Science Teachers' Self-Efficacy Beliefs Regarding to Use of Laboratory: Effect of Laboratory Applications Program

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Didem KILIÇ*, Özgül KELES**, Naim UZUN***

Extended Summary

Purpose

The current study aims to investigate the effect of the activity program called “Laboratory Applications for Science and Technology Teachers” on teachers’ self-efficacy beliefs regarding the use of the laboratory. For this purpose, the study seeks answer to the question “Do the teachers’ self-efficacy beliefs about the use of the laboratory vary significantly following the application of the program?”

Method

In the current study, one of the semi-experimental research models, single group pretest-posttest model was employed to determine cause and effect relationships between the variables. As the activity program developed within the current study needs to be implemented in a single group due to its purpose and content, single-group design was selected and thus the effect of the program on the teachers’ self-efficacy beliefs about the use of the laboratory was investigated. In line with the research model of the current study, pretest and posttest were administered to reveal the effect of the applied program on the teachers’ self-efficacy beliefs regarding the use of the laboratory.

The study group consists of 60 science teachers participating in the program of “Laboratory Applications for Science and Technology Teachers”. In selection of the participants for the program, those who have some difficulties in using the laboratory and conducting experiments required by the teaching program and having graduated from one of the departments of science, physics, chemistry or biology teaching were preferred. Of the total 261 teachers applying to participate in the program, 60 teachers fulfilling the criteria were selected to make up the study group. The participants are working in state schools located in 20 different cities of Turkey.

*Yrd. Doç. Dr., Aksaray Üniversitesi, Eğitim Fakültesi, didem@aksaray.edu.tr
**Doç. Dr., Aksaray Üniversitesi, Eğitim Fakültesi, ozgulkes@gmail.com
*** Doç. Dr., Aksaray Üniversitesi, Eğitim Fakültesi, naimuzun@yahoo.com
Within the context of the activity program called "Laboratory Applications for Science and Technology Teachers", laboratory experiments recommended in the curriculum of natural sciences course were conducted by the academicians. Throughout the five-day program, totally 44 experiments were conducted within 36 class hours. Before the experiments, the necessary theoretical information was presented by the instructors and then with individual or group participation depending on the content of the experiment, the experiments were conducted.

In order to investigate the participants’ self-efficacy beliefs about the use of the laboratory, “Laboratory Use Self-efficacy Perception Scale” was used. The scale consists of 18 five-point Likert type items. In the current study, for the whole of the scale, reliability value calculated through Cronbach’s alpha coefficient was found to be 0.87.

In order to determine whether the participants’ self-efficacy beliefs varied significantly after the application, dependent samples t-test was run to test the significance of the difference between the mean scores. Cohen d value was calculated for the effect size and then reported.

**Results**

As a result of the analysis of the descriptive statistics conducted, it was found that the difference between the pretest mean score of the participants ( = 73.73) and their posttest mean score ( = 79.35) is 5.62. In order to test the statistical significance of this difference, dependent samples t-test was run and it was found to be statistically significant (t(59) = -4.374; p<0.001). The effect size of this difference was calculated to be as Cohen d = 0.56. This value indicates a medium effect size. In light of these results, it can be claimed that laboratory applications program increased the participants’ self-efficacy beliefs regarding the use of the laboratory.

**Conclusion and Discussion**

In the current study, the effect of the activities carried out within the framework of laboratory applications program on the science teachers’ self-efficacy beliefs regarding the use of the laboratory was investigated. The results of the analysis showed that the laboratory applications program increased the participants’ test scores for the use of the laboratory and thus contributed to their self-efficacy beliefs. It was concluded that the participants’ self-efficacy beliefs improved after the implementation of the laboratory applications program.

As a result of the analysis of the data collected in the present study, the difference between the pretest and posttest scores was found to be significant and this shows that the participants’ self-efficacy beliefs about their capacity to conduct the experiments got stronger after the implementation of the program. Related literature has reported that individuals perform some activities and then they evaluate the outcomes of these activities, based on these evaluations, they develop a self-efficacy belief about performing similar activities and then they act depending
on their self-efficacy beliefs.

It is clear that effective implementation of laboratory applications is of great importance for the accomplishment of the objectives of science education. Thus, the laboratory utilization skills and knowledge of science teachers need to be developed and updated. In line with the findings of the current study, it can be argued that programs similar to the one developed in the current study should be offered to science teachers continuously so that they can learn how to conduct experiments through new approaches and simple materials. Such programs should focus on practice rather than theoretical information, and then they can make important contributions to the development of teachers’ self-efficacy beliefs regarding the use of the laboratory.

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