

# Conceptions and practices of Iberian mathematics teachers about humour

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## Abstract

*This study focuses on the conceptions and practices of Iberian (Portuguese and Spanish) mathematics teachers regarding instructional humour. Specifically, the study aims to answer the following questions: (1) How do Iberian mathematics teachers view humour and how do they appreciate a sense of humour? (2) What educational value do Iberian mathematics teachers ascribe to humour in the teaching and learning process of this subject? (3) How do Iberian mathematics teachers use humour in mathematics teaching? and (4) What differences, regarding humour and its use in the educational context, are found among Iberian mathematics teachers, as determined by their professional experience? A mixed methodology was adopted for this study, with a greater quantitative emphasis, combining quantitative analysis with descriptive and inferential statistics. Iberian mathematics teachers (N=1087) from all educational levels participated in the study. The data was collected through an online questionnaire, organised according to three dimensions of analysis: (1) Humour and sense of humour; (2) Educational value of humour in the teaching and learning of mathematics; and (3) Use of humour in the teaching of mathematics.*

*The results reveal that Iberian teachers who teach mathematics recognise the meaning of humour, feel they have a sense of humour and appreciate it in others, find reasons to use it in mathematics teaching and have seen it being used or use it in their classes to create a good*

*learning environment and make students think. The results show differences over the teachers' careers, especially in their use of humour and the purpose they make of it. However, the magnitude of the effect suggests the need to consider other variables in addition to the teachers' professional experience, such as the level of training, the type of training and the cultural context in which the school is located.*

*Keywords: humour, Iberian mathematics teachers, career, practices, conceptions.*

## **1. Introduction**

Studies on humour in educational settings have some tradition, as shown by some meta-analyses of research conducted on the topic (Banas et al. 2011; Martin & Ford 2018) and by several other studies (Bakar 2019; Bakar & Kumar 2019; Guitart 2012; Lovorn & Holaway 2015; Nahas 1998; Sullivan 2014). The analysis of these studies reveals several trends. Firstly, many of the studies are experimental, so they do not show us reality as it is but as it might become (Banas et al. 2011). Secondly, several of these studies pay little attention to what happens in the classroom and what its protagonists, teachers and students, think (Banas et al. 2011; Martin & Ford 2018). Third, studies that focus on the teaching and learning of mathematics are not as prevalent compared to those that focus on other school subjects, such as (native and foreign) languages (Abdulmajeed & Hameed 2017; Banas et al. 2011; Bilokçuoğlu & Debreli 2018; Sanchez & Magro 2018). Finally, we know that humour is very much shaped by culture and the individual characteristics of its users; thus, it is relevant to frame and understand it in a given context and at a given time (Martin & Ford 2018; Meyer 2015; Schmitz 2002).

This study stems from this analysis of the state of the art on humour in the field of mathematics education, seeking to occupy the insufficiently occupied investigative space. Therefore, this study focuses on humour in actual mathematics classes, revealing what Iberian (Portuguese and Spanish) mathematics teachers who teach mathematics from primary school to higher education think and do. In light of the above, this study aims to answer the following questions: (1) How do Iberian mathematics teachers view humour and how do they appreciate a sense of humour? (2) What educational value do Iberian mathematics teachers ascribe to humour in the teaching and learning process of this subject? (3) How do Iberian mathematics teachers use humour in mathematics teaching? and (4) What differences, regarding humour and its use in the educational context, are found among Iberian mathematics teachers, as determined by their professional experience?

## **2. Theoretical foundations**

In this section, we start by discussing the concepts of humour and sense of humour and then focus on humour in Mathematics Education.

### **2.1. Humour and sense of humour**

The subject of humour is not new and much has been written about it over the ages. Even if Larkin-Galiñanes argues that the term 'humour' itself is quite recent, dating "no further back than the 20th century" (2017: 4), the fact is that it is difficult to reach consensus on the concept(s) of humour and sense of humour, given its ancient roots, as well as its multifaceted

and imbricated nature. There is little doubt that its etymology may be traced to the “Latin word (*humorem*), meaning fluid or liquid” (Martin & Ford 2018: 20), which came to be used in Medieval medical practice to refer to the four main fluids (i.e., blood, yellow bile, phlegm, and black bile), representing the four main elements (i.e., air, fire, water, and earth) and their temperamental analogous traits (i.e., sanguine, choleric, phlegmatic, and melancholic), as Hempelmann (2017: 35) summarises in a concise and visual manner.

