



How do We Proceed? A Needs Assessment Study with Chemistry Teachers

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Abstract

The purpose of this study was to determine the general weakness of chemistry teachers in the usage of technology, content knowledge and pedagogy. The data were collected with a survey from a meeting which was organized by local educational ministry in Afyonkarahisar province in Turkey. The general aim of the meeting was to determine the problems of chemistry teachers and to propose solutions to these problems from faculty. Survey was consisted of 4 sections and these are personal information, technology, chemistry knowledge, and pedagogy. Survey consisted of 15 open ended questions in these four sections. The data were collected from 27 chemistry teachers. In addition to survey, the field notes from this meeting were gathered and analyzed to support the survey data. Data triangulation was granted with the investigation of the content of high school chemistry textbooks about the already mentioned issues in the meeting. This study is qualitative in nature and all data was collected from this research analyzed with content analyses. Three main theme were predetermined and all emerged problems were classified under these. These themes are problems related to the technology, pedagogy and chemistry content knowledge. The main concern that was emerged from the study that educational administrators impose to use new educational methodologies with giving minimal guidance and support to chemistry teachers and students. The frequent change in the content and organization of the chemistry curriculum is another main obstacle for chemistry teachers to adapt and teach chemistry effectively. Chemistry teachers are willing to use social media for private purposes not within their instruction. Other results emerged under three themes were presented in detail.

1. Introduction

Teachers are the core of any educational system. They are the key actors who design what will actually happen in the classroom. Because of this they should be the first priority of any changes in the educational system. Teachers' response has the crucial importance and their adaptation to new challenges determines the achievement level of the planned innovation [1]. Turkey has a very large pool of teachers and almost 600.000 teachers are only working in primary and secondary schools [2]. This is a very big and centralized system and comes with many educational problems.

Chemistry teachers are one part of a this massive construct. The importance and support of chemistry teaching and learning for our current technological advancements and daily life are apparent so providing a quality chemistry education is crucial. Chemistry teachers are the key stake holders. Determining their problems and giving them fair support to improve their instruction is important. There are also reported research about chemistry teachers problems regarding chemistry curriculum, teaching methods and so on [3,4]. Maybe one of the effective ways to adapt and support chemistry teachers to these innovations is promoting collaboration between the faculty and teachers. Developing mutual relations between faculty and teachers are probably very helpful to penetrate these innovations to the classroom level. The main aim of this research emerges from this collaboration in our province. The meetings were arranged in regular basis to develop better collaboration between faculty and teachers. This research reported the problems that came to the stage on one of these meetings.

2. Methodology

2.1 Research Design

This study is qualitative in nature and all data was gathered for this research analyzed with content analyses. The data were collected through a collaboration meeting with faculty and chemistry teachers.



2.2 Setting

The survey was directly conducted by the researcher in a meeting room full of chemistry teachers. One of the aims of the meeting was to determine the problems of chemistry teachers and how to overcome them in our province. Researcher explained the aim of the survey as determining the current problems of chemistry teaching in their classrooms so the faculty and teachers were together propose solutions to these problems.

2.3 Sampling

The data were collected from 27 chemistry teachers. The details of the sample were presented in the table 1.

Table 1. Details of Participant Chemistry Teachers

	0-10	11-20	20-over	Total
Teachers' Experience	4	12	10	26*
				* 1 missing data
	Bachelor	Master	PhD	Total
Teachers' Degree	22	5	0	27
	School of Education	Faculty of Science	Total	
Degree From	18	9	27	

2.4 Data Collection

Data were collected with a survey. Survey is consisted of 4 sections and these are personal information, technology, chemistry knowledge, and pedagogy. Survey consisted of 15 open ended questions in these four sections. In addition to survey, the field notes from this meeting were gathered and analyzed to support the survey data. Data triangulation was granted with the investigation of the content of high school chemistry textbooks about the already mentioned issues in the meeting. Three main theme were predetermined and all emerged problems were classified under these. These themes are problems related to the technology, pedagogy and chemistry content knowledge.

3. Result

Results were presented under these three themes.

3.1 Results Related to Chemistry Content Knowledge

The frequent change in the content and organization of the chemistry curriculum is one of the main concerns for chemistry teachers to adapt and teach chemistry effectively. This change was also required to learn new chemistry topics but there is not enough support for teachers to overcome this problem swiftly. Although most of the teachers were reported that they easily cover the missing content knowledge with little support from other resources, other teachers need serious support for solving these issue (Table 2). The most problematic two units are emphasizing the relationship between chemistry and physics (Energy for Humans and Industry & Chemistry and Electricity).



Table 2. Sufficiency in chemistry content knowledge

Sufficiency	Number of teachers	
I need little support	22	
I need frequent support	3	
I need serious support*	7	
*I need serious support in this chemistry units	Topics	Number of t.
	Acids, Bases and Salts	1
	Energy for Humans and Industry	5
	Chemistry is Everywhere	3
	Chemistry and Electricity	5
	Gases	1
	Reaction Rate & Equilibrium	1
	Introduction to Carbon Chemistry	1
	Organic Chemistry	1
	Modern Atom Theory	1
	Solutions	1

3.2 Results Related to Pedagogy

The main concern that was emerged from the study that educational administrators impose to use new educational methodologies with giving minimal guidance and support to chemistry teachers and students. Teachers have limited capacity to develop an instructional design based on student centered methodologies because of their extensive background with teacher centered approaches. Three methods which were mostly emphasized were direct teaching, question & answer, and discussion (Table 3). These methods are the indicators of teachers preference for more teacher centered classroom instruction [5].

