3) analyzing data and 4) disseminating research results.

3. Research self-efficacy

Research self-efficacy is based on Bandura's theory of self-efficacy which suggests that outcomes change according to expected results. For example, teaching self-efficacy tells one how much one believes in one's ability to teach. Likewise, research self-efficacy is about how much one believes in one's ability to conduct research [2] [5].

There are many ways to develop student teachers' research self-efficacy. One of them is to create an atmosphere of research-related training. Relevant parties must provide student teachers with knowledge, suggest practical methods, and facilitate and organize research-related events for the student teachers to take part in [6]. Another way is to organize activities related to self-efficacy theories, such as pointing out the benefits of research so that student teachers become aware of its importance, apply psychological principles, and organize hands-on activities [4]. Student teachers should be given opportunities to undertake research in different situations or study other people's research so that they develop research self-efficacy. At present, the focus is on developing research-related knowledge in compliance with subjects and the behavioral objectives of subjects aiming at providing student teachers with research-related knowledge such as methods of searching for knowledge, queries, designing research of many kinds, choosing statistics to analyze data, writing and presenting reports and evaluating research. Activities relating to exposing student teachers to research activities are consistent with the research-based learning concept, which will be used to develop research self-efficacy.

4. Research-based learning

Research-based learning uses research processes and research results to organize learning, or uses research processes to gather knowledge. Research results could be given as examples or discussed among student teachers. They should have opportunities to undertake research from the first step until it is completed [7]. In addition, [8] stated that research-based learning allowed student teachers: 1) to practice the different research steps; 2) to undertake research with teachers; 3) to study research in order to obtain more knowledge; and 4) to use research results or examples in an area of interest to obtain more knowledge.

In this research, research-based learning is used to allow student teachers to practice doing research. Instructors act as facilitators. Research topics will be the student teachers' choices. Another method is to use examples or research results associated with learning. Examples of correct or wrong information in research can be pointed out. Student teachers can study research to gather knowledge. Instructors will keep an eye on the knowledge that student teachers obtain. Another method is to let student teachers undertake research with teachers. Due to context and time constraints, this method was not chosen in this research.

After studying documents and related research studies, the findings can be summarized as follows. Student teachers obtain knowledge via research-based learning. They will gain confidence and realize the level of their ability to undertake research, which is good in both the short and the long run. In the short run, research self-efficacy helps student teachers succeed in research subjects and develop their teaching skills. In the long run, when student teachers graduate and engage in their career, they will be confident and unhesitant when it comes to undertaking useful research. Details of research content are as follows.

5. Research framework

Based on the above presentation of documents and related research, it may be concluded that when learners learn through the research-based learning, they will gain confidence or know their levels of research ability. These are good in both short and long terms. In the short term, recognition of their own ability to conduct research will result in their achievement in research courses, and improve the teaching and learning. The long-term effects will be related to the learners during their future professional training because they will have the confidence and courage to initiate research and to yield results of even more use. Particulars of the research concept are as follows.

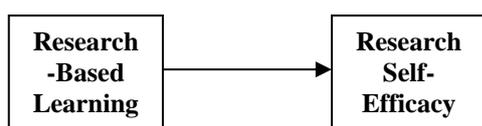


Figure 1 Research framework

6. Research method

This classroom action research was part of the Research for Learning and Teaching Development course. A sample of 56 student teachers was divided into an experimental group and a control group, with 28 in each group. Students' backgrounds in the experimental group and the control group were equal.

6.1 Research design

A pretest-posttest control group design was used in this classroom action research as Figure 2. The experimental group was instructed using research-based learning, and the control group was instructed using conventional methods.

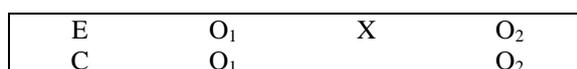


Figure 2 Research design

The experimental group was instructed using research-based learning and the control group was instructed using conventional methods. Table 1 showed the difference of leaning activities between experimental group and control group.

6.2 Instruments

The research instruments were learning notes and a research self-efficacy scale, which had content

Table 1. Example of research-based learning and conventional methods

research-based learning (experimental group)	conventional methods (control group)
Content	
Foundation principles and methods of knowledge acquisition; application of knowledge in social and behavioral sciences to research for learning improvement; nature and types of research; research procedures, research design, sample determination, development of research instruments, and data collection; statistics for research; data analysis using computer software; interpretation and presentation of data analysis result; research proposal writing; research report writing; research presentation; quality assessment and use of research for learning improvement.	
Activities	
<ul style="list-style-type: none"> - Reading and criticizing research papers - Writing research proposal - Doing research - Lecturing research knowledge - Constructing knowledge from research examples - Using activities involving in research situation 	<ul style="list-style-type: none"> - Reading and criticizing research papers - Writing research proposal - Doing research - Lecturing research knowledge
Instructional media	
<ul style="list-style-type: none"> - Knowledge sheets, research papers, VDO-clips, games, dices. 	<ul style="list-style-type: none"> - Knowledge sheets

validity, internal consistency reliability (Cronbach's α coefficients equal to 0.93) and construct validity. Quality of research instrument showed in Table 2.

