**Spanish Case Study - portfolio**

Alfonso is a training chemistry teacher in Spain. He has attended to the PROFILES CPD workshop during the academic year 2011-2012. Throughout the course he was part of a group that developed a module on Climate Change and he was very motivated after the implementation of the module in his classroom. His colleagues, who worked in the same team, wrote in their reflections about the fruitful and pleasant experience they felt working with Alfonso.

*“The fact that we were working as a team during the CPD showed that the networking of teachers improves the quality of teaching and promotes their motivation, especially when working with somebody as enthusiastic as Alfonso.”*

The final part of the PROFILES CPD, which is part of the Master for Secondary School Teachers, involves a teacher’s practice period in a High School. There, he had the opportunity to implement in the classroom the module that they had previously developed. He wrote about his experience:

*“Using PROFILES modules can help students to get some capacities like motivation, encourage, and reflection about their own work, something useful not only for improving their science knowledge but for their lives.”*

*A student told me after using the Module about Global Warming in which we learned curriculum content related to Chemistry, and in particular to the study of the water properties in solid state, density, hydrogen bond, and others: “Something that we have checked will be in our memory better than something that simply we have read or they have explained to us”.*

At the end of the course, he decided to prepare his academic Master Dissertation about his experience with the PROFILES philosophy using IBSE strategies and his own module at the High School. The project showed his deep identification with PROFILES and a sense of professional development during the CPD. The title of his project was “Preparing IBSE material: teaching science in Secondary Education in an efficacy and amusing way”. He defended the importance of the IBSE strategies in science education, and explained how the experience working with the module in the classroom was.

*“The way from a transmitting to an inquiry methodology is a long and complicated process, but it really makes sense. I have experienced that students learning are more consistent and permanent. Teachers have to continually encourage students to contribute their ideas and engage in critical problem-solving process in a variety of contexts whether curricular or social. Stimulating student´s curiosity contributes to deeper questions and favours critical thinking”.*

After that, he and his colleagues had the opportunity to show the module they developed and implemented on the classroom at the first PROFILES conference in Berlin. The module was entitled “Designing an IBSE Module: A task for Pre-service Teacher Training”.

**Appendix 1**

***Alfonso's reflection after the course finished.***

Reflection 1: about IBSE strategies

*"Working with the PROFILES philosophy has helped me to confront the idea that we live in a continuous changing world that affects to all the life fields, specially the school, as a social microcosms that reflects the environment in which is involved. We are far away from the school full of memory and authoritarian teachers. Today we have students with other characteristics and that demands changes in the competencies of teachers.*

*We, as teachers, have to form citizens able to look for, select, store, organize, and make meaningful the information without getting lost. Moreover, students have to be able of communicate their experience. Because of that, allowing students to experience learning science in a different way showed me that they became more autonomous in their learning, which is essential intellectually and personally.”*

*“I have noticed how students are much more interested in exploring a topic when they appreciate its relevance to their own live experience”*

*“In more traditional classrooms, the teacher is the expert of knowledge and transmits information to students through a well-organized series of lessons. In an inquiry-based learning environment the teacher is a facilitator. Teaching and learning about the natural environment is fundamental to understand global systems. The following cite resumes the idea: “Basic understanding begins with exploring how things happen. Observing how things happen in the natural world is the basis of some of the most ancient and spiritually profound teachings of Indigenous cultures. Nature is the first teacher and model of process. Learning how to see nature enhances our capacity to see other things”.* G. Cajete, Look to the Mountain: Ecology of Indigenous Education (1994).

Appendix 2

**Reflection 2: The Development of a module on "Climate Change" during the PROFILES CPD.**

*The design of the module with the teachers’ team during the course was a laborious task, not only trying to make it motivational for students but to relate it to their real life and establishing a relationship with the curricular content. We knew that the chosen topic would be attractive for them because students are aware of problems of climate change but we thought a lot about approaching and introducing the topic, the first stage of the module. Finally we decided to propose the idea of the possibility of losing our coastal areas and the fact that I implemented the module next to the summer vacations, which includes beach time for most of them was a successful way.*

