



AN ANALYSIS OF THE RELATIONSHIPS BETWEEN PROSPECTIVE CHEMISTRY TEACHERS' VIEWS OF LEARNING-TEACHING, THE NATURE OF SCIENCE, PREFERRED LEARNING STYLES AND THEIR CLASSROOM PRACTICE: IS THERE A CONSONANCE?

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Abstract

The present study aimed to investigate the relationship between prospective chemistry teachers' (PCTs) views of learning-teaching, views of the nature of science, preferred learning styles and real classroom practice. At the outset of the study, PCTs' views of learning-teaching were determined via open-ended questionnaire. Their learning styles and views of the nature of science were also determined. PCTs' instructions at secondary schools were recorded digitally to find out if there is a consonance between instructions they carried out and their views of learning-teaching and the nature of science. Fourteen PCTs participated in the study. With the help of ideographic analyses, we decided whether their views of learning-teaching are constructivist in nature or not. The results of this analysis were compared with their preferred learning styles and their views towards the nature of science. The findings indicated that ten of the PCTs have constructivist points of view concerning teaching and learning. These PCTs' preferred learning styles are either collaborative or independent. Findings also indicated that even though they appeared to have constructivist points of view, most of the PCTs planned and conducted their lesson in behaviorist ways in differentiated ratios. It seems that there is dissonance between PCTs' views of teaching and their actual practice in classrooms.

Keywords: Teacher Education, Prospective Chemistry Teachers, Learning Styles, the Nature of Science, Constructivism

INTRODUCTION

Constructivism has been the underpinning philosophy for many current reform efforts in education (Tobin & Tippens, 1993). Educational reform launched in 2004 has emphasized constructivist instructional approaches. Starting from elementary schools, the new curriculum has been developed in a constructivist approach. Since 2008, science curriculum in high schools has been implemented according to the constructivist philosophy. Teacher training programs were re-designed to change prospective teachers' views of learning and teaching from transmission to constructivism.

Research results indicated that educational change becomes effective if students' perceptions are also changed accordingly (Lawness, Richardson, 2002; Segers and Dochy, 2001). Teacher-centered approaches have been the prevailing teaching method in Turkey for many years. Students are

usually viewed as passive recipients of knowledge transmitted by teachers. Pajares (1992) points out that teachers' conceptions about teaching and learning are influenced by their earlier educational experiences as students. Thus, it would be possible that prospective teachers hold such positivist teaching and learning points of view even if they were informed and practiced the new philosophy during their pre-service education programs.

Teachers' conceptions related to the learning and teaching are expected to be consonance with their practice in real classrooms. The literature seems to produce conflicting evidence as some studies indicated that teachers' views, beliefs or perceptions could be taken as an indication of their classroom related behaviors (Brown, 2004; Chan and Elliott, 2004; Pajares, 1992). On the other hand, according to some studies, there is a gap and dissonance between teachers/prospective teachers' values and practice (Allen, 2009; Eren, 2010; Segal, 1998). Even though there are studies that investigate the relationship between prospective teachers' views about constructivism and their teaching methods or actual classroom teaching, these studies didn't investigate interference of the variables such as learning styles, the nature of science views on this relationship. In this regard, we decided to determine the relationship between prospective chemistry teachers' views of teaching-learning, their preferred learning styles and views of the nature of science. The study also aims to investigate dissonance or/and consonance between PCTs' conceptions about learning-teaching points of view and their actual practice in classroom settings.

Purpose of the Study

The present study aimed to investigate the relationship between PCTs' learning-teaching points of view, preferred learning styles, views of the nature of science and actual classroom instruction. In this respect, the research questions can be stated as;

1. What are PCTs' preferred learning styles?
2. What are PCTs' views of the nature of science?
3. Do PCTs have constructivist or behaviorist learning- teaching points of view?
4. What is the relationship between PCTs' learning styles and views of learning - teaching?
5. Is there a consonance between PCTs' views of the nature of science and learning-teaching approaches?
6. Is there a consonance between PCTs' views of learning –teaching and their actual classroom practice?

METHOD

In the study a mixed research design was used. A case study design as qualitative and a correlational design as quantitative design were benefited in the study. Fourteen PCTs (consisting of 6 female and 8 male teachers) participated in the study. The PCTs were in their final year of education and they completed their pedagogical content knowledge courses - including Teaching

Methods (2 terms), Curriculum and Instruction, Chemistry Textbook Design and School Practice. At the outset of the study, PCTs' views of learning and teaching were determined via a questionnaire involving eight open ended questions (Mirzalar-Kabapınar & Salan, 2000). In the questionnaire, the PCTs were asked to describe learning and teaching processes, to explain how learning and teaching occur and the roles of learner and teacher. The questionnaire also presented dialogues between a student and his/her teacher about chemistry concepts and asked the PCTs to fill in the gaps in these dialogues. Additionally, their learning styles (Grasha - Riechmann Learning Styles Questionnaire, designed by Hruska-Riechmann and Grasha, 1982) and views towards the nature of science (VNOS-C, designed by Lederman et al, 2002) were determined to map out the relationship of these views with their preferred teaching approaches in their teaching practice. During their teaching practice at secondary schools, they carried out instructions in various chemistry topics. These instructions were recorded digitally so as to find out if there is a consonance between their instructions and views of learning-teaching and the nature of science. We observed them and took field notes during our observations. The PCTs' open-ended responses to questionnaires concerning views of learning-teaching and the nature of science were analyzed in ideographic terms. With the help of these analyses, we decided whether their views about learning and teaching constructivist in nature or not. These analyses also helped to map out PCTs as having post-modern science view or traditional science view. Video records of PCTs' instructions were analyzed with special emphasis to language used around the teaching activities to find out the whole instruction as constructivist or behaviorist. The results of this analysis were compared with their preferred learning styles.

