



Analysis of the Emotions in the Teaching and Learning of Technology of High School Pre-Service Teachers

Guadalupe Martínez-Borreguero¹, Francisco Luis Naranjo², Jesús Maestre
Jiménez³

Abstract

The training of science teachers must be one of the fundamental pillars for the development of today's society. One of the lines of research that is taking shape in recent times relates the influence that exists between the affective and cognitive domain in the process of learning to teach scientific contents. Specifically, a growing number of researchers highlight the importance of emotions, and their influence on the beliefs of self-efficacy of different scientific subjects. In this line of research, the aim of this work is to analyze the emotions experienced by the future high school teacher of technology. The sample was formed by 46 students of the Master of Teacher Training in Secondary Education. The methodology used for data collection was descriptive by survey. As an instrument of measurement, a questionnaire of our own elaboration, based on previous studies of our research group, has been used. The questionnaire was designed to extract information on different variables with the aim of establishing relationships and correlations between them. Thus, we have analyzed the emotions experienced by future teachers in scientific subjects back in their school days. On the other hand, we have inquired about the emotions they experience as teachers depending on the course of technology and the content block to be taught. In addition, a study of the capability and beliefs of self-efficacy has been carried out, both in the role of present day student and future teacher. The analysis of the data obtained reveals the existence of a relation between the memory of the emotions experienced in the school stage with the emotions experienced as teachers. The statistical study showed that there are statistically significant differences ($\text{sig} < 0.05$) between the different emotions, both positive and negative. Likewise, we have detected statistically significant differences in the variables related to emotions, capability and beliefs of self-efficacy depending on the course and the content of technology to be taught.

1. Introduction

The Master's Degree in Teacher Training in Secondary Education is the first approach of students with a higher degree to their future profession as teachers. This formative stage is especially relevant for the development of its professional life, not only from a didactic or cognitive point of view, but also emotional. Some authors [1] point out that emotions play an important role in training teachers. Specifically, different research on the relationship between affective, emotional and cognitive dimensions have been carried out in recent years within the framework of didactics of the sciences [2]. The teacher in training begins his university stage with a baggage related both to the cognitive domain and to the affective domain, the product of his own academic stage [3]. Specifically, during his initial training, the teacher has to learn to integrate academic knowledge, personal conceptions and practical knowledge, to generate his own didactic knowledge of content [4]. In certain investigations [5] it is specified that, during the stage of teacher training in secondary education, students should reflect on their knowledge and emotions for the teaching and learning of certain scientific contents. Specifically, these attitudes, knowledge and emotions of the future teacher can influence their future students [6]. Some studies in this field [7, 8] are based on the different emotions experienced in specific subjects by different groups. In order to ensure teacher training, it is relevant to analyze the different emotional factors that may influence the professional development of secondary education teacher in training. Additionally, there are studies that relate emotions to the concept of self-efficacy [9]. In the teaching field, the teacher in training can present different levels of self-efficacy, which can influence notoriously in his emotional state, generating positive or negative emotions that can affect his teaching practice.

¹ University of Extremadura, Department of Didactics of Experimental Sciences

² University of Extremadura, Department of Didactics of Experimental Sciences

³ University of Extremadura, Department of Didactics of Experimental Sciences



2. Methodology

In this work, different variables related to the cognitive and emotional domain were analyzed through a descriptive methodology by survey. Not only emotions were studied, but also their causes, the beliefs of self-efficacy and the self-concept of the selected sample, both in the role of student and in the role of the future teacher of secondary education.

The main objective was to diagnose the emotions and motivations towards the teaching and learning of the sciences and technology that teachers of secondary education in training experience.

The sample was selected by non-probabilistic sampling for convenience, mainly due to the ease of access. It was composed by 46 students between the ages of 22 and 44 years. These students are training to be teachers of secondary education in the specialty of Technology, and they come from degrees in various scientific disciplines or different branches of engineering and architecture.