The perfect balance of these fluids would determine a person’s health and wellbeing, whereas the prevalence of one or more over the other(s) would contribute to a pathologically imbalanced temperament. So, through this overview of the diachronic development of the term, we start noticing that it has morphed from a physical substance – today still associated with the anatomy of the eye – to psychological connotations. It is only from the sixteenth century onwards that this unbalanced mood or temperament became associated with deviation of social norms and, thus, with an odd or eccentric personality opening doors for funniness, ridicule, and laughter (Ruch 1998: 8; Ruch 2008: 43). Being laughed at or making others laugh, through the imitation of the peculiarities of deviant individuals, was seen as something negative and should be avoided. According to Larkin-Galiñanes (2017: 7), “[i]t was not (...) until the Renaissance that a renewed, more positive interest in laughter and humor arose, but this new period was marked (...) by a different emphasis that relegates the ‘dangers’ and threats that beset the laughter to a secondary position”. By the end of the nineteenth century, the difference between ‘laughing at,’ i.e., making fun of someone, or ‘laughing with’ had arisen and, over time, it became socially acceptable and associated with an expression of one’s wit or cleverness, based on sympathy and benevolence rather than on aggressiveness, antipathy or sarcasm (Ruch 2008: 46).

Nowadays, these two connotations have not ceased to exist, and the term humour came to be used as an umbrella term for everything that elicits laughter, whether positive or negative. In fact, this broad term is ambivalent in that it can be applied in various situations and referring to different behaviours or conditions, as Gibson, quoting Levine (1963), reminds us: “(...) laughter has been associated with madness. (...) However, (...) laughter and humor are signs of good mental health” (2019: 190), as well. Besides that, it may be seen as a threat, a powerful weapon, the glue that aids in the cohesion of groups (ibidem: 52) or even as “a coping mechanism” (Gibson 2019: 179).

As we have just seen, humour has many and even paradoxical connotations, which is not surprising because, even if it is universal in human beings, it is also a product of culture and history, as Guidi (2017: 19), leaning on several other studies, points out: “Humor is (...) present in some form in all human groups and, at the same time, it is recognized as a culturally and historically contingent construct (Fine 1983; Boskin 1987; Hall et al. 1993; Purcell et al. 2010). Different cultures view humor in different ways (Alford & Alford 1981).”

The situations in which the use of humour is considered appropriate or completely understood in a given culture may not be the same and fail in many ways in other cultural settings, since humour violates shared expectations or conventional thinking; it involves violations of social norms, logic or communication, causing surprise. However, for this surprise not to cross the line into offensive behaviour, we need to be acquainted with the norms, assumptions, traditions, customs, values, and language of the target culture.

Actually, having a sense of humour implies some flexibility in encoding or decoding a humorous message or situation, even more so if an intercultural axis is added into the equation, as previously mentioned. It is, therefore, a desirable personality trait that is highly valued, being considered a cardinal virtue in the nineteenth century (Wickberg 1998; Ruch 2016), and currently still imbued with positive connotations, often used along with, for instance, creativity and innovation (Brône 2017). Its definition is, however, elusive, because, as Ruch argues,

there is disagreement on how to define it: “(...) there have been speculations what the core of sense of humor is, what components are best used to break the scientific concept down to measurable elements” (Ruch 2014: 682).

Despite its vague nature and its difficulty in measuring it, many fields embrace humour as a stress-relieving mechanism due to its reinforcing, motivational and soothing effects. Among the several areas that have used humour, it has become of particular interest in healthcare, namely psychotherapy, in linguistics, other language sciences and communication sciences, in the workplace at large and in educational settings. Being an important tool in academic achievement, in the next subsection, we will provide a glimpse of its use in education and, in particular, in mathematics education.

## **2.2. Humour in education and mathematics education**

For some decades, the use of humour for educational purposes has been studied by different authors with different interests. In 2011, Banas, Dunbar, Rodriguez and Liu conducted a comprehensive review of the literature on humour in educational settings over the past four decades. The authors conclude that the use of humour is a recurrent communication behaviour in educational settings having different goals (Banas et al. 2011). The use of positive humour is pointed out in several studies as an important element in creating a good learning environment, characterised by being more interesting, relaxed and motivating for students. In addition to the motivational and affective aspects of the use of humour, research shows that humour facilitates the recollection of learned information, especially on more complex topics (Banas et al. 2011).

Some research on instructional humour, especially more recently, has drawn attention to teachers' conceptions and practices (Bakar 2019; Lovorn & Holaway 2015; Sullivan 2014). Analysing the types of humour used by primary school teachers in New Zealand, Sullivan (2014) reveals that humour is a key component in teachers' discourse through which they negotiate and manage their teaching practice.

Lovorn and Holaway (2015) analyse the teachers' perceptions of the use of humour as a teaching, interaction, and management tool in the classroom. The study focused on online discussions about the use of humour in education by teachers from preschool to grade 12. The results show that teachers understand the impact that humour has on teaching and learning and most of them point out examples of their use of humour in the classroom, but few appeared to perceive humour as a structured classroom strategy and consequently it is not deliberately planned, happening spontaneously.

Studying teacher and student conceptions of appropriate and relevant humour in a university classroom, Bakar (2020) concludes that, for them, appropriate humour occurs at the right time and in the right way and this humour improves teachers' credibility. On the contrary, inappropriate humour is disrespectful humour. For participants, relevant humour is linked with the content being learnt and with daily experiences. Otherwise, irrelevant humour is one that students do not understand.

