

***International Conference on Initiatives in
Chemistry Teacher Training
Limerick, November 29th 2013***

***“Preparing and Retaining High Quality Chemistry
Teachers in Greece ”***

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This project has been funded with support from the European Union.
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Introduction - Objectives

- Explore the links between in-service Greek chemistry teachers'

Training experiences – Beliefs – Classroom practices

- **Inspiration**
 - Pre-service teachers often regard **theory and practice to be inconsistent.**
 - Chemistry teachers tend to teach as they were taught in school and university, rather than as they were taught to teach
 - **Teachers' beliefs** stem from a combination of **personal experience, knowledge, and social background.**

Introduction

- Recent cross-level study on German student teachers' beliefs about teaching and learning chemistry *[Markic & Eilks, 2013]*
- The study involved
 - a) university freshmen
 - b) student teachers midway through their university teacher education program
 - c) recently graduated teachers starting to gain experience as full-time teachers.
- **Freshmen possess very traditional beliefs** about teaching and learning.
- **The other two groups hold more modern beliefs**
- **However, student teachers midway through training appear to have the most modern teaching beliefs.**

Thus, taking into account that

Effective teaching of chemistry is much more than the transmission of chemical knowledge and also much more than good pedagogy and knowledge of educational theory

We anticipate that

The findings of our project could aid towards the design of more effective science teacher training programs in Greece.

Methodology

Participants (N = 15)

- 1 primary school teacher and 9 secondary school chemistry teachers
- 5 scientific experts from 5 different Institutions
- Three groups of five persons each
- Each group containing at least one scientific expert

Workshop activities

Participation of all groups in three activities

- Participants were given a specific amount of time (ca 20 minutes) to freely interact with the other members of their group and discuss the theme of the activity.
- At the end of this free interaction, each group was asked to present the summary of their in-between discussion via one spokesperson for a maximum period of 10 minutes.
- The spokespersons' talks were taped and transcribed.
- Content analysis

Methodology

Activity 1

Discussion on teacher training by focusing on two main themes:

- a) **personal experiences** of the participants in relation with their training
- b) the information provided by the **Papers and Publications** related to “Teachers’ training” in the project database.

Activity 2

Exchange of experiences and opinions on different teaching approaches/methods of a chemistry subject.

- a) Participants’ **opinions and training on innovative teaching approaches**,
- b) Participants’ **practices** in chemistry classroom and laboratory.

Activity 3

Proposals on different aspects of teacher training.

- a) **Content** of teacher training
- b) **Type** of teacher training
- c) **Responsibility** of teacher training.

Results and Discussion

Pre-service training

- Intensive and in-depth academic training in the subject of their specialization (chemistry, physics, biology, chemical engineering) but very limited training related to psychology, pedagogy or chemistry education.
- Few relevant courses which always belonged to the category of elective or elective-obligatory in the best case.
- Enter the teaching profession by considering their own science teachers as a prototype.

In-service training

- Reported both positive and negative experiences.
- Obligatory three-phase initial training program at regional training centres: “Not really very useful” – Theoretical information inconsistent with classroom practice

Results and Discussion

In-service training (cont.)

Assessment of three **optional** in-service teacher training initiatives

- a) Practical courses organised by regional “**Science Laboratory Centres**” (Supporting educational structures known as EKFE).
- b) The two-phase practical training course on “**ICT in Education**”
- c) The programme of “**Major Training**” (“Meizona Epimorfosi”)

Participants felt that all three programmes above have been **useful** for their professional development.

However, the first two did not seem to have clear educational objectives and focus.

The program of “**Major Training**” had a clear aim and orientation related to the cooperative teaching approach and group activities (social dimension). **However**, this program is **still in the phase of development** and has so far been applied on a pilot scale with a limited number of participants (ca 850 science teachers).

Results and Discussion

The extent at which the different teaching dimensions are covered during preparing and retaining chemistry teachers as unveiled by participants' experiences, is shown in the following table.

| | Dimensions of teaching | | | | |
|----------------------|------------------------|-------------|---------------|------------|------------|
| | Subject Matter | Pedagogical | Psychological | Social | ICT |
| Pre-Service training | adequate | absent | absent | absent | absent |
| In-service training | absent | inadequate | inadequate | inadequate | inadequate |

Results and Discussion

Factors influencing the effectiveness of teacher training programs

Positive influence

1. Learning about the existence of ICT tools
2. Learning about the usefulness of interactive ICT tools
3. Learning how to exploit ICT in the classroom
4. Attending “live” experiments
5. The cooperative teaching approach and group management issues
6. Clear objectives and focus

Negative influence

1. Sporadic nature
2. Optional participation
3. Limited length of the program
4. Limited available number of trainees
5. Lack of active participation of trainee
6. Presentation of experiment without a suitable teaching approach.
7. Theory inconsistent with practice

Results and Discussion

Major obstacles for implementation of novel teaching approaches

- a) The **anchoring** of upper secondary school to the National (Panhellenic) exams for entering tertiary education institutions
- b) The **closed curriculum** and student evaluation method which are imposed horizontally in all secondary schools of the country
- c) The **competitive co-existence** and conflict between the official school education and the private tutoring system (“Frontistirio”).
- d) The **lack of basic equipment** from the large majority of science laboratories of public schools

These obstacles are related with **structural characteristics** of the Greek educational system – The implementation of a teacher training program is inhibited.

Results and Discussion

Proposals for the Content of Teacher Training

- a) **Active learning** methods – **Practical advice** for successful implementation
- b) Research based **evaluation of ICT use** in the teaching process
- c) **Pedagogical dimension** of teaching based on findings of educational research
- d) **Psychological dimension** of teaching (developmental psychology focused on adolescents, cognitive psychology)
- e) **Update on new scientific knowledge** and general current trends in science – **Transformation** of academic knowledge into school knowledge that can be didactically exploited in a secondary school classroom
- f) **Interdisciplinary** subjects (connections between chemistry and other disciplines)

Results and Discussion

Type of teacher training program (in-service)

- Continuous (lifelong) and systematically organized with a constant rate.
- Preferably not done in parallel with work (professional burn out)
- Possibility for long-term (a few months) leave of absence

Responsibility for teacher training (Who?)

- Not necessary to have or create a separate institution/organization.
- Active collaboration and commitment between already existing structures (University and School domains), as also suggested in the literature

Results and Discussion

Comparison of Greek chemistry teachers beliefs and experiences with important characteristics of a TT program identified in another cultural context (USA)

- Duration of the teacher training program
- In-service training on academic subject matter
- The possibility for active learning
- The overall coherence of the training program
- Thus, our case study analysis indicates that exploring the actual classroom practices, beliefs and experiences of in-service chemistry teachers could help towards the design of a teacher training program which will have realistic aims and maximal impact on the trainees.

Acknowledgements

Workshop participants

Dr. Katerina Salta

EU-LLP “Chemistry is All Around Network”



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**Thank you for your
attention**