revista española de pedagogía
año 80, n.º 283, septiembre-diciembre 2022
Spanish Journal of Pedagogy
year 80, n. 283, September-December 2022

Table of contents

Sumario

Book reviews

This is the English version of the research articles and book reviews published originally in the Spanish printed version of issue 283 of the **revista española de pedagogía**. The full Spanish version of this issue can also be found on the journal's website http://revistadepedagogia.org.

ISSN: 0034-9461 (Print), 2174-0909 (Online)
https://revistadepedagogia.org/
Depósito legal: M. 6.020 - 1958
INDUSTRIA GRÁFICA ANZOS, S.L. Fuenlabrada - Madrid

Studies

Understanding epistemic aspects of the nature of science in Spain's new curriculum for compulsory-secondary education since the LOMLOE law

La comprensión de aspectos epistémicos de la naturaleza de la ciencia en el nuevo currículo de Educación Secundaria Obligatoria, tras la LOMLOE

Antonio GARCÍA-CARMONA, PhD. Professor. Universidad de Sevilla *(garcia-carmona@us.es).*

Abstract:

This study analyses the attention to understanding of epistemic aspects of the *nature of science* (NOS) in Spain's new science curriculum for the compulsory secondary education (ESO) stage, which was approved following the entry into force of the new LOMLOE education law (Organic Law 3/2020). To this end, the curricular provisions for the biology and geology and physics and chemistry subjects (Royal Decree 217/2022) are examined using qualitative content analysis. The theoretical reference used in the analysis of the document is the set of epistemic aspects of NOS included in the latest PISA conceptual framework for scientific competence. The results show that Spain's science curriculum for compulsory secondary education is not consistent in either quantity or depth with the PISA framework in relation to the understanding of the epistemic aspects of NOS. In conclusion, understanding of these aspects is regarded as a minor or secondary educational challenge in the new curriculum for basic science education. Therefore, it represents another missed opportunity to give greater importance to such key dimension of public scientific literacy.

Keywords: compulsory-secondary education, curriculum, epistemic aspects, LOMLOE, nature of science, scientific literacy.

Revision accepted: 2022-05-18.

This is the English version of an article originally printed in Spanish in issue 283 of the **revista española de pedagogía**. For this reason, the abbreviation EV has been added to the page numbers. Please, cite this article as follows: García-Carmona, A. (2022). La comprensión de aspectos epistémicos de la naturaleza de la ciencia en el nuevo currículo de Educación Secundaria Obligatoria, tras la LOMLOE | *Understanding epistemic aspects of the nature of science in Spain's new curriculum for compulsory-secondary education since the LOMLOE law. Revista Española de Pedagogía*, 80 (283), 433-450. https://doi.org/10.22550/REP80-3-2022-01

https://revistadepedagogia.org/ ISSN: 0034-9461 (Print), 2174-0909 (Online)

Resumen:

Este estudio analiza la atención que se presta a la comprensión de aspectos epistémicos de la *naturaleza de la ciencia* (NDC) en el nuevo currículo de ciencias para la etapa de Educación Secundaria Obligatoria (ESO), aprobado tras la entrada en vigor de la LOMLOE (Ley Orgánica 3/2020). Con este propósito, se examinan las disposiciones curriculares de las materias de Biología y Geología y Física y Química (Real Decreto 217/2022), mediante un método de análisis cualitativo de contenido. El referente teórico usado en el análisis es el conjunto de aspectos epistémicos de la NDC, recogido en el último marco conceptual de PISA sobre la competencia científica. Los resultados revelan que el currículo de ciencias para la ESO, en España, no sintoniza, ni en cantidad ni en profundidad, con el marco de PISA en lo que respecta a la comprensión de aspectos epistémicos de la NDC. Se concluye que la comprensión de tales aspectos es considerada un reto educativo menor, o secundario, en el nuevo currículo para la educación científica básica. Por tanto, supone otra oportunidad perdida de haber dado un mayor protagonismo a esta dimensión clave de la alfabetización científica de la ciudadanía.

Descriptores: alfabetización científica, aspectos epistémicos, currículo, Educación Secundaria Obligatoria, LOMLOE, naturaleza de la ciencia.

1. Introduction

Understanding basic concepts about the *nature of science* (NOS) is, nowadays, regarded as a key component in achieving the desired scientific literacy among the general population (National Science Teaching Association [NSTA], 2020). It is a type of *metaknowledge* about science, which principally arises from interdisciplinary studies and reflections by historians, philosophers and sociologists of science[1] (Acevedo & García-Carmona, 2016; McComas & Clough, 2020).

There are various reasons that justify introducing NOS content in basic scientific education. Of these, two fundamental ones can be emphasised. One is that explicit attention to aspects of NOS in science classes might favour the comprehension of scientific ideas (NSTA, 2020), if accompanied by a conscious reflection on the complex process that leads to the establishment of such ideas (García-Carmona & Acevedo, 2018). The other important reason is that NOS provides a framework of basic ideas about the characteristic features of scientific activity, the factors that influence it, and the knowledge produced (Acevedo & García-Carmona, 2016), which is ideal for critical analysis of personal and social matters relating to science (Almeida et al., 2022). In effect, a person who is well educated in aspects of NOS will be able to handle arguments that go beyond simple personal valuations when analysing and taking a position in socio-scientific disputes; for example, understanding the need to evaluate the reliability of sources of information used by different parties. Equally, a basic comprehension of *how science works* helps detect *pseudosciences*,

which base their arguments on false beliefs and untested suppositions. One of the characteristics of science is that it is evidence-based (Bell, 2009); this means that scientific knowledge must overcome many verification tests, through rigorous evaluation processes, before being accepted by the scientific community (García-Carmona & Acevedo, 2018). Therefore, the scientific validity of any knowledge *proposal* that has not passed through all of these filters, should always be put to the test.

Possessing basic NOS knowledge also makes it possible to counter the arguments of science *deniers*, who often believe in conspiracy theories or false experts or believe that science must be perfect if it is to be reliable (McIntyre, 2021). One paradigmatic case is that of *creationists*, who object to the *theory of evolution* with the argument that it is "only a theory", which has still not become a scientific law that can be accepted (Rennie, 2002). However, this is easy to refute because scientific laws and theories are two different types of knowledge and so are not in a hierarchical relationship or a relationship of subordination in which it is possible for scientific theories to become laws (Lederman et al., 2013).

Similarly, NOS explains, for example, why there were changes of scientific consensus during the Covid-19 pandemic, with the aim of preventing the spread of this coronavirus (García-Carmona, 2021a). Scientific knowledge is built on the basis of the data available at each moment. Consequently, although certain ideas or explanations are regarded by the scientific community to be the most acceptable at a given moment in the development of research, they are accepted as *tentative*. In other words, they are ideas that are liable to change in the light of new evidence that might call them into question (Lederman et al., 2013). Similarly, scientific progress is not just because of practices that are *epistemic* or exclusively *rational* in nature, but it also depends to a great extent on extrascientific or *non-epistemic* aspects, such as funding received, the socio-political interests of each period, or scientific competition, to cite a few (García-Carmona, 2021b). This last element, for example, was apparent in the development of the Covid-19 vaccines. These were created in an extremely short period of time, something that had not happened before with other vaccines, thanks to the governmental support that laboratories received. By the same token, a "race for the vaccine" between countries was apparent, to see which would develop one first; in other words, a sort of scientific *nationalism* (Acevedo & García-Carmona, 2017). Nonetheless, the present work will only consider the *epistemic perspective* of NOS for the reasons set out below.

Consequently, the robustness of the arguments that members of the public develop in relation to socio-scientific questions will largely depend on how well-trained they are in aspects of NOS (García-Carmona & Acevedo, 2018). Because, what didactic research shows is that when people with limited training in NOS opine on topics related to science and technology, they usually limit their arguments to personal values, morals/

ethics, and social concerns (Bell & Lederman, 2003). Therefore, the development of an informed understanding of basic aspects of NOS is a central challenge for science education from the most basic levels (Akerson et al., 2011).

Nonetheless, the importance of learning basic concepts about NOS has not yet permeated the basic scientific education promoted in Spain. Proof of this is the scant attention it has traditionally received in Spanish publications on teaching of sciences, in comparison with other school science content (García-Carmona, 2021c). Didactic research also notes that science teachers do not usually have adequate training in NOS and how to teach it (García-Carmona et al., 2011; García-Carmona, 2021d). Meanwhile, some studies indicate that even science teachers with good training in this metaknowledge do not include it in the basic content of their plans (Akerson & Abd-El-Khalick, 2003). One possible explanation for this could be the limited importance of content relating to NOS in the regulations governing basic scientific education; something that has been noted in official curriculum documents from other countries (Olson, 2018). It is, then, important to question whether the situation is similar in Spain's new science curriculum for basic education (Royal decree 217/2022), which was approved following the enactment of the most recent education law (Organic Law 3/2020), known as the LOMLOE. In order to answer this, we carried out a piece of qualitative research guided by the following research question: What attention is paid to the comprehension of epistemic aspects of NOS in science curriculum provisions for compulsory secondary education in the framework of the LOMLOE?

2. Theoretical Framework

2.1. The nature of science in international reports and documents on scientific education

Twenty years ago, the theoretical framework of the TIMSS (Trends in International Mathematics and Science Study) international project, which evaluates educational performance of basic educational students in sciences and mathematics, set out the need to acquire basic concepts of NOS as follows:

> It is expected that students (…) will possess some general knowledge of the nature of science and scientific inquiry, including the fact that scientific knowledge is subject to change, the importance of using different types of scientific investigations in verifying/testing scientific knowledge (…). (Mullis et al., 2002, p. 79)

Some years later, the report by the Nuffield foundation on the state of scientific education in the European Union (*Science education in Europe: Critical reflections*), noted the following in relation to comprehension of NOS:

> Improving the public's ability to engage with such socio-scientific issues requires (…) not only a knowledge of the content of science but also a knowledge of 'how science works' – an element which should be an essential component of any school science curriculum. (Osborne & Dillon, 2008, p. 8)

Recently, the theoretical framework of the PISA project for evaluating scientific competence, states that "Understanding science as a practice also requires 'epistemic knowledge', which refers to an understanding of the role of specific constructs and defining features essential to the process of building scientific knowledge" (Organization for Economic Co-Operation and Development [OECD], 2019, p. 100). It should be made clear that, in international literature on science teaching, *epistemic knowledge* of science is another of the terms used to refer to aspects or content of NOS. Although it is also necessary to note that this term has limitations for representing the NOS construct holistically, given that it only refers to the *rational aspects* of the development of science, disregarding the *non-epistemic* ones that also influence it (García-Carmona, 2021b, 2021c; García-Carmona & Acevedo, 2018), as noted above.

Outside Europe, the main country driving NOS as basic content of science teaching is the USA (NSTA, 2020). For decades, the educational authorities of this country have explicitly suggested it in successive documents on science curriculum reform (Lederman, 2018). The most recent of these documents is *A framework for K-12 science education* (National Research Council [NRC], 2012), which states:

> Understanding how science has achieved [its] success (...) is an essential part of any science education. Although there is no universal agreement about teaching the nature of science, there is a strong consensus about characteristics of the scientific enterprise that should be understood by an educated citizen. (NRC, 2012, p. 78; ellipses added)

This broad review, of various of the most influential international reports on scientific education, reflects the extensive consensus around the promotion of a comprehension of basic concepts of NOS, in order to achieve the desired scientific literacy among the public.

2.2. What learning about the nature of science means and how to teach it

As noted above, NOS is metaknowledge about science. Therefore, learning it involves developing a comprehension of the most characteristic features of the practices that people dedicated to science carry out, the many factors that influence such practices, and the knowledge produced (Acevedo & García-Carmona, 2016; Adúriz-Bravo, 2005). So, while *learning science* generally refers to understanding scientific concepts, laws, models and theories, as well as developing different skills, such as observing, formulating hypotheses, taking measurements, recording data, etc., NOS relates to a comprehension of the epistemological, ontological and sociological characteristics of these aspects (Acevedo & García-Carmona, 2016; McComas & Clough, 2020). For example, it is one thing to know certain scientific models (atomic model, model of the double helix of DNA, etc.), and another different one to understand that these are partial and limited representations of reality that try to explain and predict the behaviour of nature, and that their validity is constantly being reviewed by the scientific community. Similarly, acquiring skills to

observe phenomena is not the same as understanding that scientific observation is conditioned by scientists' expectations, by the limitations of their senses, and by the instruments used, and that what is observed can be interpreted in various ways, according to different observers, etc. In summary, knowledge *of* sciences and *about* science are two complementary but different perspectives; and our attention here is centred on the second of them.

As for how to teach aspects of NOS, didactic research has repeatedly shown that the best way to learn about it is with an *explicit-reflexive* didactic focus (Acevedo, 2009; Lederman, 2007). This means that NOS must be regarded as (*i*) curriculum content with its own learning objectives, whose introduction in class requires (*ii*) activities that promote reflection by students on questions about it, as well as (*iii*) a specific plan to evaluate the students' achievements and learning difficulties (García-Carmona, 2021d; Schwartz et al., 2004). So, simply participating in scientific enquiry at school does not necessarily mean that students will understand the most characteristic traits of scientific practice if no conscious reflection on it is undertaken, in parallel with the tasks required in the development of this enquiry (García-Carmona, 2012). Metaphorically, it is equivalent to saying that a person does not learn about the phenomenon of vision just by seeing.

Regarding how to introduce NOS content into the school science curriculum, there are various possibilities (Acevedo & García-Carmona, 2016): (*i*) integrated into the habitual school science content, (*ii*) as independent content, or (*iii*) through a combination of both of these strategies. Students' comprehension of NOS does not seem to depend on whether this is planned as specific content or integrated into other science content (Khishfe & Lederman, 2007). Nonetheless, the option of integrating NOS into the other content from the science curriculum has the advantage that it barely alters the planning of the school science course, which would encourage science teachers to introduce NOS in their syllabuses (Bell et al., 2012). Similarly, reflecting on aspects of NOS in authentic contexts of scientific development, such as scientific debates about a particular socio-scientific topic, can favour a more realistic vision of scientific activity (Acevedo & García-Carmona, 2017).

2.3. What should be taught about the nature of science

Give the multifaceted character of the NOS construct, establishing which aspects of it should be taught is a complex question that is constantly being debated (Acevedo & García-Carmona, 2016). Nonetheless, there are some interesting and viable proposals for introducing NOS content into the school science curriculum (e.g., Lederman, 2007; Erduran & Dagher, 2014; García-Carmona & Acevedo, 2018). Setting out a detailed comparative review of the different proposals in international literature on this topic would require a lot of space (see, for example: Acevedo & García-Carmona, 2016). Consequently, we will only consider the proposal from one of the most influential or representative documents at an international scale:

the recent PISA theoretical framework for scientific competence (OECD, 2019). This document combines much of the consensus on the minimum NOS content to be taught. This consensus is basically restricted to the *epistemic* perspective on NOS; in other words, that which focusses on the rational or cognitive aspects of this metaknowledge. There is somewhat less agreement regarding the *non-epistemic* perspective on NOS (García-Carmona, 2021b).

Under the label of *epistemic knowledge*, the theoretical framework of PISA makes a proposal for content relating to the *rational* or *epistemic* component of NOS.[2] Table 1 shows general indicators of the basic ideas in this regard, which — according to this document — should include this dimension of scientific competence, along with the other two key dimensions of this competence (knowledge of scientific content and procedural knowledge). Without entering into a debate about whether this proposal should be more comprehensive, given that it does not consider the non-epistemic perspective of the NOS, what does seem reasonable is that — in order to be consistent — all of the countries that participate in the PISA programme, including Spain, should feature, such ideas in their official school science curricula as a minimum. Therefore, the proposal from this document will be used as framework of reference in this study.

TABLE 1. Epistemic aspects of NOS in the theoretical framework of PISA 2018 for evaluation of science competence.

A. The constructs and defining features of science, that is:

1. The nature of scientific observations, facts, hypotheses, models and theories.
2. The purpose and goals of science (to produce explanations of the natural world), as distinguished from technology (to produce an optimal solution to human needs), what constitutes a scientific or technological question, and what constitutes appropriate data;
3. The values of science, such as a commitment to publication [of results and research conclusions], objectivity and the elimination of bias;
4. The nature of reasoning used in science, such as deductive, inductive, inference to the best explanation (abductive), analogical and model based;

B. The role of these constructs and features in justifying the knowledge produced by science, that is.

1. How scientific claims are supported by data and reasoning in science;
2. The function of differing forms of empirical enquiry in establishing knowledge, including both their goal (to test explanatory hypotheses or identify patterns) and their design (observation, controlled experiments, correlational studies);
3. How measurement error affects the degree of confidence in scientific knowledge;
4. The use and role of physical, system and abstract models, and their limits;

5. The role of collaboration and critique and how peer review helps to establish confidence in scientific claims;
6. The role of scientific knowledge, along with other forms of knowledge, in identifying and addressing societal and technological issues.

Source: OECD (2019, p. 108).

3. Method

To answer the research question, we considered the curricular provisions in Spain set out in the LOMLOE for science subjects in compulsory secondary education (Royal Decree 217/2022). We did this by applying standard qualitative content analysis procedures (Mayring, 2000). As noted above, the framework of reference for the analysis was the list of *epistemic aspects of NOS*, shown in Table 1 (OECD, 2019).

The information was analysed in three progressive filtering phases (Cáceres, 2003) using an *intraobserver* analysis method. In the *first phase*, we located explicit mentions to epistemic aspects of NOS in the different parts of the curriculum for the Biology and Geology (B-G) and Physics and Chemistry (P-C) subjects from the four years of compulsory secondary education in Spain. This resulted in the detection of a total of 50 mentions of epistemic aspects of NOS, distributed across the following sections of the curriculum for both subjects: (I) *course objective of the STEM competence*[3]; (II) *presentation/justification of the subjects*; (III) *list of specific competences of the subjects*; (IV) *evaluation criteria*; and (V) *basic knowledge*.

In the *second phase* of the analysis, carried out approximately one month later, the information was filtered. This process entailed considering only those mentions to epistemic aspects of NOS, the comprehension of which forms part of the evaluable learning. To do so, the corresponding evaluation criteria were consulted, given that these are the reference points that ultimately provide guidance about students' expected performance levels in relation to scientific competence. As a result, mentions of epistemic aspects of NOS, that are only in the document to justify the value or importance of science subjects in basic education were eliminated. For example, in the B-G curriculum, the role of modelling in the development of science is referenced in two different sections:

- In the description of *specific competence 4*, which states: "(…) in certain empirical sciences (…) data about reality are obtained, that must be interpreted in accordance with logic to establish models of a biological process (…)." (Royal Decree 217/2022, p. 41608).

- In the proposal for basic knowledge, included in block "A. Scientific project", for the courses from years one to three of compulsory secondary education: "Modelling as a method of representation and comprehension

> of processes or elements of nature" (Royal Decree 217/2022, p. 41611).

However, none of the evaluation criteria for the B-G subject for these academic years refers to a basic comprehension of the nature of scientific models, nor to the role of modelling in the development of the science. Therefore, these mentions were rejected. The same process was followed in the other cases.

As a result of this filtration, the initial list of epistemic aspects of NOS was reduced to 41 mentions. It should be noted that the mention of NOS in the *course objective* for the STEM competence, is not explicitly considered in the evaluation criteria for either of the two subjects. Nonetheless, we decided to consider it as evaluable learning in the curriculum because, as the regulation itself states, "The Course Objective is (...) the cornerstone of the whole curriculum, (...) towards which the objectives of the different stages converge (...) and the reference point of the evaluation (...) of the students' learning (...)" (Royal Decree 217/2022, p. 41594).

After two weeks, we examined the information again (*third phase*). As a result, this list of 41 mentions to epistemic aspects of NOS was reduced to 35 mentions with explicit attention in the evaluable learning. In terms of reliability, this gave a degree of intraobserver agreement of 88% and a *kappa* index equal to 0.67, and so, the analysis had a *substantial* level of agreement (Abraira, 2001). Of the difference between phases 2 and 3, 14.6% was because six mentions were finally eliminated as after analysing their content and wording again, it was not clear to the researcher that they actually represented a metaknowledge. A key part of this decision was the theoretical framework's position regarding how the promotion of learning of content relating to NOS should be clear and explicit in terms of how it involves achieving a *metascientific* comprehension of them.

4. Results

The first thing we should note is that, unlike what is stated in the international reports about scientific education consulted (e.g., Mullis et al., 2002; NRC, 2012; OCDE, 2019), in the curricular provisions analysed there is no clear reference to the fact that comprehension of NOS (i.e. a metaknowledge about science) comprises a key component of the scientific competence. Attention to aspects of NOS in the official science curriculum for compulsory secondary education in Spain must be inferred from more or less explicit references to it, which are scattered arbitrarily through the different sections in which this curriculum is organised. This is not in accordance with the PISA theoretical framework for scientific competence (OECD, 2019), which clearly states that comprehension of epistemic aspects of NOS is one of the three pillars of this key competence.

Table 2 shows the distribution of mentions of epistemic aspects of NOS, which

have an impact on evaluable learning for science subjects. It is worth noting that, in the *course objective* relating to the STEM competence, conceived as the *cornerstone* of the curricula for science subjects, there is only a brief and general mention of NOS in one of the five operative descriptors of this competence: "STEM2. Uses scientific thinking (…), appreciates the importance of precision and veracity and displays a critical attitude towards the scope and limitations of science" (Royal Decree 217/2022, p. 41599).

As for the presentation of the subjects and the description of the specific competences, it should only be noted that references to epistemic aspects of NOS appear in a proportion similar to (and integrated with) those that are made about learning *of* sciences. However, given that this proportion was hard to quantify, we decided not to calculate the percentage of its weight.

The other notable piece of data is the limited attention to the learning of concepts about NOS in the evaluation criteria

TABLE 2. Mentions of epistemic aspects of NOS that affect evaluable learning from the science subjects (B-G and P-C) in compulsory secondary education, in the curriculum framework of the LOMLOE.

	Section of the curriculum				
	Course objective*	Presentation of the subject	Description of the specific competences	Evaluation criteria**	Basic knowledge***
B-G	1	3	5	6 (17.5%)	5 (6.9%)
F-Q		2	4	5 (16.7%)	4 (8.0%)

* Common to both subjects, in the framework of the STEM competence.
** Percentages calculated from the total evaluation criteria for the subjects: 35 criteria for B-G, and 30 criteria for P-C, corresponding to the four years in the stage.
*** Percentages calculated from the total of basic knowledge for the subjects: 72 criteria for B-G, and 50 criteria for P-C, corresponding to the four years in the stage.

Source: Own elaboration.

and basic knowledge, both in B-G (17.5% and 6.9% respectively) and in P-C (16.7% and 8% respectively). As noted above, the evaluation criteria, along with the corresponding basic knowledge, are the principal indicators or referents for teachers to develop their teaching plans. Therefore, the curriculum of both subjects gives the idea that the comprehension of aspects of NOS is something subsidiary or secondary compared to the acquisition of scientific knowledge and skills, and of particular attitudes. This perspective also differs from the approach of the PISA theoretical framework (OECD, 2019), where the weight of the comprehension of epistemic aspects of NOS is balanced with that of the other two basic dimensions of the

scientific competence. In this sense, the Spanish science curriculum would be more or less consistent with this framework, if it allocated to the comprehension of NOS approximately a third of the evaluation criteria and basic knowledge.

Moreover, we analysed which epistemic aspects of NOS, of those identified in the PISA theoretical framework, were mentioned in the different sections of the curriculum for the science subjects from ESO. Table 3 summarises these results. It shows that, of the 10 epistemic aspects that this framework identifies, only four of them are suggested, reasonably explicitly: *A.3 the values of science*, *B.1 scientific claims are supported by data and reasoning*, *B.5 the role of collaboration and critique in science*, and *B.6 the role of science in the development of technology and society*. However, only the last three are present in the different specific sections of the curriculum for both subjects. The references to the values of science are very short and occasional: one in the operative descriptor of the course objective, cited above, when the importance of precision and veracity in science is discussed; and the other, in one of the evaluation criteria for biology and geology, when it refers to "adopting a critical and sceptical attitude towards information without a scientific basis" (Royal Decree 217/2022, p. 41610). Table 4 contains, as examples, extracts from mentions to these three aspects of NOS that most recurrent in the compulsory secondary education science curriculum. It is apparent that the mentions are, in general, fairly brief and linked to other types of content and learning, which are omitted in the extracts to underline only what relates to NOS.

TABLE 3. Epistemic aspects of NOS proposed in the PISA theoretical framework, which are referred to in the evaluable learning of the science subjects in compulsory secondary education, in the curriculum framework of the LOMLOE.

Epistemic aspects of NOS*	Course objective	Presentation of the subjects	Description of the specific competences	Evaluation Criteria	Basic knowledge
A.1 Nature of scientific knowledge (models, theories, etc.)					
A.2 Objectives of science and its difference from technology					
A.3 Values of science	✓			✓	
A.4 Nature of the types of scientific reasoning					

B.1 Scientific knowledge is based on data and reasoning	✓	✓	✓	✓
B.2 Function of the different forms of research				
B.3 The role of error in science				
B.4 Modelling in science				
B.5 Role of collaboration and critique in science	✓	✓	✓	✓
B.6 Role of scientific knowledge in technology and society	✓	✓	✓	✓

* To simplify the descriptors of the epistemic aspects of NOS, established in the PISA theoretical framework (Table 1), a brief identifying tag was used for each of them.

