



## Self-regulation of Emotions and Feelings: Towards a More Complete Evaluation of Pre-service Primary Teacher Training in Science Education

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### Abstract

*All teacher trainers often ask ourselves about the effectiveness of the teacher training we implement. Although many universities provide the scores of the opinion surveys on teaching answered by the students, this is an external indicator, and it is necessary to plan a more systematic evaluation to triangulate qualitative and quantitative results taking into account the objectives set. Furthermore, as the emotions experienced by the students are key in the teaching-learning process, in this study, we present an evaluation design that meets the above characteristics, as well as we show results obtained with a semi-open questionnaire about the emotions that pre-service Primary teachers declare feel in a Science Education course. This course has the special distinction of being focused on a Model-Based Inquiry framework, in which pre-service teachers make explicit and implicit reflections on: what science is, and how it works, why people need to learn science, how people learn science, and how to teach science. Moreover, they are actively engaged in a learning process by an Inquiry-Based Science Education approach that can be used as methodological model to teach.*

### 1. Introduction

The search for evaluation strategies, productive results to improve teacher training is becoming increasingly important. As McNamara (2008) [1] highlights, program assessment can: understand or increase the effectiveness of the education, improve delivery mechanisms to be more efficient, verify that “you’re doing what you think you’re doing”, facilitate management’s thinking about what its program is all about; and produce useful information for communicating results.

Continually teachers’ trainers ask ourselves if our teacher training program really work [2], and how could we know it to get closer to the goals we expect with the teacher training we develop. In fact, the responses of fourteen science teacher educators in a interview [3] recognizes not only the importance of having evidence of the initial teacher training effectiveness, but also the lack of a systematic evaluation proposal in their courses: “This is the unfinished business that we have all “how to assess”; In this respect we all are drifting; I have very little data”...

### 2. Approach to the problem: Do we have any evidence about our teacher training effectiveness?

Usually we rely on perceptions or hunches that we notice in our classes, but according to McDermott (cited by Viennot (2011) [4]) these are usually not a valid indicator. Other information provided by many universities are the scores of a selection of items from the opinion surveys on teaching answered by the students, as an institutional instrument. However, it is necessary to plan a more systematic evaluation to triangulate qualitative and quantitative results which describe not only specific times (before and / or after) but also the evolution of student profiles throughout the training thanks to follow-up instruments for the student teacher thinking and knowledge [2].

In order to measure the effect of our initial teacher training courses we have designed and implemented an evaluation proposal that consider important aspects related to the influence of the training in prospective teachers knowledge, their conceptions (about science, science teaching and learning...), and their satisfaction with the course. To this end, we have designed numerous instruments of a different nature, seeking to combine a quantitative and qualitative analysis methodology [2] (table 1) which results allowed us to confirm the effects produced by the training course [5].



Aspects evaluated	Instrument
<b>Evolution in didactic conceptions</b>	Questionnaire
	Activity ( <i>students productions</i> )
	Semi-structure Interviews ( <i>individual interviews for students</i> )
	Daily classroom forums ( <i>students 'journals'</i> )
<b>Scientific knowledge acquired</b>	Misconceptions questionnaire
	Exams
<b>Degree of satisfaction &amp; opinions</b>	Opinion surveys
	Anonymous forum to assess the subject (just examples)

Table 1. Summary of the experimental design to assess the training proposal

### 3. Towards a more complete evaluation of pre-service primary teacher training: self-regulation of emotions

This evaluation of effectiveness would be insufficient if we do not make use of the training function that the evaluation has whereby students regulate their own learning. Such self-regulation in the learning process often focuses on the cognitive aspects, developing activities to check the conceptual and procedural content knowledge of pre-service teachers [2], i.e. *Knowledge and Prior Study Inventories* (KPSI).

Nevertheless, the processes of learning and teaching science are not merely cognitive, but are highly charged with feelings, as the research in science education recognizes, the importance of emotions in teaching and learning advocates the need to consider the cognitive and affective dimensions (Otero, 2006) [6], and metacognitive regulation should be expanded to include not only cognitive but emotional regulation as well (Brígido et al., 2010) [7].

