

author

Creative sciences

Proposals for
discovering science in
today's classroom



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INTERVIEW WITH RAQUEL FERNÁNDEZ AND NATALIA SOLANO

by Ana Moreno

How did the idea of writing a book for primary science teachers come about? What was your purpose?

This book results from our participation in a science outreach project funded by the FECYT and the RSEQ entitled *Knowing science today opens the doors to tomorrow*. After visiting several schools to carry out experiments during four school years, between 2012 and 2016, we perceived the needs passed onto us by teachers interested in incorporating experiments into their teaching practice. They were aware of their lack of training or the lack of teaching materials that would help them connect the possible experiments with their curriculum to incorporate them as classroom material and not just to be used on special days.

Our purpose was to provide the teachers with the requested material using guides to develop the experiments in their classroom, including evaluating the knowledge acquired by the students to help them in their learning.

A large team of academics and primary school teachers took part in the book. Can you tell us how the book came about, and what was the role of each of them?

Numerous university lecturers who are both researchers and scientists have participated, but no primary school teachers are involved in elaborating the project. However, three professors from the Faculty of Education in Toledo, University of Castilla-La Mancha, were involved, including the coordinators of the project, who teach on the Primary Education Teacher Training Degree,

and who focused on the formative and curricular aspects of the book.

All the teaching staff contributed to the experiments they had been carrying out in different schools. In particular, the education experts contributed to the experiments, the book's approach to the Primary Education curriculum, and the visualisation of learning and evaluation.

It consists of 18 didactic guides to carry out different experiments to enjoy science.

In the book, you propose a series of science activities with a creative methodology. What do you mean? Could you only just describe this methodology and explain why you consider it so appropriate?

In the first chapters, we gathered different approaches to creativity and its meaning for the primary school teacher. We also offer a methodology of discovery as an active methodology. From this combination comes the word CREATIVITY.

Much literature supports that the only way to learn is through *learning by doing*, which is also included in the European Union's Horizon Europe and previous Horizon 2020 objectives. Learning by discovery based on the scientific method seems to us to best exemplify the work of a person engaged in the scientific profession. Furthermore, some studies compare different methodologies and corroborate that the best attitude of students corresponds to the use of active

methodologies, which we have verified ourselves in some research.

In the medium term, if students' attitudes towards science are more positive with this methodology, we hope that they will continue to find it attractive and choose it in their further studies at secondary school or even university.

All the activities have been implemented in the classroom; what training/information did the teachers receive before performing them? Could you tell us a test of some of the experiences? What struck you, or what do you think is relevant?

The teachers have participated as observers/mediators with their pupils in the activities we propose, as they are the ones who know them best. This is how we collaborate in the project: we bring the material and the experiments, and we work on them with the pupils. We received from them the need to have the material to do it in their classes themselves: this encouraged us to create the book.

We would highlight that as we arrive at the classrooms, the teachers or professors nearly always tell us about a student who needs special care because he or she doesn't pay attention, is disruptive, etc. But, moreover, when we finish and reflect on what has happened in class, they

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say: *Well, he or she has behaved well.*

From these experiences, we stress the need to create learning scenarios where students feel that they are the leading actors of their learning. When they are given an active and guiding role, they maintain their attention through enthusiasm and interest in learning. In addition, it is an inclusive and cooperative activity where the working groups of students carry out the experimentation at their own pace and in a collaborative way.

How do you see science learning in our country today, and what else needs to be done to make it more attractive?

Science learning is not generally based on experiments or research, which is mainly about the scientific activity. This is a fact that we regret and to which we all contribute. However, to bring about change, we must also contribute from all areas. We believe that including more micro-projects and investigations in science classes would help change the *fait accompli* view transmitted by expository teaching.

To achieve this, it would be necessary to analyse what teachers and society, in general, understand by teaching or learning. For example, if learning is conceived as an achievement when the memorised repetition of facts or even procedures is achieved, perhaps it is accomplished. However, if learning is about developing emotion, an enthusiastic and positive attitude towards science, and discovering science in the world around us, this is not reached. Therefore, the method of achieving this learning objective should be changed.

Do you think you have achieved your objectives, and when will the secondary school be ready?

The objective of elaboration has been achieved, but the social contribution of the book needs a longer time. Furthermore, it is not a best-seller, so the impact is limited; we would like it to be more significant to have a greater impact on improving science teaching.

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The project from which it was forged continues, so we may be encouraged to prepare the secondary material in a few years. In any case, the book contains suggestions for further development that teachers could use at this other educational stage and would be helpful to them, too.

Finally, what do you find most fascinating about the whole project and the book itself, and do you have any data on the impact it is already having on teachers and students in the classroom?

Coordination, agreeing on a model guide that would be useful for teachers, took time. However, the result compensates for all the efforts.

We have sold a few copies regarding the impact, but I cannot tell you how many. We spread it on networks from time to time, and it can be bought from Aljibe, Amazon, Casa del Libro, etc. According to the feedback we get from those who use it, it is very affordable and useful for primary school teachers. We are also grateful for the very positive assessment on *Aula Apoyo Inclusión* about the book.

As future lines of research, it will be interesting to study and compare groups to obtain empirical evidence on the consequences of using this methodology in comparison with others. More specifically, whether it improves the classroom atmosphere, group cohesion, student and teacher satisfaction, and whether it reduces anxiety about academic content, and improves scientific reasoning, creativity; and finally if it connects science with the environment around us.