Source: Own elaboration.

The lack of attention to epistemic aspects of NOS in the compulsory secondary education science curriculum is striking given that there is broad consensus in the international bibliography about what to learn about NOS. For example, absorbing the importance of error in the development of science (García-Carmona & Acevedo, 2018); or understanding the characteristic traits of scientific observations, models, laws and theories (Lederman, 2007). It is also notable that even when the goals of science are discussed in the presentation of subjects and the description of their specific competences, assimilating these goals is not considered in the evaluable learning.

With regards to the epistemological relations and differences between science and technology (Acevedo & García-Carmona, 2016), there is also no attempt to establish them in the curriculum; something essential in an educational framework that advocates for the integration of different subjects under the umbrella of STEM. Similarly, it is important to note that, while the compulsory secondary education science curriculum refers to the use of a variety of methods and reasonings in scientific research, it does not specifically refer to them[4]. It restricts itself to general comments such as "(…) the use of the methodologies typical of science" (Royal Decree 217/2022, p. 41658).

TABLE 4. Extracts of mentions to the epistemic aspects of NOS, established in the PISA framework, with more presence in the curricular provisions in the LOMLOE framework for the science subjects in compulsory secondary education.

Epistemic aspects of NOS	Presentation of the subjects	Description of the specific competences	Evaluation Criteria	Basic knowledge
B.1 Scientific knowledge is based on data and reasoning	"The principal reliable sources (…) coexist with biased, incomplete or false information, and so (…) responsible and critical use of information and communication technology will be fostered (…)." (p. 41605, B-G)	"… developing the critical sense and the necessary skills to evaluate and classify information (…)." (p. 41661, B-G)	"To recognise information (…) with a scientific basis, distinguishing it from pseudosciences, hoaxes, conspiracy theories and unfounded beliefs (…)." (p. 41610, B-G)	"Trustworthy sources of scientific information: recognition and use." (pp. 41611 & 41614, B-G)
B.5 Role of collaboration and critique in science	"team work is fostered (…) as cooperation and communication are an essential part of the methodologies of scientific work." (p. 41605, B-G)	"Scientific development is rarely the result of work by isolated individuals and so it requires the exchange of information and collaboration between individuals, organisations and even countries." (p. 41607, B-G)	"… valuing the importance of cooperation in research (…)." (p. 41610, B-G)	"The historical evolution of scientific knowledge: science as a collective endeavour (…)." (pp. 41611 & 41614, B-G)
B.6 Role of scientific knowledge in technology and society	"…valuing the fundamental role of science in society." (p. 41605, B-G)	"… the vertiginous advance of science and technology is the driver of important social changes that occur increasingly often and with more palpable impacts." (p. 41607, B-G)	"Recognising and valuing, through historical analysis of scientific advances (…) that there are mutual repercussions between current science and technology, society and the environment." (p. 41663, P-C)	"Valuing scientific culture and the role of scientists in the principal historical and current milestones of physics and chemistry in the advance and improvement of society." (pp. 41663 & 41666, P-C)

*Note: B-G: Biology and Geology; P-C: Physics and Chemistry.
Source: Own elaboration based on Royal decree 217/2022.

There are important epistemic aspects of NOS, which are mentioned in the description of the specific competences of the science subjects, but which, sadly, have no impact on the evaluable learning. This is the case, for example, of recognising the importance of the knowledge established in the development of the new scientific knowledges. In fact, the observations in a piece of scientific research are already *theory laden* (Lederman et al., 2013). The B-G curriculum refers to such an aspect in the description of one of its specific competences, as follows: "Any process of scientific research must start with the collation and critical analysis of the publications in the area of study, building the new knowledge of the already existing foundations" (Royal Decree 217/2022, p. 41607).

One notable aspect, in favour of the new science curriculum for compulsory secondary education, is that it considers two ideas of special importance within NOS, and that it does not consider the PISA theoretical framework, at least, explicitly. These ideas are:

Knowing and emphasising the contribution of women in science (García-Carmona & Acevedo, 2018), with mentions such as: "Valuing the contribution of science to society (…) emphasising and recognising the role of female scientists (…)" (evaluation criteria, B-G, Royal Decree 217/2022, p. 41610); and

Understanding that science is a field in constant construction (García-Carmona & Acevedo, 2018; Lederman et al., 2013), with references such as: "Valuing the contribution of science (…) understanding research as an undertaking (…) in constant evolution" (evaluation criteria, B-G, Royal Decree 217/2022, p. 41610); and "Recognising and valuing (…) that science is a process in permanent construction (…)" (evaluation criteria, P-C, Royal Decree 217/2022, p. 41663).

5. Conclusions

Based on the results of the analysis carried out, we conclude that comprehension of NOS is regarded as a minor or secondary educational challenge in the new basic scientific education curriculum. Firstly, because the curricular provisions analysed (Royal Decree 217/2022) do not explicitly emphasise that NOS should be a key part of the development of the STEM competence, with a view to improving the scientific literacy of the students (NSTA, 2020; OECD, 2019). Secondly, and perhaps as a cause of the foregoing, because the curriculum gives a fairly limited weight or position to NOS in the list of evaluable learning for science subjects (B-G and P-C) in compulsory secondary education: 17.5% of the total of them, in the best of cases. Consequently, Spain joins the countries that undervalue NOS in comparison with other content in their school science curricula (Olson, 2018).

In relation to the quantity and types of epistemic aspects of NOS, the new science curriculum for compulsory secondary education has little coherence with the PISA theoretical framework for scientific competence. This is disconcerting, given that Spain has participated officially in this

programme since its beginnings. It has been found that the Spanish curriculum only refers to four of the 10 epistemic aspects proposed in this international framework, with three of them standing out in particular: *scientific knowledge is supported by data*, *the role of collaboration in science*, and *the role of science in the development of technology and society*. Therefore, it omits various epistemic aspects of NOS, despite there being a broad international consensus on attention to it in the teaching of sciences (Lederman, 2007; García-Carmona & Acevedo, 2018). Nonetheless, the fact that the Spanish curriculum emphasises the role of women in science and the dynamic or evolving character of science should be noted, as a difference with regards to the PISA theoretical framework. Even so, the great majority of the mentions to epistemic aspects of NOS in the curriculum are scant and fairly general in their wording. Furthermore, in the evaluation criteria, for example, these mentions are almost always linked to other different perspectives on NOS; consequently, they affect its central position, since it is *shielded* by these other educational challenges that are more classical or consolidated in scientific education.

Ultimately, it can be said that an opportunity has been lost to bring Spain's educational provisions on the scientific competence into line with international frameworks such as PISA in relation to the comprehension of basic concepts about NOS. As a result, it can be predicted that, as has been happened so far in the Spanish educational context, NOS will continue to receive little attention in basic scientific education (García-Carmona, 2021c). The hope is now in the training of science teachers (García-Carmona, 2021d), which should: (1) accentuate the educational value of tackling aspects of NOS in basic scientific education; (2) improve teachers' comprehension of NOS; (3) help teachers make visible in official curricular provisions – as a prescriptive framework for their didactic designs – mentions to NOS in basic scientific education; and (4) provide appropriate didactic materials to integrate NOS content into science classes.

Notes

[1] The history, philosophy and sociology of science are also known as *metasciences* (Adúriz-Bravo, 2005).

[2] This work, therefore, identifies *epistemic knowledge* with *epistemic aspects of NOS*.

[3] This English initialism is used in the new curricular provisions corresponding to compulsory secondary education to refer jointly to *mathematical competence and competence in science, technology, and engineering* (Royal Decree 217/2022, p. 41598).

[4] The first operative descriptor of the STEM competence cites the inductive and deductive methods, but in relation to mathematical thinking; at no moment are they covered in the development of the B-G and P-C subjects.

References

Abraira, V. (2001). El índice kappa [The kappa index]. *Semergen*, *27* (5), 247-249. https://doi.org/10.1016/S1138-3593(01)73955-X

Acevedo, J. A. (2009). Enfoques explícitos *versus* implícitos en la enseñanza de la naturaleza de la ciencia [Explicit versus implicit approaches in the teaching of the nature of science]. *Revista Eureka Sobre Enseñanza y Divulgación de las Ciencias, 6* (3), 355-386. https://revistas.uca.es/index.php/eureka/article/view/3681

Acevedo, J. A., & García-Carmona, A. (2016). «Algo antiguo, algo nuevo, algo prestado». Tendencias sobre la naturaleza de la ciencia en la educación científica [«Something old, something new, something borrowed». Trends on the nature of science in science education]. *Revista Eureka sobre Enseñanza y Divulgación de las Ciencias, 13* (1), 3-19. http://hdl.handle.net/10498/18010

Acevedo, J. A., & García-Carmona, A. (2017). *Controversias en la historia de la ciencia y cultura científica [Controversies in the history of science and scientific culture].* Catarata.

Adúriz-Bravo, A. (2005). *Una introducción a la naturaleza de la ciencia [An introduction to the nature of science].* Fondo de Cultura Económica.

Akerson, V. L., & Abd-El-Khalick, F. (2003). Teaching elements of nature of science: A yearlong case study of a fourth-grade teacher. *Journal of Research in Science Teaching, 40* (10), 1025-1049. https://doi.org/10.1002/tea.10119

Akerson, V. L., Buck, G. A., Donnelly, L. A., Nargund-Joshi, V., & Weiland, I. S. (2011). The importance of teaching and learning nature of science in the early childhood years. *Journal of Science Education and Technology, 20* (5), 537-549. https://doi.org/10.1007/s10956-011-9312-5

Almeida, B., Santos, M., & Justi, R. (2022). Aspects and abilities of science literacy in the context of nature of science teaching. *Science & Education*. https://doi.org/10.1007/s11191-022-00324-4

Bell, R. L. (2009). Teaching the nature of science: Three critical questions. In *Best Practices in Science Education*. National Geographic School Publishing.

Bell, R. L., & Lederman, N. G. (2003). Understandings of the nature of science and decision making on science and technology based issues. *Science Education*, *87* (3), 352-377. https://doi.org/10.1002/sce.10063

Bell, R. L., Mulvey, B. K., & Maeng, J. L. (2012). Beyond understanding: Process skills as a context for nature of science instruction. In M. S. Khine (Ed.), *Advances in nature of science research* (pp. 225-245). Springer.

Cáceres, P. (2003). Análisis cualitativo de contenido: una alternativa metodológica alcanzable. *Psicoperspectivas, Individuo y Sociedad*, *2* (1), 53-82. https://www.psicoperspectivas.cl/index.php/psicoperspectivas/article/view/3

Erduran, S., & Dagher, Z. R. (2014). *Reconceptualizing nature of science for science education*. Springer.

García-Carmona, A. (2012). Cómo enseñar Naturaleza de la Ciencia (NDC) a través de experiencias escolares de investigación científica [How to teach Nature of Science (NDC) through school science enquiry experiences]. *Alambique: Didáctica de las Ciencias Experimentales, 72*, 55-63.

García-Carmona, A. (2021a). Learning about the nature of science through the critical and reflective reading of news on the COVID-19 pandemic. *Cultural Studies of Science Education*, *16* (4), 1015-1028. https://doi.org/10.1007/s11422-021-10092-2

García-Carmona, A. (2021b). Prácticas no-epistémicas: ampliando la mirada en el enfoque didáctico basado en prácticas científicas [Non-epistemic practices: broadening the view on the didactic approach based on scientific practices]. *Revista Eureka sobre Enseñanza y Divulgación de las Ciencias*, *18* (1), 1108. https://doi.org/10.25267/Rev_Eureka_ensen_divulg_cienc.2021.v18.i1.1108

García-Carmona, A. (2021c). La naturaleza de la ciencia en la bibliografía española sobre educación científica: una revisión sistemática de la última década [The nature of science in the Spanish literature on science education: a systematic review covering the last decade]. *Revista de Educación*, *394*, 241-270. https://doi.org/10.4438/1988-592X-RE-2021-394-507

García-Carmona, A. (2021d). Spanish science teacher educators' preparation, experiences, and views about nature of science in science education. *Science & Education*. https://doi.org/10.1007/s11191-021-00263-6

García-Carmona, A., & Acevedo, J. A. (2018). The nature of scientific practice and science education. *Science & Education, 27* (5-6), 435-455. https://doi.org/10.1007/s11191-018-9984-9

García-Carmona, A., Vázquez, A., & Manassero, M. A. (2011). Estado actual y perspectivas de la enseñanza de la naturaleza de la ciencia: una revisión de las creencias y obstáculos del profesorado [Current status and prospects for teaching the nature of science: a review of teachers' beliefs and obstacles]. *Enseñanza de las Ciencias*, *29* (3), 403-412. https://doi.org/10.5565/rev/ec/v29n3.443

Khishfe, R., & Lederman, N. (2007). Relationship between instructional context and views of nature of science. *International Journal of Science Education, 29*(8), 939–961. https://doi.org/10.1080/09500690601110947

Lederman, N. G. (2007). Nature of science: past, present, and future. In S. K. Abell, & N. G. Lederman (Eds.), *Handbook of research on science education* (pp. 831-879). Lawrence Erlbaum.

Lederman, N. G. (2018). La siempre cambiante contextualización de la naturaleza de la ciencia: documentos recientes sobre la reforma de la educación científica en los Estados Unidos y su impacto en el logro de la alfabetización científica [The ever-changing contextualisation of the nature of science: Recent papers on science education reform in the United States and its impact on science literacy achievement]. *Enseñanza de las Ciencias, 36* (2), 5-22. https://doi.org/10.5565/rev/ensciencias.2661

Lederman, N. G., Lederman, J. S., & Antink, A. (2013). Nature of science and scientific inquiry as contexts for the learning of science and achievement of scientific literacy. *International Journal of Education in Mathematics, Science and Technology, 1* (3), 138-147. https://www.ijemst.com/index.php/ijemst/article/view/19/19

Mayring, P. (2000). Qualitative content analysis. *Forum: Qualitative Social Research, 1* (2), 1–10. https://doi.org/10.17169/fqs-1.2.1089

McComas, W. F., & Clough, M. P. (2020). Nature of science in science instruction: Meaning, advocacy, rationales, and recommendations. In W. F. McComas (Ed.), *Nature of science in science instruction* (pp. 3-22). Springer.

McIntyre, L. (2021). Talking to science deniers and sceptics is not hopeless. *Nature*, *596* (7871), 165-165. https://doi.org/10.1038/d41586-021-02152-y

Mullis, I. V. S., Martin, M. O., Smith, T. A., Garden, R. A., Gregory, K. D., González, E. J., Chrostowski, S. J., & O'Connor, K. M. (2002). *Marcos teóricos y especificaciones de evaluación de TIMSS 2003 [TIMSS 2003 theoretical frameworks and assessment specifications]*. Ministerio de Educación.

National Research Council [NRC] (2012). *A framework for K-12 science education: Practices, crosscutting concepts, and core ideas*. National Academies Press.

National Science Teaching Association [NSTA] (2020). *Nature of science. Position statement*. https://www.nsta.org/nstas-official-positions/nature-science

Olson, J. K. (2018). The inclusion of the nature of science in nine recent international science education standards documents. *Science & Education*, *27* (7), 637-660. https://doi.org/10.1007/s11191-018-9993-8

Organic Law 3/2020, of 29 December, which amends Organic Law 2/2006, of 3 May, on Education (LOMLOE). *Spanish Official State Gazette, 340*, 30 December 2020, pages 122868 to 122953. https://www.boe.es/eli/es/lo/2020/12/29/3

Organization for Economic Co-Operation and Development (2019). *PISA 2018 assessment and analytical framework*. OECD Publishing.

Osborne, J., & Dillon, J. (2008). *Science education in Europe: Critical reflections*. Nuffield Foundation.

Royal Decree 217/2022, of 29 March, which establishes the organisation and minimum teaching of Compulsory Secondary Education. *Spanish Official State Gazette, 76*, 30 March 2022, pages 41571 to 41789. https://www.boe.es/eli/es/rd/2022/03/29/217

Rennie, J. (2002). 15 answers to creationist nonsense. *Scientific American*, *287* (1), 78-85. https://doi.org/10.1038/scientificamerican0702-78

Schwartz, R. S., Lederman, N. G., & Crawford, B. A. (2004). Developing views of nature of science in an authentic context: An explicit approach to bridging the gap between nature of science and scientific inquiry. *Science Education, 88* (4), 610-645. https://doi.org/10.1002/sce.10128

Author's biography

Antonio García-Carmona holds a university chair in the Department of Didactics of Experimental and Social Sciences at the Universidad de Sevilla. He has been a secondary-school teacher of mathematics, physics and chemistry for more than a decade. He is the principal researcher for the "Scientific education in context and teacher training" research group (SEJ-591). His main research interests focus on: the nature of science and its didactics; learning science through enquiry/scientific practice; science, technology and society (STS) education; and science in the media as a resource for scientific education.

 https://orcid.org/0000-0001-5952-0340

Giftedness from the perspective of neuroimaging and differential pedagogy. Are we talking about the same thing?

Alta capacidad intelectual desde la neuroimagen y la pedagogía diferencial. ¿Hablamos de lo mismo?

María Isabel GÓMEZ-LEÓN, PhD. Lecturer. Universidad Internacional de La Rioja *(isabel.gomez@unir.net)*.

Abstract:

Advances in neuroimaging techniques have significantly enhanced our ability to study differences in cognitive efficiency in children and adolescents. However, these studies have traditionally used intelligence quotient (IQ) as the sole measure of cognitive ability. Talent development experts are increasingly drawing attention to the major limitations of exclusively using this measure to identify the variables associated with giftedness, in terms of the validity of the construct they intend to measure and in respect of the measurement's reliability and stability. The aim of this study is to analyse whether the construct of intelligence on which recent neuroimaging studies are based, the type of instrument used to quantify giftedness and the corresponding neurobiological results are consistent with the advances made by differential pedagogy in respect of the multidimensional construct of intelligence. To this end, a systematic review both of neuroimaging research that seeks to explain the neural correlates of giftedness in children and adolescents, on the one hand, and of research focussing more prominently on the field of giftedness development, on the other, has been carried out. The findings suggest that brain networks and dynamics associated with creativity and motivation may have a bearing on cognitive performance variability. However, as the majority of neuroimaging studies continue to use IQ as the sole measure of intellectual ability, most of the data produced by these studies cannot be generalised for the purpose of determining what differential pedagogy experts refer to as "giftedness".

Revision accepted: 2022-07-13.

This is the English version of an article originally printed in Spanish in issue 283 of the **revista española de pedagogía**. For this reason, the abbreviation EV has been added to the page numbers. Please, cite this article as follows: Gómez-León, M. I. (2022). Alta capacidad intelectual desde la neuroimagen y la pedagogía diferencial. ¿Hablamos de lo mismo? | *Giftedness from the perspective of neuroimaging and differential pedagogy. Are we talking about the same thing? Revista Española de Pedagogía, 80* (283), 451-473. https://doi.org/10.22550/REP80-3-2022-02

https://revistadepedagogia.org/ ISSN: 0034-9461 (Print), 2174-0909 (Online)

Keywords: giftedness, intelligence, differential pedagogy, neuroimaging, assessment, identification, intelligence quotient.

Resumen:

El avance en las técnicas de neuroimagen ha supuesto una poderosa herramienta para estudiar las diferencias en la eficiencia cognitiva de niños y adolescentes. Sin embargo, tradicionalmente estos estudios han utilizado el cociente intelectual (CI) como única medida de capacidad cognitiva. Cada vez más expertos del desarrollo del talento señalan serias limitaciones en el uso exclusivo de esta medida para identificar las variables que configuran la alta capacidad intelectual (ACI), tanto en cuanto a la validez del constructo que pretende medir como en cuanto a la fiabilidad y estabilidad de la medida. El objetivo de este estudio es analizar si el constructo de inteligencia en el que se basan los estudios de neuroimagen recientes, el tipo de instrumento utilizado para cuantificar la ACI y los resultados neurobiológicos obtenidos son coherentes con los avances hallados por la pedagogía diferencial en cuanto al constructo multidimensional de la inteligencia. Para ello, se ha realizado una revisión sistemática tanto de las investigaciones en neuroimagen que intentan explicar los correlatos neuronales de la ACI en niños y adolescentes como de aquellas investigaciones con mayor relevancia en el ámbito del desarrollo de la ACI. Los hallazgos sugieren que las redes y dinámicas cerebrales asociadas a la creatividad y la motivación podrían influir en la variabilidad del rendimiento cognitivo. Sin embargo, la mayoría de los estudios de neuroimagen continúan utilizando el CI como única medida de capacidad intelectual, por lo que la mayoría de los datos obtenidos a través de estos estudios no pueden generalizarse a lo que los expertos en la pedagogía diferencial denominan ACI.

Descriptores: alta capacidad intelectual, inteligencia, pedagogía diferencial, neuroimagen, evaluación, identificación, cociente intelectual.

1. Introduction

The human brain is designed predominantly to improve efficiency, that is, to minimise the effort involved in processing information and maximise the capacity for growth and adaptation. But why do some people appear to have more efficient brains than others? In recent years, this topic has been extensively researched in the fields of education and neuroscience.

The advances made by genome-wide association studies (GWAS) have revolutionised the research conducted into the genes that regulate variation in intellectual capacity. Moreover, data produced by brain imaging (neuroimaging) techniques have transformed our understanding of the neural correlates of these differences. It has been shown that genetics have no direct bearing on variations in intelligence. Genetics shape phenotypes which in turn affect intelligence

(Goriounova & Mansvelder, 2019). Consequently, neuroimaging techniques have become indispensable to our understanding of the effects of evolution (phylogeny) and development (ontogeny) on learning and intellectual capacity during the life cycle.

In light of recent advances in neuroimaging techniques, paving the way for higher resolution, and of the particular emphasis placed on paediatric populations, short- and long-range structural and functional connections have been established with a view to understanding typical and atypical brain maturation. These studies have shown that neural efficiency is linked to certain quantitative and qualitative characteristics of the neural network, such as a greater density of grey and white matter, an advanced maturation rate, an extended myelination period, greater structural and functional interconnectivity and a greater degree of inter-hemispheric activation (Gómez-León, 2020d; Goriounova & Mansvelder, 2019). These characteristics have been linked to differences in intellectual functioning, such as increased processing speed, reduced energy consumption, greater executive efficiency, and a proficiency in analogical, abstract and creative thinking (Gómez-León, 2019, 2020c; Sastre-Riba & Ortiz, 2018). One conclusion consistently drawn from network neuroscience theory is that functional and structural brain networks with higher global efficiency are associated with higher scores in general intelligence assessments both in children and adults (Barbey, 2018).

This research has traditionally focussed on psychometric intelligence quotient (IQ) tests to measure intelligence, whether they involve a single-factor model such as Raven's test, or a multi-factor model such as the Wechsler Scales (Barbey, 2018; Sastre-Riba & Castelló, 2017). IQ tests measure convergent thinking based on the selection of a single correct answer, unlike tasks designed to assess divergent thinking in which the child is able to provide a solution to a problem via a free-flowing, intuitive or creative approach.

There is quite a broad consensus that intelligence represents not one, but a group of abilities and skills upon which one draws to think rationally, plan, understand complex ideas, learn quickly, solve problems effectively and adapt to the environment (Castelló, 2008; Sternberg, 2012). The capacity to create and innovate is one of the key skills that human beings need to adapt, thrive in rapidly changing environments, undertake complex tasks and make high-quality decisions. Gifted children and adolescents not only perceive complex relationships, form concepts more quickly and store data more efficiently, but they also fare better in solving problems they have not previously encountered and manipulate information more creatively (Gómez-León, 2020b). They exhibit creative aspects of intelligence as well as a greater capacity for fluid reasoning, working memory and mental imagery (Gómez-León, 2020b; Jiménez et al., 2008). That is why talent development experts point out that giftedness is not merely a cognitive phenomenon that can be measured by conventional tools such as IQ tests. They take the view that it also requires the integration of different cognitive and emotional resources which promote learning at an earlier age, differ-

ent kinds of reasoning and the generation of useful and original ideas (Pfeiffer, 2020; Renzulli, 2021).

Some authors make the distinction between academic abilities related to IQ and productive/creative skills related to inductive reasoning and creative problem-solving (Renzulli, 2021). The predominance of some over others may result in different gifted profiles with distinctive cognitive and behavioural characteristics. While there is no single intellectual profile that is able to define individuals with a greater capacity to adapt successfully to the environment, as a profile increases in complexity, i.e., it presents both convergent and divergent characteristics, the response that a subject is able to deliver to a problem is more effective (Sastre-Riba & Ortiz, 2018). Efficiency in this respect depends both on the amount of stored information and on the number of available intellectual resources and the capacity to manage them (Castelló, 2008; Renzulli, 2021).

Some of the most relevant authors from the field of giftedness (Renzulli, 2021; Sastre-Riba & Castelló, 2017; Tourón, 2020) posit that the use of IQ as a sole measure of intelligence means that:

- The corresponding results are only applicable to some of the aptitudes that give rise to intelligent behaviour, but not all and possibly not to the most relevant ones;
- It is not possible to link the results to the differential complexity of the intellectual profiles of giftedness.
- The samples of gifted children and adolescents may be distorted by false positives and false negatives.

