

Relationship between self-efficacy beliefs and emotions of future teachers of Physics in secondary education

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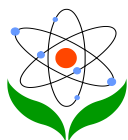
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Abstract

The self-efficacy beliefs of prospective teachers of secondary education in their physics classes are analysed, observing their perceived ability to successfully teach their students and to relate to the emotions they foresee in their future physics classes. To this end, a questionnaire was designed inquiring into the possible emotions they might feel when teaching physics content. The sample consisted of 178 prospective secondary education teachers of the University of Extremadura in Badajoz (Spain) taking the official pedagogical aptitude course (the “CAP”) during the 2008/2009 academic year. Generally, the results showed the prospective teachers to feel qualified to teach physics content with the training they had received in their respective undergraduate degree courses. Positive self-efficacy decreased and negative self-efficacy increased if there existed negative emotions.

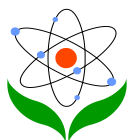
Keywords: emotions, self-efficacy, pre-service secondary teacher, physics.

Introduction

Bandura (1977) defines self-efficacy as beliefs in one's ability to organize and execute actions required to handle future situations. Put more simply, self-efficacy refers to a person's confidence that they can do what they have to do. For that author, the process of self-reflection allows individuals to assess their own experiences and thought processes. There are several lines of research on self-efficacy being pursued in the field of education. Most of them focus on the impact of self-efficacy on students' motivation, performance, and the development of their academic and professional interests and goals, highlighting the predictive value of self-efficacy (Brown et al., 2008; Valentine, DuBois & Cooper, 2004).

Self-efficacy is particularly related to the subject's behaviour, especially in activities ultimately aimed at attaining final success. This construct implies that the subject selects tasks that they are able to successfully carry out, to be persistent in their actions, maintaining effort over time, and seeking to acquire new skills from those tasks (Schunk, 1987).

According to Quintero, Pérez and Correa (2009), subjects who score positively on self-efficacy perform better in their chosen field, and there is also an influence on their personal judgement, creating a state of emotional calm focused on getting



things done. In contrast, low levels of self-efficacy create emotional instability, resulting in a practice of general failure.

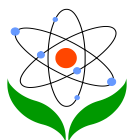
Teachers whose beliefs reflect high self-efficacy with which they feel capable of dealing with difficult situations in the classroom normally feel comfortable with what they do, and indeed enjoy it. The positive emotions they present are good predictors of satisfaction with the task of teaching. In contrast, teachers with low self-efficacy are sensitive to the anxiety associated with failure, and they approach difficult situations as if they constitute an ongoing threat (Ashton & Webb, 1986; Perrenoud, 1996). Furthermore, low teacher self-efficacy is related to professional burnout, to increased stress, and to numerous negative behavioural aspects in class planning, in the alternative ideas they have on scientific content (Jones & Carter 2007), and in the importance they attach to active learning (Enochs, Scharmann & Riggs 1995).

Schunk (1995) showed that past experiences influence achievement in future situations by maintaining high levels of self-efficacy with which to approach learning situations. Bresó, Salanova, Martínez, Grau and Agut (2004) found a direct relationship between past success and expectations of future success. In sum therefore, successful experiences in the past increase self-efficacy and the expectations of achievements.

Moyne (1986) notes that what is transmitted in the classroom cannot be separated from the person who transmits it, since it is knowledge that is tied to a being who communicates. In particular, there is a connection between the cognitive and the emotional dimensions which characterizes the teaching profession. Hence, the emotions prospective teachers experience during their teacher education in experimental sciences could affect the emotional dimension and beliefs that their own future pupils will have towards them (Gómez-Chacón, 1998; Bermejo, 1996). For pupils to acquire meaningful learning, it is essential that their teacher's actions are characterized by positive attitudes (Cervantes, Cappello & Castro, 2009).

The ability to cope with problems and the emotions they generate is a key element in the learning process. It is particularly important to empower these aspects in the initial stages of the teaching profession when they begin to be consolidated, because then over time they will become more resistant to change (Prieto, 2007).