Table 3. Teachers preferred methodologies in chemistry teaching

Preferred Methodology	Number of teachers
Direct Teaching	25
Question & Answer	27
Discussion	21
Science Trips & Observations	10
Laboratory Work (Hands on)	20
Laboratory Work (Demonstrations)	18
Context Based	12
Problem Based	17
Project Based	4
Creative Drama	5
Brain Storming	15
Role Playing	9

Hands on laboratory work and project based learning are the two methods which teachers need support to design a quality classroom instruction (Table 4). The main problems were resources and physical conditions for the hands on laboratory work. Teachers do not have any laboratory support personnel and they have time limitation on preparing the labs for students. Most of the teachers offered faculty to conduct all the chemistry textbook experiments in the university lab and videotaped them for the dissemination to all chemistry teachers in the province. Teachers at least would like to watch them with their students in the classroom. For the project based learning, they would like to use university resources such as labs, library and others at least with ambitious students for research. They also said that they feel in sufficient about preparing materials for project based learning such as research problems, rubrics and other resources.



Table 4. Methodologies teachers would like to get some support to be better

Preferred Methodology	Number of teachers
Direct Teaching	2
Question & Answer	2
Discussion	2
Science Trips & Observations	5
Laboratory Work (Hands on)	9
Laboratory Work (Demonstrations)	5
Context Based	3
Problem Based	2
Project Based	9
Creative Drama	4
Brain Storming	2
Role Playing	4

Teachers are mostly not very satisfied about the 9th grade chemistry textbook (Table 5). This book is written by the guidance of the currently disseminated chemistry curriculum. Only one third of the teachers in the study were reported some satisfaction with the separate units in the book.

Table 5. Teachers' ideas about 9th grade chemistry textbook

Used the 9 th grade chemistry textbook		The content load of the 9 th grade chemistry textbook		
Yes	No	Heavy	Normal	Light
22	5	6	7	2

9 th grade units in the book presented well	Number of teachers
Introduction to Chemistry	9
Atom and Periodic System	6
Interactions Between Atoms and Molecules	8
States of Matter	8

Most of the teachers said that they do not use chemistry textbook efficiently in the classroom. Some of the teachers found the book superficial in some subjects and they thought that the topics in the book are not very well organized (Table 6).

Table 6. Teachers usage of the chemistry textbook

Using textbook effectively	2	
Textbook & Additional resource	9	
Not prefer to use textbook primarily*	12	
*Why?	Chemistry subjects are presented superficial	6
	Chemistry subjects presented in detail	1
	The topics are not very well organized	6

Most of the chemistry teachers had been in teacher training programs (Table 7) but they were not happy about these.

Table 7. Involvement of teachers to training programs

Involvement Frequency	Number of teachers
Never	6
1-3 times	15
4-10 times	6
11 or more	0

Most of them reported that teacher trainings are generally ineffective (Table 8). They were not pleased with the training programs because of their intensive theoretical style. Another problem regarding this issue was the random selection of the instructors for the training problems. Educational administrators do not paying enough attention to finding the right expert for the available training.



Table 8. The reasons why teacher training programs are in effective

Reasons	Number of teachers
The presented knowledge is not updated	3
Mostly theoretical & Limited practical importance	11
Crowded classroom environments	4
Inactive training environment & Direct teaching	13
Teacher trainers are insufficient about the topic	11
Teacher cooperation is not promoted	8

3.3 Results Related to Technology

Teachers in common have personnel computers to do their personnel and school work (Table 9). Only 16 teachers have an email address which they frequently used to communicate with others. Teachers are generally comfortable with using presentation tools.

Table 9. Usage of web technologies

Web Technology	Number of teachers
E-mail	16
Personel Computer	22
Tablet	12
Smart Phone	17
Presentation Tools (Powerpoint, prezi, etc.)	16
Animation Tools (Goanimate, powtoon etc.)	2
Concept map & Drawing (Cacoo, Cmaps, etc.)	4
Learning Management Systems (Edmodo, Wikispaces, etc.)	3
Online storage & Cloud (Dropbox, gdrive, etc.)	3
Wordle Cloud (Wordle, tagcloud, etc.)	0

Chemistry teachers are willing to use social media for private purposes not within their instruction (Table 10). They mostly preferred to use facebook followed by twitter for personnel use.

Table 10. Usage of social media in class & personnel

Personal Use		Social media in classroom	
Social Media Tool	Number of teachers	Social Media Tool	Number of teachers
Facebook	16	Facebook	0
Twitter	8	Twitter	0
Instagram	5	Instagram	0
Foursquare/Swarm	2	Foursquare/Swarm	0

References

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