The aim of this study is to analyse whether the construct of intelligence on which recent neuroimaging studies are based, the type of instrument used to quantify giftedness and the corresponding neurobiological results are consistent with the advances made by differential pedagogy in respect of the multidimensional construct of intelligence.

To this end, the studies examining the neural correlates of substantial cognitive ability in children and adolescents are comprehensively reviewed. The following particular aspects shall be assessed: 1) the concept of intelligence defended by the authors; 2) the kind of instrument used to measure intellectual capacity, or intelligence; 3) any cut-off point used to determine giftedness; 4) the brain areas under consideration; 5) the results and the potential scope to generalise them among the gifted population.

The validity of the results produced by neuroimaging studies is addressed on the basis of a comparison with arguments proposed by some of the authors of the most up-to-date intelligence models who are broadly supported by research and the scientific community (Gagné, 2015; Pfeiffer, 2020; Renzulli, 2021; Sastre-Riba & Castelló, 2017; Tourón, 2020).

2. Methodology

Neuroimaging studies linking neurobiological variables to the cognitive ability of

subjects were systematically reviewed in accordance with the criteria of the PRISMA statement. To search for these studies, the following terms were entered into the search menus of Pubmed, Scopus, Web of Science and Google Scholar without any language restrictions: gifted* OR talent OR "high ability" OR "high intellectual ability" OR "intelligence" OR "IQ"; AND "neuro*" OR "MRI" OR "brain networks" OR "structural connectivity" OR "functional connectivity" OR "morphometry" OR "DTI" OR "functional magnetic resonance imaging"; AND "development" OR "children" OR "adolescents". The search identified a total of 688 scientific articles.

For the purpose of applying inclusion and exclusion criteria, database entries were imported into the Rayyan QCRI tool (Ouzzani et al., 2016). Duplicates were deleted and a preliminary analysis was carried out on the basis of the abstract sections of the articles. Since the aim of this study was to analyse the construct of intelligence used by these authors, any research focussing exclusively on one or more cognitive skills were excluded as they did not address the global cognitive ability or intelligence of the subjects. After also excluding studies that did not meet the inclusion criteria set out in Table 1, a total of 124 articles remained.

A classification system was established on the basis of the Airtable database in order to extract specific information: author and year; size of sample and sex; age range, mean and standard deviation; intelligence test, analysed IQ interval and cut-off point; principal findings; and brain parameter under examination. After reviewing all the articles, those that failed to meet the inclusion criteria were excluded. As a result, the remaining 24 articles were analysed in depth.

TABLE 1. Inclusion and exclusion criteria.

Inclusion criteria	Exclusion criteria
Years of publication: 2010–2021	Year of publication occurring outside of period between 2010-2021
Use of neuroimaging techniques	Review articles and case studies
Samples of children and adolescents	Focussing exclusively on adults
Linking structural and functional characteristics of the brain to global cognitive ability	Linking structural and functional characteristics of the brain to one or more specific cognitive skills (not defined as global cognitive ability)
Assessing scores above population mean or any from the upper portion of the scale	Only analysing scores under the population mean.
The sample does not present any medical or psychological condition that may affect the development of the nervous system.	The selected samples present a medical or psychological condition that may affect the development of the nervous system.

Source: Own elaboration.

A subsequent search was performed to identify the most relevant authors from the field of giftedness development. The Dialnet and Eric databases were added for this purpose. The terms used in this search were "gifted*" OR "talent" OR "high ability" OR "high intellectual capacity"; AND "identification" OR "Diagnosis" OR "development". It included articles published within the past 4 years of the systematic review that meet the eligibility criteria of this research. After the articles were comprehensively reviewed, indirect searches were carried out to identify the most widely cited authors or those whose data are deemed to be relevant or original for the study.

3. Results

The characteristics of the sample (number, sex and age) are specified for the purpose of determining the cognitive construct to which the neural correlates found in the selected studies refer. Moreover, the type of instrument used to measure intellectual ability and the point at which the term "Giftedness" begins to apply are also established.

Magnetic resonance imaging makes it possible to study the neural correlates of cognitive ability via different imaging methods. The corresponding data have been arranged according to the method adopted by the author: structural resonance imaging (Table 2); diffusion tensor imaging (Table 3); and functional MRI and properties of the neural network via graph-theoretic approaches (Table 4).

One of the principal assumptions which sought to link brain characteristics to cognitive ability was that brain volume may be associated with intelligence. It is now feasible to examine the relationship between the morphology of various types of brain tissue and anatomic regions, on the one hand, and cognitive ability, on the other (Table 2).

White matter consists of myelinated axons which transfer information from one region of the brain to another. It makes up around half of the human brain and plays an essential role as primary conductor of nerve signals and also regulates cognitive function. Diffusion tensor imaging has made it possible to measure the properties of the micro-structure of the brain's white matter tracts, such as fractional anisotropy (FA).

The networks analysis describes the brain as a set of nodes, or regions of the brain, that are linked via white matter connections (Barbey, 2018). The brain's functional connectivity data, obtained during rest or task conditions, have been used to assess the functional efficiency of the brain network in relation to cognitive ability (Table 4).

While numerous big data studies have been produced in the past decade around the world to assess the function and structure of the developing human brain on the basis of magnetic resonance imaging, they have not been included because the reviewed samples failed to meet one or more of the inclusion criteria of this study.

TABLE 2. Studies examining relationships between brain morphometry and cognitive ability during development.

First author Year of publication	Sample number (N) Sex: Male (M); Female (F)	Age range, and Mean ± SD	Intelligence test IQ interval Cut-off point	Main results	Brain parameter
Burgaleta et al. (2014a)	N= 188 (78 H, 110 M)	6 - 20 11.59 years ± 3.46	WASI C.I:99.1 -125.34	Links between changes in IQ measurements and changes in cortical thickness, predominantly in left frontal regions.	Cortical surface area, cortical thickness
Fjell et al. (2015)	N= 204 (98 H, 106 M)	8-20 14.8 ± 3.6	WASI C.I: 98.3-119.7	The heterogeneous expansion of the cortical surface area correlates positively with intellectual capacities.	Cortical surface area
Karama et al. (2011)	N= 207 (92 H, 115 M)	6–18.3 11.8 ± 3.5	WASI, WJPEB-III C.I:99-123	Cortical thickness correlates with specific cognitive performance after taking into account the general intelligence factor.	Cortical thickness
Khundrakpam et al. (2017)	N= 586 (141 H, 165 M)	6–18	WASI Low IQ:92-108 High IQ:113-129	The High IQ group has a thicker cortex, not least in the occipital, temporary and limbic cortex.	Cortical thickness
Lange et al. (2010)	N= 285 (130 H, 155 M)	4.10 ± 18.4 10.9 ± 0.21	WASI GCA < 6 años CI:74-144	Positive correlation between volumes of temporal grey matter, temporal white matter and frontal white matter, on the one hand, and IQ, on the other.	Total and regional brain volume
MacDonald et al. (2014)	N= 303 (142 H, 161 M)	6–18,3 11.4 ± 3.5	WASI C.I: 98.7-123.4	Positive correlation between intelligence and striatal volume.	Striatal volume

revista española de pedagogía
year 80, n. 283, Septembre-Dicember 2022, 451-473

Margolis et al. (2013)	N= 76 (39 H, 37M)	5-18 10.5 ± 0.5	WASI, WISC-III C.I:80-150	Correlation between cortical thickness in the anterior and posterior regions and the verbal and performance IQ discrepancy.	Cortical thickness
Menary et al. (2013)	N= 181 (81 H, 100 M)	9-24 16.31 ± 3.99	WASI C.I:80-148	Links between cortical thickness and general intelligence in children, adolescents and young adults.	Cortical thickness
Navas-Sánchez et al. (2016)	Mathematically gifted: N= 13 (8 M, 5 F) Control: N= 17 (11 M, 6 F)	Mathematically gifted: 12–14 Control: 11-15 years	WISC Gifted: IQ:112-149 Control: IQ:112-137 Selection criterion: Mathematically gifted group: ESTALMAT	Mathematically gifted adolescents have a thinner cortex and a larger surface area in key regions of frontoparietal networks and on a predetermined basis.	Cortical thickness and surface area
Schnack et al. (2015)	N= 504 (282 H, 222 M)	9–60	WAIS III, WISC-III C.I:80-140	The relationship between cortical thickness and cortical surface area, on the one hand, and intelligence during development, on the other.	Cortical thickness, cortical surface area
Westerhausen et al. (2017)	N= 495 (245 H, 250 M)	6,4-21.9	WASI	Positive correlation between corpus callosum morphology and intelligence.	Corpus callosum

WAIS: Wechsler Adult Intelligence Scale; WASI: Wechsler Abbreviated Scale of Intelligence; WISC: Wechsler Intelligence Scale for Children; WJPEB-III: Psycho-Educational Battery; GCA: General conceptual ability of the differential ability scale; ESTALMAT: visuospatial thinking, intuition, creativity, abstraction, manipulation and management of cognitive stimuli.

Source: Own elaboration.

TABLE 3. Studies examining relationships between the properties of the brain's white matter and cognitive ability during development.

First author Year of publication	Sample number (N) Sex: Male (M); Female (F)	Age range, and Mean ± SD	Intelligence test IQ interval Cut-off point	Main results	Brain parameter
Clayden et al. (2012)	N= 59 (25 H, 34 M)	8-16 11.5 ± 2.1	WISC-IV CI:88-137	Structural changes in FA are a predictor of full scale IQ.	The entire brain.
Kocevar et al. (2019)	N= 43 (32 H, 11 M)	8-12 9.82 ± 1,06	WISC-IV	High IQ associated with greater integrity and density of white matter in the main intra- and inter-hemispheric fibre bundles and well-balanced network organisation between local and global scales.	The entire brain
Koenis et al. (2018)	N= 330 (158 H, 172M)	9-22.9 13.45 años	WISC-III WASI. III C.I:86.4-117	Genetic correlation between IQ and global and local efficiency increased with age.	The entire brain
Navas-Sánchez et al. (2014)	Mathematically gifted: N= 13 (8 M, 5 F) Control: N= 23 (19 M, 4 F)	Mathematically gifted: 12–14 13.8 ± 0.6 Control: 12-15 years 13.4 ± 0.8	WISC Gifted: IQ:112-149 Control: IQ:112-137 Giftedness selection criterion: ESTALMAT	IQ shows considerable positive correlation with the micro-structure of white matter, predominantly in corpus callosum.	Medial orbitofrontal cortex. Rostral anterior cingulate cortex

revista española de pedagogía
year 80, n. 283, Septembre-Dicember 2022, 451-473

Nusbaum et al. (2017)	N= 44 (36 H, 8 M)	6,01 - 20,01 11,59 años ± 3.46	WISC-IV ACI CI: ≥ 130 Control CI: 96.4 – 114	Greater integrity of inter- and intra-hemispherical white matter in gifted children.	The entire brain.
Tames et al. (2011)	N= 168 (81 H, 87 M)	8-12 17.7 ± 6.1	WISC-IV CI:82-141	Negative and positive relationships between cortical thickness and volume of white matter, respectively, and IQ.	64 cortical and sub-cortical regions.
Wang et al. (2012)	N= 16 (8 H, 8 M)	13–18 15,3 ± 1,24 16.26 ± 1.3	WASI CI:106.8-125.46	Considerable positive correlation between FA and full scale IQ.	The entire brain.
Westerhausen et al. (2017)	N= 109 (54 H, 55 M)	8-20 17.7 ± 6.1	WASI CI:96.3-118.5	Changes in white matter during life cycle manifest themselves via a dynamic pattern of neurobiological and environmental interactions.	The entire brain.

WAIS: Wechsler Adult Intelligence Scale; WASI: Wechsler Abbreviated Scale of Intelligence; WISC: Wechsler Intelligence Scale for Children; ESTALMAT: visuospatial thinking, intuition, creativity, abstraction, manipulation and management of cognitive stimuli.

Source: Own elaboration.

TABLE 4. Studies examining relationships between functional connectivity or global and local efficiency of the connectome and cognitive ability during development.

First author Year of publication	Sample number (N) Sex: Male (M); Female (F)	Age range, and Mean ± SD	Intelligence test IQ interval Cut-off point	Main results	Brain parameter
Bathelt et al. (2019)	N= 63 (34 H, 29 M)	7–12	WASI (Fluid reasoning) AWMA	The efficiency of the white matter connectome is closely related to IQ and level of education.	The entire brain.
Kim et al. (2016)	N= 99 (54 H, 45 M)	6-11 7.8 ± 1.22	WISC-IV (Perceptual Reasoning)	Positive association between global and local efficiency and visuospatial motor processing.	The entire brain
Langeslag et al. (2013)	N= 115 (56 H, 59 M)	6-8	Snijders-Oomen Niet-verbal- R Subtest: Mosaics, Categories	Association between non-verbal intelligence and parieto-frontal functional connectivity.	The entire brain
Solé-Casals et al. (2019)	N= 29	12.03 ± 0.54	WISC EFAI CI ACI:148.80±2.93 Control:122.71 ± 3.89	High IQ associated with a more integrated (less segregated) neural network and greater inter-modular communication.	Cortical grey matter
Suprano et al. (2019)	N= 58 (44 H, 14 M)	8-12 10.1 ± 1.2	WISC-IV CI ACI 130	Greater efficiency and neural transmission in the giftedness group.	The entire brain

WAIS: Wechsler Adult Intelligence Scale; WASI: Wechsler Abbreviated Scale of Intelligence; WISC: Wechsler Intelligence Scale for Children; AWMA: Working memory assessment: digit recall task, backwards digit recall test, dot matrix and Mister X task; EFAI: Factorial Evaluation of Intellectual Abilities.

Source: Own elaboration.

4. Discussion

4.1. Sample analysis

Despite advances in the exploration methods by which initial stages of brain development are studied, these methods have rarely been applied to developing populations, especially during early childhood at an age when substantial cognitive changes take place. The samples of all the studies under analysis exceed the ages of 4 years and 10 months. The drawback of working with younger subjects predominantly concerns the anxiety that these children will feel as they undergo the MRI, which may make them less cooperative. Moreover, the limited attention span and low accuracy in respect of task performance, coupled with excessive head movement, may potentially undermine the quality of the data and ultimately hinder effective interpretation.

Research shows that, from the age of 4, exposure to favourable or unfavourable environments, or a focus on some domains at the expense of others, has the greatest influence on cognitive and creative development (Gómez-León, 2020c). That is why there is a growing consensus that skills associated with gifted individuals start, peak and end their trajectories at different stages depending on the particular domain in which they develop (e.g., mathematics, creative writing, etc.) (Pfeiffer, 2020). However, the study produced by Navas-Sánchez et al. (2014) is the only research to consider the particular domain in which skills are developed.

On the other hand, according to the study carried out by Schnack et al. (2015), the results corroborate and complement other longitudinal research studies which show that the pattern of cortical maturation in children with high IQ scores is atypical. For instance, the cortical development of children with a high IQ accelerates between the ages of 11 and 12.5 and slows down between the ages of 12.5 and 14. On the other hand, the cortex of children with an average IQ develops slowly between the ages of 11 and 12.5 and speeds up between the ages of 12.5 and 14 (Gómez-León, 2020d). This piece of data is particularly important when cross-sectional samples are studied, as measurements only provide a general insight into changes expected during development. However, of all the studies consulted, not one takes into consideration the differences in the pattern of maturation of the samples.

4.2. Construct of intelligence

Save for the study produced by Navas-Sánchez et al. (2014), all research studies adopt a monolithic approach to measure intelligence via IQ tests. These scales are based on Spearman's factor model whereby performance in mental capacity assessments jointly reflects a specific factor, *s*, which is unique to every test, and a general factor, *g*, which is common to all tests. In terms of general skill level, individuals who fare well in one domain also tend to perform well in others, which is referred to as positive variety. The authors of the studies under review justify the validity and relevance of this instrument as the sole measure of intelligence, by contending that scores: are highly correlated and generate a strong

general factor that underlies different abilities; are stable over time; are characterised by high heritability; and predict major life outcomes (Goriounova & Mansvelder, 2019).

However, some authors have analysed whether differences in average IQ between groups with different academic levels can be attributed to *g*, based on the finding that there is no significant association between the scientific construct of general intelligence (*g*) and the differences in intelligence in general (IQ) assessed under WAIS-III (Wechsler Adult Intelligence Scale) (Colom et al., 2002).

On the other hand, scientific evidence has shown that cognitive ability is subject to highly dynamic processes governed by neuronal activity. The structure and functionality of the regions of the brain associated with IQ change during childhood and adulthood and are shaped by learning, hormonal differences, experience and age (Gómez-León, 2020c; Goriounova & Mansvelder, 2019), which is why IQ scores may also change significantly during the life cycle. The Study of Normal Brain Development (NIH) revealed that the scores recorded by 25% of participants between the ages of 6 and 18 in tests-retests taken at an interval of 2 years were marked by differences of 9 points or more (almost 2/3 standard deviation) (Waber et al., 2012). Moreover, the number of hours devoted to practice is a predictor of the level of success achieved in various domains (Pfeiffer, 2020)

In respect of heritability, genome-wide association studies show that intelligence is a highly polygenic trait where genetic variants can only predict between 20% and 21% of IQ variance, less than half of heritability estimates in studies of twins (> 50%), and 0.022% of variance when it is associated with academic achievements as a phenotype of intelligence (Goriounova & Mansvelder, 2019). Consequently, genetic effects on cognitive ability do not materialise independently of environmental factors, but are revealed via transcriptional regulation by signals promoted by experience. As such, some data show that socio-economic status modifies the heritability of IQ in young children (Turkheimer et al., 2003) and that the education of parents has a strong bearing on the IQ of children, without being affected by total or regional brain volumes (Lange et al., 2010).

Moreover, there is growing body of evidence to suggest that IQ scores are not an effective predictor of academic achievements and success in life (Sastre-Riba & Castelló, 2017). In Spain, statistics show that 70% of gifted pupils underachieve at school and between 35-50% fail (Nolla et al., 2017). On the labour market, employees who have achieved a satisfactory academic level do not always reach a professional status that reflects their IQ (Sugiarti et al., 2018). Some authors have taken the view that the selection of individuals based on their high IQ gives them access to a greater number of resources, which facilitates the development of intellectual capacities and enables them to perform better at work (Byington & Felps, 2010), this would be an alternative explanation to the prevailing statement

that professional performance is facilitated by IQ in and of itself. More recently, according to the data of the Adolescent Brain Cognitive Development (ABCD), one of the leading neuroimaging studies involving adolescents shows that socio-economic status has a bearing on cognitive development (Sripada et al., 2021), and not necessarily the inverse.

Current talent development models are distancing themselves from this reductionist, static and immutable vision of intelligence and now consider it to be a dynamic, ecological, transactional and developmental status (Renzulli, 2021; Tourón, 2020). From this perspective, every development stage is affected by variables such as available resources, opportunities presented and exploited, social and emotional support system, personal choices, certain personality traits, unforeseen events and even good fortune. This set of variables is thought to determine the score of IQ tests and, ultimately, life success (Pfeiffer, 2020).

4.3. Measurement instrument

All the research papers examined under this study have used different Wechsler scales, save for the research of Langeslag et al. (2013), which was based on the Snijders-Oomen (SON) non-verbal intelligence test. In total, 37% of the research papers have used the Wechsler Intelligence Scale for Children (WISC). This scale is designed to estimate Spearman's *g* factor, according to which a full IQ scale is not regarded as a unitary and interpretable construct unless there is a standard deviation of 1.5 in composite scores (23 points) (Silverman & Gilman, 2020). While this scale is one of the most commonly used to measure IQ, gifted children tend to achieve average/high scores in abstract reasoning tasks (verbal, visuospatial, and fluid reasoning) and lower scores in working memory and processing speed tasks. Discrepancies between these scores may be so significant that the results are not able to be interpreted. As such, according to the recommendation of the National Association for Gifted Children (NAGC), the General Ability Index should be ascertained by performing 6 Verbal Comprehension and Perceptual Reasoning tests broadly related to the abstract reasoning skill which represents the most effective measure of giftedness.

In total, 54% of the studies under assessment used the abbreviated version of Wechsler WASI *(Wechsler Abbreviated Scale of Intelligence)* with 4 sub-tests (similarities, *vocabulary, matrix reasoning, block design)*. This shortened form has been used to produce a quick and reliable assessment of intellectual ability. WASI is underpinned by a number of sub-tests which assess high-level cognitive skills such as verbal comprehension and perceptual reasoning. While these tests have proven to be broadly efficient in the field of giftedness (Aubry & Bourdin, 2018), the position statement of WISC IV and V of NAGC advises that some variables may reduce IQ scores in this population. One of which is the estimated administration time for every test. By and large, these children are more contemplative than their normo-

typical peers and are not particularly quick to complete timed and randomised paper and pencil tasks. They tend to achieve higher scores in non-timed sub-tests involving abstract reasoning than in timed reasoning sub-tests. Moreover, examiners have reported numerous additional correct answers in some sub-tests if the test continues to be administered until its conclusion, despite the child reaching the interruption criterion of three consecutive failures. That is why the removal of suspension criteria may accelerate test administration. However, it penalises gifted children and may underestimate their abilities (Silverman & Gilman, 2020). There is no indication that any of the examined studies took these recommendations into account, which may affect the quality of the measurement.

It has been shown that differences in measurement quality have a moderating effect on the correlation between brain volume and intelligence and functional connectivity and intelligence under rest conditions. In a bid to ascertain this quality, Gignac & Bates (2017) have presented an essential guide which lists the number of tests, their cognitive dimensions, testing time and correlation with *g* on a 4-point quality scale: 1: "poor"; 2: "fair"; 3: "good"; and 4: "excellent". In accordance with these criteria, 42% of the 23 articles that were reviewed would be categorised as "good" (Bathelt et al., 2019; Clayden et al., 2012; Kim et al., 2016; Kocevar et al., 2019; Langeslag et al., 2013; Navas-Sánchez et al., 2014; Nusbaum et al., 2017; Solé-Casals et al., 2019; Tamnes et al., 2011; Suprano et al., 2019) while the remaining 58% would classify as "fair".

4.4. Cut-off point between giftedness and normotypical IQ

While 79% of the selected studies correlate neurobiological measures with IQ, they do not produce a statistical comparison between gifted and non-gifted groups. It may be a misinterpretation to consider that both study types should inevitably converge towards the same results, as it may be that the group with a high IQ is not simply found at one end of the continuum of general intelligence and corresponding brain properties, but may present qualitatively different structural and functional characteristics (Navas-Sánchez et al., 2014). Moreover, only three of the five studies that make inter-group comparisons (Nusbaum et al.,2017; Solé-Casals et al., 2019; Suprano et al., 2019) follow the recommendations of the APA (American Psychological Association) (American Educational Research Association, American Psychological Association, National Council on Measurement and Education, 2014) predicated on a cut-off point of 2 standard deviations above the mean (IQ of 130 in Wechsler) to identify gifted and non-gifted children. The cut-off points established in the remaining two studies (Khundrakpam et al., 2017; Navas-Sánchez, 2014) are close to the population mean, despite research indicating that as the intellectual profile distances itself from the normotypical scores, the differential characteristics of cognitive functioning are quantitatively

and qualitatively greater (Sastre-Riba & Ortiz, 2018).

4.5. Regions of brain under study and IQ-related neurobiological findings

The findings of the morphometric research under review show that brain volume, volumes of grey and white matter, the volume of some sub-cortical structures, such as the striatum, and the thickness and surface area of some cortical regions have positive correlations with IQ. However, 72% of the research papers predominantly focus on the anatomical characteristics of the cerebral cortex, related to logico-deductive reasoning, whereas only 28% examine sub-cortical structures related to creativity and motivation, despite the extensive evidence that they are linked to higher order cognition (Gómez-León, 2020a; 2020b).

White matter plays a key role during the development of cognitive functions. Indeed, as distant regions of the brain become more efficiently interconnected, so the capacity to transfer and analyse information also increases in efficiency, thereby contributing significantly to processing speed and cognitive development. In respect of the research papers that have assessed the integrity of white matter in the brain, 87% have examined both cortical and sub-cortical regions and detected positive correlation with IQ. While this greater number of inter- and intra-hemispherical connections has also been frequently associated with creative thinking (Gómez-León, 2020b), none of the reviewed research papers has assessed whether or not, or the extent to which, these results are due to the overlapping effects of complex profiles where convergent and divergent processes interact.

Studies that refer to the relationship between the functional connectivity of neuronal connections and cognitive ability show positive correlation between the local and global efficiency of the network and the logico-deductive skills measured by IQ. It is thought that cognitive ability depends on the contributions of different regions of the brain which work together as an integrated network and interact to produce variations in the system at every stage of development. When gifted groups are compared to different profiles on the Wechsler scale, from a heterogeneous (score >130 in verbal comprehension or perceptual reasoning) and homogeneous perspective (score >130 on both scales), greater structural and functional connectivity is detected in the homogeneous group (Nusbaum et al., 2017; Suprano et al., 2019). Furthermore, recent neurocognitive research has shown that the integration of the neural network, its dynamic interaction, and the capacity to reach complex network statuses which facilitate adaptive problem-solving is greater in processes related to creativity than in those related to intelligence (Kenett et al., 2018). However, the study produced by Navas-Sánchez et al. (2014) is the only one to have used open-response tasks which enable the relationship between network integration and interaction, on the one hand, and creativity, on the other, to be studied in complex gifted profiles.