The study of humour for educational purposes has some tradition in the field of (native and foreign) languages (Abdulmajeed & Hameed 2017; Bilokçuoğlu & Debreli 2018; Sanchez & Magro 2018). What about the use of humour in the field of mathematics education? Is mathematics, a subject that generates much anxiety for many students, compatible with the use of humour? The work in this area is sparse, with few descriptions of what mathematics teachers think and do with humour in the classroom, the materials they use and for what purpose. The main North American Mathematics Teachers Association has published a collection of books with mathematical tasks based on graphic humour entitled “Cartoon

Corner” (NCTM 2007, 2013). Flores (2003) and Flores and Moreno (2011) also edited two books for mathematics teachers (*Graphic humour in the mathematics classroom* and *Mathematically competent to laugh*) with proposals for the use of graphic humour in mathematics classrooms. In none of these cases have studies been carried out that assess how teachers take ownership of these proposals and how students learn from them.

This literature review reveals that humour is a familiar topic for teachers, who use it in their classes, especially in an unplanned way to facilitate classroom management and teach curriculum content (making it, thus, more relevant). What mathematics teachers think and do with the humour to teach mathematics remains largely unknown and this is the main challenge of this study.

### **3. Methodology**

Considering the purpose of this study, a quantitative approach was used to process the data resulting from the teachers’ answers to the questionnaire, aiming at describing and interpreting such data (Gall et al. 2003). In addition to items designed to characterise the participants, the questionnaire used in this research is organised around three dimensions of analysis: (1) Humour and sense of humour; (2) Educational value of humour in mathematics teaching and learning; and (3) Use of humour in mathematics teaching. In turn, the first dimension includes five subdimensions: Meaning of humour (6 items); Sense of humour (5 items); Sense of humour in others (4 items); Issues of humour (4 items); and Sources of humour (5 items). The second dimension presents four subdimensions: Compatibility of humour with the teaching of mathematics (5 items); Use of humour in teaching mathematical topics (5 items); Resources for promoting humour (4 items); and Support for the use of humour (5 items). Finally, the third dimension comprises two subdimensions: Purpose of the use of humour by their former mathematics teachers (4 items); and Purpose of the use of humour in teaching mathematics (4 items).

The option to use mostly closed-response items was due to: (1) being questions that were easy and quick to answer for teachers; and (ii) the expected large number of participants. The questionnaire had, however, two open-ended questions: “Report an episode involving the use of humour, by a former teacher, in your mathematics lessons” and “Report an episode in which you used humour in your mathematics lessons”. To answer each of the closed-response question, teachers would have to select an option from 1 to 4, considering that 1 refers to the lowest score and 4 to the highest score. Based on the teachers’ answers, the average of these scores was determined for each item.

The questionnaire was sent to schools from primary to higher education in Portugal and Spain to create the sample database. The sampling method was convenience sampling (Hill & Williams 2012) since the questionnaires were distributed in several schools and completed online by any interested mathematics teachers. This methodological approach is motivated mainly by the limited resources available compared to the target group (Mathematics teachers from all levels of education in Portugal and Spain).

A total of 1087 teachers, whose ages ranged from 23 to 67 years, with an average age of approximately 47 years, participated in the study. Except for two, who did not specify the level, these were teachers who taught in primary education (from the 1st to the 6th grade), totalling 374 (34.4%); in middle/secondary education (from the 7th to the 12th grade), there was a total of 635 (58.4%); in higher education (after the 12th grade), a total of 76 (7%). Regarding their teaching experience, the length of their service was 21 years on average, with some teachers starting their careers (having 0 years of experience) and some having 49 years

of tenure. Among the teachers who specified their gender, 69.8% were females and 30.2% were males. Concerning the teachers' nationality, 594 were Portuguese (54.6%) and the remaining 493 were Spanish (45.4%).

Regarding their working experience, except for 36 (3.3%) who did not provide any information, the teachers were divided into four groups: up to 7 years of experience (totalling 78 teachers, 7.2%); from 8 to 15 years of experience (in a total of 230 teachers, 21.2%); from 16 to 25 years of experience (386 teachers, 35.5%); and more than 25 years of experience (reaching a total of 357 teachers, 32.8%).

Finally, quantitative data analysis was carried out using the SPSS software, version 23 for Windows, and was conducted at two levels: descriptive and inductive. At the descriptive level, we determined the mean concordance rate expressed by the teachers according to each of the four groups corresponding to the length of service under consideration, which allowed us to compare these groups in each item of each subdimension pre-established in the questionnaire. Next, at the inductive level, we compared the mean concordance rates of the four groups in each item through the One-Way Anova analysis of variance, considering 0.05 as the level of statistical significance. In case the analysis of variance determined statistically significant differences between the groups, we continued the analysis with the study of multiple comparisons between any two groups, using the Bonferroni test. In order to determine the proportion of variance of the dependent variable that can be attributed to the independent variable, that is, service experience, we determined the squared eta value ( $\eta^2$ ) considering the following cut-off points to determine the effect size: low ( $\eta^2 < 0,01$ ); medium ( $0,02 < \eta^2 < 0,06$ ); and high ( $\eta^2 > 0,14$ ) (Cohen, 1988). The answers to the question "Report an episode in which you used humour in your mathematics lessons" were subjected to content analysis.

