Available online at www.sciencedirect.com

ScienceDirect

Procedia Social and Behavioral Sciences 1 (2009) 890–895

Procedia
Social and Behavioral Sciences

World Conference Education Science 2009

Determining science teachers' ideas about the science process skills: a case study

Fethiye KARSLI[a], Çiğdem ŞAHİN[b], Alipaşa AYAS[c]*

a.bGiresun University, Faculty of Education, Giresun, 28200, TURKEY
[c]Karadeniz Technical University, Faculty of Education, Trabzon, 61335 Söğütlü – Trabzon/ TURKEY

Received October 20, 2008; revised December 11, 2008; accepted January 02, 2009

Abstract

The aim of this study is to investigate science teachers' ideas about the science process skills (SPS) using qualitative analysis. This study was carried out at the first term of 2008- 2009 academic year. A case study research methodology was used. The sample of this study consisted of 10 science teachers (ST), who has been working at Giresun center elementary schools in Turkey. A semi-structured interview procedure was used to collect data. The collected data were analyzed with Nvivo 8 program. The results indicate that the majority of sample have not had widespread theoretical knowledge on SPS.

Keywords: Science and technology; science process skills; science teacher.

1. Introduction

The knowledge that the world society has is improving and increasing so fast as a result of testing of new ideas around the world in either research institutions or else. It is not possible to have students to grasp all information in any of the discipline. On this account it is accepted that to teach the ways of reaching information instead of teaching the known in any educational system at the present day (Mallinson:Mallison, 1998). The students need the process skills both when doing scientific investigations and in their learning process (Harlen 2000; Taconis, Ferguson-Hessler & Broekkamp 2000). For these reasons, students should be informed about the importance of SPS. In some of the societies classical methods are limiting education thus the most of the students don't even literate as scientific when they graduate from their schools. They are not ready to join a society based science and technology or to guide this society (Hurd, 1991:33). All students who graduate from schools have to know 'what scientific research is', be aware of 'how science is connected with their culture and life' and gain some basic concepts, skills and attitudes. SPS defined as the adaptation of the skills used by scientists for composing knowledge, thinking of problems and making conclusions (MNE, 2006; Temiz, 2007). Çepni et al. (1997) also

*Alipaşa AYAS ;
E-mail address: fethiyekarsli28@gmail.com.

1877-0428
doi:10.1016/j.sbspro.2009.01.158

defined SPS as facilitating basic activities as regards learning science, gaining research method and techniques, helping students to be active and to make learning lasting. It is expected from individuals to be able to aware of and describe and solve individual and socials problems. To have and use SPS is very important in learning problem solving. Besides, SPS have great influence on developing other higher mental processes such as critical thinking and decision making (Lee, Hairston, Thames, Lawrence, and Herron, 2002; Tan, and Temiz, 2003; Arslan, and Tertemiz, 2004; Koray, Köksal, Özdemir, and Presley, 2007). Individuals who developed higher mental processes can think creatively and they can transfer this ability to the other disciplines (Meador, 2003). To be aware of the problem and formulate hypothesis are also components of SPS. On this account, it is mentioned that individuals who can use SPS are better about their scientific creativity (Cheng, 2004; Hoover, 1994; Hu ve Adey, 2002; Innamorato, 1998; Liang, 2002; Meador, 2003; Roberts, 2003). For this reasons, SPS should be gained to the students in a systematic way from pre-school to up until the final stage of the formal education. In this context, in order to have the new generation the science process skills, teachers at first hand have to have these skills.

Therefore, teachers should have gained the SPS theoretically and practically. In our country teacher guide book was prepared to have science teachers be aware of SPS by the Ministry of National Education in 2006. Thus, the topic of this study is to investigate whether teacher guide books effects the science teachers' ideas on SPS.

2. Methodology

A case study research methodology is used in this study. This study was carried out in the first term of 2008-2009 academic year. The sample of this study consisted of 10 science teachers (ST), who work in the elementary schools of Giresun city center in Turkey. To collect data a semi-structured interview procedure, included 6 questions related to SPS, was used. A group of experts were asked to comment on the reliability of the interview questions. They indicated that the questions were on purpose. Science teachers' ideas about SPS were examined with these interview questions in detail. Interview data were quantitatively analyzed by making use of NVivo 8 program. According to the content analysis of data, tree and free nodes were composed from science teachers' (ST') statements. To acknowledge reliability of data, ST' statements were given as quotation and ST were represented with letter from A to L. The data are presented in tables in the following section. The curriculum of science and technology course in elementary schools was developed by the Ministry of National Education in Turkey (NME-T) in 2006 and it has been emphasized seven categories. These categories are nature of science and technology, key words related with science concepts, science process skills, Science- Technology- Society- Environment Relations, scientific and technique psycho-motor skills, values accounted for core of science, attitude and values related with science. NME-T has arranged teachers guide book for science teachers. Teachers guide book has information about adopted foundations of the curriculum of science and technology course in detail (NME-T, 2006).