FINDINGS

The PCTs' Preferred Learning Styles

The Grasha-Reichmann Learning Styles Questionnaire results showed that PCTs' preferred learning styles were independent, dependent, competitive and collaborative. The frequencies and percentages of PCTs learning styles can be seen in Table 1.

Table 1. The Grasha-Reichmann Learning Styles Questionnaire

Learning Styles	Independent	Dependent	Competitive	Collaborative	Avoidant	Participant
Frequency	4	4	2	4	0	0
Percent	28,6%	28,6%	14,3%	28,6%	0%	0%

The PCTs' Views of the Nature of Science

According to VNOS-C results, a small number of the PCTs have a post-modern understanding of the nature of science (n=5). The rest of them (n=9) have a naive understanding of the nature of science. Two of the answers which show traditional and post modern features of the nature of science views are presented below together.

One of the PCT's answer/post-modern point of view:

Question: Do social and cultural values affect science?	Answer: Of course they do. For example, in ancient Egypt, people believed they would come back to life after their death. Because of that, they studied on mummifying death people.
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One of the PCT's answer/ traditional point of view:

Question: Do social and cultural values affect science?	Answer: I believe that science is universal. It should not be a property of a certain society. Otherwise, it would not be used/ benefitted by other societies.
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One of the items in the VNOS-C questionnaire was related to the relationship between theory and law. All of the PCTs including those who possess post-modern view of the nature of science seem to believe that there is a hierarchical relationship between theory and law. They thought that theory becomes law if it is proven. They could not realize that theory and law different types of concepts. One of the PCT's response to the question of "Is there a difference between theory and law?" can be seen below.

If the accuracy of a theory is proven for certain and if it is accepted by everyone (if it gains universal value), then it can be a "law".

The PCTs' Views of Learning - Teaching

According to the results of questionnaire analyses, ten of the PCTs possess constructivist view, whereas the rest of them (n=4) have a behaviorist view of learning and teaching. As previously stated, the PCTs were asked to respond the questions "what is learning?" "what is teaching?" and "what are teacher and students doing during learning?". Excerpts from PCTs' responses are presented below together for behaviorist and constructivist views of learning - teaching.

One of the PCTs answer/ behaviorist approach:

Question: What is teaching?	Answer: Teaching is to pass on your knowledge, ability, experience to learner and make him/her gain these.
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One of the PCTs answer/ constructivist approach:

Question: What is learning?	Answer: Learning is to produce new knowledge using what you have already known. After that, learning can be called as gaining this ability (learning to learn).
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The PCTs' Learning Styles and Their Views of Learning-Teaching

The results indicated that PCTs who prefer independent and collaborative learning styles have a constructivist view of learning and teaching whereas PCTs with dependent or competitive learning styles possess a behaviorist view of learning and teaching.

The PCTs' Views of the Nature of Science and Learning- Teaching Approaches

The examination of the relationships between PCTs' views of learning-teaching and their views of nature of science indicated that PCTs who have behaviorist view of learning also have inadequate and naive understanding towards the nature of science. These PCTs thought that science is absolute and scientific knowledge never changes. Similarly, PCTs who have constructivist view of learning and teaching do possess naive understanding of the nature of science.

The PCTs' Views of Learning-Teaching and Their Actual Classroom Practice

The results of the video records analysis concerning PCTs' classroom instruction indicated that even though they seemed to have constructivist view; in practice, most of the PCTs (n=11) prefer traditional teaching methods. They mainly adopted transfer of chemistry knowledge. According to field notes some of the school advisors motivated PCTs to impart knowledge rather than organizing constructivist teaching activities. Yet, this was the case not for all of the PCTs. Thus, this finding might be taken as an indication of a dissonance between PCTs' views of teaching and their actual practice.

DISCUSSION

The results of the study showed that there is relationship between PCTs' preferred learning styles and their learning – teaching views. PCTs who prefer collaborative and independent learning styles also possess constructivist view of learning and teaching. This is reasonable because through their pre-service education, they worked cooperatively in small groups. Also during their chemistry teaching method courses they are asked to work in pairs and are encouraged to organize their classmates or class in small groups in teaching activities. Those who prefer independent learning styles choose to work alone when constructing knowledge and require little direction from the teacher. On the other hand, dependent learners need feedback from their teacher for guidance and prefer to have someone tell them what to do. Therefore, it seems that they prefer knowledge transfer (behaviorism) instead of constructing their own knowledge.

The results also indicated that there is no relationship between the views towards the nature of science and learning and teaching approach. PCTs who have constructivist approach of learning and teaching do possess naive understanding of the nature of science. The reason might be that PCTs attended the history of science course but not the nature of science course. This might not be enough for them to develop an understanding of a post-modern view of nature of science. A similar dissonance was detected between their views of learning and teaching and their real classroom practice.

CONCLUSION

The results of the study lead us to some important conclusions. The most important of these, even though prospective teachers give value to constructivist teaching, they practiced in a traditional way. A course on history of science or a few teaching activities concerning the nature of science could not be affective in changing PCTs' view of nature of science. A specific course on the nature of science needs to be designed for them in which philosophy and history of science topics as well as explicit nature of science instruction are integrated. PCTs' inadequate understanding towards the nature of science might affect their future students and they can transfer their naive ideas to their students. This could be a problem for raising scientific literate students. Teaching nature of science must become priority when educating prospective teachers.

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