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PRE-SERVICE SCIENCE TEACHERS' IMAGES OF PHYSICIST AND PHYSICS COURSE

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ABSTRACT: The aim of this study is to investigate the pre-service science teachers' images of physicist and physics course. A total of 69 students, who were studying in primary science teaching at the Education Faculty of Muğla Sıtkı Koçman University in Turkey. The data were collected using Word Association Test. Response words with the same meaning were classified under the most frequently repeated words. Words less than two times and those words that could not be associated were considered as irrelevant and were excluded. After contents have been analyzed, the frequency of the response words has been calculated and categorized. Participants' associations of the term physicist were arranged into four categories. Participants' associations of the term physics course were arranged into six categories. According to results, most of the participants related to personal character of physicist. More than half of the participants' images are that physics course is difficult and most of them have negative attitudes towards physics course.

Key words: Physicist, physics course, image, word association test

INTRODUCTION

Physics help us to understand most of the facts/phenomenon/events in real life. Additionally, individuals can gain scientific thinking abilities through physics education. This is mainly based on the interactions and communications which take place between physicist and students. On the other hand, instructor's qualifications for physics course are so important that learning physics is accepted difficult by some of the researcher (Lederman, 1993). Physicist's characteristics, including the actions and behaviors from the beginning till the end of the lesson can affect the students' perspectives about physicist and physics course. Therefore it is essential to understand how students' perceive physicist and physics course. Students' images of physicist and physics course can inform us how students see them and what they sense about them. The aim of this study is to investigate the pre-service science teachers' images of physicist and physics course.

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METHODS

Participants

A total of 69 students, who were studying in primary science teaching at the Education Faculty of Muğla Sıtkı Koçman University in Turkey, participated in this study. They were in first year in their teacher training program. The majority of the participants were female (%89.8). This study was conducted during September 2013.

Data Collection

Participants were asked to complete a word association test (WAT). The word association test is a data collection technique which is reported in the literature to be used to investigate a person's or a group's conceptual field or image on a particular subject. In it's simplest form one or a series of stimulus words projected orally or written to the participants who must respond with the first word(s) that come(s) to their mind (response words) (Daskolia, Flogaitis, & Papageorgiou, 2006). In the test, the terms "physicist" and "physics course" were presented as a stimulus in the following format:

Physicist:
Physicist:
Physicist:
Physicist:
Physicist:
Related Sentence:…….

The reason for writing the term stimulus five times, one under the other, is to prevent the risk of chain responses. If the teacher does not return to the stimulus term after writing one response, he or she will tend to write words associated with the previous response word that he or she wrote instead of the stimulus word. This situation could be detrimental to the purpose of the test. Teachers were asked to write the first five words that came to then-mind when hearing or reading terms "physicist" and "physics course." The technique is based on the assumption that providing a stimulus word and asking respondents to freely associate the ideas which come to mind gives relatively unrestricted access to mental representations of the stimulus term (Bahar, Johnstone, & Sutcliffe, 1999; Sato & James, 1999). During the implementation, the participants were provided with necessary explanation. In the first stage, they were given 40 seconds for writing responses (Gussarsky & Gorodetsky, 1990) In the second stage, participants were also expected to write down a sentence related to the key concepts in 20 seconds.

Data Analysis

Data collected from word association test were analyzed by authors. Response words with the same meaning were classified under the most often repeated words. Words less than two times and those words that could not be associated were considered as irrelevant and were excluded. After contents have been analyzed, the frequency of the response words has been calculated and categorized. Related sentences were individually examined during the data analysis to determine participants' images of physicist and physics course. Many studies have shown this type of data analysis technique provides reliable results (Daskolia et al., 2006; Torkar & Bajd, 2006).

RESULTS and FINDINGS

The data collected from responses regarding the word association test are submitted in two separate sections. They are pre-service science teachers' images of physicist and physics course.

Pre-Service Science Teachers' Images of Physicist

Participants' associations of the term physicist were a total of 315. A total of 17 (5%) of these associations could not be categorized. These words appeared once and could not be categorized with the other words. Inferentially, they were excluded from the results in Table 1. The remaining 34 different associations were divided into four categories. These categories, response words and their frequency are listed in Table 1.