3. Findings

Findings of the semi-structure interviews are shown at tables 1-6 below. As showed in Table 1; ST described the SPS as true, partly true and false,

Question 1: In your opinion what is the SPS?

Table 1. Science teachers' descriptions on the science process skills

Tree Nodes	Free Nodes	Frequencies	Science Teachers' Ideas
True Descriptions	-	3	SPS are the skills such as observing, make a hypothesis, determination of variables, making research and experimenting and knowing the ways of reaching information (B) SPS remind me skills which are used by scientists when they make research. For example, observing, collecting data, recording data, making a hypothesis, determining and controlling variables etc.(G)
Partially True descriptions	-	1	When I hear the SPS, It reminds that the ways of reaching information (F)
False descriptions	Research	1	SPS are to show that how a research is made, and research reports are prepared to students (D).
	Concept understanding	2	SPS are students' understanding one concept as scientific. That is, SPS are to grade concepts from basic to complexity (E)
	Applying the theory	2	SPS are to be able to apply the information was learned (A.K)
	Methodology	1	SPS are methods and techniques which are applied in the class environments to students (C)

Question 2: To aware of the SPS, what kind of references did you benefit from?

Table 2. Science teachers' sources of information about science process skills

Tree Nodes	Free Nodes	Frequencies	Science teachers ideas
Awareness a ways	Bachelor degree	4	I learnt at the university, and besides we can see it books (D). I came across the first time in my bachelor degree. (G)
	Seminary	2	I became aware of the SPS at the Seminaries and guide books (L).
	Guide Book	5	I became aware of the SPS at the guide books. (B)
	Internet	2	I became aware of the SPS at the internet and guide books. (A)
	Profession	3	I heart the SPS in the my profession(C)
	Unit Plans	1	SPS has been listed in the science and technology teacher guide book. Also, It is showed SPS' attitudes in the unit plans (H).

Question 3: What do you think about to take place SPS' attitudes in the curriculum?

Table 3. Science teachers' ideas about to take place sps' attitudes in the curriculum

Tree Nodes	Free Nodes	Frequencies	Science teachers ideas
	True Expression	3	In our times, students need to have some features such as solving problem, critical thinking etc. therefore SPS need for solving problem as used scientific methods. Because SPS support that students solve problems and think critically (G).
	Experiment	1	SPS need because of Science and technology course based on experiment (D).
	Unrelated	3	If methods and techniques are not applied, teaching can not become true (C). Because we determine our aims (K).
	Scientific course	1	Science and technology course is a scientific course (E).
	Following our times	1	SPS need because we have to keep up with our times (A).

	Problem solving	1	SPS need because students need knowing, understanding and solving the problems (B).

Question 4: In your opinion, are the activities in the Curriculum of Science and Technology effect?

Table 4. Science teachers' ideas about the activities in the curriculum of science and technology effectiveness

Tree Nodes	Free Nodes	Frequencies	Science teachers ideas
It is effective	Unrelated reasons	7	Activities in the program are on the same level so each students can easily understand these activities (C) Activities books are useful for students to be more active (K)
	Partly related reasons	1	SPS support and reinforce learning (R)
It is not effective	Related reasons	5	We are trying to compensate with extra examples. All students are not the same, so we have difficulty being gained SPS (A) the majority of the activities has SPS but they don't support to transfer students to the high-level SPS. For example students can't make a hypothesis and control variables (B) Some hypothesis in the activities is though as very simple guesses(G)

Question 5: What kind of different activities can be prepared?

Table 5. Science teachers' ideas about activities related with science process skills

Tree Nodes	Free Nodes	Frequencies	Science teachers ideas
Different Activities	Experiment with related SPS	1	Students centered activities which give chances to students make experiment should be prepared (G).
	Visuality	1	Visuality CD and films should be used (Visuality materials) (L)
	Examples related with Real life	2	In the program examples should be selected from real life. So students can evaluate better science concepts (C).
	Laboratory activities	1	laboratory studies should be transferred to developing science and technology domain (A)
	Project	1	Project groups should be composed. These groups should be given topics of project like natural research (B)
	Technology and internet	1	Teachers should provide for students technology and internet environment (A)
Enough	Enough activities in the program	4	In my opinion, activities in the program are enough even we can not apply all activities because we don't have enough time (D).

Question 6: Can you prepare the suitable learning and applying environment to improve your students' SPS?

Table 6. Science Teachers' ideas about the suitable learning and applying environments to improve your students' SPS

Tree Nodes	Free Nodes	Frequencies	Science teachers ideas
No	Not suitable environment	3	I can not provide suitable environments because school' sources are limited and I have overcrowded class (B). I can't. Time is limited gaining all attitudes (H).
Yes	Suitable environment	7	Yes I can. But what I can do is limited with school' sources so I believed that I can do better (A, K). I believe that I do my best (D, F) I can because our school has a good laboratory. Our laboratory has almost all laboratory tools I believe that If a teacher wants to provide suitable environments she/ he can provide(E).

