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PRE-SERVICE SCIENCE TEACHERS' VIEWS ABOUT TEACHING THEORIES AND METHODS

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ABSTRACT

The purpose of this study is to explore the secondary school pre-service science teachers' views about teaching theories and methods. Qualitative research method and purposeful sampling were used in the study. The participants of the study were the five students in the final year of their studies in Science Teaching Department of Bayburt Education Faculty at Bayburt University. The interviews were carried out face to face with the participants by one of the researchers and they were recorded with a recorder after they gave their consent. After the interviews, the data recorded was transcribed. Then the texts were given to the participants so that they could verify the accuracy and completeness of the data. Therefore, the reliability of the data was obtained. Content analysis was used for data analysis. When the data obtained as a result of data analysis was examined, it was found that pre-service science teachers attributed conceptually similar meanings to teaching theories and methods. Moreover, it was discovered that pre-service teachers expressed opinions mainly about behaviourism and constructivism as teaching theories and recitation and discussion as teaching methods.

Key Words: Pre-Service Science Teachers, Teaching Theories, Teaching Methods.

INTRODUCTION

Human beings gain knowledge, skills, attitudes, and values as a result of their interaction with the environment throughout their life. These experiences serve as basis for learning. In general terms, learning is defined as modification of existing behaviours within the individual (Driver, 1989: Ertürk, 1993). According to another definition, learning is a change in beliefs, perceptions and behaviours of an individual as a result of his interaction with the environment. However, there are different views about how this change occurs. How learning takes place is tried to be explained with cognitive and behaviourist theories. According to cognitive theorists, learning is a cognitive process and it occurs by attributing meaning to the knowledge which reaches the brain (Ebenezer, 2001). This sense-making changes according to the student's acquiring his own experience, the culture he has, the nature of interaction where learning occurs and the student's role in the process (Nakiboğlu, 1999). Behaviourist theory which aims at acquiring the desired behaviours within the individual proposes that external environment must be modified in order to obtain the desired behaviours. In addition to this, many theories are suggested in order to explain how learning takes place and the commonly used theories in science teaching are the theories which are developed by Jean Piaget, Jerome Bruner, Robert

Gagné and David Ausubel. Besides these, learning cycle and the generative or constructivist model have been suggested.

The countries try to improve their science education programs, improve teacher quality and equip the education institutions with the tools and instruments (Ayas, Çepni and Akdeniz, 1993). As teachers are the practitioners of science education curriculum in schools, it is important that teachers should be trained to have contemporary knowledge, skills and attitudes and they must be aware of the new teaching and learning theories and methods used in science teaching (Özmen, 2004; Taber, 1995; Turgut and Gürbüz, 2011).

Science course which started to be taught in 2006 was based on constructivist approach. The core of this approach is to actively involve the knowledge constructed in learning process. Teachers' role has changed with this approach. They are not traditional teachers who attend the classes and transfer the knowledge in the book to the students anymore but they adapt to the role of facilitator (Sözbilir, Şenocak and Dilber, 2006; Solmaz, 2007). Constructivist approach supports student-centred teaching methods. Some of them are role-plays, field trips, projects, discussions, and problem-solving. Teacher-centred methods such as teacher presentation and question-answer are underemphasized (Küçükahmet, 2005).

Today the purpose of science teaching is not to transfer more knowledge but to have them gain critical thinking skill as knowledge changes over time. Moreover, technological advances make it easier to access any kind of information (Kaptan and Korkmaz, 2002; Töman, Çimer and Çimer, 2012).

There are individual studies which involve the use of teaching theories and methods in education in literature; however, there are not studies in literature which present the pre-service science teachers' views about science course. This qualitative research aims at presenting secondary school pre-service science teachers' views about teaching theories and methods in order to close the gap in this field.

Purpose of the study

This study aims at revealing the secondary school pre-service science teachers' views about teaching theories and methods.

METHOD

Qualitative research method was used in the study. Qualitative research is a method where data is produced without any statistical operations or any other numerical means (Çepni, 2009). The main characteristics of qualitative research techniques are that they are context sensitive, the researcher has the role of a participant, they have holistic perspectives, they are concerned with process, they have flexibility in design, they have naturalistic inquiry and they have inductive reasoning for data analysis (Yıldırım and Şimşek, 2004).