As evaluation tool, a questionnaire has been designed based on our own previous research [7, 8]. The questionnaire has been developed in order to analyze various aspects related to emotions and self-efficacy as future teachers in relation to the scientific-technological component that they must impart in their future work. Subsequently the questionnaire is divided into 7 blocks. The first is related to the assessment of general aspects of didactic training as a future teacher. The second block is related to the memory of the emotions that they experienced in their school stage in the different subjects and educational levels. The third block refers to the scores they obtained. In the fourth block, they are asked about the level of competence and self-concept that they experienced as students in different scientific subjects. In the fifth block, the causes for expressing different emotions are sought. The sixth block is oriented to identify self-efficacy as a teacher in function of the different blocks of scientific-technological content to be taught. Finally, in block 7 the teachers in training are asked about the emotions they experience when they have to impart different content on different courses.

3. Results

Figure 1 shows the results obtained regarding the memory of the emotions experienced in different subjects by the teachers in training in their school stage.

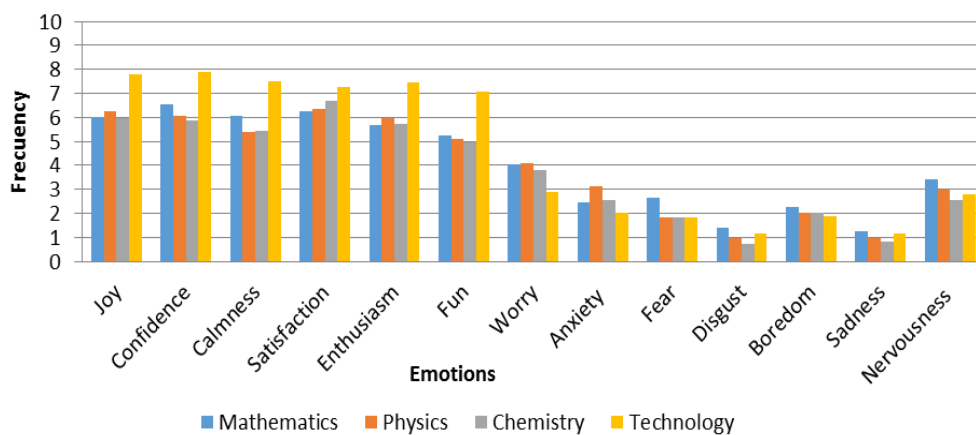


Fig. 1. Average frequency of the emotions experienced by the teachers in training in their school stage

It can be observed that there are differences between positive and negative emotions, and in all science subjects the frequency of positive emotions stands out. Likewise, differences are observed depending on the subject, being Technology the subject with the highest values in positive emotions. Inferential statistical analysis (ANOVA with post-hoc Tukey HSD) has revealed that these differences are statistically significant for a sig < 0.05 in some of the emotions analyzed as *joy*, *confidence*, *enthusiasm*, *fun* or *calmness*. These variables have a higher average frequency in the subject of Technology compared to those of Mathematics, Physics or Chemistry. On the other hand, negative emotions such as *worry*, *anxiety* and *nervousness* decrease in Technology compared to other science subjects (sig. < 0.05).

Figure 2 shows the different emotions experienced as instructors by the teachers of secondary education in training. The graph represents the differences found in terms of the different years in which they must teach the subject of Technology, from the first year of Compulsory Secondary Education (12-13 years old students) to the second year of Baccalaureate (16-17 years old students). A clear decrease in all positive emotions can be seen as the age of pupils increases. Consequently, there is an increase in



negative emotions as the student's level increases. Thus, the teacher in training experiences less *enthusiasm, confidence, calmness, fun, joy* or *satisfaction* in the second year of Baccaulaureate than in the first year of Compulsory Secondary Education. In the same way, emotions like *fear, worry, stress, anxiety* or *despair* increase in the second year of Baccaulaureate. In order to study these results in a more exhaustive way, a more detailed analysis has been carried out in function of the different blocks of contents that must be taught in the subject of technology in the different school years.

