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EXAMINATION OF EXPERIENCED CHEMISTRY TEACHERS' PEDAGOGICAL CONTENT KNOWLEDGE TOWARDS 9th GRADE CHEMISTRY CURRICULUM

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ABSTRACT: The aim of this study is to analyze the experienced chemistry teachers' (ECTs') pedagogical content knowledge (PCK) about what extent ECTs' using of 9th grade chemistry curriculum, taking into consideration the objectives, goals and acquisitions. The study was designed as a case study, a kind of qualitative research design, and it was performed with 3 ECTs during the spring semester of 2014-2015 education year. The data were collected by observations, interviews and lesson plans. The data were analyzed through constant comparative method and enumerative approach. It was found that the teachers' PCK related to the 9th grade chemistry curriculum was not sufficient generally. The teachers did not stick to the curriculum exactly. Instead, they thought that, it was enough to follow the course book, even they could intervene the curriculum if it was necessary according to them. At the same time, it was determined that the teachers were not able to fulfill the aims, goals and acquisitions in the curriculum strictly.

Key words: Pedagogical content knowledge, curriculum knowledge, 9th grade chemistry curriculum, experienced chemistry teachers, physical and chemical changes

INTRODUCTION

Curriculum can be described that a systematic and intended packaging of competencies (i.e. knowledge, skills and attitudes that are underpinned by values) those students should acquire through organized learning experiences both in formal and non-formal settings. Curriculum contributes to the development of students' thinking skills and science process skills, and the acquisition of relevant knowledge that learners need to apply in the context of their studies, daily life and careers. Well-designed curriculum also plays an important role in forging life-long learning competencies, as well as social attitudes and skills, such as tolerance and respect, constructive management of diversity, peaceful conflict management, justice and inclusiveness [URL-1]

An effective curriculum provides teachers, students, administrators and community stakeholders with a measurable plan and structure for delivering a quality education. Curriculum serves as a guide for teachers during the teaching process. It can be said that the curriculum should do everything for teachers and tell them exactly what to do, when to do, and in what order. They also provide togetherness among teachers in terms of aims, goals, acquisitions, subject order and subject matter knowledge. Therefore, the teachers' sticking to the curriculum which belongs to the level of class is quite important for teaching.

Pedagogical content knowledge (PCK) was introduced as a specific category of knowledge and described as "that special amalgam of the content and pedagogy that is uniquely the province of teachers, their own special form of professional understanding" by Shulman (1986). Cochran *et al*. (1993) have proposed a modification of PCK based on the constructivist view. The components of PCK have been defined in various ways by different authors. One of the components of PCK is *knowledge of the curriculum*. The knowledge about science curriculum consists of two categories: mandated goals and objectives, and specific curricular programs and materials (Magnusson et al., 1999). Knowledge of goals and objectives includes horizontal curriculum knowledge that is the relation of topics in the same grade and vertical curriculum knowledge that is relation of

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topics taught in different grades (Grossman, 1990). The second component is related to teachers' knowledge about the curriculum that they use and the materials needed to teach science or a particular topic.

Research Question
What is the nature of ECTs ' knowledge of 9th grade chemistry curriculum for teaching?

Sub-Research Questions

1. In which ways do the ECTs stick to the 9th grade chemistry curriculum?
2. What are the ECTs' opinions toward the 9th grade chemistry curriculum's philosophy?
3. What extent do the ECTs adhere to the goal, objective and acquisitions placed in the 9th grade chemistry curriculum?
4. What kinds of connections do the ECTs make in the context of chemistry curriculum during the teaching process?

METHODS

The research was designed as a qualitative study defined by Yin (2003) as: "*In general case studies, are the preferred strategy when "how" or "why" questions are being posed, when the investigator has little control over events, and when the investigator has little control over events, and when the focus is on a contemporary phenomenon within some real-life context* (p.1)." Then the case study model was used. According to Stake (1995: Xi) "*...case study is the study of the particularity and complexity of a single case, coming to understand its activity within important circumstances* (cited in Patton, 2002 p.297)."

The research was performed with 3 ECTs during the spring semester of 2014-2015 education year. The teachers' experiences varied from 26 to 36 years, and they were working at different schools but they were teaching chemistry according to the same curricula. The data were collected by observations, interviews and lesson plans.

Data analysis

Data were analysed with two different approaches: a) constant comparative method b) enumerative approach. In constant comparative method data were compared with data to find similarities and differences (Charmaz, 2006). Then with enumerative approach was used to reduce the subjectiveness of qualitative coding and facilitate identifying the characteristics of each teacher's PCK (Park and Oliver, 2008 p. 267). The objectives were analysed according to Revised Bloom's taxonomy. Revised Bloom's taxonomy (Krathwohl, 2002) has two dimensions, one of them is knowledge dimension, and the other is cognitive process dimension.