There is a relationship between science teaching and emotion, and both positives and negatives, play an important role in teachers' construction of pedagogical content knowledge, curriculum planning and relationships with children and colleagues [7]. Therefore, we should focus on contributing to the research results of emotions in science education [8] while we give prospective teachers the opportunity to be aware of the emotions they experience [9] when they learn science and about science through an IBSE approach [10].

Accordingly, we decided to design an instrument which lets our students (pre-service Primary teachers) identify the different emotions they are feeling along a training course focused on IBSE.

With the intention of verifying the functionality of the tool measuring the feelings and emotions, and also to set if there is an evolution on them along the year, we had implemented it in the moments we expected to obtain significant differences for being key along the IBSE development

Then, the design of the instrument and the results obtained with its implementation are presented above.

### 4. Design, methods and samples to identify emotions

A semi-open questionnaire was designed to identify the emotions that prospective teachers experienced along the course "Science Education". The questionnaire items were taken from the emotions and feelings chosen in [11], selecting only those more understandable and clearly different from the others, avoiding overlapping, and excluding those emotions we consider have no sense to be asked in relation to the activities we develop in science education, such as love or anger. These items were organized in summarized tables where pre-service Primary teachers had to tick whether they had felt each emotion; and, if so, they were asked for the moment when they experienced that emotion to specify the kind of activity in which they were involved. The instrument can be found in <http://bit.ly/1SEroiY>.

The subjects participating in the study were 225 students of pre-service Primary teacher training from the University of Almeria. They were selected by a non-probabilistic sampling procedure (does not involve random selection) of convenience, based on the class attendance, but without giving the students prior notice.

Data were collected during the 2014-2015 academic year, and, although the information has not been collected at regular intervals over time, it was done in some key moments of the course:

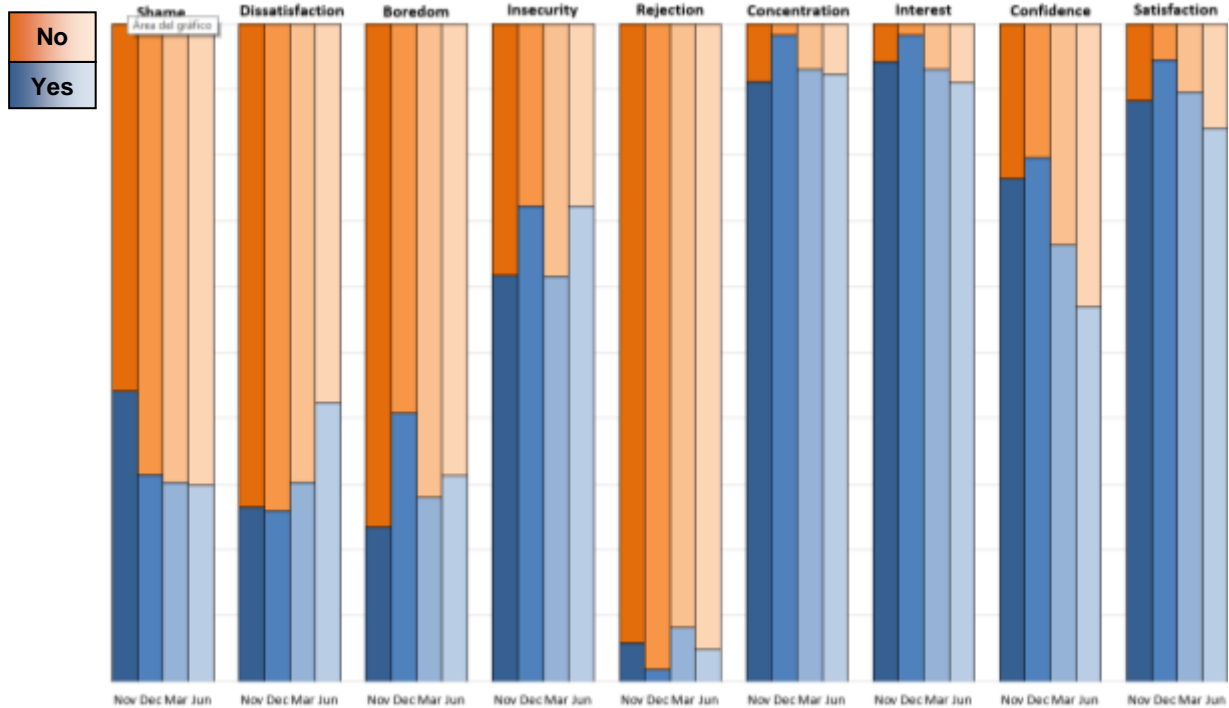
- First data collection was November 4<sup>th</sup>, one month after starting the lessons, after finishing the first IBSE sequence.
- Second data collection was December 16<sup>th</sup>, two days before the first midterm exam.



