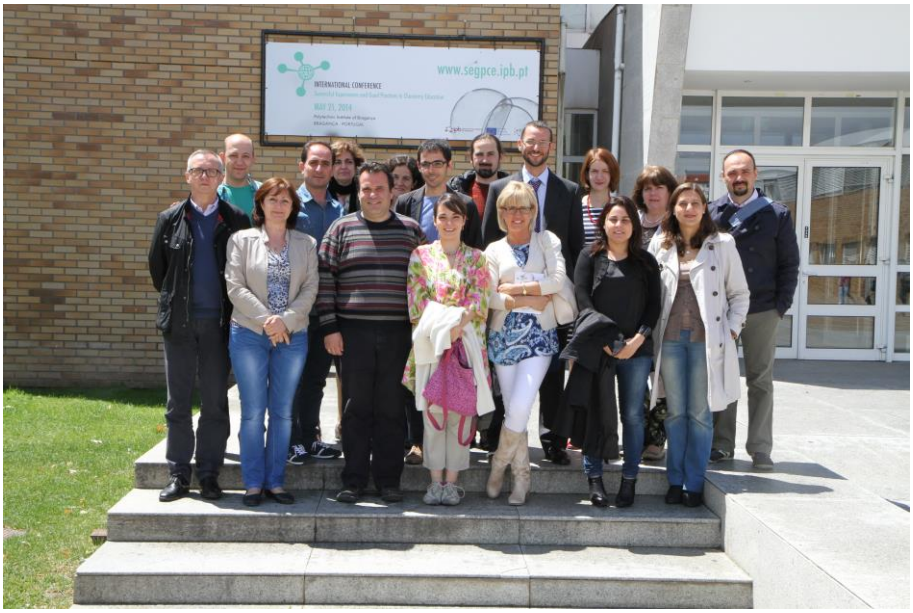
518300-LLP-2011-IT-COMENIUS-CNW

7.1 – Annex 1 Bragança Conference Report

Successful Experiences and Good Practices in Chemistry Education

First Conference on the thematic area

Successful Experiences



Escola Superior de Tecnologia e Gestão

Instituto Politécnico de Bragança

Bragança (Portugal)

21th May 2014

Lifelong Learning Programme

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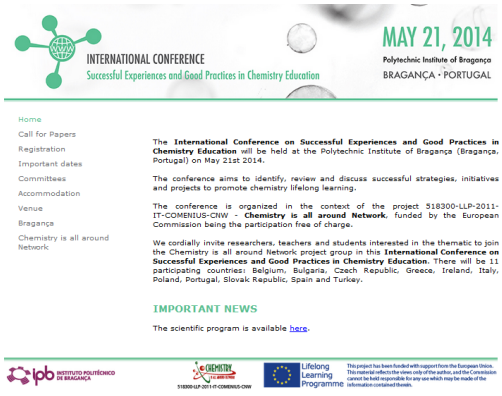
Introduction

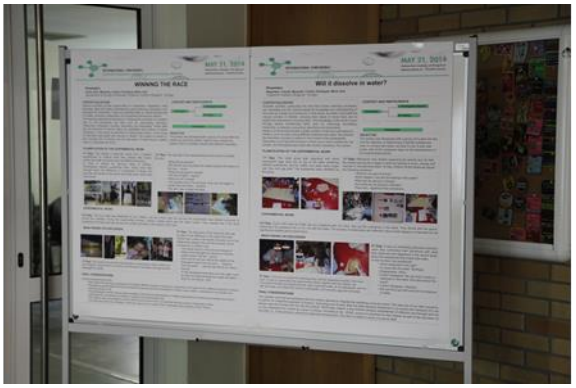
The international conference **"Successful Experiences and Good Practices in Chemistry Education"** took place in Bragança on 21th May 2014 at Escola Superior de Tecnologia e Gestão do Instituto Politécnico de Bragança. The aim of the conference was to share European experiences on successful strategies, initiatives and projects to promote chemistry lifelong learning. The Conference was funded by the 518300-LLP-2011-IT-COMENIUS-CNW Chemistry is All Around Network project resources. It was part of the prescribed 3th year activities of the Chemistry is All Around Network project and was the first conference on the thematic Successful Experiences.