Table 2. Quality of research instrument

Components	Items	Content validity	Reliability
Searching and synthesizing research results	5	0.67 – 1.00	0.78
Designing research	11	1.00	0.88
Analyzing data	4	1.00	0.71
Disseminating research results	10	1.00	0.90
Overall	30	0.67 – 1.00	0.93

6.3 Data collection

Qualitative and quantitative methods were used. Qualitative data were collected in the form of learning notes after using research-based learning activities in the classroom. Quantitative data were gathered before and after using research-based activities in the classroom.

6.4 Analysis

Data were analyzed with the use of content analysis, descriptive statistics and a t-test. The results are presented below.

7. Results

Results are divided into 3 parts: 1) Synthesis of research-based learning methods; 2) Comparison of the research self-efficacy of the experimental group before and after research-based learning; and 3) comparison of research self-efficacy after the experiment involving experimental group and control group.

7.1 Synthesis of research-based learning methods

From 13 research-based learning activities, details, successful methods, things to be cautious of/improve and results of learning activities observed by instructors, were identified and summarized in Table 3, 4 and Figure 3.

Table 3. Contents and activities using in research-based learning

Week	Contents	Activities
1	Introduction to the course	-
2	Foundation principles and methods of knowledge acquisition	1. Lecturing 2. Watching VDO-clips 3. Classifying 15 research papers
3	Types of research	1. Lecturing 2. Searching and classifying research from internet
4	Research procedures	1. Playing research jigsaw 2. Lecturing
5	Research proposal writing	1. Lecturing 2. criticizing research papers
6.	Research problem and hypothesis	1. Lecturing 2. criticizing students' research proposal
7	Research design	1. Lecturing 2. Playing game 3. Studying different types of research
8	Lecture from expert	-
9	Midterm	-
10	Sample determination	1. Lecturing 2. Practicing on sample determination from dices
11	Development of research instruments, and data collection	1. Lecturing 2. Studying different types of research instruments
12	Statistics for research, data analysis using computer software, interpretation and presentation of data analysis result	1. Lecturing 2. Practicing on data analysis using computer software
13	Research report writing	1. Lecturing 2. criticizing research reports
14	Quality assessment and use of research for learning improvement.	1. Lecturing 2. Practicing on research evaluation
15	Oral presentation	1. Practicing on oral presentation 2. Criticizing research presentation
16	Final	-



Figure 3. Example of instructional media using in research-based learning

Table 4. Synthesis of research-based learning methods

Principles	Methods	Things to be cautious of/improve	Results
Focusing on creating knowledge together with using examples or research details	<ul style="list-style-type: none"> Giving lectures to student teachers so they have access to the main ideas Giving research examples to student teachers to allow them to discuss the good and bad points 	<ul style="list-style-type: none"> Main ideas and examples should be presented separately. They should not be mentioned only at the end. 	<ul style="list-style-type: none"> Student teachers can see the picture, obtain knowledge, and practice critical thinking.
Practicing thinking about research examples	<ul style="list-style-type: none"> Let student teachers observe and analyze details and criticize good and bad points of pieces of research 	<ul style="list-style-type: none"> Sometimes letting student teachers undertake activities before they obtain knowledge of those activities is not as successful as it should be. 	<ul style="list-style-type: none"> Student teachers participate in activities. Student teachers react while working. Student teachers get to practice critical thinking.
Simulating activities related to research studies	<ul style="list-style-type: none"> Simulating research situations for student teachers to practice, for example engaging in research activities in which research examples can be obtained (group work) 	<ul style="list-style-type: none"> Instructors must continuously supervise student teachers. Giving opportunities to student teachers to meet their advisors regularly. 	<ul style="list-style-type: none"> Student teachers get to practice research skills. Creating good interactions between instructors and student teachers.
Learning from real situations	<ul style="list-style-type: none"> Instructors must prepare teaching materials related to research, such as research articles, research reports, research instruments, etc. 	<ul style="list-style-type: none"> Suggesting and giving questions to student teachers, so they think about and analyze the instructor's examples. 	<ul style="list-style-type: none"> Student teachers get to practice research skills. Student teachers gain direct experience.
Tracking and giving suggestions on researching continuously	<ul style="list-style-type: none"> Discussing and exchanging ideas on how to undertake every research step with student teachers. Communicating and giving information in a timely manner. Having tools to track progress. 	<ul style="list-style-type: none"> During discussions and idea exchange sessions, student teachers should be encouraged to fully express their opinions. Focusing on giving advice based on empirical data. 	<ul style="list-style-type: none"> Student teachers understand and get to continuously practice research skills. Enhancing interactions between instructors and student teachers.

