

Improving Efficacy of Pre-Service Teachers in Educational Research Through Peer Review Process

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Abstract

The purpose of the present research was to examine the effect of peer review on educational research efficacy of pre-service teachers. A quasi-experimental design with a pretest-posttest control group was adopted, over a period of 12 weeks using peer review process in the experimental group and lecture-based teaching in the control group. The participants of the research consisted of pre-service teachers ($n = 118$), enrolled in the faculty of education of a middle scale public university in the Central Anatolia Region of Turkey. In collection of the data, "Self-Efficacy for Research Scale of Teachers" (SCRT), was used to examine pre-service teachers' efficacy in educational research. According to the results, it was revealed that the experimental group in which the peer review process was conducted outperformed in the efficacy in educational research, compared to the control group. This result showed that peer review was more effective in the improvement of efficacy of pre-service teachers in educational research than the lecture-based teaching.

Key words: *Peer review, efficacy in educational research, pre-service teachers, quasi-experimental design*

Introduction

In recent years, engaging teachers in educational research has become an increasingly popular trend in education (Willekens, Consuegra, Struyven, & Engels, 2017) to close the gap between research and practice (Biesta, 2007; Broekkamp & Van Hout-Wolters, 2007). It is increasingly important for teachers to base their teaching practices on educational research findings (Gratch, 2002; Hemsley-Brown & Sharp, 2003); therefore, it is necessary to train pre-service teachers with high efficacy in research in teacher training programmes (Munthe & Rogne, 2015). Becoming “a teacher as researcher” is seen essential in teacher training (Cochran-Smith & Lytle, 1993), and it is considered as a way of sustaining lifelong learning of pre-service teachers worldwide (Munthe & Rogne, 2015).

Since both following and conducting educational research may lead to professional development (Everton, Galton, & Pell, 2000), pre-service teachers are expected to have adequate educational research efficacy (Gitlin, Barlow, Burbank, Kauchak, & Stevens, 1999). Improving efficacy of pre-service teachers in educational research is believed to contribute to pedagogical practices (Hemsley-Brown & Sharp, 2003), as well as school development (Nisbet, 2005) and reform initiatives (Newman, 1997). So getting pre-service teachers to have efficacy in educational research can make them reflect research findings on classroom practices (Hangreaves, 2000), which in turn contributes to the effectiveness of learning and instruction (Vanderlinde & Braak, 2010).

Because making pre-service teachers efficient both in conducting and following educational research has gained widespread attention (Munthe & Rogne, 2015), courses to support such efficacy have been integrated in teacher training programmes (Green & Kvidhal, 1990). It has been observed that even after completing such courses, pre-service teachers have difficulty in following and conducting educational research, and their efficacy in this area is considerably low (Demircioglu, 2008) due to a limited number of opportunities in practising research methodology (Hemsley-Brown & Sharp, 2003). Pre-service teachers, as the teachers of the future, are expected to bring solutions to the routine problems of classroom learning and instruction (Holmesland & Tarrou, 2001), yet their efficacy in educational research is not adequate (Kart & Gelbal, 2014). So, it can be claimed that educational research efficacy of pre-service teachers needs to be improved to support classroom learning and instruction. Getting feedback from peers can be considered an important way to provide support to the improvement of educational research efficacy of pre-service teachers (Liu & Carless, 2006).

Peer feedback, which scholars use in reviewing research papers to provide a critical contribution to the quality of papers (Mulder, Pearce, & Baik, 2014), is a frequently implemented instructional method with academic research in higher education (Huisman, Saab, van den Broek, & van Driel, 2019). Just as peer review is a fruitful way which forces scholars to assess, monitor, and regulate their research papers (Yore, Hand, & Florence, 2004), it can well contribute to the efficacy of pre-service teachers in educational research. Through peer review process, pre-service teachers can get a rich experience if they have an opportunity to review their peers' research papers, as well as their papers are reviewed by their peers. The use of peer review process may provide opportunities to pre-service teachers to engage in educational research context, and it may guide them to conduct and examine research papers more carefully in terms of, for example, purpose, literature review, methodology, and formatting guidelines, which may lead them to improve efficacy in educational research. Therefore, the purpose of the present research was to examine the effect of peer review on educational research efficacy of pre-service teachers through a quasi-experimental design. In achieving this purpose, the following research questions were addressed:

1. Is there a significant difference between pretest and posttest scores of the experimental group in terms of efficacy in educational research?
2. Is there a significant difference between pretest and posttest scores of the control group in terms of efficacy in educational research?
3. Is there a significant difference between experimental and control groups in terms of efficacy in educational research?