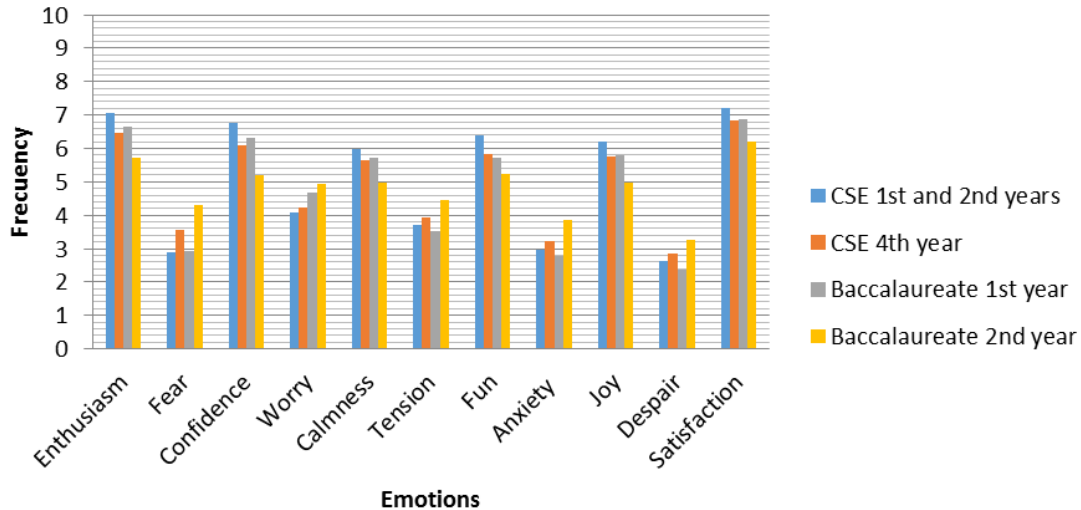


Fig. 2. Average frequency of the emotions experienced as teachers

Figure 3 shows the Content Blocks of the Curriculum of Technology in Secondary Education.

Block	CSE 1 st and 2 nd year	CSE 4 th year	Baccaulaureate 1 st year	Baccaulaureate 2 nd year
B I	Process for solving technological problems	Home Installations	Technological products: design, production and marketing.	Materials
B II	Technical expression and communication	Technical expression and communication	Introduction to the science of materials	Fundamentals of machines
B III	Materials for technical use	Electronics	Machines & Systems	Automatic systems
B IV	Structures and mechanisms: Machines & systems	Control & Robotics	Manufacturing procedures	Circuits and logic systems
B V	Information and Communication Technologies	Pneumatics & Hydraulics	Energy resources	Control and programming of automatic systems
B VI		Technology and Society		

Fig. 3 Content Blocks of the Curriculum of Technology

As an example, the emotions experienced by school teachers in training as they impart specific scientific and technological content in the 2nd year of Baccaulaureate are shown in Figure 4 (top). In Figure 4 (bottom) it is also represented the level of self-efficacy and capacity that the teacher in training has. In general terms, we can observe that when teaching in the 2nd year of Baccaulaureate, the teacher in training presents high values in negative emotions and low values in positive emotions, with no statistically significant differences between them from an overall point of view. However, there are significant differences in some specific blocks of content, depending on the values of self-efficacy of the teacher in training. Specifically, there is a correlation between the level of teacher self-efficacy specific to a block of content and the emotion experienced. Thus, the lower the value of teacher self-efficacy in a specific content, the less positive emotions will the teacher in training experience.