7.2 Comparison of the research self-efficacy of the experimental group before and after research-based learning

The value of the research self-efficacy of the 28 experimental group student teachers before research-based learning ranged from 3.04 to 3.64, with an overall average value of 3.37. The range of the research self-efficacy of the 28 experimental group student teachers after research-based learning was 3.45 to 3.89. The result was shown in Table 5

Table 5. The average value of the research self-efficacy of the experimental group before and after research-based learning

Components	Timing	N	M	SD
Searching and synthesizing research results	Before	28	3.64	0.47
	After	28	3.89	0.42
Designing research	Before	28	3.46	0.49
	After	28	3.83	0.48
Analyzing data	Before	28	3.04	0.61
	After	28	3.45	0.51
	Before	28	3.29	0.53

Disseminating research results	After	28	3.59	0.51
Overall	Before	28	3.37	0.44
	After	28	3.71	0.42

When the average values of the research self-efficacy of the experimental-group student teachers before and after research-based learning were compared, it was found that research self-efficacy of the student teachers overall, and in four aspects, before and after research-based learning was different, with a statistical significance of 0.05. The average value of research self-efficacy was higher than before the experiment. The result was shown in Table 6.

Table 6. Comparison of the research self-efficacy of the experimental group before and after research-based learning

Components	Mean difference	SD	t	df	p
Searching and synthesizing research results	0.25	0.56	2.33	27	.03
Designing research	0.37	0.56	3.67	27	.00
Analyzing data	0.41	0.74	2.93	27	.01
Disseminating research results	0.30	0.63	2.54	27	.02
Overall	0.34	0.49	3.69	27	.00

7.3 Comparison of research self-efficacy after the experiment involving experimental group and control group

The average values of research self-efficacy in each aspect of the 28 experimental-group student teachers and the 27 control-group student teachers after the experimental group has had research-based learning and the control group has had conventional learning methods were evaluated. With regard to the aspects of design and data collection and data analysis, the experimental group had a higher value than the control group. The average value in terms of searching and synthesis of knowledge from research and research reports of the experimental-group student teachers and the control-group student teachers was similar. The result was shown in Table 7.

When the average values of research self-efficacy on the part of the experimental-group student teachers and the control-group student teachers after research-based learning and normal learning (after the experiment) were compared, it

was found that only the average values relating to design and data collection and data analysis were different with a statistical significance of 0.05. This shows that research-based learning made the level of research self-efficacy in design and data collection and data analysis of the experimental group higher than that of the control group. The result was shown in Table 8.

Table 7. The average value of the research self-efficacy of the experimental group and control group

Components	Group	N	M	SD
Searching and synthesizing research results	Ex.	28	3.65	0.46
	Con.	27	3.64	0.47
Designing research	Ex.	28	3.29	0.39
	Con.	27	3.45	0.49
Analyzing data	Ex.	28	2.94	0.48
	Con.	27	3.04	0.61
Disseminating research results	Ex.	28	3.03	0.56
	Con.	27	3.29	0.53
Overall	Ex.	28	3.22	0.37
	Con.	27	3.37	0.44

Table 8. Comparison of research self-efficacy after the experiment involving experimental group and control group

Components	Levene's Test		t-test for Equality of Means		
	F	p	t	df	p
Searching and synthesizing research results	0.04	.84	0.09	53	.93
Designing research	1.25	.27	-1.30	53	.20
Analyzing data	1.82	.18	-0.61	53	.54
Disseminating research results	0.63	.43	-1.76	53	.09
Overall	0.19	.66	-1.41	53	.16

8. Conclusions

The research-based learning methods in the classroom that were achieved consisted of 1) focusing on creating knowledge together with using examples or research details; 2) practicing thinking about research examples; 3) simulating activities related to research studies; 4) learning from real situations; and 5) tracking and giving suggestions on researching continuously. After using research-based learning, four components of research self-efficacy in the experimental group were significantly higher than before, at the level of 0.05. In addition, the research self-efficacy in terms of research design, data collection and data analysis of the experimental group were significantly higher

than that found in the control group, at a level of 0.05.

9. Discussions

The successful management of the research-based learning in research courses comprises five fundamental principles, namely 1) creation of the body of knowledge together with provision of research examples or particulars, 2) acquisition of a thinking skill based on the research examples, 3) simulation of research-related activities, 4) learning from real experience and 5) tracking and offering of advice on the ongoing research.