## **4. Results**

We present the results in three sections: Humour and sense of humour; Educational value of humour in teaching and learning mathematics; and The use of humour in teaching mathematics.

### **4.1. Humour and sense of humour**

A sense of humour is an intrinsic characteristic of every teacher, which depends on his/her personality and conceptions about the contents he/she teaches. Given the role it may play in the way of being and acting in the workplace, we began by questioning the teachers about what humour is. Their answers were grouped according to the attributes specified in the questionnaire, as shown in Table 1. Among these attributes, the most prominent is its effect in 'provoking laughter,' 'chilling someone out,' 'stimulating one's mind,' 'relieving tension/anxiety' and 'improving self-esteem.' Overall, teachers with more than 15 years of tenure show a higher mean concordance rate in the different attributes analysed.

Table 1. Teachers' mean concordance rate and *p*-value in items about what humour is, according to their length of service (*n* = 1087)

For me, humour is any funny situation that:	$\bar{x}$	Mean according to length of service				Value of <i>p</i>	$\eta^2$
		≤ 7	≥ 8 and ≤ 15	≥ 16 and ≤ 25	≥ 26		
Provokes laughter	2.95	3.15	3.02	2.93	2.89	0.014*	0.012
Chills us out	3.14	2.83	3.06	3.24	3.15	0.000*	0.020
Helps us deal with loss, grief or disappointment	2.75	2.68	2.70	2.76	2.76	0.738	0.006
Stimulates our mind	3.31	2.99	3.22	3.39	3.36	0.000*	0.027
Helps relieve tension/anxiety	3.40	3.23	3.35	3.46	3.41	0.013*	0.012
Contributes to improving self-esteem	3.20	3.01	3.12	3.28	3.20	0.009*	0.008

\* Statistically significant differences for *p* < 0.05. Source: Authors' own study (2021).

Comparing the mean scores of the four groups according to the teachers' length of service using One-Way Anova, significant differences were found in five of the six items. Regarding the attribute 'provoking laughter', there are statistically significant differences, with a low effect size, between teachers with less than eight years of experience and teachers with more than 25 years of experience. For the attribute 'chilling someone out', there are significant differences, with a low effect size, between teachers with more than 15 years of experience and teachers with less than eight years of experience, as well as significant differences between teachers with 16 to 25 years of experience and teachers with eight to 15 years of experience. These differences between the same groups of teachers also occur in the attribute 'stimulating one's mind,' with a medium effect size.

In the remaining attributes, 'relieve tension/anxiety' and 'improve self-esteem,' significant differences are observed between teachers having 16 to 25 years of tenure and teachers having less experience.

Regardless of one's personality, the majority of teachers (89.9%) consider themselves to have a sense of humour, which is expressed by the assertions 'I can say things in a way that makes people laugh', 'Sometimes funny situations or stories come to mind', 'Through funny expressions, I get others thinking' and 'I can relieve a stressful situation by saying something funny' (Table 2).

Table 2. Teachers' mean concordance rate and *p*-value in items about their sense of humour, according to their length of service (*n* = 1087)

I see myself as a person with a sense of humour because:	$\bar{x}$	Mean according to length of service				Value of <i>p</i>	$\eta^2$
		≤ 7	≥ 8 and ≤ 15	≥ 16 and ≤ 25	≥ 26		
I can say things in a way that makes people laugh	2.84	2.79	2.78	2.89	2.83	0.157	0.006
People expect me to say funny things	2.35	2.33	2.20	2.40	2.43	0.004*	0.014
Sometimes funny situations or stories come to mind	3.00	2.97	2.91	3.05	3.03	0.076	0.007
Through funny expressions, I get others thinking	2.86	2.74	2.82	2.87	2.91	0.174	0.005
I can relieve a stressful situation by saying something funny	2.87	2.97	2.82	2.87	2.90	0.386	0.003

\* Statistically significant differences for *p* < 0.05. Source: Authors' own study (2021).

Comparing the mean scores of the four groups of teachers ranked by length of service, we notice that there are significant differences, with a low effect size, in the item relating to the attribute 'saying funny things' between teachers with more than 15 years of experience and teachers with 8 to 15 years of experience.

In addition to the predisposition to provide pleasant moments, almost all teachers (99.5%) appreciate a sense of humour in others, mainly because it helps 'to manage difficult situations,' 'to feel more at ease and relaxed', 'handle everyday situations' and 'to be more productive at work' (Table 3).