Sampling

Purposeful sampling was used in the study. In qualitative research smaller samples are used for an in-depth understanding. Therefore purposeful sampling is preferred rather than random sampling (Munn, Johnstone and Holigan, 1990). In this sampling the criteria important for the sampling are determined and the sampling chosen according to the criteria is thought to represent the population with its all qualities (Yin, 2003). The research was carried out with the students in the final year of their studies in Science Teaching Department of Bayburt Education Faculty in Bayburt University. The participants' names were not used due to research ethics, so the participant pre-service teachers were coded as PT_1, PT_2, PT_3, PT_4, PT_5. The qualities of secondary school pre-service science teachers were presented in Table 1.

Table 1: The qualities of secondary school pre-service science teachers

Participants	*Education Level*	*Gender*
PT_1	*University*	*Female*
PT_2	*University*	*Female*
PY_3	*University*	*Male*
PT_4	*University*	*Female*
PT_5	*University*	*Male*

Data Collection and Analysis

Semi-structured interviews were used in the study as a data collection tool. This technique is advantageous as it is open, allowing new ideas to be brought up during the interview as a result of what the interviewee says and in-depth understanding of a specific topic (Çepni, 2009).

The interviews were carried out face to face with the participants by one of the researchers and they were recorded with a recorder after the participants gave their consent. The data recorded was transcribed after the interviews. Then the texts were given to the participants so that they could verify the accuracy and completeness of the data. Therefore, the reliability of the data was obtained. Content analysis was used for the analysis of data. Content analysis is defined as the technique which enables the researcher to include large amounts of textual information and systematically identify its properties by summarizing it into categories using codes based on specific rules (Büyüköztürk, Kılıç Çakmak, Akgün, Karadeniz and Demirel, 2008). The raw data obtained from the interviews were coded and the categories were determined. The data were classified under these categories and became a meaningful content for the reader. Coding and categorization were done repetitively by one of the researchers. Therefore, unnecessary codes were eliminated adhering to the problem and purpose of the research and new codes were added to the necessary parts. The researchers worked together while naming the categories. Tables where each participant's views about the subject were presented were obtained. Besides these, the reliability of the questions were obtained with expert views, related literature, and piloting. In results and discussion section of the study, the findings obtained from the analyses were presented.

FINDINGS AND INTERPRETATIONS

The findings obtained from the pre-service teachers were presented in tables for each question asked.

Question 1: "*What does the term "teaching theories" mean to you?"*
The responses of pre-service teachers to question 1 were presented in Table 2.

Table 2: The analysis results of the pre-service teachers' responses for question 1

PR-SEVICE TEACHERS	*CATEGORIES*
PT_1	*The way teaching and learning takes place*
PT_2	*Means to transfer knowledge*
PT_3	*Methods and approaches in learning and teaching*
PT_4	*Methods and approaches in learning and teaching*
PT_5	*The way teaching and learning takes place*

The question "*What does the term "teaching theories" mean to you?"* aims at exploring what pre-service teachers thought when they first heard the term "teaching theories" and when the responses of pre-service teachers PT_3 and PT_4 were examined, most of the teachers stated that they were the methods and techniques in learning and teaching. While PT_2 explained teaching theory as the way to transfer knowledge, PT1 stated that it was how teaching and learning occurred. The responses of PT_3 and PT_4 are able to explain the present situation.

PT_3: "They cover methods and techniques appropriate for the student's way of thinking and developed as a result of a specific research carried by the experts in the field to teach a new knowledge to an individual."
PT_4: "They are learning and teaching practices and also they are the entire techniques which comprise of prescribed methods, techniques, and concepts."
PT_5 states that teaching theory is the way how teaching and learning occurs:
"What I understand from the teaching theory is that how teaching occurs and how it is taught. In other words, it is the most comprehensive way of how a student understands the lesson and how he makes it more productive."

Question 2*:"What teaching theories do you know" Which theories are the most useful in teaching environment? Please explain it by giving your reasons. "*

The responses of pre-service teachers to question 2 were presented in Table 3.