In teacher education, it is necessary to bear in mind that prospective science teachers carry with them a body of knowledge, conceptions, attitudes, and emotions about



teaching and learning different subjects which is the result of the many years they spent as pupils at school (Mellado, Bermejo, Blanco & Ruiz, 2008). Oosterheert and Vermunt (2001) include the regulation of emotions as a functional component of learning to teach science. Teacher training is a space in which these aspects need to be considered so that prospective teachers will be able to control and self-regulate their emotions (Brígido, Borrachero, Bermejo & Mellado, 2013). The relationship between self-efficacy and emotions has been recognized in the analyses that some authors have made of these two constructs. For Saarni (2000), emotional competence is the demonstration of self-efficacy in expressing emotions in social transactions. Self-efficacy requires awareness of one's own emotions and the ability to regulate them to achieve one's desired results.

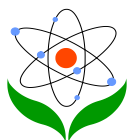
The study on prospective primary teachers of Brígido et al. (2013) found most of them to have positive emotions towards nature sciences but negative ones towards the hard sciences. Their beliefs concerning their self-efficacy were significantly related to their emotions about their future teaching of the hard sciences: high self-efficacy was significantly correlated with more positive emotions and fewer negative emotions towards physics and chemistry.

Other recent work has addressed the empirical study of some emotional states as sources of self-efficacy in secondary school teachers. Martínez and Salanova (2005) show in a sample of teachers that low levels of self-efficacy are preceded by high levels of negative emotions. Ritchie, Tobin, Hudson, Roth and Mergard (2011), in a study of a novice science teacher, find that positive emotions are related to the achievement of positive expectations and to the failure of the actual fulfilment of negative expectations, while negative emotions are related to the failure to achieve positive expectations. Other work has also shown that certain negative emotions can act as mediators between self-efficacy and its facilitators or obstacles, indicating that the fact of experiencing a negative emotional state affects the levels of self-efficacy (García, Llorens, Salanova & Cifre, 2006).

Method

Objective

The objective was to determine whether there exists a relationship between the self-efficacy beliefs of prospective secondary education teachers and the emotions they experience in teaching physics content.



Sample

The sample was one of non-probabilistic convenience, chosen for the availability of cases and of time. It comprised 178 students of the "CAP" (Curso de Aptitud Pedagógica – Pædagogical Aptitude Course) at the University of Extremadura in the 2008/2009 academic year. Most were women (67%), and most were younger than 30 (76.4%).

These are future secondary school teachers who have followed different paths in their university studies (Figure 1). In particular, 28% of the sample had studied Social Sciences, 25% Engineering, 21% Health Sciences, 14% Sciences, and 12% Arts and Humanities.

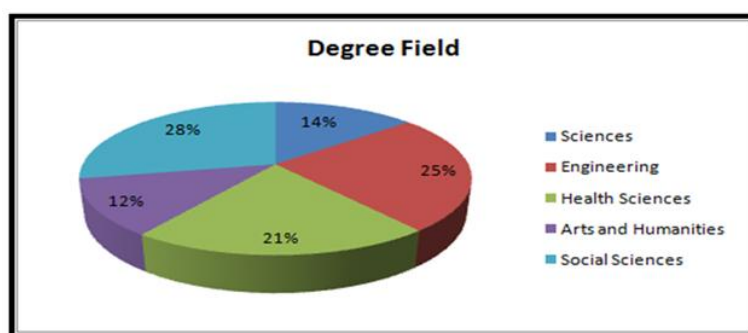


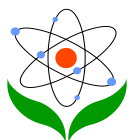
Figure 1. Distribution of the sample's subjects according to their undergraduate itinerary.