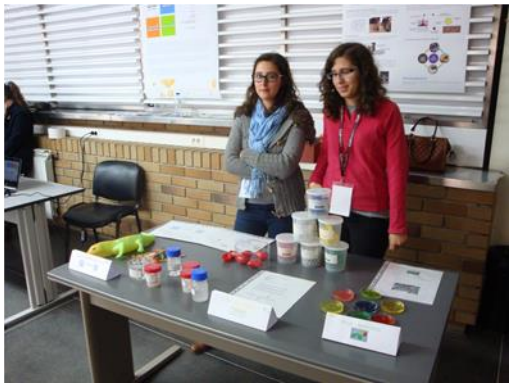
Conference Organisation

The Conference was a one-day event with the morning session centred around the European experiences collected through the Chemistry is All Around Network project, and the afternoon devoted to other contributions, namely the ones from the Portuguese Scientific experts integrating the Chemistry is All Around Network project.



In addition to the oral session, one poster presentation and one exposition comprising the results of several Portuguese science communication/dissemination projects were organized. The compositions of the organizing and scientific committees, as well as the conference programme are available both on the conference web site (http://www.segpce.ipb.pt/) and as appendix to this document.





Conference Participants

Around 100 participants registered from a number of European countries, with the largest representation from Portugal. These included representatives from universities, schools, educational companies and public authorities. The complete list of participants is available both on the conference site and as an appendix to this document.

Conference Contents

All presented papers are included in the conference proceedings which have been published in a book in digital and paper format.

The participants were welcomed to the conference by the President of IPB and by the Dean of the School of Technology and Management. The Chairperson for the day was Filomena Barreiro followed by Olga Ferreira.

The papers presented addressed Successful Experiences and Good Practices in Chemistry Education. The following themes have been addressed by the project members:

Maria Maddalena Carnasciali (Italy) presented a paper entitled "Successful experiences in primary school science education". The paper presented two successful experiences to teach basic chemistry contents at primary school. The first one was an interdisciplinary teaching proposal focused on the chemical process of dissolution and based on the laboratorial approach. The second started with a motivating context: the preparation of pickled olives and fruit in syrup. She concluded that both experiences encourage children motivation.

The work of **Dionysios Koulougliotis** (Greece), entitled "What constitutes a successful experience in teaching Chemistry? Characteristic examples from the Greek educational context" comprised two parts. In the first part a brief literature review was made trying to elucidate what is meant by "successful teaching experience". In the second part a set of five examples of successful chemistry teaching experiences were presented and analysed. As a conclusion, it was stated that the Greek examples provide evidence for the need of concurrent use of a carefully selected variety of teaching strategies, techniques and materials in order to readily enhance the effectiveness of chemistry (and science) teaching.

Julien Keutgen (Belgium) presented the work of Divna Brajkovic entitled "Issues, initiatives and prospects of ICT use in chemistry teaching" analysing the survey preformed by the AWT (Agence Wallonne des Télécommunications – The ICT platform of Wallonia) in 2013 concerning the assessment of ICT equipment and use in compulsory education in Wallonia. The study came to the conclusion that there is a lack of computer material and teacher training. Moreover, to make chemistry learning more efficient, the investigative approach is unavoidable in secondary education.

Filomena Barreiro (Portugal) presented the work "Chemistry education – the relevance of innovative pedagogical practices in the early years". The work analysed the importance of chemistry education from early years as contributing for the formation of informed and prepared citizens, with scientific literacy competences and able to pursue an active, participative and responsible citizenship. In this context, school was assumed to play a major role and should, therefore, provide chemistry education for all children.

The work of **Murat Dermirbas** (Turkey) entitled "Successful experiences in Chemistry teaching in Turkey: Teaching activities based on inquiry and argumentation" addresses examples resulting from successful implementations of the teaching activities in the field of chemistry in Turkey by inquiry based and argumentative method. Some applications were analysed and successful experiences exemplified.

Milena Koleva (Bulgaria) presented the work "Teaching chemistry at school: Bulgarian innovative practice". The paper presented successful experience and good pedagogic practices in teaching chemistry at Bulgarian secondary schools in the context of the European educational policy for development of key competences for the young people. Problem-based approach, experimental work, project-based activities and other innovative teaching methods and technologies were discussed as an effective way to improve the students' scientific literacy and motivation to study chemistry.