In the first and second principles, emphasising on the creation of the body of knowledge together with provision of research examples or particulars and on acquisition of a thinking skill based on the research examples, it can be seen that the nature of the research activities held every week is to stimulate thinking through good or bad examples related to research or research stages. The students themselves build the body of knowledge on research via these activities before the present researcher provides the knowledge so that the students can validate their previously created body of knowledge. These methods allow the learners to learn by trial and error, to be engaged in research practice and to not only be knowledge takers [1]. These methods are the basis that give students confident and make them believe that they are likely to be able to conduct research [4].

The other three principles, namely simulation of research-related activities, learning from real experience, and tracking and advice on the ongoing research, are simultaneous. In the management of all sessions of research courses, the students will be trained by research-related simulation; that is, the actual research project as one of their workloads. The students in the present researcher's experiment, however, will be different in that they will continuously be tracked and advised by the researcher, from selecting the research problem, revising the design of each student group and following up with clearly defined timeframe and milestones up to analysing the research data.

The only difference between the experimental and control groups in this research is the learning methods or activities employed. Although the instructors in both groups are two different people, they have talked about the extent of content, the learning objectives, and the main activities in which both groups need to participate as well as the order of the content in each week so that both groups are equal. The teaching method applied to the students in the experimental group will be different from that in the control group, as shown in the beginning. The present researcher has informally confirmed about the teaching method in the control group by

inquiring the instructors and students at particular sessions so as to ensure that both groups are really managed to learn differently. The control group mainly learns by lectures while the experimental one will learn from real experience via the research-related activities. When combined with continuous tracking as well as sharing and learning, the latter group will have a greater confidence in conducting research and also be able to do so properly throughout the entire procedure, whether it be to identify the clear research problem, to appropriately design the research, to share and learn, or to present their findings [6].

The research results showed that the level of research self-efficacy in every aspect of the experimental-group student teachers was higher after research-based learning. The aspects with the highest average value were searching and synthesis of knowledge from research and design, and data collection and data analysis. The reason why these two aspects had the highest average value may be that most subjects placed more importance on research design, which started from determining the research focus to drafting the research structure. The amount of research-based learning that most researchers had must be consistent with the content of each subject.

After quantitative data was considered, the overall research self-efficacy of the student teachers after research-based learning was higher in every aspect. Learning activities for student teachers are ongoing activities throughout. This will increase student teachers' confidence in researching through activities that are organized by the researcher as part of classroom activities. Activities that the researcher does regularly are using examples as main activities in the classroom and continuous discussion [2]. These activities help student teachers perform better, but one question that has not been answered in this research was 'Which activities are the main factor for student teachers to perform well?'. The answer will require additional research.

Research results also showed research self-efficacy in terms of the aspects of design and data collection and data analysis on the part of the experimental group to be higher than that of the control group with a statistical significance of 0.05, while in terms of other aspects, the research self-efficacy of the experimental group was higher than that of the control group but with no statistical significance. When the activities that the researcher organized for the experimental group were considered, it was found that most activities focused on research design, and practicing analyzing data linked to the design of the research in each aspect. In addition, recommendations were given and information was exchanged with regard to student teachers while they analyzed data in their groups. These activities are probably the reason for the

research self-efficacy of the experimental-group student teacher with regard to the aspects of design and data collection, with data analysis being clearly higher than that of the control-group student teachers.

10. Recommendations

The results showed that research-based learning could develop the research self-efficacy of student teachers. Therefore, when arranging courses related to research at the Bachelor's degree, Master's degree and Doctorate degree levels, instructors should focus on examples to be used in teaching so that student teachers are exposed to real research activities. In addition, student teachers should be exposed to thinking skills, because researching processes usually involve thinking in a number of different ways. On another note, instructors should supervise student teachers undertaking research and should focus on student teachers exchanging ideas with the instructors.

Even though the level of research self-efficacy with regard to the aspect of data analysis on the part of the experimental-group student teachers was different from that of the control-group student teachers with a statistical significance of 0.05, the average value was still lower in terms of other aspects. This research result showed that instructors should allow more time for student teachers to develop their analytical skills and interpret analysis results using computer programs, and in order to help student teachers understand how to analyze data and interpret analysis results.

The level of research self-efficacy of student teachers after the experiment using research-based learning was higher. Various methods or activities should be used in future research to allow greater in-depth analysis. The research self-efficacy of student teachers should be measured and evaluated after each learning activity.

A variety of factors will result in the higher level of research skill awareness of students. This study, however, looks into the management of the learning only because of time restrictions. Next research could add other factors as well as study effects of such awareness.

11. Acknowledgement

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