- Third data collection was March 26<sup>th</sup>, after finishing the second IBSE sequence and making an explicit reflection about the IBSE characteristics.
- Fourth data collection was 2<sup>nd</sup> of June, after the last exam, when a Model-Based Inquiry sequence was developed and the students had used the built model.

## 5. Results and analysis

Pre-service teachers' responses have been compared based on the time when they answered the questions and whether the emotion they experienced. The percentage of pre-service teachers who felt each positive (concentration, interest, confidence, satisfaction) and negative (shame, dissatisfaction, boredom, insecurity, rejection) emotions we asked them for on each key moment are shown in Graph 1.



Graph1. Percentage of students that felt each emotion

In general, we can observe that the percentage of students who stated they had felt positive emotions is higher than the percentage stated had felt negative emotions; with the exception of "Insecurity" in which the proportion of students who claimed to have felt this emotion is higher than the one who didn't.

We can also notice that several emotions are more remarkable than others because of the high percentages obtained; this is the case of Concentration, Interest, Satisfaction and Rejection. More than 85 percent of students affirmed feeling positive emotions (Concentration, Interest and Satisfaction) at every moment we implemented the questionnaire, whereas only 9 percent of students explicitly affirmed feeling Rejection when they were asked.

As one of our objectives was to know if there were significant changes in the students' answers along the different moments of the course, we decided to contrast the hypothesis about the equality of more than two proportions of independent samples with nominal's variables. The results were statistically analysed by means of an ANOVA using the Chi Square test, obtaining not significant results.

## 6. Discussion and conclusions

The impressions, as well as some data from opinion surveys of students provided by universities can run roughly as an indicator of the effect of a training course. But it is necessary a more detailed analysis that helps us to know what works or what doesn't do. Therefore, a systematic evaluation linked to the objectives of the course and the use of multiple instruments to triangulate the results is needed. But, given the importance of feelings and emotions in science learning and teaching, it is essential to consider the emotions felt by pre-service teachers during their training and their reasons, helping them to explicit their emotions.



The instrument designed to identify emotions experienced by our students (concentration, interest, confidence, satisfaction, shame, dissatisfaction, boredom, insecurity, rejection) and why they felt so has been implemented in different moments along a science education course. The results show that 4 emotions highlight, because of being experienced by a high number of students (Concentration, Interest and Satisfaction) or due to the low number of confirmations given (Rejection).

We have also checked the existence of relevant variations in their responses along the course, finding out that there are no significant differences. This not notable difference could be related to the effectiveness of the questionnaire, and the fact that this instrument collects the students' feelings related to the relationship between the teacher and the students, as an external viewer who assisted to the classes this course confirmed.

To control these factors resulting of disagreements and conflicts with the teacher, so that the instrument could collect only the students' emotions they felt as consequence of being engaged in IBSE activities, we are revising and improving the questionnaire. In the new tool, as the students will be asked for stating their emotions in each specific activity, such as formulating hypothesis, looking for evidence..., the questionnaire will be more useful to reflect on the effect of each kind of activity, and how to use this effect to improve the teacher training we develop focused on the IBSE approach.

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