Methodology

Research Design

A quasi-experimental design with a pretest-posttest control group was adopted (Dugard & Todman, 1995), over a period of 12 weeks using peer review process in the experimental group and lecture-based teaching in the control group. The independent variable of the research was the use of peer review process, and the dependent variable was the efficacy in educational research of pre-service teachers.

Participants

The participants of the research consisted of pre-service teachers ($n = 118$), enrolled in the faculty of education of a middle scale public university in the Central Anatolia Region of Turkey. The participants were selected based on con-

venience sampling, which is a group of individuals who are available for study (Fraenkel & Wallen, 2009). Before implementing the experimental process in the research, a pretest was performed to test the equivalence of the experimental and control groups, which revealed no significant difference between the pretest scores of the two groups, with respect to defining problem $t(116) = .1372, p = ns$, identifying hypotheses $t(116) = 1.180, p = ns$, literature review $t(116) = 1.009, p = ns$, method $t(116) = 1.870, p = ns$, data analysis $t(116) = 1.627, p = ns$, and reporting $t(116) = 1.495, p = ns$, respectively. The experimental group comprised of 60 pre-service teachers with an age range of 19–21, and the control group comprised of 58 pre-service teachers with an age range of 20–21. The grade point average (GPA) of the participants was within a range of 55–93 on a 100-point scale in both groups. Also, most of the participants had middle parental socioeconomic status (SES), with an urban residence.

Instrument

In collection of the data, “Self-Efficacy for Research Scale of Teachers” (SCRT), was used to examine pre-service teachers’ efficacy in educational research through a quasi-experimental design (Akçölketin, 2019). The SCRT consists of 37 items with a six sub-factor structure (Reporting-*Item32* = I can complete the reporting phase considering the research as a whole; 7 items, $\alpha = .92$; Data Analysis-*Item26* = I can use both quantitative and qualitative analysis programmes; 6 items, $\alpha = .81$; Literature Review-*Item7* = I can examine the literature regarding the problem statement; 7 items, $\alpha = .89$; Method-*Item20* = I can define the limitations of research design; 6 items, $\alpha = .89$; Identifying Hypotheses-*Item14* = I pay attention to the rationality and clarity of hypotheses; 5 items, $\alpha = .88$; Defining Problem-*Item1* = I can define the problem statement by observing the environment/context; 6 items, $\alpha = .86$), with an overall Cronbach’s alpha value of .92. Besides, the results of the Confirmatory Factor Analysis (CFA) indicated that the scale has acceptable values (GFI = 0.77; CFI = 0.97; NFI = 0.95; RMSEA = 0.073; CFI = 0.97) to be used in further research (Akçölketin, 2019).

Procedure

The treatment process, adopting peer review in educational research, lasted for 24 hours with a period of 12 weeks. Although the content of the Educational Research Course in teacher training had a broad spectrum of subjects, for example educational ethics, the nature of educational research, and so on, it was restricted to the subjects consisting of “Defining Research Problem”, “Identifying Research Hypotheses”, “Literature Review”, “Methodology”, “Data Collection”, “Data Analy-

