

Report on ESERA travel award 2009

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Purpose of the visit and preliminary activities

I applied for the 2009 ESERA travel award for less experienced researchers to have the opportunity to meet a senior researcher in science education. The idea was that even a short period spent with a senior researcher could have given me the opportunity to receive suggestions on methods to be used for data collection and analysis. In fact in my university I was lacking exactly a dialogue with experts on research design and methods.

I got the ESERA travel award to visit Maria Pilar Jiménez Aleixandre at the Department of Experimental Sciences of the University of Santiago de Compostela (Spain). The visit was possible from 4th to 21st June 2009 and during that period I had the opportunity to meet and to discuss with her and with some PhD students of her group.

Before that period I had the opportunity to meet Maria Pilar Jiménez Aleixandre in Italy, and to talk with her about my research project. From then we kept in touch via e-mail and she gave me some suggestions about data collections.

The idea behind my project

In my experience as a secondary school teacher I saw that most of times environmental and health issues are not covered at all during traditional lessons or they are taught marginally.

I believe that science education must include information about processes and consequences regarding environmental and health issues to let everyone have skills and knowledge in order to choose how to behave. School must give this information in a way that enables students to reason on processes and discover consequences and not just saying what is good and what is not for their and environmental health. If teachers use an active learning approach, instead of the “traditional” method, it’s more likely that students will develop critical and reflective abilities which can lead to responsible actions towards themselves and the environment.

Moreover, as teachers, we should try to engage students in science topics which are relevant for them. The report “Science Education in Europe: Critical Reflections” recommend to develop and extend the ways in which science is taught for improving students’ engagement, and the European Commission report “Science Education NOW: A renewed Pedagogy for the Future of Europe” suggests that the use of inquiry-based science education methods would improve student interest.

An inquiry-based method that could help in increasing students’ engagement is Problem-based learning (PBL). PBL can positively influence students’ motivation because with a relevant problem students get involved in exploring the topic and in researching about it. Moreover, PBL allows developing self-direct learning skills, thus increasing students’ autonomy. In addition, the use of authentic problems can also help in developing argumentation skills, and science education research shows that argumentation is important for the appropriation of scientific practice.

In my work I chose to use PBL method to treat traditional curricular issues integrated with environmental or health themes. I planned to use an environmental or health problem to take students into the more traditional life or earth sciences topics. Students have to look for information by themselves and try to explain or give answers to the questions raised during the discussion about the given problem.

The objective of my work is to find the best way to adopt the PBL method to Italian secondary school situation (large classes, students not used to active learning approaches, few hours) and understand if PBL can be an effective method to integrate environmental and health themes with curricular topics and, at the same time, to increase student interest, motivation, abilities, and awareness.

Methods

During spring 2008, I started working with six classes with a problem regarding water supply with the aim to treat the hydrosphere module and the socio-environmental problems related to water. At the end of the three weeks module, I interviewed teachers and gave questionnaires to students to have their feedback on the method. Teachers also gave students a final test to assess knowledge acquisition. According to the evidences got from interviews and questionnaires I decide to change some aspects of how PBL approach would have been used next time.

During fall 2008, I used the adopted PBL method to work with four of the six classes previously involved. We started with a problem regarding smoking effects with the aim to treat the human respiratory and circulatory systems module. At the end of the module teachers were interviewed and, after the final test, students had to fill up two questionnaires both with open-ended and multiple choice questions. After five months students were given a re-test. They were asked to answer to the following question: “One of your friends is pregnant. Nevertheless, she doesn’t want to stop smoking, Give her a suggestion and justify why she should do what you suggest.”

In spring 2009 I also had the opportunity to work with pre-service teachers for 30 hours. I had to deal with ecology education and I decided to use a PBL approach. At the beginning and at the end of the course I gave a questionnaire to have pre-service teachers’ point of view about PBL and, in general, active learning approaches used for integrating environmental issues in natural sciences secondary school curriculum. I also gave them a problem regarding ecological trophic levels, used also with the students of the University of Santiago de Compostela.

Activities during the visit

During the first day of my visit I was introduced to the staff and the other PhD students of the science education group from Santiago and to a visiting PhD student from the King’s College of London. The second day we had a meeting where each of us had the opportunity to present his/her research. Listening to all PhD students’ presentations was a good opportunity to know their research projects and to understand better what they were doing, especially about argumentation in science education.

During the following days I had meetings with Maria Pilar Jiménez Aleixandre and we started working on the analysis of data, which was the main activity undergone during the visit. We focused on the justification given by students in the re-test regarding smoke and pregnancy. Maria Pilar gave me suggestions on how to consider all the different aspects of the answers, and to categorize them. After each meeting I worked with the data and, then, I went back to her to check categories and results. This happened a few times until when main categories and sub-categories were well established and all the data were classified according to them. That was definitely a good exercise because allowed me to get more familiar with qualitative analysis of students’ justification, something that I was not used to. For my work it was also interesting to note that student used for their justifications many of the concepts regarding physiology of the

respiratory and circulatory systems that were treated during PBL sessions. The results of this analysis will be a part of my PhD thesis and I also use them for a paper that I would like to propose to a scientific journal. In fact, Maria Pilar gave me also some clues on how to prepare a scientific paper and on some journals I could send the proposal.

Maria Pilar Jiménez Aleixandre also gave me suggestions on how to analyze other qualitative data I got from secondary students and pre-service teachers, and on how to organize the presentation I had to prepare for the ESERA conference, being that my first international conference. We also decide to keep in contact to analyze the answers given by Italian pre-service teachers to the problem regarding ecological trophic levels, that was similar to the one given to Spanish students.

During my visit I also could establish good relations with the other PhD students and to discuss with them on different aspect of science education, and especially on the application in the classroom of evidences and suggestions coming form research. This exchange of opinions was particularly important for me because in my university I am the only PhD students with a project on science education.

Moreover, at the University of Santiago, I had the opportunity to access to a well furnished library with science education journals and books, and find some interesting articles about inquiry-based science education.

Other than the activities at the university, during the period spent in Santiago I had the opportunity to appreciate the Galician food, music and landscape and I hope there will be other opportunities for me to visit that region.

Definitely ESERA travel award can give good chances to PhD students. Probably it would be even better if the student could visit the senior researcher both at the beginning of his/her PhD project, and, then, during the data analysis stage.

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