Data collection instrument

The methodological approach taken in the study was that of a descriptive (also termed non- experimental) survey-based study. This was chosen as the most appropriate approach with which to gather opinions, beliefs, and attitudes (de Vaus, 2001). The instrument applied was a purpose designed questionnaire of closed items. These were based on the work of Buendia (1999) and on some ideas in the primary teacher questionnaire of Brígido, Caballero, Bermejo and Mellado (2009) which includes items concerning teacher self-efficacy measured on a 4-point Likert scale (1 - Strongly Disagree, 2 - Disagree, 3 - Agree, 4 - Strongly Agree). In Table 1, these items are displayed.

Table 1. Items concerning to the teacher self-efficacy.

	1	2	3	4
I believe that would be able to teach physics with my training				
I will feel more confident to teach physics if my students are in the first years of secondary education				



The explaining of complex scientific content will cause me anxiety				
I believe that I possess the necessary skills to teach science content				
I will feel more confident when I am teaching theory than when the pupils are doing practical work				

The specific emotions considered were selected in accordance with the classification made by Damasio (2005). They were presented as a table of 12 positive emotions (attraction, confidence, enthusiasm, fun, gratification, joy, motivation, pleasure, pride, satisfaction, sympathy, and tranquillity) and 12 negative emotions (anger, anxiety, boredom, concern, depression, fear, frustration, hate, nervousness, pessimism, sadness, and uncertainty), with the subjects being asked to indicate those they believe they will experience when they are teaching the content of secondary school physics.

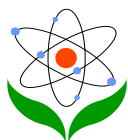
Analysis procedure

The questionnaire was responded to by several groups of CAP students during class time. They took about 45 minutes to complete them. They showed great interest in the content of the questionnaire and in the subsequent results. The completed questionnaires were processed using the SPSS (Statistical Product and Service Solutions) vn 17.0 for Windows software package.

Results

In the following paragraphs, we shall present some of the most relevant results, basing on the items that have obtained significant differences. The plots represent the percentages of subjects experiencing positive (on the left) and negative emotions (on the right) in teaching secondary school physics content, and whether they agree or disagree with the proposed statements, indicating their corresponding positive or negative self-efficacy in each case.

Figure 2 shows that the prospective teachers who feel capable of teaching science (Positive self-efficacy: “3 – Agree” and “4 - Strongly Agree”) also present positive emotions (trust, pleasure, satisfaction,...) about their future teaching of secondary school physics content. However, the subjects who feel themselves to be less capable (Negative efficacy: “1 - Strongly Disagree” and “2 – Disagree”) experience



increased negative emotions (frustration, boredom, anger, fear,...) about their future teaching of physics content.

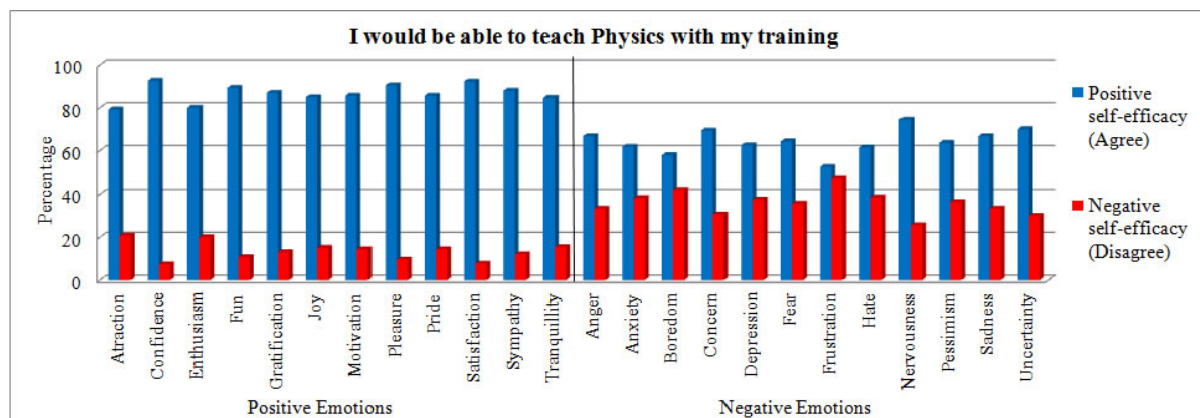


Figure 2. Graph of the relationship: The belief that I would be able to teach physics with my training / Emotions on teaching the content of (secondary education) physics.

