

BINDING THE SUSTAINABLE DEVELOPMENT AND THE CURRICULUM: THE EFFECT OF A TRAINING FOR PRE-SERVICE PHYSICS TEACHERS

This study aims to examine the effect of sustainable development (SD) training on pre-service physics teachers' binding SD and secondary education physics curriculum. The online training was given to 26 pre-service teachers by 8 trainers for 5 days with the support of TÜBİTAK 2237-A Scientific Activities Support Program. The content of the training consists of SD goals, applications intended for the goals, and how to teach physics with different education methods intended for SD goals. Before and after the training, the participants were asked to select the units they thought were related to SD in the secondary education physics curriculum of Türkiye. The data were analysed both based on grades in the curriculum and the units. As a result, there are notable increases in the number of grades bound and, in the units, bound the exception. In general, it was determined that the participants started to think about SD in a wider context after the training and made more bound.

Keywords: Sustainable development, physics education, physics curriculum

INTRODUCTION

At the beginning of the 2000s, no nation meaningfully reflects the philosophy of sustainable development (SD) in their education systems (Yapıcı, 2003). Uitto and Saloranta (2017), in their study, argue that an understanding that will integrate SD principles, values, and practices into all education should be included in school curricula, found that teachers can include SD in the education process in a narrow scope. In his study, Gökmen (2014) revealed that the shortcomings of teachers in incorporating SD targets into the education process date back to before starting their professional life.

On the other hand, increasing awareness of individuals on SD facilitates reaching educational goals (Brause & Wood, 1993). Considering the issues stated in the Sustainable Development Goals Evaluation Report (2019) report and the results of the studies above, it was given training to pre-service physics teachers through the project, titled "Physics Education for Sustainable Development" (Project Code: 1129B372200014) supported by the Scientific and Technical Research Council of Turkey (TÜBİTAK) in 2237-A Scientific Activities Support Program on how to give physics education associated with SD goals. this study aims to examine the effect of the training on the pre-service physics teachers' binding SD and the secondary education physics curriculum.

METHOD

The design of this study is a one-group pretest-posttest pre-experimental design. In such studies, there is an experimental group where only the pre-test and post-test are applied, there is no randomization, and an intervention is made between the pre-test and post-test (Salas Blas, 2013). Research data is collected quantitatively, and descriptive analysis is used in the analysis of the data.

Participants

Participants were selected from among the applicants who met the criteria during the application process for the training, which lasted approximately two months. During the application, the participant candidates were informed about the content of the study, and their approval was obtained. Therefore, the participants voluntarily participated in the study and the training. The criteria for participation in the Training are: (i) To be a pre-service teacher in the physics education department (ii) To be in at least the third year of education to have taken the basic courses.

19 of the 26 pre-service teachers who participated in the training, who completed the pre-test and post-test, constitute the sample of this study. The sample consisted of pre-service teachers from six different universities.

