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# The use of out-of-the-school learning environments for the formation of scientific attitudes in teacher training programmes

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**Abstract**

The current research employing a case study, one of the qualitative research designs aims to examine the effects of out-of-the-school learning environments on prospective teachers' scientific attitudes. Maximum sampling, a purposeful sampling method, was employed in this research, and the study group was composed of the students attending the faculty of education. The data were collected through the "Scientific Attitudes Views Form" (SAVF) developed by the researcher, and were subject to content analysis. Consequently, it was found that out-of-the-school learning environments, especially science centers, had positive influences in students' attitudes towards science. Moreover, it was also found that the students established associations between science and daily life and that they were of the opinion that science was necessary for comprehending nature/environment and for facilitating the life. Following the application, the number of students wishing to be a scientist was seen to increase; which was supportive of the findings.

*Keywords:* Out-of-the-school learning environments, teacher training programmes, scientific attitude

## 1. Introduction

Out-of-the-class activities are defined as planned, programmed and regular work which is performed in school or outside the school in line with the educational purposes, based on students' interests and desires so as to develop students' personality with the school administration's knowledge and under the teacher's guidance (Binbaşıoğlu, 2000). Resnick (1987) differentiates sharply between the nature of ''school learning'' and ''other learning.'' To understand fully children's science learning, one should look not only at learning that takes place in the kindergarten and primary school but also at learning that takes place out-of-school. This is very important considering the fact that 85% of the time children are awake is spent outside the classroom (Eshach, 2007). Out-of-the-school learning is the education performed through a variety of channels outside the school. It includes such activities as watching TV, extensive reading, reading magazines and newspapers, visiting museums and science centres. The process enables the learner to control what, why, how and when he or she learns. Museums and science centers can contribute greatly to the understanding of science and encourage students to further their interests outside of school (National Research Council, 1996). Science enrichment programmes involve activities that are designed to supplement and/or reinforce formal classroom instruction. They offer learning experiences that are "above and beyond" the formal school

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curriculum and are non-evaluative and non-competitive (Caleon and Subramaniam, 2007). Out-of-the-class learning environments may be grouped into non-formal and informal science learning (Eshach, 2007).