Cristina Gaitán (Belgium) presented the work of António Torres Gil entitled "Teaching chemistry with a new cooperative model in the classroom". The work pointed out a decrease in the number of science students as well as in students´ interest in Chemistry and Physics. As a result, teachers have started to use different methodological strategies in the classroom aimed at improving academic results and student's motivation. The paper presented a brief review of two approaches often used: "contextualized Science" and cooperative learning.

Zdeněk Hrdlička (Czeck Republic) presented a paper describing "Successful experience and good practices in teaching chemistry at schools in Czeck Republic. Educational system of the Czech Republic faces many problems and challenges not only in the field of natural sciences. However, successful experiences in

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chemistry teaching can be found. For example, students of primary and secondary schools who achieved great results in national and international competitions; teachers interested in lifelong learning; successful experts and their wonderful research; national and international projects promoting chemistry teaching; many excellent chemical high schools and universities; increasing support for ICT teaching (new portals with many educational resources for students and teachers) etc. The paper reported some successful examples of good practice that could help to improve students' attitude towards chemistry.

Magdalena Gałaj (Poland) presented the work “Feel the chemistry with chemistry. Successful experiences in teaching and learning in Poland”, whose objectives were focused on Polish chemistry education and training issues. In the context, the authors consider several case studies of successful educational initiatives, projects, and lesson plans whose main objective was to create new quality in teaching and promoting chemistry in the contemporary world. As a conclusion the authors announce a change of priorities in the increasing level of effectiveness of educational programs, from developing technical infrastructures and creating new tools to the application of the existing ones with higher level of creativity, commitment and expertise.

Juraj Dúbrava (Slovakia) presented the work of Katarína Javorová and Martin Šponiar within the thematic “Group work in teaching chemistry in topic pH of solutions”. Group work was presented as one way to improve student skills. During group work the student learns how to cooperate with other students, gives his opinion, argues, and learns to respect, listen and tolerate peers. Examples of teaching methods application during chemistry lessons at primary school in two classes of 8th year were presented. The group work strategy was chosen because it was most often used in chemistry lessons, mainly during lab work.

The work entitled “Successful experiences in chemistry teaching and learning: a review of some suggestions for good practice” was presented by **Mary Walsh** (Ireland). The central idea was that motivating students and providing relevant learning experiences require a continuum of effort from teachers. It has been shown that successful experiences in Chemistry teaching and learning may arise from: understanding and managing difficulties with language; understanding and reacting to the skills levels of students; placing Chemistry in a multidisciplinary context; using modelling – both computer simulations and concrete models, employing active learning and inquiry-based strategies for teaching and learning; and, last but not least, conceding that technology used well can enhance the teaching and learning process.

All the scientific experts belonging to the Portuguese “**Chemistry is all Around Network”** project have contributed for the conference success. Namely they have presented the following oral communications:

- Discovering Chemistry through Food: history, concepts and knowledge
  Sónia Fernandes, **Carla Morais** and João Paiva
- Interacting with the Past: A Journey into the Beauty and Science of Medieval Colours
  Maria João Melo
- Obtaining Lead Iodide in the Laboratory: Looking for Answers
  Manuela Ortigão and **Fátima Paixão**
- “Active Engagement” of Students in TP classes: a solution for several problems?
  Paulo Ribeiro-Claro

Mónica Oliveira gave her contribution through the presentation of the “Tudo flui…” project. Moreover **Paulo Ribeiro-Claro** provided the videos from the project “Química das coisas” that were shown during Poster sessions/Coffee break.

Filomena Barreiro and **Olga Ferreira** thanked the conference participants who had presented, listened, discussed and otherwise appreciated a very packed and informative programme.

Conference Evaluation

At the end of the conference the participants gave verbal evaluations that were positive about the organisation, venue and programme.

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Conclusions

The conference received presentations from representatives of eleven different European countries. It was an opportunity to consolidate the work of the Chemistry is “All Around Network” project. Furthermore, it allowed associate partners and experts from Portugal to meet the European partners. The model of mixing oral and poster communications with practical workshops was very positive bringing dynamism and fomenting an active discussion between participants.