4. Discussion and Conclusion

In the Table 1, it is showed that; 6 science teachers have confused SPS with concepts such as understanding, applying the theory and methodology. It can be interpreted that the majority of science teachers don't know SPS theoretically. Farsakoğlu etc. (2008) determined that prospective science teachers confused SPS with different concepts such as Bloom Taxonomy, Piaget's Formal Operation Stage and problem solving.

In the Table 2, it is showed that 5 science teachers learnt SPS from teacher guide book and 4 science teachers learnt SPS from their bachelor degree. But the majority of the science teachers described to SPS as false. In this case, it can be interpreted that teacher guide book is not an adequate source for explaining SPS or SPS has not been given the needed importance during teacher training at pre-service. At the outset of these reasons, in order to improve ST' SPS, teacher guide books should be prepared in a manner that they emphasize the SPS in more detail. 2 science teachers stated that seminars are useful to create awareness of once own SPS. The other teachers indicated that seminars related with SPS are not enough in terms of both their numbers and effectiveness. From this point of view, we can conclude that seminars should be prepared with adequate content and activities in terms of SPS.

In the Table 3, it is showed that all of teachers believe that SPS' attitudes need in teaching the science and technology curriculum. Only 3 science teachers in the sample could be able to explain relationship between science and technology curriculum and SPS as true. But, 3 science teachers could not be able to explain relationship between science and technology curriculum and SPS as true. In the sample the others science teachers explained relationship between science and technology curriculum and SPS statements such as "SPS need for making an experiment; science course is scientific; SPS need for following our times; SPS need for improving problem solving skills".

As can be seen in Table 4, it is obvious that science teachers had the highest frequencies of effective answers in the question, 'In your opinion, is the activities in the Curriculum of Science and Technology effective? Whereas 7 science teachers has presented with unrelated reasons, only 1 science teacher explained with a related reason for the question.

When different activities related with SPS were asked to science teachers, some science teachers suggested activities such as doing experiment, using project and examples related with Real life (see B, C, and G Science Teachers' ideas in the Table 5). The majority of the science teachers stated that activities in the program are enough even these activities could not been applied because of limited time. Some science teachers stated that SPS' activities are enough, but the others stated that SPS' activities are not enough. Thus, it can be interpreted that application of SPS are depended on science teachers' ability. In order to have science teachers gain SPS, effective and applicable SPS improvement programs should be developed.

As can be seen in the Table 6, the majority of science teachers stated that they can provide suitable learning environments for developing students' SPS. But these science teachers emphasized that what they can do is limited with school' sources (See A, K science teachers). 3 science teachers stated that they did not have suitable learning environments for developing their students' SPS. Only one science teacher stated that the sources are enough at their

school. The science teachers' statements indicate that schools' sources are very important on developing of students' SPS. It is believed that SPS' attitudes can be gained by students with tools or equipments which are supplied easily from their daily life.

References

Aktamış, H., & Ergin, Ö., (2007). Bilimsel süreç becerileri ile bilimsel yaratıcılık arasındaki ilişkinin belirlenmesi (Investigating the relationship between science process skills and scientific creativity). Hacettepe Üniversitesi Eğitim Fakültesi Dergisi (H. U. Journal of Education), 33: 11-23.

Cheng, V. M. Y. (2004). Developing physics learning activities for fostering student creativity in Hong Kong context. Asia-Pasific Forum on Science Learning and Teaching, 5 (2).

Çepni, S., Ayas, A., Johnson, D. ve Turgut, M. F. (1996). Fizik Öğretimi. Ankara: Milli Eğitimi geliştirme projesi hizmet öncesi öğretmen eğitimi deneme basımı.

Farsakoğlu, Ö. F., Şahin. Ç., Karslı, F., Akpınar, M., Ültay, N., (2008). A study on awareness levels on prospective science teachers on science process skills in science education, World Applied Sciences Journal, 4(2), 174-182.

Hurd, P. D. (1991). Why we must transform science education educational leadership, october.

Ilköğretim fen bilgisi programı (2000). Tebliğler Dergisi Kasım, Millî Eğitim Bakanlığı, Ankara.

Mallinson, G. ve Mallinson, G. (1998, June). Science content: What's worth knowing? Monroe. Retrieved June 15, (1998) from the World Wide Web: http://www.monroe2boces.org/shared/instruct/sciencek6/content.htm.

Meador, K. S. (2003). Thinking creatively about science suggestions for primary teachers, Gifted Child Today, 26 (1), 25-29.

Ministry of National Education, Science and Technology Teaching Program (Elemetry Education 6, 7, and 8th grades. Ankara. (2006).