Science Process Skills in Hands-on Science Activities

Ela Ayse Koksal
Secondary Science and Mathematics Education
Faculty of Education
Middle East Technical University
06531 Ankara Turkey
ela@metu.edu.tr

Fulya Oner
Elementary Science Education
Faculty of Education
Erciyes University
38039 Kayseri Turkey
fulyaner@yahoo.com

Abstract. *This study intended to give information about teachers' opinions on science process skills in hands-on activities. For this purpose, a qualitative case study was performed in two elementary schools, each of which is implementing different programs. The reason to select these schools was to understand whether the teachers' opinions on hands-on activities differ according to the curricula. This is the second aim of the study. The first school is an ordinary school whereas the second is designed for gifted students, aims to nurture them as the future scientists and artists of Turkey.*

Keywords. Hands-on science, science process skills, teachers' opinions.

1. Introduction

As it is known science process skills are the skills and knowledge students use in scientific inquiry, whereas hands-on science activities help students to understand the science phenomena while manipulating the objects. The instruction which bases each method makes the students active. Science process skills of inquiry activities include the skills of observation, classification, measurement, interpretation of data, formulation and testing hypothesis, and experimentation, etc (Temiz & Tan, 2003).

On the other hand, hands-on activities develop students' observation, hypothesis, inference, prediction, and experimentation skills (Willison, 1996 as cited in Hardal, 2003). In addition to these developed knowledge and skills, inquiry and hands-on activities help students to gain positive attitudes toward science.

As summarized beforehand, the research studies on hands-on science activities have found that students' cognitive, psychomotor and affective characteristics improve as they engage in these activities. However no such study focused on how teachers develop hands-on activities considering science process skills in mind was found.

This study investigated teachers' opinions about science process skills mentioned in hands-on science activities. For this aim, a qualitative case study was done with elementary teachers from two Turkish elementary schools, each of which is implementing different science programs, representing each case. The first school is using the current science curricula, whereas the second is in fact a science and arts centre in an elementary school. Science and art centers (SAC) are for education of gifted children (Gokdere et al., 2003 as cited in Gokdere & Cepni, 2004) and their teachers are selected from the teachers who are successful at the oral exam taken after a seminar.

The reason to select these schools is whether the participant's opinions on hands-on activities differ according to the curricula implemented. This is the second aim of the study, because each curriculum expects teachers to use different methodologies to achieve the outcomes predetermined by the Ministry of National Education in Turkey. It can be said that the first school is close to student-centered education. On

the other hand, the third institution is designed for gifted students, aims to nurture them as the future scientists and artists of Turkey, and as it is thought does not have a corresponding place when we considered its philosophy in terms of the continuum of student- and teacher-centered education.

This study intended to give information about what teachers think about science process skills mentioned in hands-on activities, how these opinions differ from or resemble to each other. Additionally it was expected to understand how curricula make a difference in the way teachers think about science process skills mentioned in hands-on activities.

2. Literature Review

There are several factors that influence science teaching: It has been stated that the system and school context of curriculum control science teaching practices mostly in negative way (Appleton & Kindt, 1999).

Another factor affecting science teaching is lack of science teaching resources. This could result in a topic not being taught, determine how a topic was taught or determine the actual activities children engaged in (Appleton & Kindt, 1999).

3. Methodology

Two classroom teachers from one elementary school and two science teachers from a science and art center were interviewed after the semester was over with respect to their opinions on science process skills in hands-on science activities and the aim, content, materials and evaluation of the activity.

The limitation of the study was triangulation, use of other data sources, since the schools were closed and in summer holiday, we only interviewed with the teachers.

Data analysis required reading of the field-notes that taken during the interviews. It started with predetermined list of coding, determination of more broad categories and ended with interpretation of phenomena being studied. Moreover the cases, two institutions, were compared with each other and conclusions were done.

The analysis of data was given as subtitles in the results section.

4. Results

4.1. How teachers see hands-on activities?

The teachers of elementary school stated that they see the hands-on science activities as either a concrete material to be done by the students or a cause and effect relationship developed in the students. For example, in the activity that included making a tape measure and measuring length was stated by these teachers as a concrete material, whereas another activity which involved falling of an iron and a plastic balls from the same height was seen by these teachers as an activity cause and effect relationship.

On the other hand, the teachers of SAC see the hands-on activities as an opportunity to make the students love science.

4.2. How science teaching resources effected implementation of hands-on science activities?

For especially the elementary school science program, it can be said that text-books serve as teacher materials because hands-on activities included in these resources (in fact, the interview with these teachers were made according to the hands-on science activities found in the text-books).

However for the SAC science program, the teachers stated that they should find the hands-on science activities, since there is no text-book to use.

4.3. How program effected implementation of hands-on science activities?

The teachers of elementary school use both the program and the text-books in implementation of hands-on science activities.

On the contrary, the teachers of SAC stated that they use the subjects outlined in the gifted education program they used in their center. As they stated, the program begins with Adaptation, goes with Support and Individual Abilities, and ends with Project. When we interviews with them, they were doing Support education, therefore they selected activities suitable to this subject, but considering their own subject areas. For example one of the teachers, originally a chemistry teacher, said that she made “acid and

base in foods" activity, while another teacher, originally a biology teacher, preferred her students to watch a n educational CD showing experimental researches that studying adaptation of animals to changing environment.

4.4. Which science process skills addressed in hands-on science activities?

The teachers of elementary school made use of observation, inference, measurement, experimentation in hands-on science activities.

On the contrary, the teachers of SAC stated that they made use of observation, classification, measurement, experimentation, inference, application and generalization in hands-on science activities.

5. Conclusion and Suggestions

This research showed that the degree of science program on teachers' use of hands-on activities is considerable important.

Affective characteristics of teachers should be studied by future researches. Self-confidence, sense of self-as-teacher, for example as stated by Appleton & Kindt (1999) is a factor that influences effectiveness of science teachers and the topics and teaching style they choose.

Textbooks should serve as a good teacher and student reference and detailed information about science process skills.

7. References

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