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Appendix 1: Committees

Scientific Committee

Carla Morais, Faculty of Sciences - University of Porto, Portugal
Dionysios Koulougliotis, Technological Educational Institute (T.E.I.) of Ionian Islands, Greece
Hana Bartkova, Institute of Chemical Technology,Prague, Czech Republic
Maria Filomena Barreiro, Instituto Politécnico de Bragança, Portugal
Maria João Melo, Universidade Nova de Lisboa, Portugal
Maria José Rodrigues, Instituto Politécnico de Bragança, Portugal
Maria Maddalena Carnasciali, University of Genoa, Italy
Marie Walsh, Limerick Institute of Technology, Ireland
Milena Koleva, Technical University of Gabrovo, Bulgaria
Mónica Oliveira, University of Strathclyde, United Kingdom
Murat Demirbaş, Kırıkkale University Education Faculty, Turkey
Olga Ferreira, Instituto Politécnico de Bragança, Portugal
Paulo Ribeiro Claro, Universidade de Aveiro, Portugal

Organizing Committee

Adilia Tavares da Silva
Ana Isabel Pereira
Ana Raquel Rodrigues
Elisete Afonso
Maria Filomena Barreiro
Maria João Afonso
Maria José Alves
Maria José Rodrigues
Olga Ferreira
Paula Plasência

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Appendix 2: List of Participants

	Name	Organization	Country
1	Alice Alves	Agrupamento de Escolas de Mirandela	Portugal
2	Clotilde da Conceição Ferreira Nogueira	Centro Ciência Viva de Bragança	Portugal
3	Manuel Luis Silva Pinto	Casa das Ciências	Portugal
4	Maria Elisete C. P. Afonso	CFAEBN	Portugal
5	Maria João Melo	Universidade Nova de Lisboa,	Portugal
6	Paulo Ribeiro-Claro	Universidade de Aveiro	Portugal
7	Maria Manuela Meneses Ortigão de Oliveira	Escola Secundária Daniel Faria, Baltar	Portugal
8	Sónia Fernandes	Faculdade de Ciências - Universidade do Porto	Portugal
9	Márcia Moreno	UDC	Portugal
10	Adília Tavares da Silva	Agrupamento de Escolas Abade de Baçal	Portugal
11	Ana Isabel Pereira	Instituto Politécnico de Bragança	Portugal
12	Filomena Barreiro	Instituto Politécnico de Bragança	Portugal
13	Maria João Afonso	Instituto Politécnico de Bragança	Portugal
14	Maria José Rodrigues	Instituto Politécnico de Bragança	Portugal
15	Olga Ferreira	Instituto Politécnico de Bragança	Portugal
16	Paula Plasencia	Instituto Politécnico de Bragança	Portugal
17	Alda Afonso	Escola Básica Paulo Quintela	Portugal
18	Luísa Maria Fernandes	Escolas Emidio Garcia	Portugal
19	Maria José Minhoto	Escola Básica Paulo Quintela	Portugal
20	Susana Sabina Pires Fernandes	Freixo de Espada à Cinta	Portugal
21	Teresa de Jesus Calvo Pinto	Agrupamento de Escolas Emídio Garcia	Portugal
22	Adorinda Gonçalves	Instituto Politécnico de Bragança	Portugal
23	Ana Maria Queiroz	Instituto Politécnico de Bragança	Portugal
24	António Ribeiro	Instituto Politécnico de Bragança	Portugal
25	Carla A. S. Geraldes	Instituto Politécnico de Bragança	Portugal
26	Florbela Fernandes	Instituto Politécnico de Bragança	Portugal
27	Joana S. Amaral	Instituto Politécnico de Bragança	Portugal
28	João Paulo Pais de Almeida	Instituto Politécnico de Bragança	Portugal
29	Paulo Brito	Instituto Politécnico de Bragança	Portugal
30	Porkodi Kadhirvel	Instituto Politécnico de Bragança	Portugal
31	Cristina Gaitán	CECE	Spain
32	Deniz Altınışık	Kırıkkale University	Turkey
33	Dionysios Koulougliotis	Technological Educational Institute (T.E.I.) of Ionian Islands	Greece
34	Hana Bartková	Institute of Chemical Technology Prague	Czech Republic
35	Julien Keutgen	Inforef	Belgium
36	Juraj Dúbrava	TRANSFER Slovensko, s.r.o.	Slovakia
37	Lorenzo Martellini	Pixel	Italy
38	Magdalena Gałaj	WSINF – the Academy of Information Technology	Poland
39	Marcela Grecová	Institute of Chemical Technology Prague	Czech Republic
40	Maria Maddalena Carnasciali	Genova University	Italy
41	Marie Walsh	Limerick Institute of Technology	Ireland
42	Milena Koleva	Technical University of Gabrovo	Bulgaria
43	Murat Demirbaş	Kırıkkale University	Turkey
44	Zdeněk Hrdlička	Institute of Chemical Technology Prague	Czech Republic
45	Maria Inês Dias	Instituto Politécnico de Bragança	Portugal
46	Alexandra Marques Moreira.	Instituto Politécnico de Bragança	Portugal
47	Ana Carolina Mota	Instituto Politécnico de Bragança	Portugal
48	Ana Isabel Canteiro Trigo	Escola Superior de Educação - Instituto Politécnico de Bragança	Portugal
49	Ana Margarida Gouveia Peixoto	Escola Superior de Educação - Instituto Politécnico de Bragança	Portugal
50	Ana Oliveira	Instituto Politécnico de Bragança	Portugal
51	Ana Patrícia Alves de Freitas	Escola Superior de Educação - Instituto Politécnico de Bragança	Portugal

