The Investigation of The Effect of Visiting Science Center on Scientific Process Skills

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Abstract

Science centers are a learning environment which aims to increase positive attitudes towards science by hands on experiments. The mission of this environment is to develop basic skills for science and keep the interest alive. The aim of this study was to investigate the effect of visiting Bursa Science and Technology Center on 6. grade students’ scientific process skills. As a consequence of the research the regularly visiting of the science center is effective on students’ scientific process skills. In this perspective, science centers have an important role for making practice and development scientific skills in Science Education.

1. Introduction

The idea of science promotion in the social structure and application of this idea is gradually increasing in recent years. Today, this idea is particular making a mark in science education objectives, achievements and educational policies. The individuals that have characteristics of the lifelong learning programs, science-technology-society-environment relationship was required to train in science education. Science education will be provided for life-long learning in this direction and are intended to be related with daily life. Non-school educational experiences were necessary to be done in a systematic way as well as in school for the realization of this goal. The renewal

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movements in science education increased the importance outside of school (Ogawa, Loomis and Crain 2007). Science centers were an educational environment that designed to meet this need. This interaction environment was designed to creation of knowledge as an active ways, testing of existing knowledge, appeal to multiple senses to learn, ensuring long-term learning, development of skills such as conducting experiments and discovery. Science centers aims to teach discover information but not present. Science centers were a learning environment that could everyone freely explore, make the experiment and create their information unlike Science and Natural History museums. This free learning environment that appeals to all age groups in society increases the interest for science and technology (Rennie and Jonston 2007). It is important to increase the level of interest in science for lifelong learning. Students’ attitude and interest levels were not to decline at the end of a two-month period (Jarvis and Pell 2005). This increasing level of interest that occurs in permanently in the life was important to adapted science in daily life. In addition, students' regular visits to science centers have a positive increase on attitude toward the science lessons (Radzilowicz 2008). This result is shown that science centers are carried out for school learning. The resulting increase in interest and attitudes because of personal own efforts can be said science centers have an important role in science learning. Information that learned in the school process, integration of experiences in science centers benefits to individuals in terms of cognitive development (Boram 1991).

Science Centers also provide significant improvements in educational activities at the school. It has a positive effect on meaning of school learning and the level of discussing the scientific subject. (Guisasola at all 2009). Science Centers with rich interactive media, performed making in real life and permanent in school science learning. Students’ activities in science centers related to understanding better the scientific concepts and skills to explore these concepts in meaning of cognitive sense (Dewitt and Osborne 2010).

The primary purpose of science centers to provide scientific skill and enable individuals to reach knowledge rather than to present information. The hands-on activity with intensive interaction was provided psycho-motor and cognitive skills. Experiment skill that included both science skills was used extensively in the science center. Research show that learning activities in science centers was developed conducting experiment skills, and these skills have been effected permanently (Bamberger and Tali Tal 2008). Visitors will see the cause-effect relationships, understand the results of changing variables when completed each hands-on activity. They were the active learner in this process. Moreover, they understand the process and method for complete hands-on activities. Scientific process skills were plays an important role in completion experiment activities, meaning of content and harmonizing with daily life. Scientific process skills were grouped in basic skills and integrated process skills. Basic process skills were been; observation, measurement, classification, data recording, number and spatial relationship. Integrated process skills were identified as controlling and identifying variables, generation hypothesis and testing, data interpretation, work to tap the definition, defined as conducting experiments and modeling. Each of scientific process skills used in science education as active ways. Students have to be active and make the hands-on experiment in science education provides the positive development of the scientific process skills (Ozdemir and Presley 2007). Science education program should provide that interactively environment an adequate level. The increase of interaction in the learning environment has the opportunity to the development of these skills. However, textbooks which used in our country did not include these process skills a systematic way(Dokme 2007). In addition, the renewed science books and programs intended to gain more knowledge and attitudes but not adequate in terms of scientific process skills (Tannverdi 2009). Scientific process skills should be used in a systematic and intensive for development of continuous and long-term learning. Science education programs that conducted in elementary schools did not offer sufficient to development of these skills. The out-of-school experiences were very limited for provided opportunities of the development of the scientific process skills. There was not any content was found in the media which effective out of the school life, about the scientific process skills (Kavak, Tufan and Demirelli 2006). This reveals the need for made school learning meaningful, related to cognitive and psycho-motor area, which addresses the use of processing skills in a systematic and intensive way.

Students were constantly active learning with the complete different experiments and activities in science. They constantly used cognitive and psycho-motor skills and scientific process skill for complete activities in a meaningful way. The studies that related to science centers were examined the factors such as meaningful learning, attitude,
motivation, scientific communication and exploring skills. The review of the literature showed that there was not any study about science center and scientific process skill. Aim of this study; investigate the primary school students' regular visits to Bursa Science and Technology Center and their scientific process skills.