Table 3: The analysis results of the responses of the pre-service teachers to question 2

PRE-SERVICE TEACHERS	***CATEGORIES***		
	Teaching theories	***Most appropriate one/s for teaching environment***	***Reasons***
PT_1	*- Gestalt theory* *- Discovery learning* *- Progressive teaching method*	*- Constructivist teaching theory*	*- Class environment, physical conditions and most appropriate in terms of time*
PT_2	*- Behaviourist teaching theory* *- Constructivist teaching theory*	*- Constructivist teaching theory*	*- Student learns by doing and through experience*
PT_3	*- Constructivist teaching theory* *- Multiple Intelligence theory* *-Behaviourist teaching theory* *-Cognitive teaching theory*	*- Constructivist teaching theory* *- Multiple Intelligence theory*	*- In constructivist theory, students construct their own understanding of the knowledge* *- Multiple intelligence theory takes into consideration individual differences*
PT_4	*- Behaviourist teaching theory* *- Constructivist teaching theory*	*- Constructivist teaching theory*	*- Student learns by doing and through experience*
PT_5	*- Behaviourist teaching theory* *- Constructivist teaching theory* *- Discovery learning*	*- Discovery learning theory*	*- It guides students to do research and discover new things*

When Table 3 is examined, the responses given by the teachers to question 2 are classified under three categories. These categories are the teaching theories they know, the most appropriate theory and why they are appropriate for teaching environment. When the responses of pre-service teachers about teaching theories are examined, all the pre-service teachers except PT_1 centre upon behaviourist and constructivist theories. The second and third part of the question "Which theories are the most useful in teaching environment and why?" aim at obtaining in-depth knowledge and all the pre-service teachers except PT_5 considered mainly constructivist teaching theory and stated that it was effective in learning environment. What draws attention is that most pre-service teachers who stated that constructivist teaching theory was effective in learning environment argued that students should learn by doing and through experience.

The responses of PT_3 and PT_4 given below are able to explain the present situation.

PT_1: "The most appropriate teaching theory is constructivist theory because a student learns by doing something in the class and through experience. The student is actively involved in learning process and the theory encourages the student to do research and question.
PT_4: "In my opinion the most appropriate one is constructivist teaching theory. Because the student is involved in learning process, he learns by doing or through experience."

Another pre-service teacher (PT_5) stated that the most effective theory in teaching environment was discovery learning because this theory encourages the student to do research and discover new things. PT_5 explained the situation as follow:

"This method encourages the student to do research, develop himself, discover new things, think, and express what he thinks. In short, the main quality of the method is to make the student study. The student is not spoon-fed with the new knowledge but he does research on his own to learn. Moreover, in order to create a future where individuals who develop themselves under the guidance of their teachers will be raised, we should raise individuals who are used to studying."

Besides these, pre-service teachers' views about the theories they know and their frequencies were presented in Table 4.

Table 4: Pre-service teachers' views about the theories they know and their frequencies

Teaching theories	***Frequency***
Constructivist teaching theory	*4*
Behaviourist teaching theory	*4*
Discovery learning	*2*
Cognitive approach	*1*
Multiple Intelligence theory	*1*
Gestalt theory	*1*
Progressive learning theory	*1*

Question 3:*"In your opinion, what does teaching methods refer to?"*

The responses of pre-service teachers to question 3 were presented in Table 5.

Table 5: The analysis results of the responses of the pre-service teachers to question 3

PRE-SERVICE TEACHERS	CATEGORIES
PT_1	*The ways teachers used while teaching the course to the student*
PT_2	*The ways teachers used while teaching the course to the student*
PT_3	*The ways teachers used while teaching the course to the student*
PT_4	*The ways teachers used while teaching the course to the student*
PT_5	*How and in what ways teaching will occur*

The question "*In your opinion, what does teaching methods refer to?*" aims at exploring what pre-service teachers thought when they first heard the term "teaching methods" and all the teachers except PT_5 stated that teaching methods comprise the principles and methods used for instruction by the teachers while teaching the students . The statements PT_2 and PT_3 were given as examples for teaching methods.

PT_2: "Teaching methods mean how teaching and learning occur. In other words, while teaching occurs, it is the choice of a method or a way which largely depends on the student and content."
PT_3: "Teaching methods are the methods which teachers use while explaining the lesson. They are also the methods which increase the student's interest in the lesson or help them to understand the lesson."
However, PT_5 used the following expressions about teaching methods:
"Teaching methods comprise how and in what ways the teaching practice will take place."

Question 4*: "Which teaching methods do you know? What are the most appropriate teaching methods for learning environment? Please explain giving your reasons."*

The responses of pre-service teachers to question 4 were presented in Table 6.