sis”, and “Reporting”, respectively. All the pre-service teachers in the experimental group were informed about how carry out the peer review process of research papers. Then, all the subjects in the syllabus were lectured orderly to pre-service teachers in the course, and they were asked to write/prepare the part of the research including the subject that was taught in each week. After preparing the related part of the research papers, they were delivered anonymously to pre-service teachers in the classroom to examine whether the papers are suitable, for instance, for defining research problem, data collection, reporting, and so on. Each week, pre-service teachers reviewed the research papers, and then the reviewer reports were re-delivered to the authors/researchers themselves. Based on the reviewer reports, the pre-service teachers attempted to regulate the research papers if necessary, or they advocated their papers by referencing educational research textbooks. The lecturer of the course played the role of an editor in the process, and he served in areas of receiving research papers from authors, delivering the papers to reviewers, and suggesting changes in the papers based on reviewer comments. On the other hand, in the control group the pre-service teachers were lectured based on the subjects of the course, and they were not included in a peer review process as in the experimental group. The pre-service teachers in the control group were lectured for a period of 12 weeks, and their efficacy in educational research were examined with a posttest in the same time with the pre-service teachers in the experimental group.

Data Analysis

Prior to the analysis, the data set was checked whether it demonstrated a normal distribution, which identifies the homogeneity of variances. The distribution of a data set determines the type of statistic that will be used in research; so, Kurtosis and skewness values were used to identify whether the data set displayed a normal distribution. Based on the results, it was indicated the pre-test and post-test scores obtained from the experimental and control groups from the SCRT demonstrated a normal distribution, ranging all between -1.96 and 1.96 (Tabachnick & Fidell, 2007). Thus, it was determined to use independent samples *t*-test to test the significance of the arithmetic means of the experimental and control groups. Also, in the comparison of pretest and posttest scores of each group, paired samples *t*-test was performed. When all the data were coded in MS Excel 2010, analyses of the research were performed through Statistical Package for Social Sciences (SPSS) 22.0. In all the statistical decoding, a significance level of .05, which indicates an error rate of 5%, was accepted.

Results

In this part of the research, the comparison of pretest and posttest scores gathered from the SCRT of the experimental and control groups were presented. Then, the posttest scores of the experimental and control groups were compared through an independent samples *t*-test. First, in the research the comparison of pretest and posttest scores of the experimental group was made (Table 1).

Table 1. Pretest and posttest scores from the SCRT of the experimental group

SCRT	Test	n	M	SD	df	t	p
Defining problem	Pretest	60	6.80	1.94	59	-41.080	.000*
	Posttest	60	23.90	2.71			
Identifying hypotheses	Pretest	60	7.10	2.50	59	-27.214	.000*
	Posttest	60	20.78	2.89			
Literature review	Pretest	60	6.70	2.18	59	-40.608	.000*
	Posttest	60	26.13	3.33			
Method	Pretest	60	5.43	.69	59	-38.312	.000*
	Posttest	60	21.05	2.89			
Data analysis	Pretest	60	5.46	.67	59	-37.177	.000*
	Posttest	60	18.80	2.60			
Reporting	Pretest	60	6.26	1.54	59	-39.046	.000*
	Posttest	60	25.16	3.87			

Note. * $p < .05$

According to the analysis, it was determined that there was a significant difference between pretest and posttest scores of the pre-service teachers in the experimental group in all sub-factors of the SCRT, regarding defining problem $t(59) = -41.080, p < .05$, identifying hypotheses $t(59) = -27.214, p < .05$, literature review $t(59) = -40.608, p < .05$, method $t(59) = -38.312, p < .05$, data analysis $t(59) = -37.177, p < .05$, and reporting $t(59) = -39.046, p < .05$, respectively. These results indicated that peer review process was effective in the improvement of efficacy of pre-service teachers in education research. Second, in the research the comparison of pretest and posttest scores of the control group was carried out (Table 2).