Table 3. Teachers' mean concordance rate and *p*-value in items about a sense of humour in others, according to their length of service (*n* = 1087)

I appreciate a sense of humour in others because:	$\bar{x}$	Mean according to length of service				Value of <i>p</i>	$\eta^2$
		≤ 7	≥ 8 and ≤ 15	≥ 16 and ≤ 25	≥ 26		
Other people's humour helps me to feel more at ease and relaxed	3.39	3.37	3.38	3.43	2.35	0.362	0.003
Intelligent humour helps me to manage difficult situations	3.41	3.31	3.33	3.47	3.41	0.035*	0.008
Handling everyday situations with humour is a way for me to adapt better to them	3.26	3.26	3.34	3.26	3.22	0.173	0.005
Using humour helps me to be more productive at work	3.16	2.99	3.20	3.20	3.13	0.073	0.007

\* Statistically significant differences for *p* < 0.05. Source: Authors' own study (2021).

Comparing the mean scores of the four groups, although there are significant differences, with a low effect size, in the item related to the attribute related to helping 'manage difficult situations,' the application of Boferroni's Post Hoc test does not determine differences between the groups. The teachers in the two groups with more working experience value this attribute more highly.

When asked about possible subjects on which they appreciate humour, teachers highlighted issues on ‘Uses and customs’ and ‘Education’ the most (Table 4).

Table 4. Teachers’ mean concordance rate and *p*-value in items about the issues on which they appreciate humour, according to their length of service (*n* = 1087)

I appreciate humour on:	$\bar{x}$	Mean according to length of service				Value of <i>p</i>	$\eta^2$
		≤ 7	≥ 8 and ≤ 15	≥ 16 and ≤ 25	≥ 26		
Politics	2.80	2.49	2.70	2.86	2.89	0.001*	0.016
Uses and customs	3.27	3.38	3.31	3.22	3.27	0.185	0.005
Sports	2.72	2.29	2.62	2.83	2.78	0.000*	0.025
Education	3.17	3.15	3.17	3.18	3.16	0.972	0.000

\* Statistically significant differences for *p* < 0.05. Source: Authors’ own study (2021).

Comparing the mean of the four groups, significant differences are found in two of the four items, concerning the attributes of enjoying humour in matters of ‘Politics’, with a low effect size, and ‘Sports,’ with a medium effect size. In the first item, significant differences are observed between teachers with more than 15 years of service and teachers with less than 8 years of experience. In the other item, significant differences are observed between teachers with more than seven years of service and novice teachers, as well as between teachers whose length of service is between 16 and 25 years and teachers whose experience is between 8 and 15 years.

When searching for humorous subjects, teachers resort to different sources. In this case, teachers look for more humorous situations in ‘Groups of friends’, ‘Internet’, ‘Cinema’ and on ‘Television’ (Table 5).

Table 5. Teachers’ mean concordance rate and *p*-value in items on sources of humour, according to their length of service (*n* = 1087)

Where do I look for humour?	$\bar{x}$	Mean according to length of service				Value of <i>p</i>	$\eta^2$
		≤ 7	≥ 8 and ≤ 15	≥ 16 and ≤ 25	≥ 26		
Television	2.78	2.77	2.73	2.87	2.71	0.059	0.007
Cinema	2.78	2.82	2.83	2.80	2.70	0.197	0.004
Magazines	2.26	2.09	2.19	2.23	2.37	0.014*	0.010
Internet	2.88	3.41	3.11	2.80	2.70	0.000*	0.058
Groups of friends	3.46	3.62	3.53	3.47	3.36	0.001*	0.015

\* Statistically significant differences for *p* < 0.05. Source: Authors’ own study (2021).

Significant differences were found between the mean scores of the four groups in three of the five items. Even if the application of Boferroni’s Post Hoc test does not determine differences between the groups, we notice that teachers with more than 25 years of tenure use this resource more often.

For the item ‘Internet,’ there are significant differences, with a medium effect size, between teachers with less than 8 years of service and the remaining teachers, as well as significant differences, with a low effect size, between teachers with 8 to 15 years of working experience and teachers with more than 15 years of working experience. As for the attribute ‘Groups of friends,’ there were significant differences, with a low effect size, between teachers

with less than 16 years of working experience and teachers with more than 16 years of working experience.

#### 4.2. Educational value of humour in teaching and learning

Despite the abstract nature of mathematical objects, which supports the idea of an exact discipline of high cognitive complexity and seriousness, almost all teachers consider that teaching mathematics is compatible with the use of humour (98%). Teachers who are newer in their teaching careers stand out from more experienced teachers with regard to the concordance rate they ascribe to this compatibility in making ‘mathematics lessons more enjoyable’. Teachers in the longer-serving groups, meanwhile, stand out from the others when it comes to finding humour compatible with stimulating ‘mathematical thinking’ and facilitating ‘mathematical communication.’ The teachers in the groups with 8 to 25 years of tenure stand out from the remaining groups with regard to the level of agreement on the compatibility of humour in making ‘mathematics more attractive.’ On the other hand, the role of humour in fostering ‘the pedagogical relationship between teacher and students’ is more emphasised by the teachers in the group with shorter working experience and the group with 16 to 25 years of working experience (Table 6).