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52	Armando Martins	Instituto Politécnico de Bragança	Portugal
53	Carla Raquel Almeida	Escola Superior de Educação - Instituto Politécnico de Bragança	Portugal
54	Carlos Lopes	Instituto Politécnico de Bragança	Portugal
55	Cátia Patrícia Mendes Cunha	Escola Superior de Educação - Instituto Politécnico de Bragança	Portugal
56	Cátia Sofia Sousa	Instituto Politécnico de Bragança	Portugal
57	Diana Francisco Cuma	Instituto Politécnico de Bragança	Portugal
58	Emanuel Rosa	Escola Superior de Educação - Instituto Politécnico de Bragança	Portugal
59	Hugo Alexandre Ferreira Martins	Escola Superior de Educação - Instituto Politécnico de Bragança	Portugal
60	Juliana Rosas	Escola Superior de Educação - Instituto Politécnico de Bragança	Portugal
61	Lívio Ferraz	Instituto Politécnico de Bragança	Portugal
62	Marta Bobiano	Instituto Politécnico de Bragança	Portugal
63	Nádia Couto	Escola Superior de Educação - Instituto Politécnico de Bragança	Portugal
64	Nuno Miguel Martins Marques	Instituto Politécnico de Bragança	Portugal
65	Rute Marina Torrão Veiga	Escola Superior de Educação - Instituto Politécnico de Bragança	Portugal
66	Sofia Margarida Alves Sousa Meireles	Escola Superior de Educação - Instituto Politécnico de Bragança	Portugal
67	Tânia Daniela Almeida Lopes	Escola Superior de Educação - Instituto Politécnico de Bragança	Portugal
68	Bruna Rodrigues	Escola Superior de Educação - Instituto Politécnico de Bragança	Portugal
69	Márcia Raquel da Cruz Lopes	Escola Superior de Educação - Instituto Politécnico de Bragança	Portugal
70	Daniela Santos Aguiar	Instituto Politécnico de Bragança	Portugal
71	Dalila da Assunção Maia Vieira	Instituto Politécnico de Bragança	Portugal
72	Sara Brito	Escola Superior de Educação - Instituto Politécnico de Bragança	Portugal
73	Marta Pinto	Escola Superior de Educação - Instituto Politécnico de Bragança	Portugal
74	Pedro Pires	Escola Superior de Educação - Instituto Politécnico de Bragança	Portugal
75	Óscar Loureiro	ESTiG	Portugal
76	Sara Ribeiro	Escola Superior de Educação - Instituto Politécnico de Bragança	Portugal
77	Ana Raquel Gonçalves Ferreira	Escola Superior de Educação - Instituto Politécnico de Bragança	Portugal
78	Gabriela Dinis	Escola Superior de Educação - Instituto Politécnico de Bragança	Portugal
79	Donilda Aguiar	Escola Superior de Educação - Instituto Politécnico de Bragança	Portugal
80	Vanessa Dantas	Escola Superior de Educação - Instituto Politécnico de Bragança	Portugal
81	João Magalhães	Escola Superior de Educação - Instituto Politécnico de Bragança	Portugal
82	Leandro Borges	Escola Superior de Educação - Instituto Politécnico de Bragança	Portugal
83	Cândido Miguel Ferreira	Escola Superior de Educação - Instituto Politécnico de Bragança	Portugal
84	Paulo Filipe Ferro Freitas	Escola Superior de Educação - Instituto Politécnico de Bragança	Portugal
85	Maria José Câmara Viveiros Alves	Instituto Politécnico de Bragança	Portugal
86	Inês Rodrigues	GRI – Instituto Politécnico de Bragança	Portugal
87	Raquel Rodrigues	GRI – Instituto Politécnico de Bragança	Portugal
88	Ângela Silva	Escola Superior de Educação - Instituto Politécnico de Bragança	Portugal
89	Alexandra Silva	Escola Superior de Educação - Instituto Politécnico de Bragança	Portugal
90	Maria Cidália Ribeiro Costa	Escola Superior de Educação - Instituto Politécnico de Bragança	Portugal
91	Alexandra Sofia Lobato Pires	Escola Superior de Educação - Instituto Politécnico de Bragança	Portugal
92	Silvia Patricia Gomes Rodrigues	Escola Superior de Educação - Instituto Politécnico de Bragança	Portugal
93	Mónica Margarida F. Castro	Escola Superior de Educação - Instituto Politécnico de Bragança	Portugal
94	Nuno André Silva Teixeira	Escola Superior de Educação - Instituto Politécnico de Bragança	Portugal
95	Simone Abel	Escola Superior de Educação - Instituto Politécnico de Bragança	Portugal
96	Mário Teixeira	Escola Superior de Educação - Instituto Politécnico de Bragança	Portugal
97	José Pedro Ramos Sampaio	Escola Superior de Educação - Instituto Politécnico de Bragança	Portugal
98	Ana Raquel Cardoso	Escola Superior de Educação - Instituto Politécnico de Bragança	Portugal
99	Fernando Jorge Gonçalves Rocha	Escola Superior de Educação - Instituto Politécnico de Bragança	Portugal
100	João Paulo Mateus Moutinho	Escola Superior de Educação - Instituto Politécnico de Bragança	Portugal
101	Daniela Verissimo Esteves	Escola Superior de Educação - Instituto Politécnico de Bragança	Portugal
102	Elza Maria Lombo Afonso	Escola Superior de Educação - Instituto Politécnico de Bragança	Portugal
103	Andreia Filipa Dias Pinto	Escola Superior de Educação - Instituto Politécnico de Bragança	Portugal
104	Fábio Miguel Mendes Cordeiro	Escola Superior de Educação - Instituto Politécnico de Bragança	Portugal
105	António Filipe Felgueiras Batista	Escola Superior de Educação - Instituto Politécnico de Bragança	Portugal