It was determined that there was a significant difference between pretest and posttest scores of the pre-service teachers in the control group in all sub-factors of the SCRT, regarding defining problem $t(57) = -30.408, p < .05$, identifying hypotheses $t(57) = -14.476, p < .05$, literature review $t(57) = -21.398, p < .05$, method

Table 2. Pretest and posttest scores from the SCRT of the control group

SCRT	Test	n	M	SD	df	t	p
Defining problem	Pretest	58	6.31	1.93	57	-30.408	.000*
	Posttest	58	18.01	2.48			
Identifying hypotheses	Pretest	58	6.63	1.65	57	-14.476	.000*
	Posttest	58	13.98	3.38			
Literature review	Pretest	58	6.34	1.58	57	-21.398	.000*
	Posttest	58	15.48	2.81			
Method	Pretest	58	5.22	.49	57	-14.229	.000*
	Posttest	58	12.55	3.87			
Data analysis	Pretest	58	5.29	.45	57	-13.770	.000*
	Posttest	58	11.13	3.08			
Reporting	Pretest	58	5.86	1.38	57	-27.256	.000*
	Posttest	58	20.89	3.74			

Note. * $p < .05$

$t(57) = -14.229, p < .05$, data analysis $t(57) = -13.770, p < .05$, and reporting $t(57) = -27.256, p < .05$, respectively. These results indicated that lecture-based teaching was effective in the improvement of efficacy of pre-service teachers in education research. Lastly, the comparison of posttest scores obtained from the SCRT of the experimental and control groups were displayed (Table 3).

Table 3. Posttest scores from the SCRT of the experimental and control groups

SCRT	Group	n	M	SD	df	t	p
Defining problem	Experimental	60	23.90	2.71	116	12.270	.000*
	Control	58	18.01	2.48			
Identifying hypotheses	Experimental	60	20.78	2.89	116	11.744	.000*
	Control	58	13.98	3.38			
Literature review	Experimental	60	26.13	3.33	116	18.736	.000*
	Control	58	15.48	2.81			
Method	Experimental	60	21.05	2.89	116	13.532	.000*
	Control	58	12.55	3.87			
Data analysis	Experimental	60	18.80	2.60	116	14.582	.000*
	Control	58	11.13	3.08			
Reporting	Experimental	60	25.16	3.87	116	6.080	.000*
	Control	58	20.89	3.74			

Note. * $p < .05$

According to the analysis, it was indicated that there was a significant difference between posttest scores of the experimental and control groups, in the favour of the experimental one in all sub-factors, regarding defining problem $t(116) = 12.270, p < .05$, identifying hypotheses $t(116) = 11.744, p < .05$, literature review $t(116) = 18.736, p < .05$, method $t(116) = 13.532, p < .05$, data analysis $t(116) = 14.582, p < .05$, and reporting $t(116) = 6.080, p < .05$, respectively. Therefore, it can be claimed that peer review is more effective in the improvement of efficacy of pre-service teachers in educational research than the lecture-based teaching.

Discussion

The present research attempted to examine the effect of peer review on educational research efficacy of pre-service teachers through a quasi-experimental design. According to the results, both the experimental and control groups improved the efficacy in educational research. However, when the posttest scores of both groups were compared with each other, it was revealed that the experimental group in which the peer review process was conducted outperformed in the efficacy in educational research compared to the control group. This result showed that peer review was more effective in the improvement of efficacy of pre-service teachers in educational than the lecture-based teaching.

Research has indicated that efficacy of pre-service teachers in educational research is low (Kart & Gelbal, 2014). Due to the fact that pre-service teachers have not adequate efficacy in educational research, they are unlikely to conduct (Sarı, 2006) and benefit from research (Baş & Kivılcım, 2017), which in turn may negatively influence their attitudes towards research (Shkedi, 1998). Therefore, efficacy in educational research is a competence in which pre-service teachers are to improve in teacher training (Gitlin et al., 1999). Indeed, the belief of pre-service teachers in terms of the advantages and applicability of educational research in schooling may make them benefit more from research findings, which in turn may contribute to their efficacy in this area (Biesta, 2007).

Although prior research has indicated that pre-service teachers have low efficacy in educational research (Gitlin et al., 1999; Kart & Gelbal, 2014), it has offered limited ways to improve such kind of efficacy. Peer review, one of the ways that can be used in learning and instruction in higher education, can well be used in teacher training, in terms of the improvement of efficacy in educational research of pre-service teachers. As the present research confirmed, peer review, just as scholars perform in reviewing manuscripts, has a significant contribution to the

improvement of efficacy in educational research. The research demonstrated that efficacy of pre-service teachers in educational research can be well improved through peer review process.