*To develop the scientific content of the module was maybe the fastest part, we felt more confident compiling this part, no so much designing it in an inquiry based approach, in which we wanted to include some laboratory work. Finally, we made the decision of including lab tasks with decision making questions that would force students to debate. The argumentation of their findings among the different groups in the classroom at the end of the work was the most gratifying part for me, as a teacher.*

*Probably following attempts will be easier, I hope, but to get confident when using inquiry based science teaching requires a very reflexive approach and I know teachers in some grades do not have the time that IBSE requires. In any case, the experience was very positive for me, and I think also for students.*

**Appendix 3**

***Alfonso published "*Designing an IBSE Module: A task for pre-service teacher training*" in the first book of PROFILES***

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Pre-service teachers were asked to plan an investigation in order to identify the main reasons of the Global warming. Competences involved are: Investigative skills, manipulative skills, cooperative-work skills, concept understanding, theory development and application, experimental-error analysis, and communication skills. The curriculum content is related to Chemistry and in particular to the study of water properties in solid state, density, hydrogen bond.

In this work we present an experience carried out with the Master of Secondary Teacher Education students, future secondary teachers, in the subject of Didactic of Chemistry and Physics. This pre-service teacher training course gives the knowledge of the principles of PROFILES and finally, they design a module following the three stages model. To assess the achievement of the educational process a questionnaire was used (Padilla et al., 2012).

**Objectives of the IBSE Module**

PROFILES promotes IBSE through raising the self-efficacy of science teachers to take ownership of more effective ways of teaching students, supported by stakeholders. The proposal innovation is through working with ‘teacher partnerships’ to implement existing, exemplary context-led, IBSE focused, science teaching materials enhanced by inspired, teacher relevant, training and intervention programs. This is undertaken by reflection, interactions and seeking to meaningfully raise teacher skills in developing creative, scientific problem-solving and socio-scientific decision-making abilities in students. The measures of success are through (a) determining the self-efficacy of science teachers in developing self-satisfying science teaching methods and (b) in the attitudes of students toward this more student-involved approach.

The project focuses on “open inquiry approaches” as a major teaching target and pays much attention to both intrinsic and extrinsic motivation of students in the learning of science. The intended outcome is school science teaching becoming more meaningful, related to 21st century science and incorporating interdisciplinary socio-scientific issues and IBSE-related teaching, taking particular note of gender factors.

**Overview of the Module**

In this work, we present a new module, developed by the Master of Secondary Teacher Education students and support of the PROFILES Spanish group entitled “Will our coastal areas be submerged because of Global Warming?” Pre-service teachers were asked to plan an investigation in order to identify the main reasons of the Global warming. The competences involved are: Investigative skills, manipulative skills, cooperative-work skills, concept understanding, theory development and application, experimental-error analysis, and communication skills. The curriculum content is related to Chemistry, and in particular to the study of the water properties in solid state, density, hydrogen bond, and others. The module follows the PROFILES three-stage model. This module begins with a scenario (Stage 1), where the teacher describes in a few words global warming and presents to the students the problem: To know the probability of losing our coasts if the sea level increases. At Stage 2, students have to resolve an inquiry-based problem-solving activity. This activity consists of searching pertinent information that supports student’s knowledge and implementing an experimental plan, in order to know more about the water-ice mix properties. Lastly, at Stage 3 (Socio-scientific decision making, Fortus et al., 2005), students relate data collected from their search and investigation (observations in the lab and several calculations) in order to give an informed opinion to the question (Bond-Robinson, 2005).

The training course positively influence the teachers’ competence and confidence to promote IBSE-related science teaching and hence raise their self-efficacy to teach in an innovative – more student centered, context-led IBSE manner as well as in valuing use-inspired research ideas.

Within this intended outcome, and by means of the training/ intervention linked to stakeholder support, a key target is to convince teachers that methods they have studied and tried in the pre-service training course can and will strongly improve the quality of their own science teaching (Michelsen & Lindner 2007). Furthermore teachers who participate in the training program course appreciate the need to convince other teachers to interact and seek support (e.g. colleagues in their schools, or from ‘nearby schools’) by disseminating their new experiences and the PROFILES IBSE-modules through informal and/or formal teacher forums. This can both be through activities organized by the PROFILES consortium partners or follow-up to the longitudinal training programs at a national and Europe-wide level (Bolte et al., 2009 and 2011).