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107	Luís Carlos Fernandes Reis	Escola Superior de Educação - Instituto Politécnico de Bragança	Portugal
108	João Paulo Rocha Silva Ribeiro	Escola Superior de Educação - Instituto Politécnico de Bragança	Portugal
109	Tânia Rodrigues Gonçalves	Escola Superior de Educação - Instituto Politécnico de Bragança	Portugal
110	Sérgio Carneiro Garcia	Escola Superior de Educação - Instituto Politécnico de Bragança	Portugal
111	Ricardo Manuel Macedo Ramos	Escola Superior de Educação - Instituto Politécnico de Bragança	Portugal
112	Vitor Hugo Ferreira Magalhães	Escola Superior de Educação - Instituto Politécnico de Bragança	Portugal
113	Sara Conde	Escola Superior de Educação - Instituto Politécnico de Bragança	Portugal
114	Lilia Magalhães Rodrigues	Rua de São José, n.º 43 5320-319 Vinhais	Portugal
115	Johnny Pinto Nogueira	Escola Superior de Educação - Instituto Politécnico de Bragança	Portugal
116	Rui Alberto Lima	Instituto Politécnico de Bragança	Portugal
117	David Espirito Santo	Instituto Politécnico de Bragança	Portugal
118	Rafael Fernandes	Instituto Politécnico de Bragança	Portugal
119	Carlos Oliveira	Instituto Politécnico de Bragança	Portugal
120	Emad Sweed	Instituto Politécnico de Bragança	Syria
121	Vitor Pereira	Instituto Politécnico de Bragança	Portugal
122	Ruben Martins	Instituto Politécnico de Bragança	Portugal
123	Miguel Correia	Instituto Politécnico de Bragança	Portugal
124	Pedro Gouveia	Instituto Politécnico de Bragança	Portugal
125	Sérgio Pereira	Instituto Politécnico de Bragança	Portugal
126	André Mesquita	Instituto Politécnico de Bragança	Portugal
127	Telmo Borges	Instituto Politécnico de Bragança	Portugal
128	Angela Fernandes	Escola Superior Agrária - Instituto Politécnico de Bragança	Portugal
129	Amanda Koike	Escola Superior Agrária - Instituto Politécnico de Bragança	Portugal
130	Edijoel Teixeira Sampaio	ESE - Centro de Línguas	Portugal
131	Nuno Miguel Silva Vales	ESE - Centro de Línguas	Portugal
132	Tânia Vaz	Instituto Politécnico de Bragança	Portugal