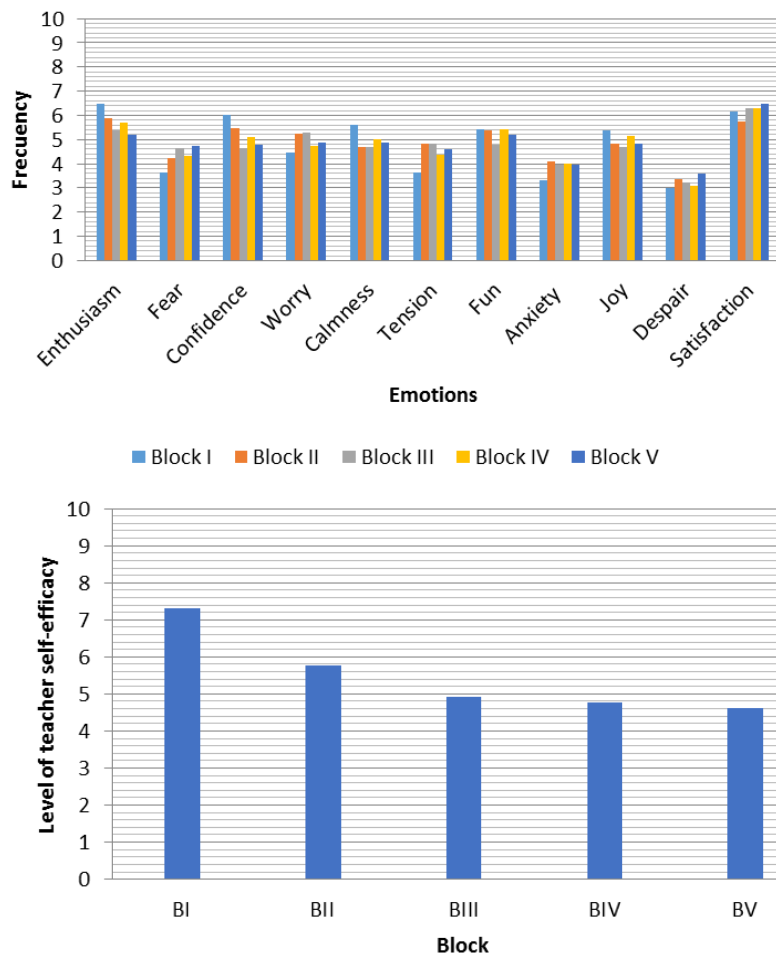


Fig. 4. Average frequency of the emotions experienced as teachers when imparting the subject of technology in the 2nd year of Baccaulaureate (top). Average assessment of the level of teacher self-efficacy for the different blocks of content in Technology in the 2nd year of Baccaulaureate (bottom).

4. Conclusions

Teaching self-efficacy is closely related to variables such as competence, motivation, self-esteem, confidence or the emotions experienced in the delivery of content. The results obtained allow us to emphasize the importance of carrying out an emotional self-reflection on the level of teaching competence of future secondary education teachers. On the other hand, the results reveal a certain correlation between the memory of the emotions in the school stage and the emotions experienced as teachers in the delivery of certain scientific contents. We consider that it is necessary to implement emotional regulation programs in the teacher training phase that allow the development of a cognitive and emotional reflection on the teaching practice. The sample studied considers relevant for their professional future to be aware not only of the emotions that manifest towards certain contents but also of their beliefs of self-efficacy, since both variables can influence and be transferred to their future students.

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References

- [1] Shoffner, M. (2009). "The place of the personal: Exploring the affective domain through reflection in teacher preparation". *Teaching and Teacher Education*, 25, 783-789



- [2] Osborne, J., Simon, S. y Collins, S. (2003). "Attitudes towards science: a review of the literature and its implications". *International Journal of Science Education*, 25(9), 1049- 1079.
- [3] Abell, S.K., Bryan, L.A. y Anderson, M.A. (1998). "Investigating preservice elementary science teacher reflective thinking using integrated media case based instruction in elementary science teacher preparation". *Science Education*, 82(4), 491-509.
- [4] Mellado Jiménez, V. (2003). "Cambio didáctico del profesorado de ciencias experimentales y filosofía de la ciencia". *Enseñanza de las Ciencias*, 21(3), 343-358.
- [5] Rosa-Silva, P.O. y Lorencini, A. (2009). "As reflexões de uma professora de Ciências: análise da dimensão emocional e suas implicações para a relação interpessoal." *Revista Electrónica de Enseñanza de las Ciencias*, 8(3), 936-951
- [6] García, M. y Orozco, L. (2008). "Orientando un cambio de actitud hacia las Ciencias Naturales y su enseñanza en profesores de Educación Primaria". *Revista Electrónica de Enseñanza de las Ciencias*, 7(3), 539-568.
- [7] Borrachero, A. B., Brígido, M., Mellado, L., Costillo, E., y Mellado, V. (2014). "Emotions in prospective secondary teachers when teaching science content, distinguishing by gender". *Research in Science & Technological Education*, 32(2), 182-215.
- [8] Brígido, M., Borrachero, A. B., Bermejo, M. L., Mellado, V. (2013). "Prospective primary teachers' self-efficacy and emotions in science teaching". *European Journal of Teacher Education*, 36(2), 200-217
- [9] Bandura, A. (1986). "Social foundations of thought and action: A social cognitive theory". New Jersey: Prentice-Hall