4.6. Generalisation of results produced by neuroimaging techniques among gifted profiles

The reduction of the intelligence construct to a single dimension may complicate the task of identifying a suitable instrument with which to measure it. Binet, as author of the first IQ tests, was aware of the limitations of their scale and had to disregard creativity tasks because he was unable to identify a rigorous method by which to assess them, which conditioned the instrument that he subsequently used to measure intelligence (Sternberg & O'Hara, 2005).

Wechsler, the author of the tests used by 96% of reviewed studies, admits that intelligence, as he perceives it, cannot be measured by any test, or at least, not entirely and, in any event, not directly, "our intelligence tests measure effectively only a portion of and not all of the capacities entering into intelligent behaviour" (Wechsler, 1943, p. 101). This author suggests that intelligence tests, as a measure of intellectual ability, only explain between 50% and 70% of intelligent behaviour, while the rest is dependent upon non-intellective factors. Moreover, if there is a contradiction between psychometric and qualitative data, he advises that the latter should prevail over the former (Wechsler, 1943).

While most differential pedagogy authors agree that basing the concept of intelligence exclusively on the scores of IQ tests overlooks many important aspects of mental capacity (Pfeiffer, 2020), all the studies under review have associated intelligence with logico-deductive reasoning and academic ability measured by IQ. This kind of test is related to memorisation and reproductive learning processes. However, it does not assess the capacity to adapt to unfamiliar situations or solve new and complex problems, which requires skills related to creativity and divergent thinking (Sternberg & O'Hara, 2005).

High levels of creativity are associated with a higher-than-average IQ score. Furthermore, the greater the demand for creative potential, the higher the necessary minimum IQ thresholds (Jiménez et al.,2008). Scientific evidence has repeatedly shown that gifted children and adolescents not only have a higher IQ and better executive functioning, but also an extraordinary level of creativity and a higher level of motivation for the task at hand (Gómez-León, 2020a; 2020b; Jiménez et al., 2008; Pfeiffer, 2020; Renzulli, 2021; Sastre-Riba & Ortiz, 2018). That is why 92% of the authors of the most commonly used in giftedness assessments, including Renzulli, Pfeiffer, Reynolds (RIAS), Kaufman, Elliot (BAS3), Raven, and the Wechsler authors, agree that the use of a single dimension to identify giftedness provides a limited sample of the ability profile of a child or adolescent, which means that their ability or potential may be over or under-estimated. Notwithstanding the foregoing, the only research paper to consider this aspect is the study produced by Navas-Sánchez et al. (2014). By way of tasks that can be classified as cognitive, motivational and creative, these authors have discovered that gifted children (high IQ and high level of creativity),

as opposed to children who only exhibit a high IQ, not only used more efficient and innovative strategies to solve new and complex problems, but were also characterised by a different brain structure:

- Greater intra-hemispheric connectivity in some regions of the corpus callosum related to fluid reasoning, executive functioning and working memory.

- Greater connectivity in frontoparietal networks and frontostriatal circuits involved in creative thinking, analogy processing and motivation.

- Greater surface area on the bilateral visual cortex related to the processing of enriched mental imagery related to visuospatial working memory.

According to these authors, a high IQ could improve information processing capacity between hemispheres, but giftedness, i.e., a high IQ along with a high level of creativity and motivation, may pave the way for greater participation in increasingly difficult and unfamiliar situations, which would equate to an adaptive advantage, since it would increase the pace of learning, cognitive flexibility and the adaptation of the whole system to constant changes in the environment and the system itself.

5. Conclusion

Individual differences affect the ability to learn, adapt to changes in the environment and solve new and complex problems. The latest neuroimaging studies have represented an unprecedented advance in the development of instruments that enable the neural correlates of these differences to be examined. However, these advances are in contrast with the instrument used to measure intelligence. An instrument based on the traditional and reductionist concept developed in the early 20th century, in which intelligence is deemed to be synonymous with IQ.

Differential pedagogy specialists take the view that giftedness represents a multidimensional neurobiological configuration that may or may not be linked to the scores obtained in IQ tests. This discipline considers giftedness to be underpinned by logico-deductive and creative components that must be measured for the purpose of identifying giftedness. However, neuroimaging studies that examine how these components interact in the development of gifted children are few and far between. One of the main reasons may be that the relevant systems and processes have been researched separately and independently of each other.

Only one of the reviewed studies has taken into consideration the intellectual profile of participants, based on convergent and divergent tasks, and reaches the conclusion that a high IQ and giftedness (high IQ and high level of creativity) are two different constructs. Gifted children have more efficient brains with densely interconnected regions which facilitate mutual interaction between various cognitive processes. This, in turn, paves the way

for the children to propose more effective solutions adapted to the specific domain in which they are active.

These results suggest that most of the data currently extracted from neuroimaging studies cannot be generalised within the gifted population. It is evident that a genuine inter-disciplinary study is needed to establish a consensus as to the validity and reliability of the construct that is to be measured, and of the instruments used to this end.

In order to adopt suitable educational programmes, it is essential to ascertain, both from a biological and a cognitive perspective, the various skills and processes by which giftedness is able to develop. If the development of skills in the 21st century "consists of applying relevant knowledge, research skills, creative and critical thinking skills, and interpersonal skills to the solution of real problems" (Renzulli, 2021, p. 25), it is suggested that the study of neural correlates of intelligence should focus on these skills.

References

American Educational Research Association, American Psychological Association y National Council on Measurement and Education (2014). *Standards for educational and psychological testing*. American Educational Research Association.

Aubry, A., & Bourdin, B. (2018). Short forms of Wechsler scales assessing the intellectually gifted children using simulation data. *Frontiers in psychology*, *9*, 830. https://doi.org/10.3389/fpsyg.2018.00830

Barbey, A. K. (2018). Network Neuroscience Theory of human intelligence. *Trends in cognitive sciences*, *22* (1), 8-20. https://doi.org/10.1016/j.tics.2017.10.001

Bathelt, J., Johnson, A., Zhang, M., & Astle, D. E. (2019). The cingulum as marker of individual differences in neurocognitive development. *Scientific Reports*, *9* (1), 2281. https://doi.org/10.1038/s41598-019-38894-z

Burgaleta, M., Johnson, W., Waber, D. P., Colom, R., & Karama, S. (2014a). Cognitive ability changes and dynamics of cortical thickness development in healthy children and adolescents. *NeuroImage*, *84*, 810-819. https://doi.org/10.1016/j.neuroimage.2013.09.038

Byington E., & Felps W. (2010). Why do IQ scores predict job performance? An alternative, sociological explanation. *Research in Organizational Behavior*, *30* (C), 175-202. https://doi.org/10.1016/j.riob.2010.08.003

Castelló, T. A. (2008). Bases intelectuales de la excepcionalidad, un esquema integrador [Intellectual foundations of exceptionality, an integrative framework]. **revista española de pedagogía**, *240*, 203-220.

Clayden, J. D., Jentschke, S., Muñoz, M., Cooper, J. M., Chadwick, M. J., Banks, T., Clark, C. A., & Vargha-Khadem, F. (2012). Normative development of white matter tracts: similarities and differences in relation to age, gender, and intelligence. *Cerebral cortex*, *22* (8), 1738-1747. https://doi.org/10.1093/cercor/bhr243

Colom R., Abad F. J., García L. F., & Juan-Espinosa, M. (2002). Educación, coeficiente intelectual de escala completa de Wechsler y *g* [Education, Wechsler's Full Scale IQ, and *g*]. *Intelligence*, *30* (5), 449-462. https://doi.org/10.1016/S0160-2896(02)00122-8

Fjell, A. M., Westlye, L. T., Amlien, I., Tamnes, C. K., Grydeland, H., Engvig, A., Espeseth, T., Reinvang, I., Lundervold, A. J., Lundervold, A., & Walhovd, K. B. (2015). High-expanding cortical regions in human development and evolution are related to higher intellectual abilities. *Cerebral Cortex*, *25* (1), 26-34. https://doi.org/10.1093/cercor/bht201

Gagné, F. (2015). From genes to talent: the DMGT/CMTD perspective. *Revista de Educación, 368*, 12-37. https://doi.org/10.4438/1988-592X-RE-2015-368-289

Gignac, G. E., & Bates T. C. (2017). Brain volume and intelligence: The moderating role of intelligence measurement quality. *Intelligence*, *64*, 18-29. https://doi.org/10.1016/j.intell.2017.06.004

Gómez-León, M. I (2019). Psicobiología de las altas capacidades. Una revisión actualizada [Psychobiology of giftedness. An updated review]. *Psiquiatría biológica, 26* (3), 105-112. https://doi.org/10.1016/j.psiq.2019.09.001

Gómez-León, M. I. (2020a). La psicobiología de la motivación en el desarrollo de las altas capacidades intelectuales. Revisión bibliográfica [Psychobiology of motivation in the development of giftedness. Bibliographical review]. *Psiquiatría biológica, 27* (2), 47-53. https://doi.org/10.1016/j.psiq.2020.01.003

Gómez-León, M. I. (2020b). Bases psicobiológicas de la creatividad en los niños con altas capacidades [Psychobiological bases of creativity in gifted children]. *Psiquiatría biológica, 27* (1), 28-33. https://doi.org/10.1016/j.psiq.2020.01.004

Gómez-León, M. I. (2020c). Desarrollo de la alta capacidad durante la infancia temprana [High capacity development in early childhood]. *Papeles del Psicólogo, 41* (2), 147-158. https://doi.org/10.23923/pap.psicol2020.2930

Gómez-León, M. I. (2020d). Psicobiología de la alta capacidad intelectual y el trastorno por déficit de atención con hiperactividad. Diagnóstico diferencial [Psychobiology of giftedness and attention deficit hyperactivity disorder. Differential diagnosis]. *Psiquiatría biológica, 27* (3), 96-104. https://doi.org/10.1016/j.psiq.2020.06.003

Goriounova, N. A., & Mansvelder, H. D. (2019). Genes, cells and brain areas of intelligence [Genes, células y áreas cerebrales de la inteligencia]. *Frontiers in human neuroscience*, *13*, 44. https://doi.org/10.3389/fnhum.2019.00044

Jiménez, J. E., Artiles, C., Rodríguez, C., García, E., Camacho, J., & Moraes, J. (2008). Creatividad e inteligencia: ¿dos hermanas gemelas inseparables? [Creativity and intelligence: inseparable twin sisters?] **revista española de pedagogía**, *240*, 261-282.

Karama, S., Colom, R., Johnson, W., Deary, I. J., Haier, R., Waber, D. P., Lepage, C., Ganjavi, H., Jung, R., Evans, A. C., & Brain Development Cooperative Group (2011). Cortical thickness correlates of specific cognitive performance accounted for by the general factor of intelligence in healthy children aged 6 to 18. *NeuroImage*, *55* (4), 1443-1453. https://doi.org/10.1016/j.neuroimage.2011.01.016

Kenett, Y. N., Medaglia, J. D., Beaty, R. E., Chen, Q., Betzel, R. F., Thompson-Schill, S. L., & Qiu, J. (2018). Driving the brain towards creativity and intelligence: A network control theory analysis. *Neuropsychologia*, *118* (Pt A), 79-90. https://doi.org/10.1016/j.neuropsychologia.2018.01.001

Khundrakpam, B. S., Lewis, J. D., Reid, A., Karama, S., Zhao, L., Chouinard-Decorte, F., Evans, A. C., & Brain Development Cooperative Group (2017). Imaging structural covariance in the development of intelligence. *NeuroImage*, *144*, 227-240. https://doi.org/10.1016/j.neuroimage.2016.08.041

Kim, D. J., Davis, E. P., Sandman, C. A., Sporns, O., O'Donnell, B. F., Buss, C., & Hetrick, W. P. (2016). Children's intellectual ability is associated with structural network integrity. *NeuroImage*, *124*, 550-556. https://doi.org/10.1016/j.neuroimage.2015.09.012

Kocevar, G., Suprano, I., Stamile, C., Hannoun, S., Fourneret, P., Revol, O., Nusbaum, F., & Sappey-Marinier, D. (2019). Brain structural connectivity correlates with fluid intelligence in children: A DTI graph analysis. *Intelligence, 72*, 67-75 https://doi.org/10.1016/j.intell.2018.12.003

Koenis, M., Brouwer, R. M., Swagerman, S. C., van Soelen, I., Boomsma, D. I., & Hulshoff Pol, H. E. (2018). Association between structural brain network efficiency and intelligence increases during adolescence. *Human brain mapping*, *39* (2), 822-836. https://doi.org/10.1002/hbm.23885

Lange, N., Froimowitz, M. P., Bigler, E. D., Lainhart, J. E., & Brain Development Cooperative Group (2010). Associations between IQ, total and regional brain volumes, and demography in a large normative sample of healthy children and adolescents. *Developmental neuropsychology*, *35* (3), 296-317. https://doi.org/10.1080/87565641003696833

Langeslag, S. J., Schmidt, M., Ghassabian, A., Jaddoe, V. W., Hofman, A., van der Lugt, A., Verhulst, F. C., Tiemeier, H., & White, T. J. (2013). Functional connectivity between parietal and frontal brain regions and intelligence in young children: the Generation R study. *Human brain mapping*, *34* (12), 3299-3307. https://doi.org/10.1002/hbm.22143

MacDonald, P. A., Ganjavi, H., Collins, D. L., Evans, A. C., & Karama, S. (2014). Investigating the relation between striatal volume and IQ. *Brain imaging and behavior*, *8* (1), 52-59. https://doi.org/10.1007/s11682-013-9242-3

Margolis, A., Bansal, R., Hao, X., Algermissen, M., Erickson, C., Klahr, K. W., Naglieri, J. A., & Peterson, B. S. (2013). Using IQ discrepancy scores to examine the neural correlates of specific cognitive abilities. *The Journal of Neuroscience: The Official Journal of the Society for Neuroscience*, *33* (35), 14135-14145. https://doi.org/10.1523/JNEUROSCI.0775-13.2013

Menary, K., Collins, P. F., Porter, J. N., Muetzel, R., Olson, E. A., Kumar, V., Steinbach, M., Lim, K. O., & Luciana, M. (2013). Associations between cortical thickness and general intelligence in children, adolescents and young adults. *Intelligence*, *41* (5), 597-606. https://doi.org/10.1016/j.intell.2013.07.010

Navas-Sánchez, F. J., Alemán-Gómez, Y., Sánchez-Gonzalez, J., Guzmán-De-Villoria, J. A., Franco, C., Robles, O., Arango, C., & Desco, M. (2014). White matter microstructure correlates of mathematical giftedness and intelligence quotient. *Human brain mapping*, *35* (6), 2619-2631. https://doi.org/10.1002/hbm.22355

Nolla, G. C., Pareja, E. M. D., Tudela, J. M. O., & de la Rosa, A. L. (2017). Análisis y valoración de la situación actual del alumnado con altas capacidades en España [Analysis and assessment of the current situation of high ability students in Spain]. *Revista de Educación Inclusiva, 5* (2), 129-140. https://revistaeducacioninclusiva.es/index.php/REI/article/view/238/232

Nusbaum, F., Hannoun, S., Kocevar, G., Stamile, C., Fourneret, P., Revol, O., & Sappey-Marinier, D. (2017). Hemispheric differences in white matter microstructure between two profiles of children with high intelligence quotient vs. controls: A tract-based spatial statistics study. *Frontiers in neuroscience*, *11*, 173. https://doi.org/10.3389/fnins.2017.00173

Ouzzani, M., Hammady, H., Fedorowicz, Z., & Elmagarmid, A. (2016). Rayyan — a web and mobile app for systematic reviews. *Systematic Reviews, 5*, 210. https://doi.org/10.1186/s13643-016-0384-4

Pfeiffer, S. I. (2020). Giftedness and talent development in children and youth. In P. Ward, J. M. Schraagen, J. Gore y E. M. Roth (Eds.), *The Oxford Handbook of Expertise* (pp. 103-127). Oxford University Press.

Renzulli, J. S. (2021). El papel del profesor en el desarrollo de habilidades cognitivas complejas en personas jóvenes [The teacher's role in developing higher level thinking skills in young people]. **revista española de pedagogía**, *79* (278), 13-32. https://doi.org/10.22550/REP79-1-2021-01

Sastre-Riba, S., & Castelló, A. (2017). Fiabilidad y estabilidad en el diagnóstico de la alta capacidad intelectual [Reliability and stability in the diagnosis of high intellectual capacity]. *Revista de Neurología, 64* (1), 51-58. https://doi.org/10.33588/rn.64S01.2017028

Sastre-Riba, S., & Ortiz, T. (2018). Neurofuncionalidad ejecutiva: estudio comparativo en las altas capacidades [Executive neurofunctionality: A comparative study in high intellectual abilities]. *Revista de Neurología, 66* (1), 51-56. https://doi.org/10.33588/rn.66S01.2018026

Schnack, H. G., van Haren, N. E., Brouwer, R. M., Evans, A., Durston, S., Boomsma, D. I., Kahn, R. S., & Hulshoff Pol, H. E. (2015). Changes in thickness and surface area of the human cortex and their relationship with intelligence [Cambios en el grosor y la superficie del córtex humano y su relación con la inteligencia]. *Cerebral cortex, 25* (6), 1608-1617. https://doi.org/10.1093/cercor/bht357

Silverman, L. K., & Gilman, B. J. (2020). Best practices in gifted identification and assessment: Lessons from the WISC-V. *Psychology in the Schools, 57* (10), 1569-1581. https://doi.org/10.1002/pits.22361

Solé-Casals, J., Serra-Grabulosa, J. M., Romero-Garcia, R., Vilaseca, G., Adan, A., Vilaró, N., Bargalló, N., & Bullmore, E. T. (2019). Structural brain network of gifted children has a more integrated and versatile topology. *Brain structure & function*, *224* (7), 2373-2383. https://doi.org/10.1007/s00429-019-01914-9

Sripada, C., Angstadt, M., Taxali, A., Clark, D. A., Greathouse, T., Rutherford, S., Dickens, J. R., Shedden, K., Gard, A. M., Hyde, L. W., Weigard, A., & Heitzeg, M. (2021). Brain-wide functional connectivity patterns support general cognitive ability and mediate effects of socioeconomic status in youth. *Translational Psychiatry*, *11* (1), 571. https://doi.org/10.1038/s41398-021-01704-0

Sternberg, R. J. (2012). Intelligence. *Diálogos en neurociencia clínica*, *14* (1), 19-27. https://doi.org/10.31887/DCNS.2012.14.1/rsternberg

Sternberg, R. J., & O'Hara (2005). Creatividad e inteligencia [Creativity and intelligence]. *CIC. Cuadernos de Información y Comunicación, 10*, 113-149. https://www.redalyc.org/articulo.oa?id=93501006

Sugiarti, R., Suhariadi, F., & Erlangga, E. (2018). The chance of gifted intelligent students' success in career. *Indian Journal of Public Health Research and Development, 9* (9), 277. https://doi.org/10.5958/0976-5506.2018.01009.4

Suprano, I., Delon-Martin, C., Kocevar, G., Stamile, C., Hannoun, S., Achard, S., Badhwar, A., Fourneret, P., Revol, O., Nusbaum, F., & Sappey-Marinier, D. (2019). Topological modification of brain networks organization in children with high intelligence quotient: A resting-state fmri study. *Frontiers in Human Neuroscience*, *13*, 241. https://doi.org/10.3389/fnhum.2019.00241

Tamnes, C. K., Fjell, A. M., Østby, Y., Westlye, L. T., Due-Tønnessen, P., Bjørnerud, A., & Walhovd, K. B. (2011). The brain dynamics of intellectual development: waxing and waning white and gray matter. *Neuropsychologia*, *49* (13), 3605-3611. https://doi.org/10.1016/j.neuropsychologia.2011.09.012

Tourón, J. (2020). Las altas capacidades en el sistema educativo español: reflexiones sobre el concepto y la identificación [Gifted education in Spanish education system]. *Revista de Investigación Educativa*, *38* (1), 15-32.

Turkheimer, E., Haley, A., Waldron, M., D'Onofrio, B., & Gottesman, I. I. (2003). Socioeconomic status modifies heritability of IQ in young children. *Psychological science*, *14* (6), 623-628. https://doi.org/10.1046/j.0956-7976.2003.psci_1475.x

Waber, D. P., Forbes, P. W., Almli, C. R., Blood, E. A., & Brain Development Cooperative Group (2012). Four-year longitudinal performance of a population-based sample of healthy children on a neuropsychological battery: The NIH MRI study of normal brain development. *Journal of the International Neuropsychological Society: JINS*, *18* (2), 179-190. https://doi.org/10.1017/S1355617711001536

Wang, L., Wee, C. Y., Suk, H. I., Tang, X., & Shen, D. (2015). MRI-based intelligence quotient (IQ) estimation with sparse learning. *PloS one*, *10* (3), e0117295. https://doi.org/10.1371/journal.pone.0117295

Wechsler, D. (1943). Non-intellective factors in general intelligence. *Journal of Abnormal and Social Psychology, 38,* 101-103. https://doi.org/10.1037/h0060613

Westerhausen, R., Friesen, C. M., Rohani, D. A., Krogsrud, S. K., Tamnes, C. K., Skranes, J. S., Håberg, A. K., Fjell, A. M., & Walhovd, K. B. (2018). The corpus callosum as anatomical marker of intelligence? A critical examination in a large-scale developmental study. *Brain structure & function*, *223* (1), 285-296. https://doi.org/10.1007/s00429-017-1493-0

Westlye, L. T., Walhovd, K. B., Dale, A. M., Bjørnerud, A., Due-Tønnessen, P., Engvig, A., Grydeland, H., Tamnes, C. K., Ostby, Y., & Fjell, A. M. (2010). Life-span changes of the human brain white matter: Diffusion tensor imaging (DTI) and volumetry. *Cerebral cortex*, *20* (9), 2055-2068. https://doi.org/10.1093/cercor/bhp280

Author biography

María Isabel Gómez-León is a postgraduate Lecturer of the Master's Degree in Special Education, the Master's Degree in Early Care and Child Development, the Master's Degree in Neuropsychology and Education and the Master's Degree in Neuromarketing at the Universidad Internacional de La Rioja and of the Master's Degree in Educational Processes of Teaching and Learning, the Master's Degree in Attention to Diversity and the

Master's Degree in Advanced Studies in Giftedness and Talent Management; and a graduate professor of the Degree in Early Childhood Education and Primary Education at Universidad Antonio de Nebrija; and a postgraduate Lecturer of the Master's Degree in Advanced Teaching Competences and the Master's Degree in Psycho-pedagogical Orientation and Intervention at Universidad Camilo José Cela; and Director and postgraduate professor of the Master's Degree in Early Intervention at Universidad Francisco de Vitoria.

https://orcid.org/0000-0001-7466-5441

Rhetoric and Education: An approach to the Roman school

Retórica y Educación: una aproximación a la escuela romana

Eduardo FERNÁNDEZ FERNÁNDEZ, PhD. Assistant Professor. Universidad Complutense de Madrid *(ejfernandez@ucm.es)*.

Abstract:

The training of proficient, educated and professional people was essential in Graeco-Roman antiquity. Rhetoric was used to deliver a speech correctly, make political decisions, defend a position, or accuse a certain person and to persuade a judge. These characteristics were developed in the school of rhetoric. This article describes the characteristics of education in Rome, its role within society, who received education and how, the changes it underwent during the course of history and, above all, the role of rhetoric in the schools of Ancient Rome. The objective of the work is to identify the influence of Roman education on Western culture and to reclaim the importance of rhetoric for contemporary education. It will consider three historical stages in which Roman education underwent changes. We will start with the description of the school day, the different types of teachers and the structure of education. Special emphasis is also placed on the role of rhetoric in education, the different declamatory exercises (controversies and suasories), the role of rhetoric in creating participative citizens and finally, the reasons for the decline of rhetoric. Among the conclusions, we will verify how some of the teaching methods and educational models inherited from the Greeks and cultivated by the Romans, still retain some of their main characteristics in today's society. For better and for worse, the virtues of education have been inherited, as have the problems, such as the matter of insufficient pay for teachers and limited access to higher education, difficulties which are yet to be resolved.

Keywords: history of education, schools of rhetoric, Roman argumentation.

Revision accepted: 2022-04-30.