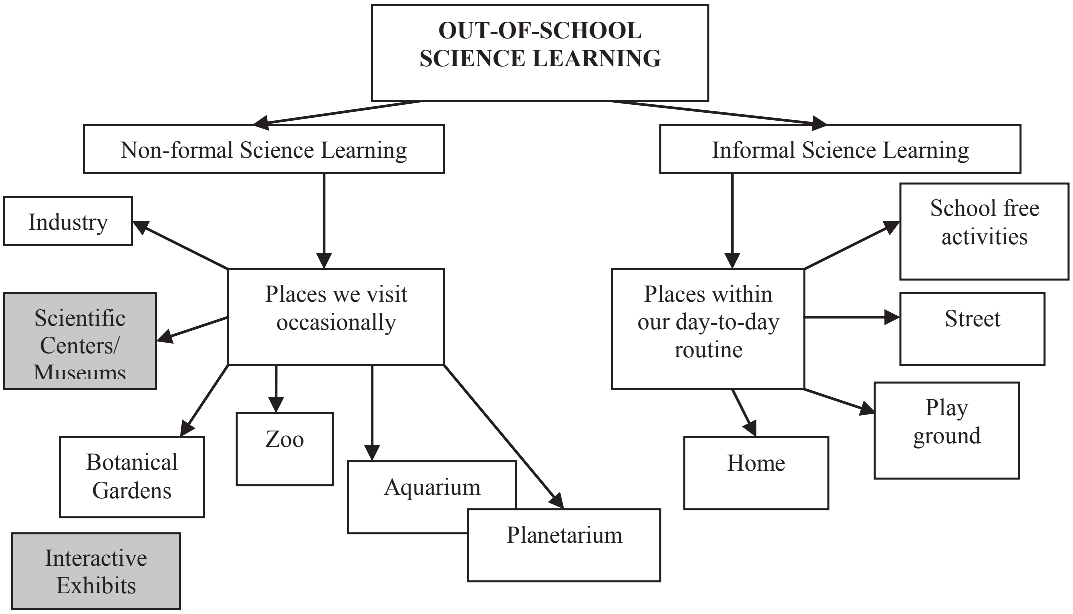


Fig 1. Out of school science learning

Out-of-the-class learning activities may be said to be as important as formal education in raising children in line with the expectations of the society and in achieving educational goals. Therefore, students must be provided with the opportunities for such activities. While providing the opportunities, students should not be left alone. Their out-of-the-class activities must be controlled by the school (Köse, 2004). Out-of-the-school learning makes significant contributions to students' in-class learning activities and to their life-long learning. Therefore, the quality of out-of-the-school learning environments should be considered in shaping the content of teacher training programmes. Thus, accessing to the knowledge, skills and values that are thought to be useful to the learners are targeted in programmes adopting constructivist learning approach (Yurdakul, 2007). This study aims to analyze the effects of out-of-the-school learning environments on prospective teachers' scientific attitudes and their teaching life in the future.

## 2. Method

This study uses a case study, a qualitative research design. In a case study, a case is researched in depth, and how the case is influenced/how the case is influential is explored in a holistic approach (Yıldırım and Şimşek, 2008). Out-of-the-school learning environments and scientific attitudes were considered as a case each in this study and the mutual influences were researched.

### *2.1. Study Group*

The research group was composed of 55 students attending the Faculty of Education (elementary school teaching, social studies teaching, science teaching departments) who were chosen through maximum sampling; and science centres (Feza Gürsey Science Centre) and museums (Rahmi Koç Science Museum, Ataturk's Mausoleum- historical museum) were chosen for application as out-of-the-school learning environments in the application process.

### *2.2. Data collection Techniques*

The research data were collected through the "Scientific Attitudes Views Form" (SAVF) developed by the researcher. The data collected may be in the form of observation notes, interview records, documents or graphic representations in qualitative research studies (Cohen, Manion and Morrison, 2007; Ritchie and Lewis, 2003). In this research, student answers stated in their handwriting were considered as the source of data. The SAVF consisted of nine open-ended questions. The items of the measurement tool were prepared in parallel to the “Scientific Attitudes Scale” developed by Moore and Foy (1997), and thus the validity of the measurement tool was achieved. The reliability of the SAVF was attained by comparing the conformity between the evaluators. The numbers of agreements and disagreements suggested by Miles and Huberman (1994) were calculated through the formula: Reliability=agreements/agreements + disagreements. The scores given by three evaluators were compared for the usability of the items in the SAVF. The conformity coefficient between evaluators for the nine items was found as .79.

### *2.3. The Application Process*

The application was done in a two-month period in the following stages: *(1) planning the activity* Having set the priorities and goals, the trip programme was prepared at this stage. *(2) Orientation* The trip programme was announced to the students. The places to visit, their features, importance and the rules were explained at this stage. *(3) Applying the measurement tools/obtaining the views (pre-application)* The measurement tool to determine the students’ scientific attitudes was applied a month before the application. *(4) Performing the application* Science centres (Feza Gürsey Science centre) and museums (Rahmi Koç Science Museum, Ataturk’s Mausoleum) were included in out-of-the-school learning environments. (*5) Applying the measurement tools/obtaining the views (post-application)* A post-application was done so as to determine the effects on students’ scientific attitudes.

### *2.4. Data Analysis*

The documents obtained were then analysed through frequencies analysis, one of the methods of content analysis. In this process, the stages of (1) encoding and selecting, (2) category developing, (3) determining the frequencies, and (4) achieving validity and reliability were taken.

## 3. Findings and Interpretations

Table 1. Students’ definition of a scientist

| Pre--application f (79) | Post-application f (121) |
|---|---|
| researches (7), curious (5), loving science (4), criticizes (3), questions (3), impartial, sticking to no ideologies (4), reaching conclusions through experiment-observation (3), establishes cause-effect relationship (3), thinks (3), devoted to science (3), other (42) | researches (20), questions (8), does experiments and observations (8), curious (5), makes equipment useful to humans (5), offers evidence, concrete (4), inventing, producing (4), studies science (4), contributes to the improvement of science (4), deals with reality (4), other (55) |

According to Table 1, defined a scientist with the concepts researches (7), curious (5), and loves science (3) in the pre-application; whereas they used the concepts researches(20), questions(8), and does experiments and observations (8) in the post-application. Besides, they defined a scientist with 79 concepts in the pre-application while they used 121 concepts in the post-application.