RESULTS and FINDING

Data were analysed for giving answer to sub-research questions and the findings were presented according to the order of those questions.

The ECTs' Ways of Sticking to 9th Grade Chemistry Curriculum

During the interviews the ECTs expressed their experiences about their sticking to 9th grade chemistry curriculum in terms of content of the topics, weeks. Some of them stated that they were sticking to course book instead of curriculum and they were thinking that it was enough. Also some of them stressed out that they were altering the curriculum when they need for example the order of topics or content of a subject. They expressed their opinion with these statements:

"...We have a curriculum and a course book. The course book was prepared according to the curriculum. And the smart board programmes were also prepared according to it. So there is not any positive or negative case." (ECT1, Interview I, p.14)

"...I look at the curriculum before planning the lesson. For example tomorrow is 7th of May. According to curriculum where should I be on 7th May, then I plan..." (ECT1, Interview I, p. 12).

"...We stick to the curriculum. We cannot do anything different from it. Even questions should be in the content of the curriculum. If we ask out of the curriculum the question can be cancelled..." (ECT2, Interview I, p. 7)

"...Sometimes the order of topics can be incorrect. Then we organize the order of the topics according to us. We have the right of changing the order..." (ECT1, Interview I, p. 14-15)

"...I broaden the content according to me, give priority to the important topics....

....I cannot teach the law of constant proportions without teaching the mole concept. They ask me what does 7/3 mean in Fe_2O_3, so I cannot do without mole. We prepare a new curriculum..." (ECT3, Interview II, p. 2-3).

Opinions of the ECTs' towards the 9th Grade Chemistry Curriculum's Philosophy

The ECTs explained their opinions towards the 9th grade chemistry curriculum's philosophy with these statements:

"...I think the 9th grade chemistry curriculum has a sense... I tell them fundamental level chemistry or advanced level chemistry and the former one is more related with daily-life context. I understand chemistry in this way..." (ECT1, Interview I, p.13).

The Status of the ECTs' Taking into Consideration the Objectives, Goals and Acquisitions Placed In 9th Grade Chemistry Curriculum

All of the ECTs stated that they could take into consideration them partially not completely. One of them explained her opinion with these statements:

"... I cannot tell that I obey them completely. Although you teach the same topic to the same grade you cannot reach to the same point..." (ECT3, Interview I, p.10).

When the lesson plans were analysed in terms of acquisitions written by the ECTs in the context of physical and chemical changes it was seen that only one of them wrote the same acquisition with the one placed in the 9th grade chemistry curriculum (*...Distinguishes the physical and chemical changes in terms of bond formation and breaking...*). The others were different. Also the levels of them varied according to the Revised Bloom Taxonomy.

The Status of the ECTs' Making Relations in the Context of 9th Grade Chemistry Curriculum

It was determined that all of the ECTs made vertical and horizontal relation both towards to future and past during the lessons in the context of 9th grade chemistry curriculum when the observation and interview findings were analysed. Some of the examples were like these:

"...As we learned before (in the same year) *in chemistry, elements are represented with symbols, compounds are represented with formulas and reactions are represented with equations****...(horizontal relation towards past)"*** (ECT1, **Observation** on 31th Marc, 2015).

"...For example when we are talking about electronic configuration I tell them ***in 11th grade (two years later)*** *you will learn this topic more detailed..."* ***(vertical relation towards future)*** (ECT2, **Interview** I, p. 9).

CONCLUSION

According to findings it can be said that as Henze (2008) found although the teachers were experienced they even did not enough experiences of using it. In contrast may be as a good result, the ECTs were aware of the philosophy of the curriculum. Also similar to Lankford (2010) it was determined that the ECTs were thinking that using the course book is enough for sticking to the curriculum. Besides the ECTs expressed that they intervened the order of topics different from the original order placed in the curriculum. This result was compatible with the study of Aydın (2012). In terms of the Revised Bloom Taxonomy the levels of acquisitions were varied. This means the ECTs perceived the topic different from the curriculum. This difference influence the implementation of the topic. At last the ECTs made both vertical and horizontal relations towards to past and future. These relations provide the spirality of the curriculum.

RECOMMENDATIONS

It can be recommended for ECTs to participate in workshops, in-service programmes to become much more professional about implementation of the course. Gacanoğlu and Nakiboğlu (2015) examined the experienced physics, chemistry, biology and mathematics teachers' awareness related to philosophy, application of the curriculum after an in-service programme. They concluded that all the teachers were well-developed in all

aspects.

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