Table 6: The analysis results of the responses of the pre-service teachers to question 4

PRE-SERVICE TEACHERS	CATEGORIES		
	Teaching methods	Most appropriate one/s for teaching environment	Reasons
PT_1	- *Question-answer* - *Discussions* - *Brainstorming* - *Recitation*	- *Brain storming*	- *Encourages free thinking*
PT_2	- *Creative drama* - *Cases study* - *Projects*	- *Recitation*	- *Has advantages in terms of time*
PT_3	- *Recitation* - *Discussion* - *Question-answer* - *Problem solving* - *Demonstrating*	- *Recitation* - *Question-answer*	- *Has advantages in terms of time* - *Has advantages in terms of physical conditions*
PT_4	- *Recitation* - *Discussion* - *Question-answer*	- *Discussion*	- *Develop critical thinking* - *Learn to respect others' ideas*

	- Recitation	*- Discussion*	*- Develop critical thinking*
PT_5	*- Discussion*		*- Make contributions to raise productive individuals*

When Table 6 is examined, the responses given by the teachers to question 4 are classified under three categories. These categories are the teaching methods pre-service teachers know, the most appropriate theory/ theories and why they are appropriate for teaching environment. When the responses of pre-service teachers about teaching theories are examined, all the pre-service teachers except PT_2 centre upon recitation and discussion. The second and third part of the question 4 "Which theories are most useful in teaching environment and why?" aim at obtaining in-depth knowledge and all the pre-service teachers except PT_1 considered mainly recitation and discussion. What draws attention is that most pre-service teachers who stated that recitation was effective in learning environment argued that this method had advantages in terms of time and physical conditions. The teachers who supported discussion in teaching environments argued that this method developed critical thinking and made contributions to raise productive individuals. The expression of PT_3 who stated that recitation was effective in teaching environment can be given as an example.

"Recitation is the most appropriate method for teaching environment because the other teaching methods are difficult to implement due to class size, time and space constraints. Recitation has advantages to both students and teachers in terms of time and physical conditions."

The expression of PT_5 who stated that discussion was effective in teaching environment can be given as an example.
"In my opinion discussion eases student learning. It enables the students to think critically. It especially teaches them to respect the others' ideas."

Apart from these, one pre-service teacher (PT_1) stated that brain storming was the most effective teaching method in teaching environment:

"In my opinion, brainstorming is the most appropriate method because it activates the free thoughts of the students. The students express what they think freely with this method." Moreover, the pre-service teachers' views about the teaching methods they know and their frequencies were presented in Table 7.

Table 7: Pre-service teachers' views about the teaching methods they know and their frequencies

Teaching methods	Frequency
Recitation	4
Discussion	4
Question-answer	3
Demonstrating	1
Problem solving	1
Projects	1
Case method	1
Creative drama	1
Brainstorming	1

DISCUSSION AND RESULTS

Based on the findings obtained from the study which was carried out to explore the secondary school pre-service science teachers' views about teaching theories and methods, the findings and interpretations obtained revealed that most of the teachers attributed similar meanings to teaching theories and methods. The reasons for this result is that conceptual differences and the hierarchical structure for teaching theories and methods were not clearly defined in text books and teaching environment. Moreover, it was concluded that most of the pre-service teachers expresses their views in favour of behaviourist and constructivist learning theories. The main reason for the emergence of such a situation is that these two theories are addressed predominantly both in school environments and also in pedagogical courses in universities. The students mainly focused on recitation and discussion methods as teaching methods. The reason for this result is that pre-service teachers mainly carried out practices about recitation and discussion throughout their education. It can be stated that pre-service teachers consider constructivist theory as the most effective theory in teaching environment as this theory is student-centred (Laney, 1990). In parallel with this, it is considered that the reason why pre-service teachers find discussion effective in class environment is that this method encourages students to think critically and makes contribution to meaningful learning (Ebenezer, 2001). Apart from discussion method, although pre-service teachers find recitation effective due to teaching methods and techniques intended for constructivist theory, it can be stated that recitation used commonly in class environments are effective. Moreover, some pre-service teachers expressed their views about the other teaching theories besides behaviourist and constructivist theories. Similar situations were experienced with teaching methods and pre-service teachers expressed their views about the other teaching methods besides recitation and discussion. It can be stated that the reasons for the emergence of such situations are that theories and methods are student-centred and they lead the students to active learning (Harwood and McMahon, 1997).

The following suggestions can be made in parallel with the findings obtained from the study which aimed at exploring the secondary school pre-service science teachers' views about teaching theories and methods:

- Pre-service teachers should be trained according to the principle of "active learning and teaching" in science teaching.
- The courses which pre-service teachers take during their education should be promoted with multiple teaching methods as far as possible.
- Reorganizations must be done for the pre-service teachers' meaningful learning in relation to cognitive and content intended for teaching theories and methods

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