The benefits of peer feedback are well established in research literature (Hattie & Timperley, 2007), showing that it contributes fruitfully to the learning process of students in higher education (Huisman et al., 2019). Peer feedback, as the present research confirmed, may improve professional knowledge and practice of pre-service teachers as well (Hemsley-Brown & Sharp, 2003). When used in higher education, peer feedback not only creates high satisfaction level with the course and positive impact on learning amongst undergraduates (Mulder et al., 2014), but it can also result in student work of a higher quality (Mei & Yuan, 2010). Peer review is closely related to self-review or self-evaluation and encourages students to take an active, reflective role in learning that fosters advanced critical thinking and higher-level cognitive skills (Liu & Carless, 2006). As reviewers, pre-service teachers develop problem-solving skills because they have to analyse, clarify and correct each other's work, identify areas for improvement, and make constructive suggestions (Dochy, Segers, & Sluijsmans, 1999). Scholars report that peer review helps them assess, monitor and regulate their manuscripts (Yore et al., 2004), it can also be a critical aid to helping pre-service teachers conduct educational research. Peer review can help pre-service teachers particularly in educational research both write and evaluate manuscripts critically, which in turn improves their work and learning. Through peer review, pre-service teachers can have the advantage of evaluating each other's work, which contributes their learning from others' mistakes in conducting educational research. Peer review is an authentic scientific skill to help improve professional competence (Yore et al., 2004); thus, through it pre-service teachers, as aspiring researchers, would find opportunities to practise educational research in classroom learning and instruction.

Conclusion

The present research demonstrated significant results to be taken into consideration. The research indicated that peer review is effective in the improvement of efficacy of pre-service teachers in educational research. Peer review was found to be more effective than the lecture-based teaching in the improvement of efficacy in educational research of pre-service teachers. Peer-review helps pre-service teachers to be more involved in educational research, which in turn makes them to improve their efficacy in research area.

The present research has its limitations, of course. First, the research was conducted with only of pre-service teachers; all undergraduates taking similar courses in higher education were omitted. Further research may address this gap, and a similar study can be conducted with undergraduates who take research course. Second, the research adopted convenience sampling, that is, it was conducted with pre-service who were easily accessible. Lastly, the research took only educational research efficacy into consideration; however, it did not consider other variables such as critical thinking skills, problem solving skills, and so on. So, peer review may not only help pre-service teachers improve their efficacy in educational research, but it may also improve other skills related to research, such as such as critical thinking and problem solving skills.

References

- Akçölketin, A. (2019). The development of the teachers' self-efficacy scale regarding scientific researches. *Kastamonu Education Journal*, 27(6), 2713–2727.
- Baş, G., & Kılıncım, Z.S. (2017). Teachers' views about educational research: A qualitative study. *International Journal of Progressive Education*, 13(2), 60–73.
- Biesta, G. (2007). Bridging the gap between educational research and educational practice: The need for critical distance. *Educational Research and Evaluation*, 13, 295–301.
- Broekkamp, H., & Van Hout-Wolters, B. (2007). The gap between educational research and practice: A literature review, symposium and questionnaire. *Educational Research and Evaluation*, 13, 203–220.
- Cochran-Smith, M., & Lytle, S.L. (1993). *Inside outside: Teacher research and knowledge*. New York, NY: Teachers College Press.
- Demircioglu, I.H. (2008). Learning how to conduct educational research in teacher education: A Turkish perspective. *Australian Journal of Teacher Education*, 33(1), 1–17.
- Dochy, F., Segers, M., & Sluijsmans, D. (1999). The use of self-, peer and co-assessment in higher education: A review. *Studies in Higher Education*, 24(3), 331–350.
- Dugard, T.D., & Todman, J. (1995). Analysis of pre-test post-test control group design in educational research. *Educational Psychology Review*, 15, 181–198.
- Everton, T., Galton, M., & Pell, T. (2000). Teachers' perspectives on educational research: Knowledge and context. *Journal of Education for Teaching*, 26(2), 167–182.
- Fraenkel, J.R., & Wallen, N.E. (2009). *How to design and evaluate research in education* (7th ed.). New York, NY: McGraw-Hill.
- Gitlin, A., Barlow, L., Burbank, M.D., Kauchak, D., & Stevens, T. (1999). Pre-service teachers' thinking on research: Implications for inquiry oriented teacher education. *Teaching and Teacher Education*, 15(7), 753–769.
- Gratch, A. (2002). Teachers doing qualitative research: Examining school practices. *Educational Studies*, 33(4), 423–435.