Figure 3 shows that the prospective secondary school teachers who experience anxiety about teaching complex scientific content (Negative efficacy: “3 – Agree” and “4 - Strongly Agree”) present negative emotions (hate, anxiety, frustration,...) about teaching physics content. In contrast, those subjects who think they are qualified to teach complex scientific content (Positive self-efficacy: “1 - Strongly Disagree” and “2 – Disagree”) show an increase in positive emotions (fun, pride, satisfaction,...).

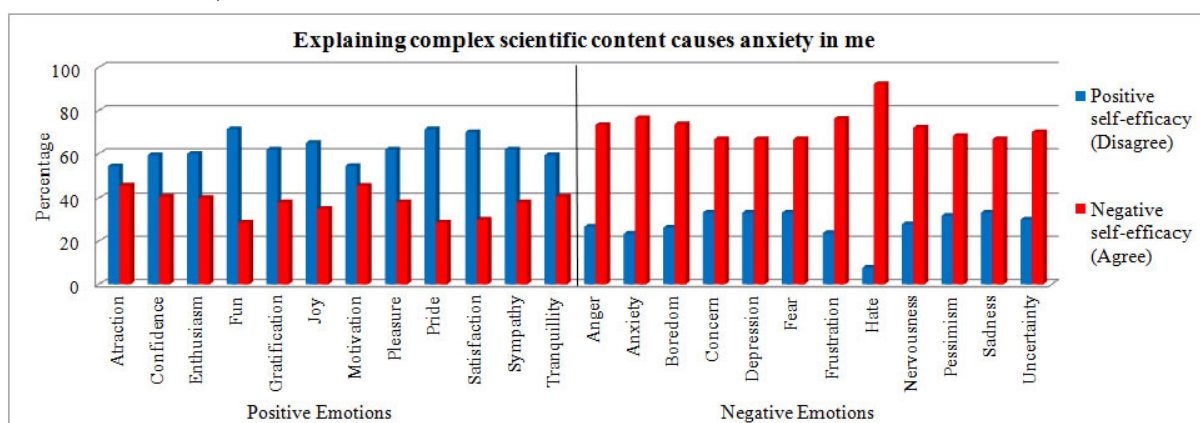
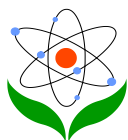


Figure 3. Graph of the relationship: The belief that explaining complex scientific content causes anxiety in me / Emotions on teaching the content of (secondary education) physics.

Figure 4 shows that the subjects who believe they have the necessary skills to teach science content (Positive self-efficacy: “3 – Agree” and “4 - Strongly Agree”)



experience mostly positive emotions (motivation, enthusiasm, pleasure,...) on teaching the subject of physics. In contrast, those who believe they do not possess the necessary skills to teach science content (Negative self-efficacy: “1 - Strongly Disagree” and “2 – Disagree”) experience increased negative emotions (sadness, pessimism, anger,...) in teaching physics.