This is the English version of an article originally printed in Spanish in issue 283 of the **revista española de pedagogía**. For this reason, the abbreviation EV has been added to the page numbers. Please, cite this article as follows: Fernández Fernández, E. (2022). Retórica y Educación: una aproximación a la escuela romana | *Rhetoric and Education: An approach to the Roman school. Revista Española de Pedagogía, 80* (283), 475-490. https://doi.org/10.22550/REP80-3-2022-03

https://revistadepedagogia.org/ ISSN: 0034-9461 (Print), 2174-0909 (Online)

Resumen:

En la antigüedad grecolatina era fundamental la formación de personas capacitadas, cultas y profesionales que supieran expresar adecuadamente sus ideas por medio del discurso, cómo tomar decisiones políticas, cómo defender una postura o acusar a determinada persona y persuadir al juez de adherirse a su argumento y conclusiones. Estas características se desarrollaban en la escuela de retórica. Este artículo describe las características de la educación en Roma, su papel dentro de la sociedad, quiénes y cómo recibían la educación, qué cambios sufrió durante la historia y, sobre todo, cuál fue el papel de la retórica en las escuelas de la antigua Roma. El objetivo del trabajo es identificar la influencia de la educación romana en la cultura occidental y rescatar la importancia de la retórica para la educación contemporánea. Se contemplan tres etapas históricas en las que cambia la educación latina. Empezaremos con la descripción de la jornada escolar, los distintos tipos de profesores y la estructura de la educación. Se hace, además, especial énfasis en el papel de la retórica en la educación, los diferentes ejercicios declamatorios (controversias y suasorias), su función como creadora de ciudadanos participativos y, finalmente, los motivos de la decadencia de la retórica.

Entre las conclusiones comprobamos cómo los métodos de enseñanza y modelos educativos heredados de los griegos y cultivados por los romanos aún conservan algunas de sus principales características en la sociedad actual. Para bien o para mal, se heredan tanto las virtudes como los problemas de la educación, tal es el caso del interés por desarrollar la capacidad argumentativa del lenguaje o entre las dificultades que aún quedan por resolver, la escasa retribución a los profesores y el acceso restringido a los niveles de educación superior.

Descriptores: historia de la educación, escuelas de retórica, argumentación latina.

1. Introduction

Education began as a special service whereby only people of a higher social status received a formal education. Today's education represents a fundamental institution for most societies, acting as a driving force for well-being and social mobility.

The origins and foundation of modern-day Western society can be found in Rome and Greece. In Graeco-Roman antiquity it was considered essential to instruct proficient, educated and professional people who could express their ideas correctly using the spoken word, take political decisions, defend a position or make an accusation before a judge. Education, therefore, plays a very important role in Roman society and in other so-called Western cultures who have inherited the classical legacy.

For this reason, this article outlines the characteristics of schooling in the ancient world and its role in society, the description of who received education and how they received it, the changes it underwent over the course of history and, above all, the role of rhetoric in Roman schools. The

main objective of this work is to identify the influence of Roman education on Western culture and to reclaim the importance of rhetoric in contemporary education.

Tacitus, in a fragment of *A Dialogue on Oratory* (*Dial*., 28-4, 29-5), provides an interesting perspective on the education of his time. The passage serves to show us the characteristics of the education system, including its challenges and expectations. It reflects the appearance in this era of stereotypes regarding education, which continue to exist in the present, such as students' lack of interest in learning or the role of the mother in educating children, as well as choosing good teachers who inculcate good habits in order to create capable, participative citizens, who are able to express their ideas appropriately, subtly and advantageously. Studying the classical model can enlighten us in our attempt to understand more fully where we come from and where we are going.

For this work, our starting point was the more traditional, historical division proposed by León Lázaro (2013). According to this author, education in Rome can be divided principally into three major stages: the first covers the eighth to the third centuries BC, that is, the Monarchy and the beginning of the Republic; the second is the period encompassing the third century BC and the second century AD, between the Punic Wars and the Antonine Dynasty, which is noteworthy for the arrival of the Greek model; and the third stage, the Late Roman Empire, when declamation was introduced as a literary genre. In addition to reviewing the characteristics of Roman education over the different historical periods, it will be necessary to review the structure of the educational system and, lastly, the use of rhetoric and oratory and the introduction of different types of exercises in declamation and argumentation.

2. The beginnings

In Ancient Rome, it was the parents who were mainly in charge of their children's education, which consisted in teaching the elements of reading, writing and arithmetic. From birth until children began to develop the first signs of an ability to reason, they were their mother's responsibility, although she would generally delegate the first three years to a nurse who would teach them to speak, and recognise numbers and letters. The nurse would also tell them the legends of the gods and goddesses. From the age of seven, boys passed into their father's care, whereas girls continued under their mother's supervision, where they learned about domestic chores and household administration.

It was usual to educate women to become the lady of the house, to watch over and assign work to the slaves, administer food supplies and take charge of raising the children. Literary sources show the image of women sewing, weaving or doing embroidery by the hearth at home, with their slaves around them, as recorded by an epitaph from the Republican era: *casta fuit, domum servavit, lanam fecit* (CIL I, 1007). The *paterfamilias* arranged the daughter's marriage and, after the wedding ceremony, she would depend on her husband and take charge of family matters in her new home.

Women's education also included their participation in social life. This participation was far more active in the culture of Rome than in that of Greece; women attended banquets in the company of their husbands, they were noted for their discretion and virtue, and because of this they enjoyed relative freedom of movement.

The Romans valued their home life highly, along with the virtues of the ancient Republic's matrons: a private archetype held up as a public model of how a mother should be, noble and virtuous, particularly bound to the responsibilities of the State, although not solely for the function of providing it with new citizens. In *The Aeneid,* the matrons rebel and pray for a city: *Urbem orant; taedet pelagi perferre laborem* (Virgil, *Aen*., V, 618-ff.) and they burn the ships while the men are enjoying themselves at the games. The main virtues that women should learn, apart from loyalty or faithfulness, are silence and bravery (Cf. Plutarch, *Mor*., 247A).

In some cases, at the highest levels of the aristocracy, care was taken to ensure that girls had specialised teachers to instruct them in Latin and Greek literature and other arts, such as music or dance, but without neglecting the running of a household and the duties which have been regarded as specifically female since ancient times. The classical tradition contains honourable exceptions, such as the mothers of the Gracchi, Julius Caesar or Octavian. Not to mention Sappho, Aspasia of Miletus or Hypatia of Alexandria. (Cf. Plutarch, *Advice to the Bride and Groom, Dialogue on Love* and *Virtues of Women).*

The most widespread tradition was for the head of the family or *paterfamilias* to take charge of his sons' education. Once a boy had learned to read and write with his mother and had turned seven, he began to receive a more practical type of education, in keeping with his physical growth, as described by both Cato the Elder (Plutarch, *Cat. Ma*., 20, 5.) and Paulus Aemilius (Plutarch, *Aem*., 6, 8), in relation to their sons' education. The aim of this education, in such an eminently conservative and pragmatic setting as Roman society, was to provide the new members of the family with moral principles and good habits, collectively known as the *mos maiorum*, to enable them to fend for themselves in social and working life, in accordance with the family principles. For this reason, the father would let his son accompany him in some of his daily tasks. Among the most significant activities were using a plough and learning the basics of agriculture; military training in the defence of territory and family; and honouring the gods. As an example, as has already been noted in numerous studies, M. Porcius Cato taught his son himself "to read and write, he taught him about laws and made him exercise in the gymnasium, (...) to use weapons and to ride a horse" (Plutarch, *Cat. Ma.,* 20,6)[1].

The responsibility for educating a son in the family ended when he assumed the *toga virilis*, between the ages of 14 and 17, when the *paterfamilias* saw fit. At this point, the boy registered as a citizen, he received the *tria nomina*, removed the amulet or *bulla* against evil spirits that he wore around his neck, and began his instruction in public life with his first visit to the fo-

rum. Although an adolescent who underwent this coming of age rite could vote and become a magistrate as a fully-fledged citizen, in order to continue his education he still had to actively accompany a relative or family friend, who would generally have more experience in judicial practice, law or even just the trading that occurred in the forum, which was at the heart of public life in Ancient Rome. This kind of forensic internship, called *tirocinium fori*, formalised the following step in the training process; later he would have to fulfil his military obligations by learning about weapons and the organisation of the army, he would learn how to coexist with other citizens and, depending on his social status, he would work as a *tribunus militum*, that is, an officer in the Roman Legion.

The Roman system of education only contemplated the instruction of free citizens. Servants and slaves, who were responsible for service and agricultural work, had no access to studies. Each home, however, had a space reserved for the education of household slaves, where they could acquire the knowledge needed to perform their obligations effectively. Extensive evidence has been provided by different sources and studies (Bonner, 2012), regarding the later development of just such a space, among the emperor's slaves, in a kind of family school run by a pedagogue.

As for formal education, there has been evidence of it since the early days of the Monarchy, found in various accounts such as those written by Plutarch (Cf. Plutarch, *Num.*, 3), who, in reference to Romulus and Remus, claims that Faustulus, the shepherd who found them in the she-wolf's cave, sent them to the small town of Gabii and there they *learned to read and write and everything else that well-born children should know.* (Cf. Plutarch, *Romm.*, 6).

Schools as such came into existence during the Republic in the city of Rome, among the shops in the forum, and in other Roman cities, *which hummed with the sound of children's voices as they learned to read;* later, around the third century BC, mention is usually made of the apparition of the first school with its own teacher, that of Spurius Carvilus (Plutarch, *Quaest. Rom.*, 59)[2]. At that time, the Greek model was used, according to the famous poem by Horace. (*Ep.*, II, 1, 156).

Despite the establishment of schools of rhetoric in Rome, even in the first century, parents took their children to religious processions in order to convey the importance of the *mos maiorum* and the weight of family traditions. As depicted in the Ara Pacis friezes, or according to the testimony of Pliny the Elder, "each child had his own father for a teacher, and those who were fatherless chose a distinguished, prudent elder to act as father; this was the best way to learn, by example and through practice, about how powerful the speakers were, the rights of those who disagreed, the authority of the judges, the freedom of others..." (León Lázaro, 2013, p. 473). However, the most usual practice among parents during the Republic consisted in entrusting their sons' education to a Greek teacher, as in the case of the Gracchi, who were taught by Diophanes of Mytilene and Menelaus of Marathon, respectively, Pompey's sons or Cicero's son.

3. The Greek model

In the third and second centuries BC, when the Romans began to have closer contact with the Greek world, many rhetoricians and philosophers arrived on the Italic Peninsula, as they had done in Greece in the fifth century, intending to democratise the culture there and replace the individualistic, aristocratic elitism, which was so typically Roman, with a social service which would allow a greater number of well-prepared people to gain access to public life and participate in it. (Jaeger, 2009, p. 265 ff.).

However, the proliferation of Greek schools increased the aristocratic nature of the education system and its relationship with the city, by creating a distinctly urban type of education. Education was limited to the free, city-dwelling population, and it established itself in towns with the aim of preparing the members of the ruling oligarchies. After gaining military and economic control of the whole of the Mediterranean, the Roman world was to undergo an overwhelming process of Hellenisation as a result of adopting the Greek education system. Military victory paved the way to economic and cultural development. (Blanco Pérez, 2005).

The first Latin writers, Livius Andronicus and Ennius, are fine examples of the assimilation of Greek culture in Rome (Suetonius, *Gram*., 1). Not long after, in the Scipionic Circle, figures such as the historian Polybius of Megalopolis, Diogenes of Babylon, Panaetius of Rhodes and Diophanes of Mytilene, among others, educated young men in Hellenic ideals.

This closeness to the Hellenic world was not without controversy and caused the Senate to expel philosophers and rhetoricians (Suetonius, *Gram*., 25) in the year 173 BC, and again shortly after in 161 BC. Although these decrees "did not state the reasons for this expulsion, they may possibly be related to the distinct anti-Hellenism that existed in certain aristocratic groups who defended the old values, the rural Roman values. These groups only wished to allow certain Hellenic values to filter through, those which the ruling senatorial class would be able to assimilate. At a certain point, philosophers and rhetoricians were potentially unassimilable and they were expelled" (*Rhetorica ad Herennium,* 1991, p. 17).

Later, in 92 BC, the censors Gnaeus Domitius Ahenobarbus and Lucius Licinius Crassus issued another edict concerning the Latin schools of rhetoric with a serious warning (Suetonius, *Gram*., 25) that in these schools young people were not learning the traditions of their elders and were wasting time *dedisceret paene discendo* (Cicero, *De Or*., 3, 93). The struggle for control of the schools of rhetoric was not only a philosophical question, the training of the future rulers of the state was also at stake, that is to say, it was a political struggle between the conservative aristocracy and the new, reinforced popular faction. At the beginning of the first century BC, this conflict would end in a civil war between the two parties, led by Marius and Sulla respectively.

Despite the prohibition, in a letter to Titinius Cicero states (Suetonius, *Gram*., 26), that when he was still a child, a certain Plotius Gallus was the first to teach rhetoric

in Latin and that, although he did not attend this school, it was because he was advised to learn from Greek teachers, as this was considered more suitable for him.

Cicero was the main architect behind a Latin version of Greek rhetorical terms used in these schools. Following the crisis of the Roman Republic and the death of Cicero, Latin rhetoric went into decline at the same time as forensic oratory began to lose its effectiveness. This produced a rupture between rhetorical training and the practice of oratory, with the latter being limited to the school environment and becoming separate from political decision-making, up to the point of being reduced to a simple treatise on eloquence.

As recalled by León Lázaro (2013, pp. 472-477), this was a gradual process and it did not entail the disappearance of the schools of rhetoric or their loss of influence. Even at the end of the first century, Vespasian created a professorial chair in Latin rhetoric in the city of Rome, which was held by Quintilian, and another in Greek rhetoric; and in the second century, at the height of the Second Sophistic, Marcus Aurelius showed his personal interest in language which is reflected in the Stoic perspective of his *Meditations* (Cf. III, 16; VII, 30 or X, 34). In his preference for philosophy over rhetoric, the emperor-philosopher endowed several professorial chairs in Athens, one in rhetoric and four in philosophy, one for each of the four major schools: Stoicism, Epicureanism, Platonism and Aristotelianism.

Previously, in the third century AD, the jurist Ulpian (*Dig*. V. 5, 2,8) mentions that elementary schools existed even in small, rural villages; it is well known, for example, that both Virgil and Saint Augustine began their elementary education in their small provincial towns; however, in order to continue their training, they had to move to larger towns and eventually completed their education in Rome.

It was essential for rulers to have a good command of rhetoric and oratory and, for this reason, at the same time as the process of Romanisation evolved and cities flourished, education was furthered through pedagogical patronage. This was bestowed by patrons ranging from emperors to local aristocrats, who actively participated in the education system in their cities, by funding the creation and maintenance of schools. Pliny the Younger (Herrero, 1959), for example, personally bore a third of the expense of establishing a school for secondary and higher education in Como, his home town (*Epistulae* IV, 13).

4. Stages of school education

Quintilian recalls that when he began his education, parents could entrust their sons to a teacher or preceptor, who was generally Greek, or send them to a school with other boys their own age in the charge of a *pedagogue*, who would accompany them, take care of school material and ensure that they behaved themselves suitably (Quintilian, *Inst*. I,1,1-5). Both of these options persisted virtually throughout the history of Rome and choosing between them depended more on conservatism in upholding family traditions than on purchasing power. Since the Greek

education system first began to develop, some of the patrician families regarded schools as a dangerous breeding ground for the new ideas that threatened the *mos maiorum*; furthermore, grouping children of the same age together made it easier to indulge moral failures which would not have been tolerated at home (Cf. Juvenal, *Sat*. III, p. 45 ff.).

Most of the educational subjects which were taught to students in the different stages of schooling have been preserved in ancient sources[3]. The main source of information is the extensive body of work by Quintilian, a complete treatise on pedagogy in twelve books, which he wrote at the end of the first century AD. According to these works, classes took place in the open air, under the forum porches or, at best, in small, rented premises. Good teachers, generally philosophers, were not supposed to lose their tempers easily, but rather be patient and restrained, and avoid scandal by behaving in an exemplary way. Despite the fact that their social standing was no better-paid than a manual labourer, (Cf. Diocletian *Edictum De Pretiis Rerum Venalium*, apud León Lázaro, 2013, p. 478), they received gifts every year or free grain and some of them achieved success as a result of their renowned lessons, even to the point of becoming rich, such as Quintilian or Pollio.

Through epigrams and satire we can reconstruct how they were regarded by their peers. In one of his satires, Juvenal (*Sat*. VII, p. 140 ff.) alludes to the high standards that parents required these teachers to have in order to take care of their sons. In a clearly ironic tone, he refers to the fees they received for entertaining their students rather than teaching them: *You're asking me to pay? Forget it! Well, what have I learned?...* Their wages were modest, specially those of pedagogues and grammarians. After fixing the wages that they would receive for their lessons, which were in any case lower than those for music classes or pantomime performances, teachers of rhetoric were paid up to five gold coins a year, though they often had to endure haggling and non-payment, which could lead to claims being brought to court.

Herodas (1981, 41-47), a Hellenistic writer in the second century BC, dedicated one of his dialogues to the epitome of a schoolteacher, Lamprisco, who had several kinds of whip to flog the boys with. In the house of Julia Felix in Pompeii, a fresco has been preserved which depicts a schoolteacher hitting a boy with sticks while two of his classmates restrain him and the others watch. Horace (*Epist*., II, 1, 70) also claims that his teacher was in the habit of beating him when he was a child, and therefore it is no surprise that Quintilian declared that the Stoic philosopher Chrysippus did not disapprove of beating students and that it was a widespread habit among pedagogues and teachers.

In Quintilian's opinion, however, although it may seem surprising in the context of ancient times and is in keeping with a more modern and educational way of thinking, these methods are not appropriate for free men, let alone for correcting occasional mistakes or ingrained habits (Quintilian, *Inst*. I, 3, p. 14 ff.).

Once the young student had acquired basic knowledge in the family, in most cases he would be sent to school, where he would go through three stages, each with a different teacher. Elementary education began at the age of seven. The school was called *ludus litterarius* and it was run by the *magister* and other teachers, such as the *litterator* or the *calculator*, who were in charge of teaching the pupils to read and write, and do simple arithmetic.

When the boys reached eleven years, they moved on to depend on the *grammaticus* for more in-depth study of the use of language, the science of speaking without making grammatical mistakes, and poetry analysis (Quintilian, *Inst*. I, 4, 2). The method and grammatical content were the same for both the Greek and Latin languages. As in primary school, the possibility existed of hiring a preceptor who would teach classes in the home or of sending the boy to one of the state schools which had become widespread following the adaptation of the Greek education system.

Being linguistically accurate, that is, having a command of grammar, without succumbing to solecisms or barbarisms, is a *sine qua non* condition in using a language correctly, which the Romans called *puritas*, or the purity of the language. Following this, they moved on to the virtues of eloquence expounded by the teachers of rhetoric (*perspicuitas, ornatus, aptum*). Mastery of the language, reading and writing correctly at all stages of secondary and higher education, has proved to be one of the most important aspects of the educational process and it should be emphasised in schools, both in ancient times and in the present.

The teachers dictated texts that the students had to read, say aloud and learn by heart, at least partially. The study of Latin and Greek grammar was conducted through the use of specific passages from Greek and Latin literature which the students had to perform in front of their classmates. Once they had read the text flawlessly, they had to analyse it, evaluate it and consider whether it made suitable use of letters, syllables, morphology of words and their meaning, as well as the different points of grammar and parts of speech. Afterwards, the focus shifted to studying history and geography in more depth and developing their knowledge of mathematics and music, that is, the subjects that later became part of the *trivium* and *quadrivium* in the Middle Ages.

Both grammar and rhetoric are arts of expression, the former is used to speak and write correctly and idiomatically, while rhetoric, responsible for creating a form containing beauty, is taught as a technique in speaking well and elegantly. The origin of these reflections on grammar and the study of the rules of how language functions can be found in the school of Philology in Alexandria, founded by Demetrius of Phalerum, a disciple and student of the teachings of Aristotle and Theophrastus. The significant contribution of this school is traditionally summarised in two major areas: the stabilisation and edition of classical texts, such as that undertaken by Aristarchus of Samothrace with Homer's works, and philological commentary on

texts, with Aristophanes of Byzantium as a clear exponent.

Studying the language used by literary authors acted as a paradigm in the construction of a standard Greek language. Once the texts had been stabilised and commented upon, it was then possible to choose the canon of authors that would be used as the educational framework in the classes imparted by the *grammaticus*. This school is generally credited with creating the Alexandrian literary canon which would later hold such importance in the Roman education system, through the teaching of rules and imitating the classical models.

The choice of canonical authors to be taught in schools was a transcendental decision in terms of the subsequent history of literature and for the education of literary tastes, and this depended a great deal on the grammar teachers. They acted as literary critics who determined the quality of the works and authors to be studied, imitated and, therefore, copied and preserved in libraries for posterity. Among the Greek authors who were most widely read and studied was Homer; among the Romans were Livius Andronicus and Ennius, the fathers of Latin literature. The other authors are those whose success and fame have survived to the present day: Virgil, Horace, Ovid, Sallust, Livy, Cicero, Seneca, etc. (Quintilian, *Inst*. X, 1, 104).

The grammar schools helped to consolidate knowledge of the Greek and Latin languages in an already bilingual society (Cf. Bravo Bosch, 2011). The language and literature of Greece represented the cultural paradigm which indicated refined knowledge and excellent taste, and this led Latin to imitate it. The same concern was reflected in the education system. Quintilian preferred children to begin by studying the Greek language, since primary education taught the Greek disciplines, but immediately afterwards this would be followed by the Latin language and knowledge related to it, so that the two languages would complement each other.

Finally, the third period involved the school of the *rhetor* which was attended by students who wished to improve their education until they were roughly twenty years old.

5. The teachings of the rhetor

In the organisation of the Roman education system the *rhetor* was the teacher of eloquence. In his school, the more ambitious students prepared for a life in the public sphere by studying the classical texts, especially those written in prose, and the difficult art of speaking, based on the study of the technical methods defined by rhetoric, as well as practice and exercises. The *rhetor* taught different rhetorical figures: commonplaces, the use of encomium or vituperation, comparisons and paraphrases, and the development of a thesis.

Both Cicero and the *Rhetorica ad Herennium* frequently emphasise the importance of oratory exercises and practice, "as only those who have, through long practice, acquired a broad knowledge of vocabulary and ways to express ideas, will

be able to discuss them with the elegance and dignity that their nature requires" (Cicero, *De inv*. II, 15, 50). The *Rhetorica ad Herennium* also repeats the same idea in several places: "I simply wish to remind you, first of all, of a very important point: theory without continuous practice is worth little; you will understand, therefore, that the study of these precepts should be applied through practice" (*Rhet ad Her*, 1,1,1).

The study and development of the rules are meaningless without oratory practice. All active learning which involves the student in any field of knowledge requires supervised practice. The teacher's corrections and comments stimulate and support the teaching of the art of rhetoric. This is Quintilian's recommendation (I,1, 33; I, 8, 1) on how to practice the first steps in relation to reading texts. The development of knowledge, learning and, ultimately, education, does not end when an adolescent ends his time at school, but rather should be put into practice throughout his life.

Studying the rules and exercising rhetoric, however, does not consist in knowledge that is exclusively pragmatic, aimed solely at standing out in public life. In the proem to his work (*Inst.* I, 9ss), Quintilian highlights the need for the orator to be honest and to develop the great virtues of justice, fortitude, prudence or temperance, which represented the moral and social ideals of the Roman aristocracy. Philosophy and rhetoric are intertwined, in such a way that wisdom and eloquence should be regarded as synonyms and for this reason manuals on rhetoric describe them in detail, as does Cicero when he speaks about argumentation in the deliberative genre (*De inventione*, II, 53, 159).

As a profession, being a teacher of rhetoric had a higher social status than that of *grammaticus* or *litterator*, because it principally concerned the sons of aristocrats who were preparing to enter the public arena. The first schools of rhetoric opened in the second century BC, a date which can be inferred from the expulsion decrees mentioned earlier. These schools displaced the ancient Roman tradition of a student learning from a young age by visiting the Roman forum in the company of his father or a renowned lawyer.

The appearance of the schools of rhetoric caused a major upheaval in Roman society, as the doctrine they taught there clashed with more conservative educational ideals. For Crassus (Cicero, *De orat*. 3, 93), the importance of practice over training seemed unprincipled and he felt it was an excuse to undermine Roman traditions and become rich at the expense of wealthy families with a thirst for power. The fact is that just a few years afterwards, the oratory practice which had evolved in the schools of rhetoric became popular and it spread among the more ambitious young men.

In his work, Cicero (*Brut*., 312ss) sketches a fantastic portrait of a young man's educational journey at the beginning of the first century BC, and describes his own concerns and experience under the teachers and tutors of rhetoric to whom he turned to complete his education: after acquiring two years' experience in defending lawsuits in

Rome, he spent a further two years on honing his skills and joined the school of Philosophy in Antioch and the school of rhetoric in Athens run by Demetrius the Syrian (Plutarch, *Cic*., 3, 5). In Asia, he focused on listening to the most prestigious orators, principally Menippus, Dionysius of Magnesia, Aeschylus of Cnidus or Xenocles, people whose names we now scarcely recognise. Finally, he went to Rhodes to spend more time with those teachers he had met and listened to in Rome and who had praised his oratory skills so highly: Molon and Poseidonius (Plutarch, *Cic*., 4, 5).

Seneca the Elder also had connections to the schools of rhetoric during his early education, and he was so inspired by the atmosphere there that he did not hesitate in returning to the school with his sons (Seneca, *Con.*, X, Praef., 2 y 9) or writing, at the end of his life, on the declaimers whom he had most appreciated (Seneca, *Con.*, I, Praef., 4).