- Green, K., & Kvidhal, R. (1990). *Research methods courses and post-bachelor's education: Effects on teachers' use and opinions*. Paper presented at the annual meeting of the American Educational Research Association, Boston, MA.
- Hangreaves, D. (2000). Teaching as a research-based profession: Possibilities and prospects. In B. Moon, J. Butcher, & E. Bird (Eds.), *Leading professional development in education* (pp. 200–210). New York, NY: Routledge & Falmer.
- Hattie, J., & Timperley, H. (2007). The power of feedback. *Review of Educational Research*, 77(1), 81–112.
- Hemsley-Brown, J.H., & Sharp, C. (2003). The use of research to improve professional practice: A systematic review of the literature. *Oxford Review of Education*, 29(4), 449–470.
- Holmesland, I., & Tarrou, A.L.H. (2001). Institutionalising research in teacher education: The creation of a research centre as a means of lifelong learning for teacher educators. *European Journal of Teacher Education*, 24(1), 67–76.
- Huisman, B., Saab, N., van den Broek, P., & van Driel, j. (2019). The impact of formative peer feedback on higher education students' academic writing: A meta-analysis. *Assessment & Evaluation in Higher Education*, 44(6), 863–880.
- Kart, A., & Gelbal, S. (2014). Determining prospective teachers' self-efficacy perception on scientific skills via pair-wise comparison method. *Journal of Measurement and Evaluation in Education and Psychology*, 5(1), 12–23.
- Liu, N., & Carless, D. (2006). Peer feedback: The learning element of peer assessment. *Teaching in Higher Education*, 11(3), 279–290.
- Mei, T., & Yuan, Q. (2010). A case study of peer feedback in a Chinese EFL writing classroom. *Chinese Journal of Applied Linguistics*, 33(4), 87–98.
- Mulder, R.A., Pearce, J.M., & Baik, C. (2014). Peer review in higher education: Student perceptions before and after participation. *Active Learning in Higher Education*. doi: 10.1177/1469787414527391
- Munthe, E., & Rogne, M. (2015). Research based teacher education. *Teaching and Teacher Education*, 46, 17–24.
- Newman, K.A. (1997). *Combining standards with changing teacher needs: Introducing teacher research strategies to preservice teachers*. Paper presented at the annual meeting of the American Association of College for Teacher Education, Phoenix, AZ.
- Nisbet, J. (2005). What is educational research: Changing perspectives through the 20th century. *Research Papers in Education*, 20, 25–44.
- Sari, M. (2006). Teacher as a researcher: Evaluation of teachers' perceptions on scientific research. *Educational Sciences: Theory & Practice*, 6(3), 880–887.
- Shkedi, A. (1998). Teachers' attitudes towards research: A challenge for qualitative researchers. *Qualitative Studies in Education*, 11(4), 559–577.
- Tabachnick, B.G., & Fidell, L.S. (2007). *Using multivariate statistics* (5th ed.). Boston, MA: Pearson.
- Vanderlinde, R., & Braak, J.V. (2010). The gap between educational research and practice: Views of teachers, school leaders, intermediaries and researchers. *British Educational Research Journal*, 36(2), 299–316.

- Willegems, V., Consuegra, E., Struyven, K., & Engels, N. (2017). Teachers and pre-service teachers as partners in collaborative teacher research: A systematic literature review. *Teaching and Teacher Education, 64*, 230–245.
- Yore, L.D., Hand, B.M., & Florence, M.K. (2004). Scientists' views of science, models of writing, and science writing practices. *Journal of Research in Science Teaching, 41*(4), 338–369.