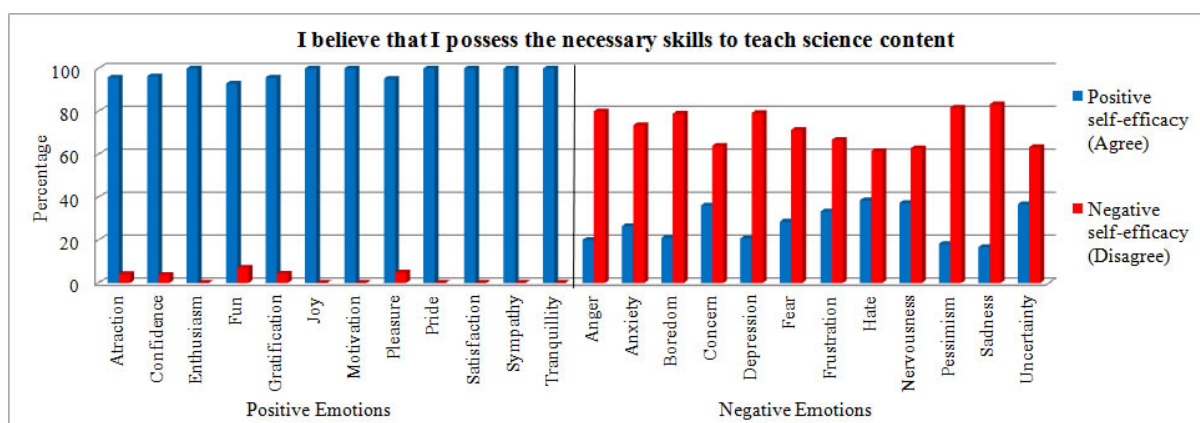


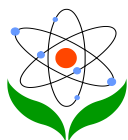
Figure 4. Graph of the relationship: The belief that I possess the necessary skills to teach science content / Emotions on teaching the content of (secondary education) physics.

Conclusions

In general, the results show that prospective secondary education teachers who have positive self-efficacy beliefs also experience positive emotions about teaching secondary school physics. In contrast, subjects who have negative self-efficacy beliefs experience negative emotions.

Similarly, positive emotions about their future physics teaching are more abundant in the prospective secondary teachers with positive self-efficacy beliefs, and, conversely, negative self-efficacy goes together with increased negative emotions.

There is no room for doubt that the prospective secondary teachers' beliefs about their teaching self-efficacy impact on the emotions they will experience when they have to teach scientific content, in this specific case, physics. If the prospective teacher perceives themselves as incapable of teaching scientific content then there will arise negative emotions that influence the teaching/learning process, and that may well be transmitted to their pupils. If, however, the prospective teacher feels capable of teaching that content then this will generate a climate of positive



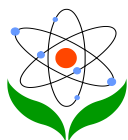
emotions in their classroom by their displaying confidence and security in their actions.

In view of these results, one sees that the study of emotions and self-efficacy is important for the training of prospective secondary teachers. In sum, these prospective teachers will have to face the everyday reality of their classes, and in this sense many expressed feeling emotionally vulnerable. They need therefore to feel empowered to self-regulate these emotions which otherwise would block their teaching of science content.

Education professionals must self-generate positive emotions towards science teaching since they have an enormous responsibility in generating emotional skills in their own pupils, both by direct example and by the use of emotional intelligence in their classes, helping to create an emotionally healthy school climate. The development of positive self-efficacy beliefs also in their pupils by fostering positive feelings and emotions will facilitate a change in the beliefs and expectations about the material being taught. Blanco, Ornelas, Aguirre, and Guedea (2012) argue that it would be recommendable that teachers, especially those who teach in contexts particularly close to when career decisions have to be made (secondary school and/or vocational training), allow their pupils to practice the skills they will need to successfully approach their future academic challenges or the performance of their jobs, providing them with activities that are related with those that they will see in their future studies or in their professional careers.

The various university degrees courses that our prospective teachers had studied do not prepare them for teaching in secondary schools. This preparation only comes when they voluntarily matriculate in the CAP or in the Master's in Secondary Education Teacher Training. It is therefore essential to implement a program of support and follow-up for their teaching practices. The intention with such programs will be to foster awareness, to enhance the capacity for self-regulation, and to change negative attitudes, beliefs, and emotions about science –specifically physics– and its learning. In particular, as observed by Delval (2002), it is in the teaching practice in schools when prospective teachers' beliefs, attitudes, and emotions become consolidated.

This study clearly points to the interest of further investigations considering more variables such as self-image, the causes of the emotions experienced in secondary school, the methodological approach that the teacher follows, the course content, the pupils' motivation and the results of their evaluation in this subject. Furthermore, the

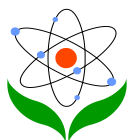


study may clearly be extended to other science subjects (Biology, Geology, Chemistry, and Technology).

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