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Appendix 3: Conference Programme

8h00-9h00	Registration
9h00-9h15	Welcome session
9h15-9h30	Successful Experiences in Primary School Science Education *Laura Ricco and Maria Maddalena Carnasciali*
9h30-9h45	Issues, Initiatives and Prospects of ICT Use in Chemistry Teaching *Divna Brajkovic*
9h45-10h00	"Feel the Chemistry with Chemistry" Successful Experiences in Teaching and Learning Chemistry in Poland *Mariusz Jarocki and Magdalena Gałaj*
10h00-10h15	Group Work in Teaching Chemistry in Topic pH of Solutions *Katarína Javorová and Martin Šponiar*
10h15-10h30	What Constitutes a Successful Experience in Teaching Chemistry? Characteristic Examples from the Greek Educational Context *Katerina Salta and Dionysios Koulougliotis*
10h30-11h00	Poster session + Coffee break
11h00-11h15	Successful Experience and Good Practices in Teaching Chemistry at Schools in the Czech Republic *Marcela Grecová and Zdeněk Hrdlička*
11h15-11h30	Successful Experiences in Chemistry Teaching in Turkey: Teaching Activities Based on Inquiry and Argumentation *Murat Demirbaş, Mustafa Bayrakci and Nazmiye Başer*
11h30-11h45	Successful Experiences in Chemistry Teaching and Learning: A Review of Some Suggestions for Good Practice *Marie Walsh*
11h45-12h00	Chemistry Education – the Relevance of Innovative Pedagogical Practices in the Early Years *Maria José Rodrigues, Olga Ferreira, Filomena Barreiro and Adorinda Gonçalves*
12h00-12h15	Teaching Chemistry at School: Bulgarian Innovative Practice *Milena Koleva*
12h15-12h30	Teaching Chemistry with a New Cooperative Model in the Classroom *Antonio Jesús Torres Gil*
12h30-14h30	Lunch break
14h30-14h45	"Active Engagement" of Students in TP classes: a solution for several problems? *Paulo Ribeiro-Claro*
14h45-15h00	Obtaining Lead Iodide in the Laboratory: looking for answers *Manuela Ortigão and Fátima Paixão*
15h00-15h15	Casa das Ciências A Collaborative Website for science teachers *Manuel Luis Silva Pinto*
15h15-15h30	Discovering Chemistry through Food: History, Concepts and Knowledge *Sónia Fernandes, Carla Morais and João Paiva*
15h30-15h45	STEP - Step Towards the Popularization of Research and Technology *Hana Bartková and Jitka Svatošová*
15h45-16h00	Interacting with the Past: A Journey into the Beauty and Science of Medieval Colours *Maria João Melo*
16h00-17h00	Poster session + Science projects + Coffee break

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POSTER SESSION

A Compilation of Postgraduate Theses Written in Turkey on Computer Assisted Instruction in Chemistry Education
Aykut Emre Bozdoğan and Murat Demirbaş

Approaches to Developing Key Competences in Natural Sciences
Krasimira Tomeva

Chemistry Dissemination through Ciência@Bragança Project
Márcia Moreno, Ana Isabel Pereira, Isabel C.F.R. Ferreira, Adília Fernandes, Cristina Mesquita, Anabela Martins and José Matias

Contemporary Possibilities in the Chemistry Education for Building Positive Motivation and Strong Interest to Natural Sciences
Violeta Konstantinova

In-Service Training Pathways of Physics and Chemistry Teachers in Northeastern Portugal
Maria Elisete C. P. Afonso

INTACT Project: Bringing Teaching Resources to Mobile Life
Isabel Chumbo and Vitor Gonçalves

Integrative Internet-Based Case Study for Sustainable Development
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