According to the results, the associations related to personal character of physicist create the dominant category (f= 234). In this category some of the participants produced positive associations, such as *intelligent*, *industrious*, *disciplined*, *successful* and *patient* related to physicist. However, some of the participants produced negative associations, such as *nervous*, *boring*, *compelling* and *scary*. When participants' sentences are examined about physicist, it is seen that the sentences were in parallel with findings of stimulus term. For example: "Physicists are very intelligent people." (Student 1), "Physicists are always industrious." (Student 2).
In the second category, participants produced associations related to activities of physicist (f= 50). In this category, most of the participants focused on *experiment*, *researcher*, *calculation* and *comment*. For example related sentence about this category: "Physicist is a person who likes to experiment and research" (Student 3).

In the third category, participants focused on the physical character of the physicist (f= 10). Accordingly, the participants consider the physicist as a person with *bespectacled*, *female* and *fat*.

In the fourth category, the participants produced associations related to careers of the physicist (f= 9), such as *teacher* and *professor*.

Table 1. Associations With The Term Physicist

Categories	**Associations Included in Categories and Their Frequencies**	**Total Frequency of Associations in This Category**	**%**
Personal Character of Physicist	Intelligent (31)	234	79
	Interesting (25)		
	Boring (23)		
	Nervous (20)		
	Compelling (19)		
	Disciplined (15)		
	Industrious (12)		
	Scary (11)		
	Successful (9)		
	Uninformed (8)		
	Funny (7)		
	Calm (7)		
	Patient (6)		
	Well (6)		
	Curious (5)		
	Careful (5)		
	Logical (5)		
	Active (5)		
	Talkative (4)		
	Thoughtful (4)		
	Cute (4)		
	Confident (3)		
Activities of Physicist	Experiment (11)	45	15
	Responsive to the needs (10)		
	Researcher (8)		
	Comment (5)		
	Dealing with physics (5)		
	Calculation (4)		
	Observation (2)		
Physical Character of Physicist	Bespectacled (4)	10	3
	Female (4)		
	Fat (2)		
Careers of Physicist	Teacher (6)	9	3
	Professor (3)		

Pre-Service Science Teachers' Images of Physics Course

Participants' associations of the term physics course were a total of 345. A total of 58 (17%) of these associations could not be categorized. These words appeared once and could not be aggregated with other words. Finally, they were excluded from the results. The remaining 29 different associations were divided into six categories. These categories, response words and their frequency are listed in Table 2.

According to the results, the associations related to qualifications of the physics course create the dominant category, (f= 180). In this category, it is observed that many of the participants focused on the *difficult, boring, enjoyable* and *tiring*. When participants' related sentences are examined about physics course, it is seen that the sentences were in parallel with findings of stimulus term. For example: "Physics course is the most difficult course among science courses" (Student 4), "Generally physics course is a theoretical course, so it is boring" (Student 5).

In the second category, the participants produced associations related to requires to be successful in the physics course (f= 34). In this category, many of the participants believed to need *decided, thinking, patient* and *attentive*. For example related sentence about this category: "Physics course is difficult and complicated. If you are patient during the lesson, you can be successful" (Student 6).

In the third category, the participants focused, in general, on activities in physics course, such as *using formula, calculate* and *experiment* (f= 34).

The fourth category reflects the associations of participants' attitudes towards physics course (f= 29). In this category most of the participants produced negative associations, such *dislike, unnecessary* and *belief for unsuccessful*. However some of the participants produced positive associations *necessary* and *excitement*. For example related sentences about this category: "I'm afraid that if I can not pass the physics course" (Student 7), "Actually I like physics course. It is interesting. But this situation can be change according to the teacher" (Student 8).

In the fifth category, the participants associated with environments of physics course, such as *laboratory* and *classroom* (f= 6). For example related sentence about this category: "We wear white laboratory coat in the laboratory" (Student 9).

In the six category, the participants have produced associations related to content of physics course (f= 13). Most of the participants in this category focused on *force and motion*.