Table 2. Students’ Opinions of absolute Truth of Scientific Ideas

| Pre-application f (64) | Post-application f (81) |
|---|---|
| there are no absolute truths (10), truths are reached through experiments (4), a thesis can be refuted (3), changes occur in science with new findings (3), other (44) | there are no absolute truths for scientific ideas (11), a more reasonable thought may replace the previous one (8), through experiments and observations (4), can change in time (4),other (55) |

According to Table 2, 10 students thought scientific ideas were not absolutely true in the pre-application whereas 11 students believed they were not absolutely true in the post-application. Besides, the answers a more reasonable thought may replace the previous one (8), through experiments and observations (4) were the frequently given answers in the post-application.

Table 3. Students' thoughts about accessibility of things through science

| Pre-application f (57) | Post-application f (18) |
|---|---|
| no (19), we can access to science topics (4), it cannot account for metaphysics (3), some knowledge is dogmatic (2), we cannot know what a person thinks (2), dreams, spirit (2), it deals with only certain topics (2), other (23) | partly (10), we can access to thing related with nature (2), other (6) |

According to Table 3, students mostly gave "no" answers (19) in relation to accessibility of things through science in the pre-application whereas they gave the answer "partly" in the post-application. Moreover, the number of concepts in students' answers in the post-application decreased.

Table 4. Students' thoughts about scientists' contributions to accessing to solutions of problems

| Pre-application f (60) | Post-application f (79) |
|---|---|
| to a considerable extent (4), presents methods and techniques (3), I'm in establishing cause-effect relationships (3), other (51) | questioning (4), in problem solving (4), guiding (3), making life easy (3), can help very much (3), other (62) |

According to Table 4, students held positive views as to scientists' contributions in accessing solutions in the pre and post applications. However, in the post-application more concepts were formed.

Table 5. Students' definition of scientific knowledge

| Pre-application f (52) | Post-application f (67) |
|---|---|
| proven knowledge (12), based on experiments and observations (11), other (23) | accuracy was proven (21), based on experiments and observations (9), universal knowledge (7), other (27) |

The students explained scientific knowledge with the concepts of proven knowledge (12), and knowledge based on experiments and observations(11) in the pre-application whereas they explained it with the concepts accuracy was proven (21), based on experiments and observations (9), and universal knowledge in the post application.

Table 6. Students' thoughts about ways to reach Scientific knowledge

| Pre-application f (63) | Post-application f (81) |
|---|---|
| by researching (12), through experiments and observations (12), by questioning (5), in books (5), other (27) | through experiments and observations (24), by researching and examining (16), by questioning and criticizing (8), by curiosity (4), other (29) |

According to Table 6, ways to reach Scientific knowledge are by researching (12) and through experiments and research (12) in the pre-application whereas they are through experiments and observations (24), by researching and examining (16), and by questioning and criticizing (8) in the post-application. The number of concepts increased in the post-application.

Table 7. Students Views Concerning the goals of Science studies

| Pre-application f (49) | Post-application f (70) |
|---|---|
| understanding nature (9), raising students who question and make correct decisions (4), generating solutions (4), understanding liveliness and lively events (3), other (27) | understanding nature (8), making life easier (7), knowing and explaining scientific knowledge (4), accounting for natural events (3), finding answers to the unknown (3), encouraging into research (3), imagining and creating (3), having feelings and giving value (3), using and applying (3), other (33) |

According to Table 7, the goal of science studies was to understand nature (9) in students' belief in the pre-application whereas it was to understand nature (8) and make life easier (7) in the post-application.

Table 8. Students Views concerning everybody's understanding science studies

| Pre-application f (63) | Post-application f (74) |
|---|---|
| everybody should understand it (12), no (10), to make life easier (4), for the improvement of society (4), to use it in problem solutions (3), to a certain extent (3), to know what the objects were made of (3), other (22) | yes, they should understand it (20), no they don't have to (6), to make our life easier (5), to understand nature/environment (8), they should understand it at least at the minimum (3), to understand the environment we live in (3), because it is the life itself (3), other (26) |

As is clear from Table 8, students answered the question "should everybody understand science studies?" as everybody should understand it (12) and no they shouldn't (10) in the pre-application. Those who gave positive answers to the question gave such reasons as making life easier (4) and the improvement of society (4). In the post-application, however, the views changed into yes, they should (20). The reasons for it were: understanding nature/environment (8) and making our life easier (5).