2. Method

Study was conducted with 50 sixth grade students with the experimental method. 25 students were in experimental group and 25 students in the control group. Experimental and control groups were selected at the same school in two different classes. Groups were determined randomly. 6. grade students were in 12 and 14 age group. The number of boy and girl students of the experimental and control group are given in table 1.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Gender</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experiment Group</td>
<td>16</td>
</tr>
<tr>
<td>Control Group</td>
<td>12</td>
</tr>
</tbody>
</table>

Both groups' students were learning same issues in science lesson. The scientific process skill test was used to measure students' science process skills. It has been developed by Burns, Okey, and Wise (1985) and adaptation of Turkish was made by Ozkan, Aşkar and Geban (1991). This test consisting of 36 multiple choice questions as; identify the variables (12 questions), life oriented identify (6 questions), create hypothesis (9 questions), graph and interpret data (6 questions), research design (3 questions). It was given 1 point for each correct item. Ozkan, Aşkar and Geban (1991) were calculated tests’ reliability coefficient of 0.82 (Tezcan and Yılmazel 2004).

Study was conducted over the six weeks period. Before the study, the scientific process skills test administered to both groups. Experimental and control groups were determined according the pre-test scores. The experimental group students visit Bursa Science and Technology Center in 2-week intervals. Bursa Science and Technology Center was temporarily opened in Bursa Merinos Atatürk Congress and Culture Center for experimental group. Each of 50 hands-on exhibits working with the active participation of students. This hands-on exhibit were related to mechanical, electrical, electronic, light, sound, fluids, weather events, space-astronomy, communication technology, mathematics and biology. The experimental group of students used all exhibits in a six-hour period. Science course conducted with two groups simultaneously.

Study carried out in accordance to experimental model with control-group. Students’ scientific process skill was examined in this study with experimental group students made regular visits to science centers.

3. Finding

T test was performed for the determined experimental and control groups' differences in terms of scientific process skills at the beginning and the end of the study. Correlation analyze was used to determine the relationship between post-test scores and Bursa Science and Technology Centers’ visits. T test was performed for the determined for whether a difference between experimental and control groups in terms of scientific process skills at the beginning of the study and after the six weeks period T test was performed again for determined a difference between experimental and control groups. The findings of both the test results were given in table 2.
Table 2. Experimental and Control Groups Pre-Test Post-Test Scores

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Experimental groups (n = 25)</th>
<th>Control groups (n = 25)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-test</td>
<td>Post-test</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
</tr>
</tbody>
</table>

According to the T-test results, there was not a statically significant difference between the experimental and control groups at the beginning of the study. Pre-tests' scores were close to both groups in each other. Scientific process skills test was applied at the end of the study. A T test was performed for comparison between experimental and control groups' post-test scores. A statically significant difference was found between the experimental and control groups in the mean of post-test scores (p<0.001).

Correlation analysis was performed to determine a significant relationship between post-test scores and count of Bursa Science Center visits. The findings are also given in Table 3.

Table 3 Relationship Between Science Process Skills and Science Center

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Students (n= 50)</th>
<th>Post-test</th>
<th>Pearson Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Science Center Visit</td>
<td>0.0001</td>
<td>0.721**</td>
<td></td>
</tr>
</tbody>
</table>

As seen Table 3, there was a statically significant relationship between students' visits to Bursa Science and Technology Center and post-test scores. As a result of high correlation coefficient, there was a strong relationship between the variables.

4. Conclusion

In this study, which included primary school children, science centers' regular visits and their effect on scientific process skills were investigated. A statistically significant relationship was found between science center visits and scientific process skills in the study, which was used with an experimental method. This result shows that science centers have more effective in developing scientific process skills than schools and similar institutions.

Scientific process skills provide lifelong learning and effective on skill-based learning in science education. These skills were not developed in school environments. Science education programs did not have a systematic structure in terms of developing these skills. Students couldn't use their scientific process skills because of the weaknesses in schools' interaction environment. The number of students, materials, freedom to learn, interaction environment, and time for making experiments play an important role in students' active participation. But each student has the opportunity to test hands-on activities in the science centers. The number of students will not be more restrictive in making the experiments. Many hands-on specific areas allows students to make different experiments. This area provides learning skills to be comprehensive in each science subject and it has a great influence on students' school experiences.

Hands-on activities, which were made in science centers, increased students' motivation (Sakari 1993). Experimental group over a period of 6 weeks of study had at least 1, more than 3 times visits to the science center. Each visit was between 2 weeks. Students were carried out 50 different hands-on activities during the study. A high level of meaningful relationship was found between visits to science centers and development of scientific process skills. This result shows that cognitive process skills should provide more with science centers' visit. Increasing the number of hands-on activities can provide a positive contribution to the development of these skills.
Making experiments in the school have affected the scientific process skills (Bilgin 2006). However, science centers were a specific area where in order to develop exploratory and experimental skills. Teachers and educational institutions will provide with regular visits to these centers.

References


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