

# Context-Based chemistry teaching: Its impacts on science expectations of pre-service teachers

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**Abstract.** The purpose of this study was to investigate pre-service teachers' science expectations on learning science after they completed introductory Context-Based teaching. The sampling of the study consisted of 21 pre-service teachers studying at Hacettepe University, Faculty of Education. This is a two-dimensional research study where qualitative and quantitative research methods are used together. The scores obtained by participating groups from the "Science Expectations Questionnaire". Additionally, pre-service teachers' interviews are given as evidences. As a result of the evaluation of pre-service teachers' the expectations about learning science on independence, coherence, concept, reality link, math link, and effort dimensions, it is thought that there will be important outcomes in terms of improvement of the quality of teacher training at the university and that there will be an important contribution to literature in this sense.

## 1 Introduction

It is a fact that the education of science plays an important role in solving the problems in real life. Mostly, these problems are so complicated that it is impossible to solve them with just one discipline's point of view. The information within the scope of education of science should be coordinated in accordance with a common goal towards basic qualifications that are necessary for life. Therefore, the generalization of Context-Based teaching at schools will enrich the learning-teaching process and will enable students to transfer what they learn in a certain course to different fields. For this reason, primarily, pre-service teachers should be capable of carrying out their courses by taking the Context-Based approach into consideration. Here, first of all, there should be applications toward the goal of letting the pre-service teachers gain this capability in their education process.

In today's chemistry teaching programs, more advanced and more functional models that interpret the ideas of students in a more comprehensive way are required [1]. Every day, more studies focus on teaching models, methods and strategies shaped around active learning-based approaches [2]. One of the teaching methods promoting active participation of students in their learning processes is the "Context-based Teaching Model". The need and willingness of students towards learning a topic in chemistry education should be considered from two aspects, namely the teacher and the student. Therefore, it is very

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important to determine the extent to which the generative learning model supported with context-based learning addresses the requirements of the model.

## 2 Methods

The purpose of this study was to investigate pre-service teachers' science expectations on learning science after they completed introductory Context-Based teaching. The study is conducted with a purpose that reflects the theoretical framework it is based on and with a method, which will serve to this purpose [3]. Findings are interpreted within the scope of this purpose. The sampling of the study consisted of pre-service teachers randomly chosen from students of Hacettepe University, Faculty of Education, with choosing 41 individuals in total. It was a case study that supported by combination of qualitative and quantitative methods.

Analysis of the data obtained in this study was performed by using the SPSS 17 software package. The data obtained following the applications were subject to parametric tests. The "Science Expectations Questionnaire (SEQ)" developed by Redish, Saul & Steinberg, (1998) [4] and adapted into Turkish by Demirci, Kırbulut, Bektas, Yalçın-Çelik, Çetin-Dindar & Kılıç (2010) [5] was used in the study. The SEQ was applied to 41 pre-service teachers. The items of SEQ were categorized in six dimensions which were independence, coherence, concepts, reality link, math link, and effort as used by Redish et al. (1998) [4]. The descriptive statistics were used in order to explain the data collected.

## 3 Findings

The pre-service teachers' responses to the items on the SEQ based on the six dimensions. The descriptive statistics analyses were conducted using the averages of pre-service teachers' scores obtained from the SEQ with the aim of determining the any potential significant differences. The results are displayed on Table 1.

**Table 1.** The Mean of pre-service teachers' responses to the questionnaire

<b>Dimensions</b>	<b>Mean</b>
Independence	3.21
Coherence	3.04
Concepts	3.53
Effort	3.16
Math Link	3.15
Reality Link	3.55

As shown in Table 1, while most of the pre-service teachers had sophisticated expectations of learning in terms of independence, Concepts and Reality Link dimensions, they had naïve expectations of learning in terms of coherence, Effort and math link dimensions before the application. In the reality link dimension, the items aim to probe whether students know that science is in close relationship to their everyday experiences.

After the applications in the study, 8 of the pre-service teachers were invited to semi-structured interview with purposefully prepared questions by the researcher. The interview

data were analyzed inductively and were formed: the pre-service teacher’s expectations about the Context-Based teaching applications. The findings obtained from the responses of the student teachers to the questions are summarized in tables without disclosing their names.

**Table 2.** Percentage values indicating whether the applications

Dimensions	Sample Student Expressions	%
Independence	“My grade in this course is primarily determined by how familiar I am with the material. Insight or creativity has little to do with it.”	%20
Coherence	“Knowledge in science consists of many pieces of information each of which applies primarily to a specific situation.”	%14
Concepts	“The most crucial thing in solving a science problem is finding the right equation to use.”	% 24
Reality Link	“Learning science helps me understand situations in my everyday life.”	% 31
Math Link	“All I learn from a derivation or proof of a formula is that the formula obtained is valid and that it is OK to use it in problems.”	%16
Effort	“Learning science requires that I substantially rethink, restructure, and reorganize the information that I am given in class and/or in the text.”	%15

According to the finds (Table 2) that have been acquired at the end of the research, after context-based chemistry implementations, positive expectations of preservice chemistry teachers towards the benefits of the daily life chemistry have increased and there have been some changes in their points of expectations. This finding shows that the context-based learning affected student teachers expectations.

## 4 Result

Context-based learning is an approach depending on the principle that scientific concepts should be presented through certain methods by establishing contexts and relationships selected from students’ daily life events [2,6]. In the light of this perspective, it aims to increase students’ motivation and attention towards the lesson, while encouraging them to learn about science and develop positive attitudes towards the courses, which in turn would increase their achievement levels [2,6,7,8,9,10]. Everyday-life based learning as a concept has marked a new epoch in teaching at the end of 1980s. Rising in popularity worldwide, everyday-life based education programs have been developed in such countries as the USA, the UK, Israel, Germany, and Holland. These programs have been initiated in a rather wide space of time.

Everyday-life based learning approach is a model that advocates the premise that “learning can be best achieved through contextualizing it within everyday life,” which was developed at the beginning of the 80s in order to increase the decreased attention to science classes, specifically to chemistry due to the fact that these courses had been taught abstractly, isolated from everyday life [11]. In the last decade, several everyday life based learning materials and teaching programs have been designed and evaluated [12,2,13,14]. Having been influenced by the studies conducted worldwide, many researchers have published articles in this field, and thus they have also contributed to the ever growing attempts to reconcile everyday life and science [14,15,16,17]. All of these aforementioned

studies have been realized with a common objective, and this objective is to reconcile everyday life and science.

According to the finds that have been acquired at the end of the research, after context-based chemistry implementations, positive expectations of preservice chemistry teachers towards the benefits of the daily life chemistry have increased and there have been some changes in their points of expectations. This finding shows that the context-based learning affected student teachers expectations As a result of the evaluation of pre-service teachers' the expectations about learning science on independence, coherence, concept, reality link, math link, and effort dimensions, it is thought that there will be important outcomes in terms of improvement of the quality of teacher training at the university and that there will be an important contribution to literature in this sense. This study was conducted with student teachers from Hacettepe University in Ankara. The conclusions of this study could be generalized for similar research with other similar groups of student teachers.

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