Table 6. Teachers’ mean concordance rate and *p*-value in items on the compatibility of humour with teaching mathematics, according to their length of service (*n* = 1087)

The teaching of mathematics is compatible with the use of humour because:	$\bar{x}$	Mean according to length of service				Value of <i>p</i>	$\eta^2$
		$\leq 7$	$\geq 8$ and $\leq 15$	$\geq 16$ and $\leq 25$	$\geq 26$		
Maths lessons that use humour are more enjoyable	3.51	3.57	3.57	3.51	3.45	0.035*	0.008
Humour stimulates mathematical thinking	3.23	3.04	3.21	3.26	3.26	0.061	0.007
Humour facilitates mathematical communication	3.26	3.06	3.24	3.32	3.27	0.025*	0.009
Humour makes mathematics more attractive	3.46	3.45	3.48	3.48	3.42	0.554	0.002
Humour fosters the pedagogical relationship between teacher and students	3.61	3.65	3.61	3.66	3.55	0.097	0.006

\* Statistically significant differences for  $p < 0.05$ . Source: Authors’ own study (2021).

The adoption of the One-Way Anova analysis of variance determined significant differences, with a low effect size, between the mean scores of the four groups of teachers according to their length of service in two items. In the item concerning the attribute ‘classes are more enjoyable,’ significant differences were observed between teachers with length of service between 8 and 15 years and teachers in the group with more seniority. In the other item, concerning the attribute ‘facilitating mathematical communication,’ there are significant differences between teachers with length of service between 16 and 25 years and teachers in the group with shorter tenure.

The compatibility of humour with mathematics teaching is corroborated by teachers in its use while teaching ‘Geometry’, ‘Statistics’, ‘Probabilities’ and ‘Numbers and operations’ with greater prominence for teachers in the group having served less than 8 years (Table 7).

Table 7. Teachers’ mean concordance rate and p-value in items on the use of humour in teaching different mathematical topics, according to their length of service ( $n = 1087$ )

Appraisal of the possibility of using humorous situations in the teaching of:	$\bar{x}$	Mean according to length of service				Value of p	$\eta^2$
		$\leq 7$	$\geq 8$ and $\leq 15$	$\geq 16$ and $\leq 25$	$\geq 26$		
Geometry	3.00	3.12	3.00	2.99	2.98	0.501	0.002
Statistics	3.35	3.49	3.35	3.36	3.29	0.133	0.005
Probabilities	3.39	3.45	3.43	3.39	3.36	0.471	0.002
Algebra	2.74	2.65	2.75	2.76	2.71	0.660	0.002
Numbers and Mathematical operations	2.94	2.70	2.96	2.97	2.95	0.059	0.007

\* Statistically significant differences for  $p < 0.05$ . Source: Authors’ own study (2021).

Although the comparison of the mean scores of the responses of the four groups does not determine statistically significant differences, Boferroni’s Post Hoc test shows significant differences, pertaining to the possibility of using humorous situations in the teaching of ‘Numbers and Mathematical Operations,’ between the teachers in the group having a tenure between 16 and 25 years and the teachers in the group with a shorter working experience.

The use of humour in the mathematics classroom can take place through various resources, among which teachers highlight in particular ‘PowerPoint presentations,’ with greater emphasis for teachers with 8 to 15 years of experience, and ‘Worksheets,’ most prominent for teachers in the group with the shortest working experience (Table 8).

Table 8. Teachers’ mean concordance rate and p-value in items on the use of resources to promote humour in the mathematics classroom, according to their length of service ( $n = 1087$ )

For each of the following resources, assess their suitability for using humour in a Maths lesson:	$\bar{x}$	Mean according to length of service				Value of p	$\eta^2$
		$\leq 7$	$\geq 8$ and $\leq 15$	$\geq 16$ and $\leq 25$	$\geq 26$		
Worksheets	2.49	2.68	2.57	2.45	2.44	0.050	0.008
Coursebook	2.39	2.23	2.41	2.43	2.37	0.238	0.004
Tests	2.01	2.03	2.02	2.02	2.00	0.984	0.000
PowerPoint presentations	3.16	3.22	3.24	3.18	3.08	0.052	0.007

\* Statistically significant differences for  $p < 0.05$ . Source: Authors’ own study (2021).

Among the resources that help to introduce humorous situations in the teaching of mathematics, teachers particularly value ‘Teacher’s talk,’ ‘Cartoons,’ ‘Comics’ and ‘Videos’ (Table 9).