Following the death of Cicero, Latin rhetoric began to decline at the same time as forensic oratory began to lose its effectiveness. This produced a rupture between education in rhetoric and the practice of oratory, with the latter being limited to the school environment and becoming separate from political decision-making, up to the point of being reduced to a simple treatise on eloquence. With the advent of the Principate, the schools of rhetoric were restricted to fulfilling the social function of training jurists and senior government officials, especially in the field of law (Quintilian, *Inst*., 12. 1, 13). The schools took over the role that the forum had previously occupied and provided training in the skill of eloquence by way of student exercises in composition and recitation, a tradition that has been preserved with the name of progymnasmata.

Declamation, originally, consisted of an academic exercise which was performed under the rhetor's supervision in the school of rhetoric. The students had to practise argumentation using simple speeches on fictitious subjects, and declamatory exercises arose from this as a way to prepare the future speeches, whether deliberative or judicial, which would determine the course of the Republic in the courts or in political assemblies, mainly in the Senate. Therefore, declamation was divided into two strands, *suasoriae* and *controversiae*.

The *suasoriae* were the first stage (and the most straightforward) which the student had to master before moving on to the *controversiae*. They consisted in monologues in which the student had to argue for or against a case in order to convince a certain mythological or historical figure, to justify his actions or to even to put himself in this figure's place and deliberate on the proposed conflict. Among the subjects preserved in Seneca's suasories, we find Cicero's dilemma on whether to beg Anthony to spare his life or his works; the Spartans' decision whether to stay at Thermopylae or flee; the expediency of Alexander entering Babylon or sailing the ocean; or the necessity of Agamemnon sacrificing Iphigenia on the coast at Aulis.

In turn, the controversies form part of the exercises relating to judicial oratory in

which a debate was held between two students who defended opposing theses. The subject would be related to one of the laws that the teachers had previously explained to the students, then a situation would be outlined, which was usually extreme, fictitious and complicated, and finally one student had to write a speech defending a position and another wrote a speech attacking it. It was made clear that the aim was not to express one's own opinion but rather to find arguments to present the relevant case to suit each occasion, regardless of the truth. The preservation of this type of rhetorical exercise in the Graeco-Roman tradition has been as a result of the work by Theon of Alexandria and Hermogenes in the second century AD, by Aphthonius in the fourth century, and by Nicholas of Myra in the fifth century AD.

6. The final references to pedagogy in the empire

The assimilation of Hellenic culture reached a height in Rome in the final stage of the empire. This synthesis, in which Christianity began to be increasingly present, both socially and culturally, as well as politically, represents the beginning of the Middle Ages and the definitive establishment of Western culture. It was period of intense institutional bureaucratisation, which would also have an influence on the education system.

In Rome, education underwent major changes during the administrative reforms introduced by the Flavians at the end of the first century AD. Under the auspices of Hellenistic culture and after the resurgence of the Second Sophistic, municipal schools flourished, privileges were granted to teachers and specific professorial chairs were created with high annual salaries, such as that held by Quintilian.

Schools continued to exist and there was also an increase in the number of students able to attend and learn there, and as a result, the number of schools and teachers grew. Hadrian (117-138) supressed the military training of students and teachers with the aim of training officials to take charge of public administration. Schools became one of the fundamental focal points in the spread of Romanisation throughout the empire, but particularly in the regions farthest away from the metropolis or in the recently conquered areas, through the education of the local elites. During the reign of Antoninus Pius (138-161), privileges were granted to the teachers in charge of education exempting them from paying certain municipal taxes.

In the fourth century, Constantine (306-337) was to set a new course for the empire. In part, he would continue Diocletian's reforms and insist on using his predecessors' methods to foster and reinforce the figure of teachers but this would be based on the prevailing new Christian ideology and Greek cultural roots.

Throughout this period, Greek retained its intellectual and cultural superiority, not only in pagan settings but also within Christianity with a rich liturgy and notable apologists, such as Origen, Saint Basil or Saint John Chrysostom. In this ideological battle between Christianity and paganism, the figure of Julian the Apostate (361-363)

stands out. He prohibited Christians from becoming teachers in the schools of rhetoric and their right of admission was limited *(Cod. Ilust.* 10, 52, 7). There were other attempts to reinstate the pagan traditions, such as the controversy involving Symmachus and Saint Ambrose towards the end of the fourth century, which denotes a certain estrangement from the Roman high aristocracy in Byzantium and from Greek cultural hegemony.

Ultimately, the liberal arts lost their propaedeutic nature with regard to the development of philosophy and they became the basis of medieval education, first of all in the state-funded schools and later in monastic training (Curtius, 1995). A good example of the integrative synthesis between ancient culture and Christianity can be found in the figure of the Venerable Bede, an English monk from the eighth century, who devoted himself to historical research and teaching. (Cf. Fernández, 2011). From this time on, Latin literature focused on the evolution of rhetoric in epistles written in prose, with new models appearing in the work of Macrobius, Symmachus himself and Sidonius Apollinaris, who all became part of the new medieval literary paradigm. (Curtius, 1995).

7. Conclusions

A review of the main documentary sources from Antiquity provides a historical approach to the subject of Roman education from its beginnings. Our objective has been to describe how young people were educated in early times, the influence of the arrival of the Greek model, the disputes about this assimilation and its consequences on the development of education in Ancient Rome, what a school day was like, who education was intended for, some of the characteristics of students and the different levels in the educational structure.

The first conclusion that can be drawn is that the ancient educational model, to which we are indebted from a historical and cultural viewpoint, can serve as a first point of comparison with the features of current pedagogy. In this way, by analysing the origin and historical development of the teaching methods and educational models used by the Greeks and Romans, we can discover our cultural heritage and observe the persistence of some their main characteristics in contemporary society

History continues to be *magistra vitae*, for better and for worse, and together with the virtues of the ancient schools, the legacy also includes the problems and bad habits of education, such as the matter of insufficient pay for teachers and limited access to higher education, difficulties which are yet to be resolved.

The specific characteristics of teaching in Roman schools, in imitation of the Greek model, determined the appearance and progression of the different teaching figures involved in the education of young Romans, beginning with the Greek tutor and passing through the *litterator*, the *grammaticus* and the *rhetor*, as well as the teaching imparted at each educational level.

Another of the most significant features that characterise education in Roman schools

from the very beginning, is the participation in the public sphere of those involved, that is, the political consequences of education. In effect, the teaching of rhetoric to young Romans was the most usual way for students to participate in public life as key players in their society's political activity.

The method of assimilating knowledge was based on the practice achieved through some of the exercises that the *rhetor* supervised, such as the suasories, controversies and progymnasmata. In addition to the evolution of the contents of the programme taught in schools, owing to their Greek origin, political changes affected Roman education drastically, both in its beginnings with the expulsion of the Greek philosophers, and among its epigones with the spread of Christianity or the founding of Constantinople.

During the third period, school rhetoric became completely detached from the public sphere, which was influenced by the need to train public officials, and due to the fact that in the ruling political system, the empire, dissidence and freedom of expression were prohibited. The lack of political freedom prevented freedom of expression, which was necessary for the development of rhetoric and for real education in citizen participation. Christianity would eventually become an influence on the way teachers were selected and the way pagan literature was taught.

Finally, the importance of rhetoric in contemporary education should be noted. If a programme were to be implemented which could train students in the mastery of their own language and in the perfection of communicative resources to express their ideas and discuss current issues properly, issues which exist in the political and cultural arena, no doubt rhetoric would serve to create citizens that were more educated, more active and conscious of the political decisions existing in their society, more human, in the sense of instigating a new humanism: a humanism that is technological but also open to dialogue, original and intelligent.

Notes

[1] Translation into Spanish by Juan M. Guzmán Hermida and Óscar Martínez García, in Plutarco, V*idas paralelas IV*, Madrid, Gredos 2017, p. 96.

[2] Other ancient testimonies are usually cited: C. Tac., *Dial*., 28, 4; Liv., 6, 25; 8·9; Plut., *Rom*., 6; Ibid., *Num*., 3; Ibid., *Publ*., 2, 1; Ibid. *Galb*., 1, 7·9; Ibid., *Cor*., 27, 1.

[3] Cf. Hermeneumata Pseudodositheana, instructional guides from the third century AD used to teach Latin to Greek speakers. For more information on these manuals, consult «L'apprentissage du grec et du latin dans l'Empire romain d'après un manuscrit de la Bibliothèque Universitaire de Montpellier» by Michel Gayraud in *Académie des Sciences et Lettres de Montpellier*, 2010, pp. 35·44.

References

Akademie der Wissenschaften der DDR. Deutsche Akademie der Wissenschaften zu Berlin (1893). *Corpus inscriptionum Latinarum (CIL)*. Editio altera Berolini: G. Reimer.

Arenal, L. (2021). La formación de la inteligencia a través de la literatura grecolatina y su pervivencia [The formation of intelligence through Greco-Latin literatura and its survival]. **revista española de pedagogía**, *79* (278), 51-58. https://doi.org/10.22550/REP79-1-2021-10

Aristotle (2002). *Retórica*. UNAM.

Blanco Pérez, J. I. (2005). Graecia capta ferum victorem cepit, una aproximación didáctica [Graecia capta ferum victorem cepit, a didactic approach]. In A. A. Ezquerra (Coord.), *Actas del XI Congreso Español de Estudios Clásicos*, vol. 1 (pp. 691-700). Sociedad Española de Estudios Clásicos.

Bonner, S. (2012). *Education in ancient Rome. From the elder Cato to the younger Pliny*. Routledge Library Editions Education.

Bravo Bosch, M. J. (2011). El bilingüismo en Roma de la época republicana a la imperial [Bilingualism in Rome: from the Republican to the Imperial age]. *Revista General de Derecho Romano*, *16*, 1-17.

Cicero (1897-1917). *Obras completas [Complete works]*. Librería de Hernando y Compañía.

Cicero (1997). *De la invención retórica [On rhetorical invention]*. UNAM.

Cicero (1999). *El orador perfecto [The perfect speaker]*. UNAM.

Curtius, E. R. (1995). *Literatura europea y Edad Media latina [European literature and the Latin Middle Ages]*, vol 1. Fondo de Cultura Económica.

Farfán Mejía, E., Perdomo Zambrano, L. A., & Mora Hernández, F. L. (2018). Habilidades del pensamiento y Retórica [Thinking Skills and Rhetoric]. *Conductual, Revista Internacional de Interconductismo y Análisis de Conducta, 6* (2), 70-85.

Fernández, E. (2011). San Beda el Venerable [Saint Bede the Venerable]. In María José Monfort (Coord.), *Santos. tesoros de la Iglesia* (pp. 45-50). Ediciones Internacionales Universitarias.

Hermogenes, Theon, Aphthonius (1991). *Ejercicios de retórica [Rhetorical exercises]*. Gredos.

Herodas, Parthenius of Nicaea (1981). *Mimiambos. Fragmentos mímicos/Sufrimientos de amor [Mimiambos. Mimic fragments/Sufferings of love]*. Gredos.

Herrero, V. J. (1959). Plinio el joven, educador y pedagogo [Pliny the Younger, educator and pedagogue]. *Estudios Clásicos V, 26*, 2-22.Horace (1972). *Epístolas [Epistles]*. UNAM.

Jaeger, W. (2009). *Paideia: los ideales de la cultura griega [Paideia: the ideals of Greek culture]*. Fondo de Cultura Económica.

León Lázaro, G. (2013). La educación en Roma [Education in Rome]. *Anuario jurídico y económico escurialense*, *46*, 469-482.

Marrou, H. I. (2004). *Historia de la educación en la antigüedad [History of education in antiquity]*. Akal.

Plutarch (1992). *Cuestiones romanas [Roman issues]*. Akal.

Plutarch (1985). *Vidas paralelas I [Parallel Lives I]*. Gredos.

Quintiliano (1999). *Institución oratoria [Oratorical institution]*. UNAM.

Retórica a Herenio [Rhetorica ad Herennium] (2010). UNAM.

Retórica a Herenio [Rhetorica ad Herennium] (1991). Bosch.

Russell, D. A. (1983). *Greek declamation*. Cambridge University Press.

Seneca (2005). *Controversias. Libros VI-X. Suasorias [Controversies. Books VI-X. Suasorias]*. Gredos.

Suetonio (1995). *De grammaticis et rhetoribus*. Clarendon Press.

Sussman. L. (1978). *The Elder Seneca*. Leiden.

Livy (2018). *Ab urbe condita*, book 6, part 25, pp 8-9. https://historicodigital.com/download/tito%20livio%20i.pdf

Tacitus (1977). *Diálogo de los oradores*. UNAM.

Author's biography

Eduardo Fernández Fernández is a graduate in Classical Philology (1994) and in Literary Theory and Comparative Literature at the Universidad Complutense de Madrid (2001). He is currently Assistant Professor at the Department of Classical Philology at the Universidad Complutense de Madrid. He has worked in teaching and research at baccalaureate level and at several universities, and he has spent periods of research in Oxford, Rome and Mexico. His lines of research are Latin rhetoric and poetics, humanistic Latin and the teaching of Latin.

https://orcid.org/0000-0002-1269-4949

Notes

Esther López-Martín, Belén Gutiérrez-de-Rozas, Andrea Otero-Mayer, & Eva Expósito-Casas
Qualitative analysis of the professional profile of a good secondary school teacher

Noelia Salas Román, Margarita Alcaide Risoto, & Carlos Hue García
Improving socio-emotional competencies in pre-school pupils through emotional educationl

Adoración Díaz López, Javier Jerónimo Maquilón Sánchez, & Ana Belén Mirete Ruiz
Validation of the Ud-TIC scale on the problematic use of mobile phones and video games as mediators of social skills and academic performance

Rosalía Jódar Martínez, María del Pilar Martín Chaparro, María Dolores Hidalgo Montesinos, & Juan Pedro Martínez Ramón
Perceived parenting style and quality of life related to health among adolescents

María de la Luz Berlanga Ramírez, & Luis Gibran Juárez Hernández
Construct validity of an instrument to assess assertive feedback in initial teacher training

Qualitative analysis of the professional profile of a good secondary school teacher*

Análisis cualitativo del perfil profesional del buen docente de educación secundaria

Esther LÓPEZ-MARTÍN, PhD. Associate Professor. Universidad Nacional de Educación a Distancia *(estherlopez@edu.uned.es)*.

Belén GUTIÉRREZ-DE-ROZAS. Trainee Researcher. Universidad Nacional de Educación a Distancia *(bgutierrezderozas@edu.uned.es)*.

Andrea OTERO-MAYER. Postdoctoral Researcher. Universidad Nacional de Educación a Distancia *(aotero@edu.uned.es)*.

Eva EXPÓSITO-CASAS, PhD. Associate Professor. Universidad Nacional de Educación a Distancia *(evaexpositocasas@edu.uned.es)*.

Abstract:

Scientific literature has shown that teacher characteristics and skills are one of the main sources of variation in students' academic performance. This potential that teachers have in improving the quality of the education system justifies the importance of identifying the teacher-related factors that are positively related to student learning. This study aims to contribute to this purpose by analysing the professional profile of a good secondary school teacher from the perspective of students, members of school management teams, and the teachers themselves. For this purpose, a qualitative research design was established based on an analysis of the views of the participants. Five focus groups were conducted with the participation of five members of school management teams, nine teachers and nine students. Through both the a priori

* This study was conducted as part of the R&D project "Competencias para el ejercicio de la profesión docente en educación secundaria: análisis de la situación actual y propuestas formativas de futuro" [Skills for secondary school teachers: analysis of the current situation and proposals for future training] (Reference: PID2019-106643GA-I00), funded by the Spanish Ministry of Science, Innovation, and Universities (2020–2023).
The authors would like to thank UNICEF Spain for its support in organising the focus groups.

Revision accepted: 2022-07-06.
This is the English version of an article originally printed in Spanish in issue 283 of the **revista española de pedagogía.** For this reason, the abbreviation EV has been added to the page numbers. Please, cite this article as follows: López-Martín, E., Gutiérrez-de-Rozas, B., Otero-Mayer, A., & Expósito-Casas, E. (2022). Análisis cualitativo del perfil profesional del buen docente de educación secundaria | *Qualitative analysis of the professional profile of a good secondary school teacher. Revista Española de Pedagogía, 80* (283), 493-516. https://doi.org/10.22550/REP80-3-2022-04
https://revistadepedagogia.org/ ISSN: 0034-9461 (Print), 2174-0909 (Online)

and inductive coding of the content of these focus groups, the professional profile of a good teacher was identified. This profile was made up of three teaching skills and seven personal skills, specified in 79 actions. The integration of all the participants' perspectives enabled the creation of a comprehensive proposal of an effective teacher by capturing the nuances provided by each individual perspective. Based on this, new research and actions can be designed that contribute to improving the quality of initial and in-service training for secondary school teachers.

Keywords: teacher skills, teacher evaluation, focus groups, qualitative research, teacher effectiveness.

Resumen:

La literatura científica ha demostrado que las características y competencias del profesorado constituyen una de las principales fuentes de variación del rendimiento académico. Este potencial de los profesores para mejorar la calidad del sistema educativo justifica la importancia de conocer qué factores asociados a los docentes se relacionan positivamente con el aprendizaje de sus estudiantes. Este estudio persigue contribuir a tal propósito, al analizar el perfil profesional del buen docente de educación secundaria desde la perspectiva de los estudiantes, los miembros de los equipos directivos y los propios profesores. Para ello, se ha establecido un diseño de investigación cualitativa basado en el análisis de las percepciones de los informantes, mediante el cual se han conducido cinco grupos focales en los que han participado cinco miembros de equipos directivos, nueve profesores y nueve estudiantes. El proceso de codificación tanto apriorístico como inductivo del contenido de los grupos focales ha permitido identificar un perfil profesional del buen docente integrado por tres competencias pedagógicas y siete competencias personales que se concretan en 79 actuaciones. La integración de las perspectivas de todos los agentes permite establecer una propuesta comprehensiva del profesor eficaz, al captarse los matices que aporta cada visión particular, sobre la que diseñar nuevas investigaciones y sugerir actuaciones que contribuyan a una formación inicial y permanente de calidad para el profesorado de educación secundaria.

Descriptores: competencias docentes, evaluación del profesorado, grupos focales, investigación cualitativa, eficacia docente.

1. Introduction

The characteristics and skills of teachers are one of the main sources of variation in students' academic performance. Empirical evidence has highlighted that, after controlling the variables associated with students and their families, teachers are the main determining factor of students' academic results, showing a greater influence than classroom- or school-related factors (Hanushek & Woessmann, 2017; Muijs & Reynolds, 2017) and accounting for over half of the variation in said results (Hattie, 2003; Muijs & Reynolds, 2017).

With the firm belief that teachers are an essential part of improving the standard of education and that the quality of any education system is defined by the quality of its individual teachers, the Spanish Ministry of Education and Professional Training has recently (2022) focused the debate around 24 proposed improvements that will guide the reform of teaching in Spain. One of the aims of these proposed improvements is to ensure that all teachers have the necessary skills to perform effectively in the classroom. At the heart of the proposed teaching reform is the need to establish a framework of professional teaching skills, which requires an in-depth analysis of the professional profile of a good teacher.

From a skills-based perspective, a good or effective teacher would have the skills and abilities needed to make a positive contribution, through their teaching, to their students' learning (Smith & Gorard, 2007; Walsh, 2001). Although there is a certain degree of agreement in the literature as to this definition, there is no such consensus when it comes to identifying the specific skills and characteristics that define a good teacher. For example, García-García et al. (2017) identify 11 skills associated with high-quality teaching practice (in-depth and up-to-date subject knowledge, identification and integration of knowledge, adapting to differences, planning and organising work, communication, technology, emotional skills, ethical commitment, leadership, teamwork and the ability to make connections in the community). In turn, Alonso-Sainz (2021) shows how personal skills, followed by teaching skills, emotional skills, social and civic skills and linguistic skills, are the hallmarks of a good teacher. In addition, a review carried out by Villaverde-Caramés et al. (2021) reveals that the defining traits of a good PE teacher are teaching ability, professional performance and commitment, personality traits and subject knowledge.

These studies clearly show a wide spectrum of skills ranging from those most closely related to teaching to those associated with personal skills or the type of training that teachers receive. This results in a broad landscape of professional teaching skills that makes it difficult to establish a commonly accepted skills-based profile of a "good teacher". That said, a distinguishing feature of these studies is that they tend to focus on the more general skills that make a good teacher (the planning and implementation of teaching, classroom management, etc.) without homing in on the specific behaviours into which these skills translate (establishing learning objectives, selecting the right methods and activities, etc.). As a result, to understand which specific actions contribute to improving the academic results of students, we need to turn to studies that focus on specific skills or review-based studies like those carried out by Hattie (2009, 2017) or by Gutiérrez-de-Rozas et al. (in press). These studies allow us to identify both the teaching-related factors and the teacher-related factors that are associated with academic performance. The teaching-related factors include the positive influence of aspects

such as setting targets, planning, selecting the right methods and strategies and feedback. In turn, the teacher-related factors that contribute to better academic results include factors associated with establishing positive interactions with students, the possession of certain personal skills, such as clarity and credibility, and teacher training, especially the role of professional development.

In light of this, the aim of this study is to identify the professional profile of a good secondary school teacher from the perspective of students, members of school management teams and teachers themselves. To do this, starting with the pedagogical and personal skills associated with teaching, the study will then examine the specific actions performed by good secondary school teachers in order to meet the educational needs of their students. This paper is structured as follows: The first section introduces the professional skills that, as per the literature, are essential for teachers. This review will help establish the initial theoretical model used to guide the definition of the professional profile of a good teacher. The second section refers to the method and describes the methodological design created to fulfil the aim of this study and the chosen data analysis strategy. The next section presents the findings of the study, which are then discussed in the "Discussion and conclusions" section.

1.1. Professional teaching skills

In the analysis of professional teaching skills, there is a distinction in the literature between teaching skills and personal skills (Danielson, 2013; Marzano, 2007; Stronge, 2018; Stronge at al., 2011; The Wing Institute, 2019, among others).

Teaching skills cover abilities linked to the planning of teaching, the implementation of teaching, classroom management and organisation and evaluation. Effective *planning* of teaching is based on the correct formulation of learning objectives (Danielson, 2013); reflecting on content so it can be properly organised into lessons and units (Marzano, 2007; Shen et al., 2020); and creating timetables that allow for maximum teaching and learning time (Stronge, 2018). In addition, this last author highlights the positive effects of planning activities and material and of tailoring this planning to the specific needs of students. Good *implementation of teaching* is characterised by aspects such as communicating and discussing the learning objectives and expected outcomes with the students (Marzano, 2007; Williams, 2010); the flexibility to respond to diversity, meeting the individual needs of students (Tapani & Salonen, 2019); the introduction of student-centred activities to encourage the development of new knowledge (Marzano, 2007; Opdenakker & Damme, 2006); and the teacher's engagement with and commitment to learning (Danielson, 2013). *Classroom management and organisation* is linked to planning and complying with the applicable rules and regulations (Marzano, 2007; Williams, 2010); encouraging respectful participation and interaction between

all members of the classroom —creating positive and safe learning environments that foster a sense of belonging and respect (Danielson, 2013; Iglesias-Díaz & Romero-Pérez, 2021; Tapani & Salonen, 2019; Williams, 2019)—; and the layout of space and students within the classroom. Lastly, teaching skills also cover the *evaluation* processes for all assessable aspects (Stronge et al., 2011; The Wing Institute, 2019), the proper planning of these processes (Marzano, 2007) and use of the most suitable evaluation tools and strategies (Williams, 2010). These evaluation processes must lead to the formation of value judgements based on pre-defined evaluation criteria (The Wing Institute, 2019) and the resulting adoption of improvement-related decisions (Williams, 2010).

In relation to the personal skills that characterise effective teachers, the key skills include those linked to professional development, guidance and orientation, leadership, communication, emotional skills and interpersonal relationships. *Professional development* skills are linked to the continuous development of teaching skills and knowledge (Danielson, 2013); personal reflection, the ability to innovate and adapt to change and professionalism (Williams, 2010); and to both knowledge of teaching and subject knowledge (Danielson, 2013). *Guidance and orientation* skills are based on knowledge of the students' skills and abilities, and knowledge of the nature of the education system as a whole and the learning environment (Tapani & Salonen, 2019), in order to provide a personalised response to the needs and interests of each student. *Leadership* skills involve participating in decisions that affect the school, the students, the curriculum and the teachers themselves (Shen et al., 2020). *Emotional* skills involve a combination of knowledge, skills, abilities and attitudes that allow teachers to properly understand, express and regulate both their own emotions and the emotions of others (Bisquerra & Pérez, 2007; The Wing Institute, 2019). Lastly, *communication* is also a key aspect of the teaching/leaning process, and it is important that teachers are able to clearly communicate learning content (Stronge, 2018) and to create interpersonal relationships and collaborate with others (Tapani & Salonen, 2019).

2. Method

In order to achieve the aims of this study, a qualitative research design was created based on an analysis of the participants' beliefs, perceptions and experiences (Creswell & Poth, 2016). To collect the necessary data, five focus groups were conducted with key figures in education such as teachers, members of school management teams and students. It is important to note that although in the Spanish education system, teachers and members of school management teams are usually one in the same, the role of school management teams, together with their broader perspective of the school as a whole, could contribute to providing a subtly different view of the profile of a good teacher.