Table 2. Associations With The Term Physics Course

Categories	Associations Included in Categories and Their Frequencies	Total Frequency of Associations in This Category	%
Qualifications of the Physics Course	Difficult (50)	180	63
	Boring (37)		
	Enjoyable (32)		
	Tiring (12)		
	Not understandable (11)		
	Curious (8)		
	Easy (8)		
	Complex (7)		
	Interesting (5)		
	Easily forgotten (3)		
	Fastmoving (3)		
	Understandable (2)		
	Detailed (2)		
Requires to be successful in the Physics Course	Decided (17)	34	12
	Thinking (9)		
	Patient (4)		
	Attentive (4)		
Activities in Physics Course	Using Formula (13)		
	Calculate (11)		

	Experiment (6)	34	12
	Observation (4)		
Attitudes toward the Physics Course	Dislike (13)	29	10
	Unnecessary (5)		
	Belief for Unsuccessful (5)		
	Excitement (3)		
	Necessary (3)		
Environments of Physics Course	Classroom (4)	6	2
	Laboratory (2)		
Content of Physics Course	Force and Motion (4)	4	1

CONCLUSION

A general feature of pre-service science teachers' images for physicist is about personal character of him/her. Dikmenli (2010) investigated undergraduate biology students' images of science and scientist. His study revealed that participants focused on personal character of scientist. Physicist is thought intelligent or interesting person by some of the participants. However, some of the participants have negative associations for physicist like boring, nervous and scary. Such kinds of negative images for scientist have been revealed in previous studies (Finson, 2002; Bovina & Dragul'skaia, 2008). Also, some of the participants focused on activities of the physicist, such as experiment, responsive to the needs and researcher.

Participants' dominant category for physics course is qualifications of physics course. Negative associations for this category are difficult, boring, tiring, not understandable, complex and easily forgotten. A widespread opinion in the literature is that physics is a difficult course for most of the students; furthermore physics is a course which students have prejudgement and fears to be unsuccessful (Angell, Guttersrud, Henriksen, & Isnes, 2004; Carlone, 2003; Korur & Eryılmaz, 2009; Osborne & Collins, 2001). Positive associations for this category are enjoyable, curious, easy, interesting, fastmoving, understandable and detailed. Another conclusion of this study, participants generally have negative attitudes toward physics course.

RECOMMENDATIONS

In this study, it was revealed that pre-service science teachers produce both negative and positive associations, regarding physicist and physics course. However, negative associations are more than positive associations. Because of these negative images are products of secondary school physics course, physics teaching can be revised in these schools. In the teacher training program, physics instructors should be aware of pre-service science teachers' negative images of physics course and physicist. Because of these negative associations can affect participants' physics success and their science teaching in the future. Physics and physics laboratory courses should support pre-service science teachers' improving positive images.

REFERENCES

Angell, C., Guttersrud, Ø., Henriksen, E.K., & Isnes, A. (2004). Physics: Frightful, But Fun. *Science Education, 88*, 683-706.

Bahar, M., Johnstone, A.H. & Sutcliffe, R.G. (1999). Investigation of students' cognitive structure in elementary genetics through word association tests. *Journal of Biological Education, 33*(3), 134-141.

Carlone, H.B. (2003). Innovative science within and against a culture of "achievement". *Science Education, 87*, 307-328.

Daskolia, M., Flogaitis, E. & Papageorgiou, E. (2006). Kindergarten teachers' conceptual framework on the ozone layer depletion. Exploring the associative meanings of a global environmental issue. *Journal of Science Education and Technology*, *15*(2), 168-178.

Gussarsky, E. & Gorodetsky, M. (1990). On the Concept On the Concept "Chemical Equilibrium: The Associative Framework. *Journal of Research in Science Teaching, 27*(3), 197-204.

Korur, F. (2001). The Effects of Teachers Characteristics on High School Students' Physics Achievement, Motivation and Attitudes. *Unpublished Master Thesis*, Middle East Technical University, Ankara, Turkey.

Korur, F. & Eryılmaz, A. (2009). High School Students' Perceptions about Effects of Teachers' Characteristics on Their Physics Achievement. *Gazi Eğitim Fakültesi Dergisi, 29*(3), 733-761.

Lederman, N.G. (1993). Introduction: Summary of research in science education. *Science Education, 77*, 465-559.

Osborne, J., Collins, S. (2001). Pupils' views of the role and value of science curriculum: A focus-group study. *International Journal of Science Education, 23*(5), 441-467.

Sato, M. & James, P. (1999)."Nature" and "environment" as perceived by university students and their supervisors. *International Journal of Environmental Education and Information, 18*(2), 165-172.

Torkar, G. & Bajd, B. (2006). Trainee teachers' ideas about endangered birds. *Journal of Biological Education, 41*(1), 5-8.