Training

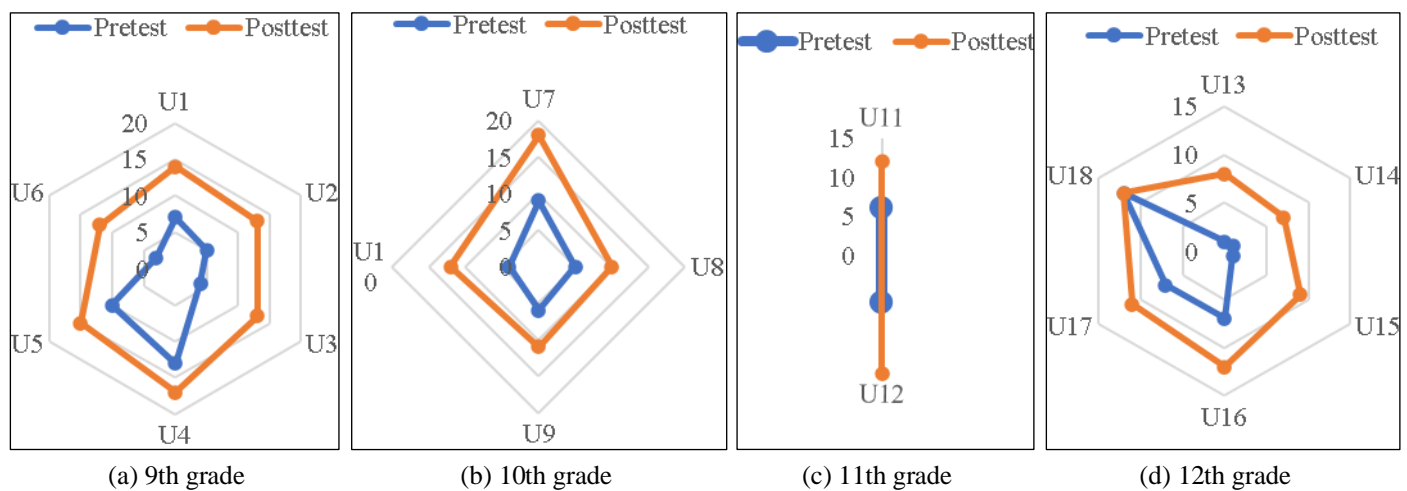
The training, titled "Physics Education for Sustainable Development", consists of 39 lectures of 30 minutes each over five days. The training was done online. Eight (4+4) lectures were held in two sessions per day (seven lectures on the last day as 4+3). The lectures are given by eight trainers with Ph.D. degrees in physics education. Lectures topics are on physics education for Sustainable Development via Creative Drama, Conceptual Change, Context-Based Approach, Digital Game-Based Education, Arduino, Problem-Based Learning, Argumentation-Based Learning, and Education for Visually Impaired Students.

Measuring Tools

In the study, the following question was asked to the pre-service teachers online both in the pre-test and in the post-test: "Which of the units in the secondary school physics curriculum do you think is bound to sustainable development? Please check." and they are given the units of the curriculum (Ministry of National Education, 2018) with a checkbox list.

RESULTS

In the pre-test and post-test, the participants' status of binding the SD and the physics units according to the grade level was examined. Although most of the participants were able to bind ninth-grade units and SD before attending the training, fewer bound units of other grades of the curriculum. After training, there is a dramatic increase in the number of bindings, especially in the units of 10th and 11th grade. Before the training, approximately 21% of the participants bind more than 50% of the units and SD. This rate increased from 21% to approximately 58% after training. All but two participants had an increase in the number of units bound SD. The number of binds for each unit in the pretest and posttest is presented in Figure 1.



U1: Introduction to Physics, U2: Substance and Properties, U3: Motion and Force, U4: Energy, U5: Heat and Temperature, U6: Electrostatics, U7: Electricity and Magnetism, U8: Pressure and Buoyancy, U9: Waves, U10: Optics, U11: Force and Motion, U12: Electricity and Magnetism, U13: Circular Motion, U14: Simple Harmonic Motion, U15: Wave Mechanics, U16: Introduction to Atomic Physics and Radioactivity, U17: Modern Physics, U18: Applications of Modern Physics in Technology

Figure 1. Number of participants binding units and SD in pre-test and post-test

According to Figure 1, the number of participants who bind all units and SD, except for the Applications of Modern Physics in Technology unit in the 12th grade, has increased. In this study, it was seen that units including mechanic energy, heat and temperature were most bound SD by the participants both before and after the study. On the other hand, the increase in the number of participants who bound units including electrostatics, electric and magnetism subjects with SD was the highest. When these two findings are

considered together, it can be deduced that the participants bind SD and units containing energy-related concepts.

DISCUSSION and CONCLUSIONS

The results of the study show that training has an effect on the increase in the amount and variety of binding SD and physics curriculum. It can be concluded that the training leads most of the pre-service teachers to think about sustainable development in a wider context.

While Training has increased the number of participants who bind SD and most units at a similar rate, electrostatic and motion and force units, which have a higher rate, draw attention. This shows that training has relatively more influence on pre-service teachers to bind the contents of these units and SD.

Nasri, Nasri, and Abd Talib (2020) found in their study that physics teachers generally understand SD in the context of environmental and future themes. Similar to the pretest findings of our study, they attributed these results to the teachers' lack of sufficient knowledge about other dimensions of SD. The potential of the training we provide in the project content to expand the SD perspectives of pre-service teachers can enable them to transfer their new perspectives to the coursework when they enter the teaching profession. It would not be wrong to think that teaching physics lessons with an emphasis on SD will increase awareness.

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