2.1. Participants

The study participants consisted of five members of school management teams, nine teachers and nine students, organised into five focus groups, as shown in Table 1.

Participants were selected based on their accessibility. In phase one, the research team sent a letter to five secondary schools inviting them to take part in the study. The schools belonged to the group of education centres involved in the UNICEF Spain education programme, which had already expressed an interest in taking part in the study. The education centres involved in this programme strive to integrate the rights of children and global citizenship into both the centre's broader educational mission and the planning of classroom activities, with the aim of maximising the holistic development of each student, encouraging students to see themselves as people with rights and responsibilities and helping create citizens who are aware of and care about the fulfilment of human rights (UNICEF, 2015). The only selection criterion for these schools was the Autonomous Community in which they are located, seeking to ensure the greatest possible geographical variation. The selected schools are in the following regions: Aragon, Catalonia, Castile and Leon, Murcia and Canary Islands. The letter of invitation presented the study and explained the purpose of the focus groups. In turn, it asked for the contact details of the people who would take part in the focus groups. This strategy resulted in the selection of the following participants: five members of school management teams, eight teachers and six students. In phase two, the number of teachers and students was increased to nine through the addition of one teacher and three students who, after learning about the study, wanted to get involved.

TABLE 1. Characteristics of the focus group participants.

FG1 School management	FG2 Teachers	FG3 Teachers	FG4 Students	FG5 Students
SM1 - Female, Castile and Leon	T1 - Male, Castile and Leon	T5 - Female, Castile and Leon	S1- Male, Castile and Leon	S5 - Female, Aragon
SM2 - Female, Aragon	T2 - Male, Aragon	T6 - Male, Aragon	S2- Female, Murcia	S6 - Female, Castile and Leon
SM3 - Male, Murcia	T3 - Male, Extremadura	T7 - Female, Catalonia	S3 - Female, Canary Islands	S7 - Male, Castile and Leon
SM4 - Female, Catalonia	T4 - Female, Catalonia	T8 - Female, Catalonia	S4 - Female, Murcia	S8 - Female, Canary Islands
SM5 - Female, Canary Islands		T9 - Female, Canary Islands		S9 - Female, Castile and Leon

Source: Own elaboration.

The research team sought informed consent to take part in the study from all teachers and members of school management teams, and from the parents, guardians or legal representatives of the students.

2.2. Data collection

The group sessions were held in June 2021, using Microsoft Teams, and each session lasted for approximately 90 minutes. The five focus groups were recorded and then typed up. To guarantee the anonymity of study participants, all personal data or information was encoded.

The design of the script for the focus groups was based on the teaching skills and personal skills identified in the literature review. The format was semi-structured with 15 open-ended questions that guided the course of the sessions and covered all the skills referred to in this study. These questions also provided the flexibility for several extended responses and for the participants to voice all of the actions that they felt are characteristic of a good teacher. Annex 1 provides the dimensions (skills) that informed the design of the script and the associated questions.

2.3. Data analysis

The coding process followed a mix categorisation system split into two phases: a deductive phase and an inductive phase. Firstly, based on the literature review, a codebook was created that included the behaviours associated with each of the evaluated skills. Secondly, categories that emerged from the focus groups but that had not been identified in the initial stage (emerging categories) were added to the a priori categories. Accordingly, the focus group content was coded using both a priori or deductive and open or inductive processes. Scientific rigour and the reliability of the results were ensured though researcher triangulation during the data coding and interpretation processes (Carter et al., 2014). As such, two researchers independently coded the interventions and subsequently shared their interpretations of the initial and emerging categories in order to develop an intersubjective understanding of the analysed data. The data analysis was conducted using ATLAS.ti 9 software. The a priori and emerging categories are presented in tables 2–5 along with the study results.

3. Results

The follow section presents the actions of secondary school teachers that school management teams, teachers and students believe contribute to ensuring that the educational needs of students are properly met.

The results have been organised according to the four dimensions analysed in the study: planning and implementation of teaching, classroom management and organisation, evaluation of learning and personal skills. There is a table for each dimension showing the a priori and emerging actions identified by the three different groups of participants. The interpretation of this information is accompanied by representative quotes extracted from the participants' discussions. The results are presented accord-

ing to the different types of participants, meaning that the codes identified in the two focus groups with students are reported altogether, as are the codes extracted from the two focus groups with teachers.

3.1. Planning and implementation of teaching

An overview of Table 2 shows that the teachers identified the highest number of behaviours associated with the planning and implementation of teaching.

TABLE 2. Planning and implementation of teaching.

Categories	Actions	SM	T	S
Effective lesson planning	Sets learning objectives		•	
	Defines the teaching methods and the learning activities to be carried out			
	Plans the teaching according to the prior knowledge of the students		•	
	Organises the syllabus into coherent lessons or teaching units	•		•
	Takes into account student diversity when planning lessons	•	•	
Communication of objectives and teaching methodology	Discusses and analyses expected outcomes with the students	•	•	•
	Informs students of the teaching methods and the learning activities to be carried out *		•	•
Flexibility in the implementation and development of learning in response to student diversity	Adjusts the implementation of learning for students with special educational needs (SEN)		•	•
	Effectively responds to the teaching and learning needs that arise in the classroom	•	•	•
	Tailors the pace of learning to the students' ability to assimilate the content		•	•
	Applies the most suitable methods depending on the learning objectives	•	•	•

Student-centred learning	Engages in facilitating active learning and guiding the work of students	•	•
	Connects classroom-based learning to real-life scenarios		•

* Emerging category not included in the initial codebook.
SM: School management team member. T: Teacher. S: Student.

Source: Own elaboration.

The detailed analysis of these categories shows how the actions related to *effective lesson planning*, which largely focus on establishing clear, easy-to-understand and achievable objectives tailored to the characteristics of the students, were mainly referred to by the teachers. In turn, the students and members of school management teams highlighted the importance of organising the syllabus into coherent units. In addition, the students stressed the need for teachers to be flexible in their teaching and learning processes, in order to adapt the content to the specific needs of the learners.

Regarding the *communication of objectives and teaching methodology*, there were numerous comments that supported the two actions for this category — *discusses and analyses expected outcomes with the students and informs students of the teaching methods and the learning activities to be carried out* —. This second action was not included in the initial proposal but its presence in the focus groups with both teachers and students meant it was included as an emerging category. In any case, on the one hand, according to the students, a good teacher should ensure that students understand why they are learning and to what end, in addition to giving them an active role in decisions about the organisation of learning content. On the other hand, the teachers focused on the need for students to understand both the objectives that guide their learning processes and the methods and timetable for achieving these objectives:

> They need to know exactly what they're going to be asked to do, what the objectives are, what you're going to do and a minimum time frame. Saying: 'look, we're going to be doing this until such a date and you're going to be assessed on this' (T2).

The importance of ensuring *flexible implementation and development of learning in response to student diversity* was highlighted by all participants. There was also particular reference to the following actions: *Effectively responds to the teaching and learning needs that arise in the classroom* and *applies the most suitable methods depending on the learning objectives*. In this respect, all participants mentioned the importance of giving individual attention to each student and of adapting teaching methods and activities to the specific needs identified at any given time:

> "They should go step by step and always adapt to the least able student in the class or, at least, spend a bit more time with them" (S1).

In turn, students agreed that good teachers often use active methods and do activities outside of the classroom that help them to learn better.

Lastly, behaviours associated with *student-centred learning* were identified in the focus groups with members of school management teams and, in particular, in the focus groups with teachers. Both these groups felt that a good teacher *engages in facilitating active learning and guiding the work of students*, so that students come to direct their own learning processes:

> I think they have every right to be involved in what we're going to..., no I mean transfer to them: it's not so much now about teaching but about how to learn, so that they can be the true protagonists (SM3).

In turn, teachers alluded to the importance of *connecting classroom-based learning to real-life scenarios*, in relation to academic performance, as it allows students to appreciate the usefulness and appeal of the content:

> Our students [...] what they are going to work on and see why it is useful, because if we start planning but, in the end, they don't see why it's useful, in a sense this dilutes the objectives that we've set (T8).

3.2. Classroom management and organisation

The results presented in Table 3 show the level of interest in this skill from school management teams, teachers and students. The majority of the actions associated with this skill were referred to in all of the focus groups.

TABLE 3. Classroom management and organisation.

Categories	Actions	SM	T	S
Rules and procedures	Establishes the rules and procedures to be followed in the classroom	•	•	•
	Checks that the rules are understood and accepted by the students	•	•	
	Monitors and requires compliance with the established rules and procedures		•	•
	Establishes mechanisms for students who do not follow the rules		•	•
Creation of a positive learning environment	Creates a learning-friendly working environment in the classroom	•	•	•
	Promotes an atmosphere of respect and confidence in the classroom	•	•	•
	Fosters intercommunication between students *	•	•	•
	Encourages collaboration between students *	•	•	•
	Motivates students	•	•	•

Layout of space and students within the classroom	Organises the layout of the classroom according to the scheduled content and activities	•	•
	Uses effective grouping strategies		

* Not included in the initial coding.
SM: School management team member. T: Teacher. S: Student.

Source: Own elaboration.

The analysis of the above-mentioned categories produced some interesting information. In relation to the *rules and procedures* category, all three groups of participants agree that a good teacher *establishes the rules and procedures to be followed in the classroom*:

> For many of our boys and girls, school is the greatest source of structure. The most secure place, a place with boundaries, where they know: 'What's happening next? What do I do next? Who am I seeing next?' (SM4).

> [A good teacher] needs to be quite demanding when it comes to the rules (S2).

According to the teachers, these rules should be established in agreement with students. In turn, both the teachers and the students stressed the importance of ensuring compliance with these rules and of establishing mechanisms for when the rules are not followed. In this respect, the students highlighted the need for teachers not to be too strict but to ensure that the main rules are followed and to guarantee respect in the classroom.

The behaviours for the *creation of a positive learning environment* were broadly supported by the participants, and all actions were referenced by all three groups. Notable importance was given to the creation of an emotionally safe space that prioritises confidence, respect and zero judgement of mistakes, and to providing the right degree of motivation for students to feel they can successfully carry out the work assigned to them. In this category, two actions emerged from the focus groups that were not included in the initial coding: *fosters intercommunication between students* and *encourages collaboration between students*, which would justify the importance of teachers encouraging their students to express and share what they've learnt and to voice any concerns or doubts in a safe space:

> ... get everyone involved, create a really friendly environment (S2).

> ... creating an atmosphere in the classroom where everyone feels comfortable and secure, where they feel they can speak up and share without that added pressure (T8).

> The ability to create a team, where they feel that the group is a team (SM2).

Lastly, it is interesting to note that the participants only referred to one of the actions related to the *layout of space and students within the classroom*. Specifically, it was the teachers and members of school

management teams who highlighted the need to organise the layout of the classroom according to the teaching content, the proposed activities and the specific needs of the students, within the limits of the organisation and layout of the school as a whole.

3.3. Evaluation of learning

The results presented in Table 4 show how, unlike the other two groups of participants, the teachers referred to practically all of the actions associated with this skill that had been identified in the literature review.

TABLE 4. Evaluation of learning.

Categories	Actuaciones	SM	T	S
Planning and communication of the evaluation process	Establishes an evaluation system for the subject which sets out the procedures to follow, the evaluation criteria and the tools to be used			•
	Shares the evaluation system (with students and their families)		•	•
Learning-centred evaluation	Encourages the self-assessment of learning	•	•	•
	Introduces co-evaluation mechanisms		•	
	Performs skills-based assessments	•	•	
Points in the evaluation process	Performs an initial assessment of the students' level of knowledge and their needs regarding the subject	•	•	
	Systematically records assessable events in the classroom and the students' attitudes towards the learning (continuous evaluation)	•	•	•
	Verifies the acquisition of new knowledge through a range of final evaluation tests		•	•
Evaluation tools	Selects (or designs) appropriate evaluation tools		•	
Making value judgements about the available information	Cross-references the collected information with the pre-defined evaluation criteria		•	
	Performs a qualitative assessment of the collected information		•	•
	Marks, gives a grade to, the students based on the results of the various evaluations		•	

Decision-making based on the evaluation results	Aligns the design of the syllabus with the interests and needs of the students in light of the evaluation results		•	
	Designs activities that allow students who have not met the planned objectives to overcome the detected learning obstacles		•	•
	Goes back over pre-delivered content if it appears that students have not fully grasped the content		•	
	Adjusts the syllabus planning with a view to future academic years		•	
Communication of evaluation results	Provides students with regular information about their strengths and weaknesses, with associated suggestions for improvement			
	Reflects on the evaluation results with the students	•	•	•
	Shares the students' evaluation results with their families	•	•	
	Meets with families to discuss the evaluation results		•	

* Not included in the initial coding.
SM: School management team member. T: Teacher. S: Student.

Source: Own elaboration.

Regarding the *planning and communication of the evaluation process*, the teachers and students felt that a good teacher should be transparent about the evaluation process so that students are always aware of both the evaluation criteria and the established timetable.

In terms of the *learning-centred evaluation* category, all participants felt that encouraging the self-assessment of learning was a trait of an effective teacher, as it allows students to become more aware of their own learning process. In connection to this, the teachers also highlighted the importance of co-evaluation processes:

> ... and it was this idea of self-assessment that means that the students are aware of their achievements, what they've accomplished, what they didn't know and what they've learnt [...] it's a truly motivating form of evaluation (SM3).

> They assess themselves, they themselves based on an activity they know where they need to get to, what the objective is. They know how to evaluate themselves using assessment rubrics that we plan out (T4).

In terms of the *points in the evaluation process*, the three groups commented that a good teacher *systematically records assessable events in the classroom and the students' attitudes towards the learning*. This action, related to the continuous evaluation of learning, earned a broad consensus across the three groups as participants felt that, while exams were necessary, they should not be the only form of evaluation:

> I think it's always good to evaluate someone based more on the effort put in rather than the exam results (S8).

> Every thing's taken into account: day-to-day work, who does their homework, effort, respect, enthusiasm for the subject, the challenges they face [...] I don't think you just evaluate on any one given day: I think nearly all of us or all of us agree that we evaluate our students every day (T2).

In contrast, the *evaluation tools* category was barely touched on by the participants, nor were the actions linked to *decision-making based on the evaluation results* or *making value judgements about the available information*. The only reference made in relation to this category was the importance of providing a qualitative evaluation of the collected information, which would allow students to understand their mistakes and improve future performance.

Lastly, in relation to the *communication of evaluation results*, the three groups expressly referred to the importance of teachers reflecting on the evaluation results with their students. The participants (especially the students) stressed the need for teachers to address students individually when talking to them, preferable on a one-on-one basis, about their evaluation results. This action came up in the different focus groups, with some very significant comments:

> You see, I like to feel a close relationship with my teacher, they call you over, you grab a chair, sit down face to face and they explain what mark you got [...] they say: 'Now, your exam...'. They look at it with me, tell me what mark I got, what I need, what I have to learn, etc. They treat me like I'm someone special (S7).

> ... speaking personally with the students, as individually as possible, grabbing a quick five minutes with each of them to explain how they've been doing over the term (T2).

3.4. Personal skills

A lot of the focus group content is centred around personal skills (Table 5), and the importance of these skills in the profile of a good teacher is reflected in the volume and variety of the actions that emerged from these sessions.

As expected, it was the members of school management teams and, especially, the teachers who identified the most actions associated with *professional development*. On the whole, these were related to aspects such as ongoing training and adaptation to change resulting from societal developments and, ultimately, the needs and interests of students. All three groups agreed on several actions, including that a good teacher *has up-to-date knowledge of their subject* and *shows a permanent commitment to the teaching profession*. There was a broad consensus that a good teacher should love their job and believe in it, transmitting a sense of enjoyment in the classroom. In this respect, the participants highlighted that a good teacher must "fully believe in their work" (T9), have a "passion for their job" (S2) and a "willingness to serve" (SM3).

TABLE 5. Personal skills.

Categories	Actions	SM	T	S
Professional development	Shows an interest in their professional development (attends courses, shares experience, etc.)	•	•	
	Transfers the knowledge gained from their training to the classroom		•	
	Adopts new teaching techniques and methods (educational innovation)			
	Reflects on their teaching practice and educational ideals	•	•	
	Displays an ability to adapt to change in their role as a teacher		•	
	Shows a permanent commitment to the teaching profession	•	•	•
	Has strong digital skills and incorporates technology in the development of educational processes	•		
	Has up-to-date knowledge of their subject	•	•	•
	Displays extensive pedagogical knowledge		•	
Guidance and orientation	Finds out about the personal, social and family circumstances of their students, as well as their academic and professional skills and interests.	•	•	•
	Coordinates with other professionals in order to contribute to the academic, personal and professional guidance of students *	•	•	
	Informs and advises students about different academic and professional options		•	•
	Plans the transition between different educational stages	•		
	Offers individual attention to students and their families	•	•	•

Leadership	Participates in decisions about the running and management of the school	•	•	
	Participates in decisions about things that affect the life of students at the school	•	•	
	Participates in decisions about the curriculum, instruction and evaluation		•	•
	Participates in decisions about things that affect the teaching staff	•	•	
Communication	Clearly communicates content to students		•	•
	Makes an effort to ensure that challenging content is understood			•
	Adapts use of language depending on different situations and who they are communicating with			•
	Shows good questioning skills			
	Communicates with enthusiasm		•	•
Emotional skills	Considers the needs, motivations and interests of students and acts accordingly	•	•	•
	Listens to students and builds trust with them		•	•
	Seeks to understand the complex reasons behind certain behaviours	•	•	
	Shows concern for the physical and emotional wellbeing of students	•	•	•
	Is tolerant of the mistakes of others		•	
	Is interested in understanding their own emotional wellbeing	•		

Interpersonal relationships	Forms positive relationships with students		•	•
	Works as a team with other teachers	•	•	•
	Establishes direct contact with families	•	•	•
	Collaborates with other members of the education community outside of the school setting			
Professional ethics	Acts fairly in evaluations *		•	•
	Treats all students in a fair and respective manner, making no distinctions *		•	
	Shows consistency between what is transmitted in the classroom and how they act *	•	•	•

* Not included in the initial coding.
SM: School management team member. T: Teacher. S: Student.

Source: Own elaboration.

As for *guidance and orientation*, the three groups felt that a good teacher should find out about the characteristics, skills and interests of their students and offer individual attention to students and their families. In this respect, the participants agreed on the importance of listening to and understanding the needs of students. Interestingly, there was one action that was not included in the initial theoretical model but that was identified by two members of the focus groups with school management teams and teachers: *coordinating with other professionals in order to contribute to student guidance*. Lastly, both the students and the teachers felt that a good teacher informs and advises their students about the different academic and professional pathways that are available to them and that are best suited to their needs and interests:

> A good teacher knows you; they know more or less what you're good at and what you're not so good at. So, they should know how to advise you and know if you're better at science or humanities, for example, and tell you if next year you'd be better off taking one route or another (S2).

In terms of *leadership* skills, it was the teachers who mentioned the most actions, and these actions were mainly associated with the importance of teachers *participating in decisions about the running of the school*. In contrast, the students only

alluded to the need for a good teacher *to participate in decisions about the curriculum, instruction and evaluation*, highlighting that it was important for teachers to choose which textbooks they will be using in the classroom.

A detailed analysis of the results for *communication* shows how members of school management teams made no reference to any of the actions associated with this skill. In contrast, the student focus groups referred to all of the actions associated with this skill, except for *shows good questioning skills,* which was not mentioned by any of the three groups. Actions associated with *clearly communicating content* and *communicating with enthusiasm* were identified in the focus groups with teachers and, mainly, with students, producing comments such as: "...that they tell it with passion and know how to communicate it to students" (S2), "...that they know how to properly explain the subject" (S6) and that they know how to "communicate with enthusiasm and joy" (T1).

The various actions that make up *emotional skills* received a lot of attention, with a focus on the importance of aspects such as trust, listening and caring about the students' problems. In addition, there was a broad consensus on the following two actions: firstly, *considering the needs, motivations and interests of students and acting accordingly*, with empathy and closeness emerging as especially valuable skills; and secondly, *showing concern for the physical and emotional wellbeing of students*. It was the students who went into most detail on both these aspects:

> Teachers should realise and say: 'hey, are you okay?' This question makes a big difference. When someone sits down to talk to you [...] and they ask: 'Are you okay? Would you like some help? Did you understand what we looked at in class? Do you want me to talk to your parents? Do you want me to do anything?' Even if you don't take them up on the offer or you don't even answer them, this makes you feel so good (S8).

As for the behaviours of an effective teacher in relation to *interpersonal relationships*, the groups highlighted, on the one hand, *working as a team with other teachers*, in indicating that a good teacher should coordinate with others and work collaboratively; and, on the other hand, *establishing direct contact with families*. In this respect, all participants stressed the importance of establishing "more direct contact with parents" (SM1) and an "ongoing connection between families" (T8).

The final section of the analysis of personal skills looked at the *professional ethics of teaching*, which were not initially considered but ended up encapsulating a range of behaviours that emerged from the focus groups. Some of these were broadly supported, such as *showing consistency between what is transmitted in the classroom and how teachers act*. In this respect, the participants stressed the importance of a good teacher setting an example for the students' development of their own personal values.

4. Discussion and conclusions

Taking a holistic approach, with the participation of three key groups in the education process, this study explored the professional profile of a good secondary school teacher. The qualitative analysis of the views of students, members of school management teams and teachers about the profile of a good teacher enabled a range of characteristic behaviours to be defined for the figure of this teacher. As such, checking the initial theoretical model against the empirical data collected from the five groups gave rise to 79 effective actions associated with three teaching skills (44 actions) and seven personal skills (35 actions).

The results show that most of the behaviours associated with being a good teacher that were identified during the literature review were supported empirically through the comments in the focus groups. This reflects the strong empirical correlation of the initial theoretical model, adding weight to the study proposal. In turn, the extensive analysis of the focus group discussions resulted in the inclusion of various behaviours that were not initially considered but which emerged directly from the focus groups. Those associated with professional ethics are of particular note, having received a broad consensus across all three groups. These findings coincide with the findings of the study by Reoyo et al. (2017), where personal ethics are identified as a characteristic skill of effective teachers. A final subgroup of behaviours associated with a good teacher would cover the a priori behaviours that, having emerged in the literature as characteristic of effective teachers, were not supported with empirical evidence from the focus groups. This was the case with the following behaviours: defines the teaching methods and the learning activities to be carried out (Stronge, 2018), uses effective grouping strategies (Williams, 2010), provides students with regular information about their strengths and weaknesses, with associated suggestions for improvement (Stronge, 2018; Williams, 2010), adopts new teaching techniques and methods (Reoyo et al. 2017; Tapani & Salonen, 2019), shows good questioning skills (Stronge, 2018) and collaborates with other members of the education community outside of the school setting (Tapani & Salonen; 2019). This does not necessarily mean that these behaviours should be discarded as characteristic of a good teacher, as the fact that they did not emerge in the focus groups in this study is no obstacle to them being considered as defining traits of good teaching practice. Complementary and representative studies would be required to form any conclusions in this respect.

A further contribution made by this study is the integration of the views of members of school management teams, teachers and students. This offers an additional dimension as it means certain behaviours can be identified that would only be perceptible from the viewpoint of the teachers themselves and of what they feel makes a good teacher. In this respect, a key finding is the signif-

icant number of behaviours associated with academic evaluation that emerged, exclusively, from the focus groups with teachers. The identification of these behaviours could shed light on the behind-the-scenes work of a "good teacher", often neglected in research projects that analyse the profile of an effective teacher from a broader perspective. This approach does not often allow for an analysis of all the behaviours associated with the evaluated skills and does not often consult the main parties involved. In addition, the focus group with members of school management teams led to the identification of behaviours associated with the students' transition through different stages of education, the digital skills of teaching staff and the wellbeing of teachers. This group's focus on these behaviours could be due to its organisational outlook and its concern with the overall running of the school. The last two behaviours could also be linked to the adaptation and restructuring required due to the health crisis caused by COVID-19. Lastly, the students were the only group to refer to establishing an evaluation system that provides full details of the evaluation procedures, criteria and tools, and to the need for teachers to make the content understandable and to adapt their use of language. All these behaviours are linked to daily school life and experiences (what is expected of me and what I need to learn), which appears to be of singular important to the students.

The individual opinion of each member of the education community as to what makes a "good teacher" requires scientific research to consider the perspective of all relevant audiences. Studies that focus on the views of a particular group will produce a biased portrayal of an effective teacher that fails to draw on other highly significant perspectives. The complexity of the professional profile of an effective teacher requires in-depth studies that take in the big picture and respond to the reality of teaching and the particular circumstances under which teachers work. Although this study has attempted to provide this broad overview, it is not without its limitations. For example, certain criteria, such as age, gender or ownership of the school were not considered in the selection of participants. The inclusion of these criteria would have allowed for an analysis of potential nuanced differences based on the specific characteristics of the participants. On the other hand, the number of focus groups in the field work of the study was established a priori and, as such, data saturation was not tested. That said, the vast majority of the categories established a priori were covered in the groups and not many new categories emerged from the discussions. This could well point to a high degree of saturation, which would need to be tested in future studies. Although the qualitative research design of this study does not allow any generalisations to be made about the professional profile of a good secondary school teacher, it does provide an interesting point of reference for further research and for reflecting on the qualification and professional training of teachers in order for them to best encourage and facilitate their students' acquisition of knowledge.