Table 9. Teachers’ mean concordance rate and *p*-value in items on the use of different resources to promote humour in mathematics teaching, according to their length of service (*n* = 1087)

For each of the following resources, assess their suitability for introducing humorous situations in the teaching of mathematics:	$\bar{x}$	Mean according to length of service				Value of <i>p</i>	$\eta^2$
		$\leq 7$	$\geq 8$ and $\leq 15$	$\geq 16$ and $\leq 25$	$\geq 26$		
Cartoons	3.24	3.42	3.27	3.30	3.12	0.001*	0.015
Comics	3.19	3.35	3.14	3.20	3.16	0.186	0.005
Videos	3.18	3.30	3.16	3.22	3.11	0.138	0.005
Written text	2.72	2.66	2.76	2.69	2.76	0.490	0.002
Teacher’s talk	3.40	3.44	3.40	3.44	3.37	0.612	0.002

\* Statistically significant differences for *p* < 0.05. Source: Authors’ own study (2021).

Comparing the mean scores of the four groups, we find that there are significant differences, with a medium effect size, in the item related to the use of ‘cartoons’ between the teachers in the group having the least working experience and the teachers in the group having the most seniority, as well as between the teachers with 16 to 25 years of working experience and the teachers in the group having the most seniority.

### 4.3. The use of humour in teaching mathematics

Mathematics learning is marked by the teaching strategies teachers have experienced in their teaching practice. Based on this assumption, teachers were challenged to recall possible episodes of use of humour in the classroom by their mathematics teachers. Most teachers (61.3%) did not recall any use of humour by their mathematics teachers. Among those who did remember, they highlighted the purposes of ‘Creating a good environment,’ with a slight emphasis by teachers with 8 to 15 years of working experience, ‘Motivating,’ especially by teachers in the less experienced group, and ‘Making people think,’ with more emphasis by teachers in the group with more seniority (Table 10).

Table 10. Teachers’ mean concordance rate and *p*-value in items on the purpose of humour used by their mathematics teachers, according to their length of service (*n* = 1087)

As a student, for what purpose was humour used by your mathematics teachers?	$\bar{x}$	Mean according to length of service				Value of <i>p</i>	$\eta^2$
		$\leq 7$	$\geq 8$ and $\leq 15$	$\geq 16$ and $\leq 25$	$\geq 26$		
Creating a good environment	3.44	3.39	3.51	3.44	3.44	0.780	0.003
Motivating	3.37	3.45	3.33	3.34	3.41	0.680	0.004
Making people think	3.13	2.87	3.11	3.14	3.22	0.090	0.016
Teaching concepts	2.83	2.76	2.87	2.84	2.82	0.926	0.001

\* Statistically significant differences for *p* < 0.05. Source: Authors’ own study (2021).

Finally, when asked whether they make use of humour in their classes to teach mathematics, most teachers (89.4%) say they do it sometimes. Teachers highlight the purposes of ‘Creating a good environment,’ ‘Motivating’ and ‘Making people think’ (Table 11).

Table 11. Teachers' mean concordance rate and *p*-value in items on the purpose of humour used in their teaching of mathematics, according to their length of service (*n* = 1087)

As a teacher of mathematics, for what purpose do you use humour in your classes?	$\bar{x}$	Mean according to length of service				Value of <i>p</i>	$\eta^2$
		≤ 7	≥ 8 and ≤ 15	≥ 16 and ≤ 25	≥ 26		
Creating a good environment	3.49	3.71	3.51	3.50	3.41	0.006*	0.013
Motivating	3.51	3.63	3.51	3.56	3.46	0.074	0.007
Making people think	3.22	2.95	3.09	3.29	3.29	0.000*	0.022
Teaching concepts	2.87	2.65	2.85	2.93	2.87	0.123	0.006

\* Statistically significant differences for *p* < 0.05. Source: Authors' own study (2021).

There are significant differences between the mean scores of the four groups in two of the four items. In the item concerning the attribute using humour for the purpose of 'Creating a good environment,' there are significant differences, with a low effect size, between the teachers in the group with the shortest length of service and the teachers in the group with 8 to 15 years of working experience. In the other item, concerning the attribute using humour to 'Make you think', there are significant differences, with a medium effect size, between the two groups of teachers with more length of service and the teachers in the group with less length of service.