Table 9. Students' views about being a scientist

| Pre-application f (62) | Post-application f (86) |
|---|---|
| yes, I'd like to be (16), no, I wouldn't (8), researching is not for me (4), other (31) | yes, I'd like to be (24), to be useful to humanity (8), researching (6), no, I wouldn't (5), thinking, questioning, criticizing person (5), other (35) |

According to Table 9, 16 students wanted to be a scientist in the pre-application while the number climbed up to 24 in the post-application. The reasons such as" making life easier" (3) and "researching is not for me" (4) were stated in the pre-application whereas reasons such as "thinking, questioning, criticizing person" (5) and "I think I am skillful" (2) were given in the post-application.

## 4. Conclusions and Recommendations

It was found that the number of concepts used in students' answers increased for each item in the post-application. This situation may be interpreted that out-of-the-school learning environments make positive contributions to students' scientific attitudes. However, the number of concepts used in answers to the question "Can we reach everything needed to be known through science?" decreased in the post-application. Here the students responded "no" in the pre-application, yet their answers changed into "partly yes" in the post-application. This can be interpreted as a change of negative attitudes.

The students emphasized the concepts of researching, curious and person with love of science in defining a scientist in the pre-application while the ordering of the concepts changed into a person researching, questioning and doing experiments and observations in the post-application.

The opinions on the solution of problems held by students were positive both in the pre and post-applications. Besides, the number of examples as to the scientists' contributions increased in the post-application.

In relation to the ways to reach scientific knowledge, students used the answers "through experiments and observations", and "by researching and examining" more often in the post-application. This situation indicates that out-of-the-school learning environments make significant contributions to the improvement in students' experimenting and observation skills.

Whereas students stated the goal/goals of science studies as comprehending nature in the pre-application, they stated it/them as understanding nature and making life easier in the post-application. In addition to that, half of them gave a yes answer to the question "should everybody understand science studies?" And the answers all changed into "yes" in the post-application. The reasons were "making life easier" and "improvement of society" in the pre-application whereas they were "understanding nature/environment" and "making our life easier" in the post-application. This situation shows that out-of-the-school learning environments, especially the learning centres have positive effects on students' attitudes towards science. The reason is that the connections between science and daily life became more prominent in the post-application. The students hold the view that science is necessary for understanding nature/environment and for making life easier. An increase in the number of students who would like to be scientists was found in the post-application, which was supportive of the finding.

The findings have shown that an effective use of out-of-the-school learning environments may be influential in changing students' scientific attitudes in a positive way. Thus, out-of-the-school learning environments should be used in designing the courses and specifying the course contents in faculties of education. In this process, activities containing aim-focused and long-term out of the school learning environments could be included in the programme.

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## References

Binbaşıoğlu, C. (2000). Okulda ders dışı etkinlikler. MEB Öğretmen Kitapları Dizisi, Milli Eğitim Basımevi, İstanbul.

Caleon , I. S., & Subramaniam, R. (2007). Augmenting Learning in an Out-of-school Context: The Cognitive and Affective Impact of Two Cryogenics-based Enrichment Programmes on Upper Primary Students. *Res Sci Educ*, 37:333–351.

Cohen, L., Manion, L., & Morrison, K. (2007). Research methods in education. New York: Routledge.

Eshach, H. (2007). Bridging in-school and out-of-school learning: formal, non-formal, and informal education. *Journal of Science Education and Technology*, 16, 2.

Köse, E (2004). İlköğretim öğrencilerinin ders dışı etkinlikleri tercih etme nedenleri. XIII. Ulusal Eğitim Bilimleri Kurultayı, İnönü Üniversitesi, Malatya.

Miles, M.B., & Huberman, A.M. (1994). Qualitative data analysis. Thousand Oaks, CA: Sage.

Moore, R. W., & Foy, R. L. H. (1997). The scientific attitude inventory: a revision (SAI II). *Journal of Research in Science Teaching,* 34(4), 327-36.

National Research Council. (1996). National science education standards. National Academy Press, Washington, DC.

Resnick, L. B. (1987). Learning in school and out. *Educational Researcher* 16: 13–20.

Ritchie, J., & Lewis, J. (2003). Qualitative research practice. London: SAGE Publications.

Yıldırım, A., & Şimşek, H. (2008). Sosyal bilimlerde nitel araştırma yöntemleri. Ankara: Seçkin Yayınevi.

Yurdakul, B.(2007).Yapılandırmacılık. (Ed. Demirel, Ö.). *Eğitimde yeni yönelimler*. Ankara: PegemA Yay.