When invited to report episodes of the use of humour in their mathematics lessons, it is mainly teachers from the third and fourth groups (≥ 16 and ≤ 25, and ≥ 26, respectively, who do so. Moreover, these reports, compared to those of the two groups, are more detailed regarding the way they use humour. One teacher from Group 4 (≥ 26) describes how he motivates his students in situations in which he intends to work on mathematical proof, thereby achieving greater involvement on their part, in a good learning environment:

After students have formulated a conjecture based on the analysis of particular cases and have tested it using cases other than those which made it possible to formulate it, but without being able to refute it, I use humour, particularly to encourage them to engage in the search for mathematical proof. An expression I use with some frequency is something like - if you can't find counterexamples to refute the conjecture, it is either your pumpkin head or it is a mathematical impossibility... Usually, from this point on, cheerful conversations arise in which students, trying to avoid falling into the category of pumpkin heads, endeavour to go further in analysing the validity of the conjecture. On later occasions, it is usual for them to start, with a smile on their lips, to include in their utterances expressions like: teacher, we are sure; it is not our pumpkin head; we have already proved... of course such conversations can only occur when there is already a good relationship with the students. (40 years of working experience)

The following account from a teacher in group 3 (≥ 16 and ≤ 25) shows how the role-playing of a joke is used to teach, with a sound understanding and good mood, the statistical concept of mean,

I use humour in role-playing problems. For example, the students role-played the old joke in which someone ate two chickens, the other ate none, and on average they both ate one chicken each! One student was a wealthy and affluent man with servants. The rich man ate both chickens and one of his servants ate nothing. In the end, the students understood the implied concepts and laughed at the situation they had role-played. (17 years of working experience)

The account of a teacher in group 2 ( $\geq 8$  and  $\leq 15$ ) depicts a cartoonish situation and essentially aims to help students memorise the rule of the square of the sum of two terms  $(a+b)^2$ :

I usually play with mathematical concepts. For example, when naming algebraic variables, I use peculiar names. For example: “The square of the sum of one cucumber and one tomato results in one cucumber squared, one tomato squared, and twice the product of the cucumber and the tomato.” (13 years of working experience)

The following reports, from teachers with shorter working experience ( $\leq 7$ ), besides being less frequent, are, as a rule, much more synthetic compared to the other groups: “The humour used by me is spontaneous, mainly when I notice the complexity of the contents to be taught” (7 years of working experience); “I use myself and my students as characters in real but ridiculous situations to formulate mathematical problems” (7 years of working experience). These reports show that humour seems to be used by teachers in a spontaneous and therefore unplanned way. To this extent, their working experience seems to play an important role in providing teachers with a wider range of possible uses of humour to teach mathematics, whether to create a good environment (affective purpose), to help understand concepts or even facilitate memorising information (cognitive purposes).

## **5. Conclusion**

This study reveals that Iberian teachers who teach mathematics from primary to higher education consider that they have a sense of humour and appreciate humour, associating it with situations that ‘provoke laughter,’ help to ‘relieve tension/anxiety,’ ‘stimulate mathematical thinking,’ ‘chill us out’ and ‘improve self-esteem.’ This view of humour is compatible with the idea of exploring humour in mathematics learning, focusing, in a funny way, on mathematical knowledge.

In general, teachers appreciate a sense of humour in others because it helps them to ‘feel more comfortable and relaxed,’ to ‘manage difficult situations’ and to be ‘more productive at work.’ Hence, teachers look for humour, especially in their relationship with friends, on the Internet and on TV.

Teachers widely recognise the educational value of humour in the teaching of mathematics and consider it useful, facilitating ‘the pedagogical relationship between the teacher and the students,’ making ‘mathematics more attractive,’ stimulating ‘mathematical thinking’ and facilitating ‘mathematical communication.’

Teachers, therefore, consider that the incorporation of humour into teaching strategies can make mathematics classes more enjoyable. Among the mathematical topics to be taught, the teachers highlight Statistics and Probability as the most appropriate to explore humorous situations. In developing these situations, teachers use ‘Oral speech’, ‘Cartoons’, and ‘Videos’.

In terms of their use of humour to teach mathematics, most teachers report doing it sometimes. They use this didactic resource for the purpose of ‘Creating a good environment’, ‘Motivation’ and ‘Making people think.’

Many teachers report episodes of using humour in their mathematics lessons, and do so in great detail, revealing the purpose of motivating students and helping to memorise information.

To sum up, these results show that Iberian teachers who teach mathematics recognise the meaning of humour, feel they have a sense of humour and appreciate it in others, find reasons to use it in mathematics teaching and have seen it being used or use it in their classes to create

a good learning environment and make students think. The results reveal some statistically significant differences in items of the variable under scrutiny, especially in the use of humour and the purpose underlying it. However, the magnitude of the effect is between low and medium, according to Cohen's taxonomy (1988). These values suggest the need to consider other variables in addition to the teachers' professional experience, such as, for example, the level of training, the type of training, and the context in which the school is located.

In line with other studies, these findings reveal that humour is prevalent in teaching, in this case of mathematics, being, however, marked by spontaneity and dependent on each teacher's sense of humour (Banas et al. 2011; Martin & Ford 2018; Lovorn & Lolaway 2015). As is seen in Bakar (2019), in this study the use of humour by Iberian mathematics teachers also appears to be marked by two concerns: being suitable for teaching and being suitable for learning mathematical content, combining aspects of an affective nature (such as creating a pleasant environment and good mood) with elements of a cognitive nature (making one think and supporting the memorisation of information).

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