ANNEX 1. Initial dimensions and questions included in the script.

Dimension (Skill)	Questions
Planning and implementation of teaching	1. What do you think a good teacher would do when planning and implementing their teaching? *Planning of teaching:* 2. What strategies would a good teacher use to plan their teaching? *Implementation of teaching:* 3. What type of things would a good teacher do to ensure that this planning can be adapted to the students' pace of learning and the teaching or learning needs that arise in the classroom?
Classroom management and organisation	4. What things would a good teacher consider when managing and organising the classroom in order to encourage learning? 5. How can a good teacher set rules and procedures for the classroom and ensure that students abide by these rules? How can a good teacher promote participatory and respectful interaction among all members of the group? 6. How can teachers effectively design different learning environments according to the activities to be carried out?
Evaluation of learning	7. What elements related to the evaluation process should a teacher consider to make sure that evaluation is a means of improving academic performance? 8. When should evaluation take place? What could be some effective strategies for gathering information about student performance? 9. How should information about the evaluation system be shared with students? And how should the results be shared?
Personal skills	10. What personal skills do you think a good teacher should have? *Professional development:* 11. What actions associated with a teacher's own development and professional training could have a positive impact on their teaching practice and, consequently, on their students' results? *Guidance and orientation:* 12. What can teachers do to guide and advise their students through their learning processes? *Leadership:* 13. Which decision-making processes do teachers need to be involved in considering the potential repercussions of these decisions on the students' academic performance? (For example, decisions about the running of the school, student life, selection of teaching material, etc.) *Communication / Emotional skills / Interpersonal relationships:* 14. Other personal skills associated with a good teacher include their ability to communicate clearly, to understand the emotions and needs of students and to form effective interpersonal relationships with other members of the education community. What elements associated with these skills could have, in your opinion, the biggest impact on the learning of students?
Other skills	15. What other skills or traits in teachers do you think could have a positive effect on the academic results of students and, as such, could enhance their learning?

Source: Own elaboration.

References

Alonso-Sainz, T. (2021). ¿Qué caracteriza a un «buen docente"? Percepciones de sus protagonistas [What characterises a "good teacher"? Perceptions of its protagonists]. *Profesorado, Revista De Currículum Y Formación Del Profesorado*, *25* (2), 165-191. https://doi.org/10.30827/profesorado.v25i2.18445

Bisquerra, R., & Pérez, N. (2007). Las competencias emocionales [Emotional competences]. *Educación XX1, 10*, 61-82. https://doi.org/10.5944/educxx1.1.10.297

Carter, N., Bryant-Lukosius, D., DiCenso, A., Blythe, J., & Neville, A. (2014). The use of triangulation in qualitative research. *Oncology Nursing Forum, 41* (5), 545-547.

Creswell, J. W., & Poth, C. N. (2016). *Qualitative inquiry and research design: Choosing among five approaches*. Sage Publications.

Danielson, C. (2013). *The framework for teaching evaluation instrument*. https://bibliotecadigital.mineduc.cl/handle/20.500.12365/17302

García-García, M., Biencinto, C., Carpintero, E., Villamor, P., Camilli, C., Pastor, L., Serrano, S., Huetos, M., Núñez, C., Arias, J., Bravo, J. L, Caravantes, A., del Mazo, J. C., Martínez, S., Sánchez, J. A., González, D., Arias, J. M., Pérez, H., Burguera, J., … & Ramos, G. (2017, June 28-30). Assessment of teaching competences for inclusion and excellence: preliminary results on teachers' perceptions. XVIII International Congress of Educational Research: Interdisciplinarity and Transfer AIDIPE, Salamanca, Spain. https://aidipe2017.aidipe.org/files/2017/07/ACTAS_AIDIPE_2017.pdf

Gutiérrez-de-Rozas, B., López-Martín, E., & Carpintero Molina, E. (in press). Condicionantes del rendimiento académico: meta-síntesis de 25 años de meta-análisis. *Revista de Educación, 398*.

Hanushek, E. A., & Woessmann L. (2017). School resources and student achievement: A review of cross-country economic research. In M. Rosén, K. Y. Hansen, & U. Wolff (Eds), *Cognitive Abilities and Educational Outcomes. Methodology of Educational Measurement and Assessment* (pp. 149-171). Springer. https://doi.org/10.1007/978-3-319-43473-5_8

Hattie, J. (2003, October). *Teachers make a difference, what is the research evidence?* [Paper presentation]. Building teacher quality: What does the research tell us. ACER Research Conference, Melbourne, Australia. https://research.acer.edu.au/research_conference_2003/4/

Hattie, J. (2009). *Visible learning: A synthesis of over 800 meta-analyses relating to achievement*. Routledge.

Hattie, J. (2017). *Visible learning plus. 250+ influences on student achievement*. https://visible-learning.org/wp-content/uploads/2018/03/250-Influences-Final-Effect-Size-List-2017_VLPLUS.pdf

Iglesias-Díaz, P., & Romero-Pérez, C. (2021). Aulas afectivas e inclusivas y bienestar adolescente: una revisión sistemática [Emotional and inclusive classrooms and adolescent well-being: A systematic review]. *Educación XX1*, *24* (2), 305-350. https://doi.org/10.5944/educXX1.28705

Marzano, R. J. (2007). *The art and science of teaching: A comprehensive framework for effective instruction*. ASCD.

Ministerio de Educación y Formación Profesional (2022). *Documento para debate. 24 propuestas de reforma para la mejora de la profesión docente [Discussion Paper. 24 reform proposals for the improvement of the teaching profession]*. https://educagob.educacionyfp.gob.es/dam/jcr:adf4f050-9832-4a88-9cd2-96cd3519c664/documento-de-debate-24-propuestas-de-reforma-profesi-n-docente.pdf

Muijs, D., & Reynolds, D. (2017). *Effective teaching: Evidence and practice*. Sage.

Opdenakker, M. C., & Van Damme, J. (2006). Teacher characteristics and teaching styles as effectiveness enhancing factors of classroom practice. *Teaching and teacher education*, *22* (1), 1-21. https://doi.org/10.1016/j.tate.2005.07.008

Reoyo, N., Carbonero, M. Á., & Martín, L. J. (2017). Características de eficacia docente desde las perspectivas del profesorado y futuro profesorado de secundaria [In-service and preservice teachers´ perceptions of characteristics of effective secondary school teachers]. *Revista de Educación, 376*, 62-86. https://doi.org/10.4438/1988-592X-RE-2017-376-344

Shen, J., Wu, H., Reeves, P., Zheng, Y., Ryan, L., & Anderson, D. (2020). The association between teacher leadership and student achievement: A meta-analysis. *Educational Research Review*, *100357*, 1-19. https://doi.org/10.1016/j.edurev.2020.100357

Smith, E., & Gorard, S. (2007). Improving teacher quality: Lessons from America's *No child left behind*. *Cambridge Journal of Education, 37* (2), 191-206. https://doi.org/10.1080/03057640701372426

Stronge, J. H. (2018). *Qualities of effective teachers*. ASCD.

Stronge, J. H., Ward, T. J., & Grant, L. W. (2011). What makes good teachers good? A cross-case analysis of the connection between teacher effectiveness and student achievement. *Journal of teacher Education*, *62* (4), 339-355. https://doi.org/10.1177/0022487111404241

Tapani, A., & Salonen, A. O. (2019). Identifying teachers' competencies in Finnish vocational education. *International Journal for Research in Vocational Education and Training*, *6* (3), 243-260. https://doi.org/10.13152/IJRVET.6.3.3

UNICEF (2015). *Cuaderno de integración curricular de Educación en Derechos*. https://www.unicef.es/educa/biblioteca/guia-integracion-curricular-educacion-derechos-infancia

Villaverde-Caramés, E. J., Fernández-Villarino, M. Á., Toja-Reboredo, B., & González-Valeiro, M. Á. (2021). Revisión de la literatura sobre las características que definen a un buen docente de Educación Física: Consideraciones desde la formación del profesorado [A literature review of the characteristics that define a good physical education teacher: considerations from teacher training]. *Retos, 41*, 471-479. https://doi.org/10.47197/retos.v0i41.84421

Walsh, K. (2001). *Teacher certification reconsidered: Stumbling for quality*. The Abell Foundation.

Williams, R. E. (2010). *Administrator and teacher perceptions of the qualities of effective teachers*. The College of William and Mary.

The Wing Institute (2019). *Teacher Competencies*. https://www.winginstitute.org/quality-teachers-compentencies

Authors' biographies

Esther López-Martín has a PhD in Education Science from Universidad Complutense de Madrid (UCM). Since 2019, she has worked as an associate professor at the Department of Research and Diagnostic Methods in Education II at Universidad Nacional de Educación a Distancia (UNED). Her main lines of research focus on the evaluation of students' academic performance and the associated factors, with a special focus on the characteristics and skills of teachers.

https://orcid.org/0000-0002-0367-2019

Belén Gutiérrez-de-Rozas holds a degree in Pedagogy (special prize) from UNED and a Master's in Educational Psychology (academic excellence grant) from UCM. She is currently a trainee researcher at the Department of Research and Diagnostic Methods in Education II at UNED. Her research focuses on the study of failing to achieve the minimum level of academic qualification and early school leaving.

https://orcid.org/0000-0003-4210-3270

Andrea Otero-Mayer holds a degree in Social Education from UNED, for which she was awarded a special degree prize. In February 2019, she joined the Department of Research and Diagnostic Methods in Education II at UNED, after being awarded pre-doctoral financial support for research training. She carried out two research periods at Universidade do Porto in 2021 and 2022, and she

was awarded a PhD with a distinction cum laude, continuing her work under a post-doctoral contract.

https://orcid.org/0000-0002-6093-6543

Eva Expósito-Casas holds a PhD in Education from UCM. She is currently an associate professor at the Department of Research and Diagnostic Methods in Education II at UNED. She is a member of the UCM MESE research group, which researches the measurement and evaluation of education systems, and the GRISOP research group, which researches educational and career guidance systems and the skills of guidance professionals.

https://orcid.org/0000-0002-9884-6148

Improving socio-emotional competencies in pre-school pupils through emotional education

Mejora de las competencias socioemocionales en alumnos de educación infantil a través de la educación emocional

Noelia SALAS ROMÁN. Teacher. CEIP Pérez de Hita state primary school *(noelasalroman@hotmail.es)*.
Margarita ALCAIDE RISOTO, PhD. Associate Professor. Universidad Camilo José Cela *(malcaide@ucjc.edu)*.
Carlos HUE GARCÍA, PhD. Psychologist *(carloshuegarcia@gmail.com)*.

Abstract:

Working with pupils on appropriate social-emotional education in schools will bring numerous benefits for human beings and for the society of the future (Monjas and González, 2000). The objective of this research is to verify to what extent the students who participate in the programme significantly improve their emotional and social competence. The method used was a quasi-experimental pre-test/post-test design with a non-equivalent control group. Statistical analysis was performed using IBM SPSS software (version 25.0) and the EXCEL spreadsheet (Microsoft Office 2019) and the non-parametric Wilcoxon and Mann Whitney test was used to see if there were statistically significant differences between the different groups. A total of 173 5-year-old pupils participated in the study, of which 89 were from the experimental group and 84 from the control group, all of them from Murcia (Spain). The experimental group was enrolled in the Annual Emotional Intelligence Programme (EMOTI[1]) (Hurtado and Salas, 2019), and the measuring instrument used was the questionnaire for students on social competence (Caruana and Tercero, 2011). The results showed that the children who participated in the study were less aggressive and showed greater social and communicative competence. After the programme, the pupils in the experimental group interact with each other in a more sociable way and better express their emotions; they develop less violent behaviour and better know how to resolve conflict situations, which has a very positive impact on their emotional and social development.

Revision accepted: 2022-07-07.
This is the English version of an article originally printed in Spanish in issue 283 of the **revista española de pedagogía**. For this reason, the abbreviation EV has been added to the page numbers. Please, cite this article as follows: Salas Román, N., Alcaide Risoto, M., & Hue García, C. (2022). Mejora de las competencias socioemocionales en alumnos de educación infantil a través de la educación emocional | I*mproving socio-emotional competencies in pre-school pupils through emotional education. Revista Española de Pedagogía, 80* (283), 517-532. https://doi.org/10.22550/REP80-3-2022-05
https://revistadepedagogia.org/ ISSN: 0034-9461 (Print), 2174-0909 (Online)

Keywords: violent behaviour, emotional intelligence, infant education, social competencies, conflict.

Resumen:

Trabajar una adecuada educación socioemocional en las escuelas con los alumnos va a reportar numerosos beneficios para el ser humano y para la sociedad del futuro (Monjas y González, 2000). El objetivo de esta investigación es comprobar en qué medida los alumnos que participan en el programa mejoran significativamente su competencia emocional y social. El método que se utilizó fue un diseño cuasiexperimental pretest-postest con grupo control no equivalente. Se realizó el análisis estadístico mediante el software IBM SPSS (versión 25) y se utilizó la prueba no paramétrica de Wilcoxon y Mann Whitney para ver si había diferencias estadísticamente significativas entre los diferentes grupos. En el estudio participaron un total de 173 alumnos de 5 años, de los cuales 89 eran del grupo experimental y 84 pertenecientes al grupo control, todos ellos de Murcia (España). Al grupo experimental se le aplicó el Programa Anual de Inteligencia Emocional (EMOTI[1]) (Hurtado y Salas, 2019) y el instrumento de medida utilizado fue el cuestionario dirigido a alumnos sobre competencia social (Caruana y Tercero, 2011). Los resultados manifestaron que los niños que participaron en el estudio son menos agresivos y tienen mayor competencia social y comunicativa. Tras la aplicación del programa los alumnos del grupo experimental interactúan entre sí de manera más sociable y expresando sus emociones; desarrollan menos conductas violentas y saben resolver situaciones de conflicto, lo que repercute muy positivamente en su desarrollo emocional y social.

Descriptores: conductas violentas, inteligencia emocional, educación infantil, competencias sociales, conflicto.

1. Introduction

The term 'emotional intelligence' has its precedent in what has been defined as social intelligence (Rodríguez, 2013).

Within the field of psychology, specifically that of learning, Thorndike (1920) formulates the term 'social intelligence' as "the ability to understand and manage men and women, boys and girls —to act wisely in human relations" (p. 228).

Social intelligence, according to Bisquerra (2009), refers to:

> A model of personality and behaviour which includes a series of elements such as social sensitivity, communication, social understanding, moral judgement, resolution of social problems, a pro-social attitude, empathy, social skills, expressiveness, an understanding of people and groups, getting along with people, being warm and caring towards others, being open to new experiences and ideas, the ability to gain perspective, knowledge of social norms, social adaptability, etc. (p. 122).

The origin of the term 'emotional intelligence' began with Gardner's theory (1983), as it was included for the first time

in the concept of intelligence in social relationships and personal skills. According to this author, along with other kinds of intelligence, there are interpersonal and intrapersonal intelligences, which are the foundation of what we now know as emotional intelligence. Taking this significant influence on intelligence as the starting point, the theories that have defined measurement indicators have always taken this socio-emotional perspective into consideration (Peinado and Gallego, 2016).

Mayer and Salovey (1997) believe that:

> Emotional Intelligence involves the ability to accurately perceive, appraise, and express emotions, the ability to access and/or generate feelings when they facilitate thought, the ability to also understand emotion and emotional knowledge, and the ability to regulate emotions that promote emotional and intellectual growth (p. 10).

For Goleman (1995 p.68), emotional intelligence "is a meta-ability determining how well we can use whatever other skills we have." He considers it to be the most significant aspect of those involved in personal balance, successful personal interactions, and workplace performance.

Mestre et al. (2017) maintain that it is the ability to resolve problems when the information we use originates in our emotions.

Emotional intelligence is the capacity to recognise our own and others' emotions and to be able to regulate them. It includes all the skills which help us resolve conflicts related to emotions and feelings (Bisquerra et al., 2015). For these authors, recognising what is happening to us and knowing how to behave accordingly are characteristics that will have repercussions on human well-being, and this can only be achieved through emotional education.

In recent decades, there has been an increase in scientific interest when it comes to studying the importance of emotional intelligence at school and its relevance in the educational environment (Alfaro et al., 2016; Salavera et al., 2017). To develop socio-emotional competence in the early years, the pre-school stage is an ideal time for preventive and educational procedures designed with the aim of fostering social and emotional development and the acquisition of social skills (Erath, 2011).

School is the best place to develop programmes which promote the development of socio-emotional skills and interaction with others, through offsetting or eliminating any problematic behaviours that the child may acquire during their development (Armas 2007).

Education provides life-long tools and it is essential to take care of emotional development, being a vital element in cognitive development. This involves strengthening pupils' emotional competence in order to foster a positive attitude to life, as well as their development in social skills and empathy in order to improve their interactions with others (Bisquerra, 2009).

Emotions are one of the factors involved in the construction of our personality and the way in which we relate to society, influencing a person's developmental processes

and how they establish secure socio-affective relationships (Cruz et al., 2021).

In the first stages of schooling, emotional development plays an important role in life and it is a prerequisite for children to progress in the different areas of their development. Teachers consider this work to be necessary and, therefore, the real educational challenge is to set educational objectives, which are put into effect through activities that foster children's emotional growth (Viloria, 2005).

Parents and teachers are role models in the learning process and in the concept a child has of themselves, which means that if the teacher shows trust and respect to their pupils and if they allow children to express their feelings, etc., the pupils' self-esteem can grow; if, on the other hand, the teacher does not respect their pupils, they ridicule them, or they do not let them express their emotions, etc., the pupils will only focus on their own defects and limitations, leading to lower self-esteem among these pupils and consequently in their social relationships (Romera, 2017; Sainz and Serrada, 2019).

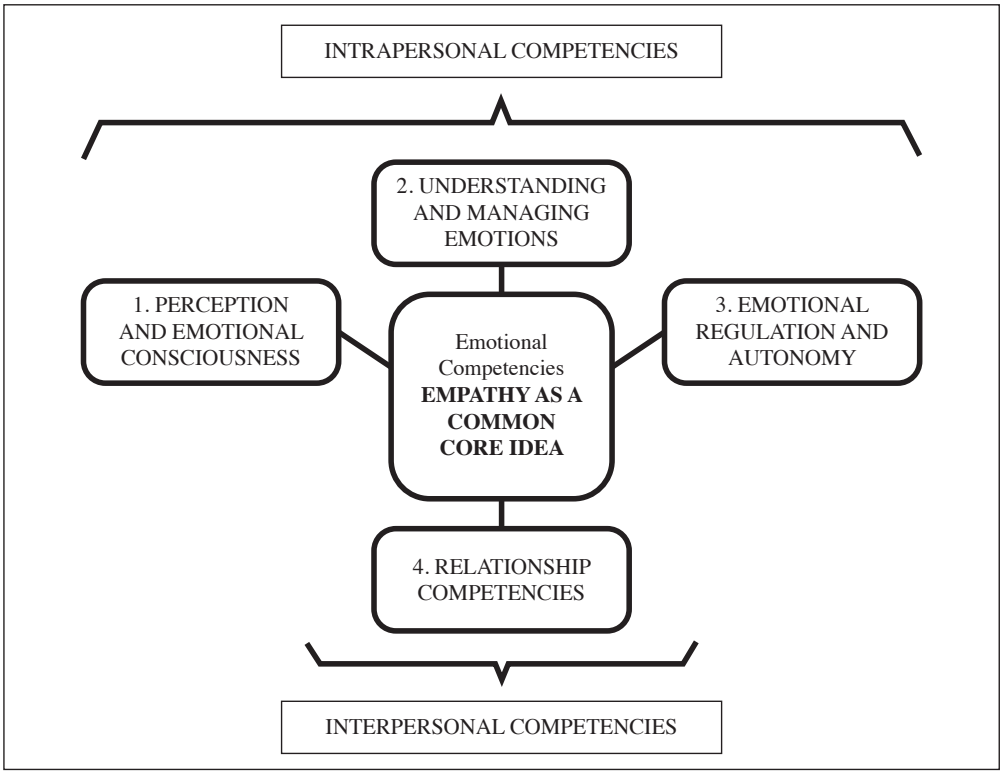
For Goleman (1995), education of emotions is necessary, and in several countries, educational programmes are already being put into practice with the aim of achieving greater social and emotional development among pupils, thereby increasing their emotional intelligence. The emotional development of pupils is not a one-person task; it involves the family and school sharing knowledge.

According to Frías (2015), schools successfully offering programmes in social and emotional learning, as well as improving the acquisition of socio-emotional skills, have reported an increase in academic success, an improvement in teacher/pupil relationships, and a decrease in behavioural problems (Cerda et al., 2019).

In this sense, the 'Annual EMOTI Programme in Emotional Intelligence for Pre-School Education' (*Programa Anual EMOTI de inteligencia emocional para la educación infantil*) (Hurtado and Salas, 2019) used in this research, has the backing of the Department of Education and Culture of Murcia (Resolution of 10 October, 2018) as well as the Department of Education and Sports of the Regional Government of Andalusia (Resolution of 8 July, 2019), and has been certified by the Spanish Association of Emotional Education.

This is a prevention programme with a universal approach based on a model of emotional and cognitive skills, with the objective involving the child's overall development, as specified in the formal curriculum for the pre-school stage. Therefore, it takes a three-track approach: biological, psychological, and socio-emotional, focusing on the child's affective development and personality. It is composed of four areas of emotional competence, of which the first three are included in intrapersonal competencies (knowing oneself), and the fourth area concerns interpersonal competencies (knowing others). Each area contains 6-7 activities, which comes to 25 activities in addition to two more annually, making a total of 27 activities. All the areas work on empathy as a common core idea (see Graph 1).

GRAPH 1. Areas of emotional competence in the EMOTI programme.



Source: Hurtado and Salas, 2019.

Proper emotional development significantly affects a person's interpersonal and academic development. Childhood is the best stage to deal with learning socio-emotional skills, abilities, and competencies, which will lay the foundations for personality in adulthood (Frías, 2015).

According to Salas et al. (2018), it has been shown empirically that it is in childhood, within the family during the early years and later at school, when habits and routines are formed and persist into our adulthood. For this reason, it is of vital importance to implement intervention programmes that foster emotional intelligence at this stage, when we can create healthy habits and routines by providing children with strategies to resolve conflicts and develop social skills such as empathy, expressing feelings, and working cooperatively.

The reason why the conduction of scientific studies on pupils in the pre-school stage is of great importance is because it was found in literature on the subject that there are not many studies either for this educational stage or for the field of emotional intelligence and socio-emotional competencies, so the goal is that this study may provide data and shed light on these topics warranting further research. Therefore, there should be greater assessment of and scientific interest in the pre-school stage in order to achieve greater benefits and results than are currently being attained.

2. Methods

2.1. Objectives

The objectives proposed are as follows:

1. 1. To check if the pupils in the experimental group interact among themselves in a more sociable way by expressing their emotions than those in the control group.

2. 2. To confirm whether the children show fewer violent behaviours and are better at resolving conflict after the implementation of the programme than the pupils in the control group.

2.2. Design

In relation to the research design, a quasi-experimental pre-test/post-test design was used with a non-equivalent control group. Two measurements were taken, one at the start of the course and another at the end, both for the control group and the experimental group, who followed the 'Annual EMOTI Programme in Emotional Intelligence for Pre-School Education from 3-6 years' (Hurtado and Salas, 2019)

The participants completed the questionnaires, signing the informed consent form in order to participate in the study. Their decision to take part was voluntary, and anonymity and confidentiality were guaranteed in relation to data collection and processing.

2.3. Procedure

Regarding the research conducted, several meetings were held with the senior management teams of the educational centres of the experimental and control groups. Furthermore, sessions and meetings were held at the Department of Education and Culture of the Autonomous Community of Murcia, specifically with the Directorate-General for Diversity and Educational Quality. Following these meetings, the Resolution of 10 October 2018 was published regarding the pilot experience for pre-school classes in the participating centres, beginning the research with the implementation of the 'Annual EMOTI Programme in Emotional Intelligence for Pre-School Education 3-6 years' (Hurtado and Salas, 2019). The programme was developed and implemented in the same way as the training course was put into effect for the senior management and teaching staff, thereby making it possible to programme and plan the educational intervention in the classroom as well as meetings regarding training and information with the families of the different groups of pupils. It was divided into three stages:

- 1st STAGE: Conducting the pretests. In October, the training course was held for the teaching staff and management at the experimental centre. Afterwards, the pretest was conducted with the pupils individually.

- 2nd STAGE: Running the programme. Once the first stage was over, the EMOTI programme was implemented with 27 activities (one a week, in sessions of an hour and a half) over a school year, treating

them as a curricular subject dealing with the development of emotional intelligence.

– 3rd STAGE: In May, the post-tests were administered and the data was analysed regarding running the programme in the test classrooms, with the aim of being able to make a comparative study between the participants and non-participants of this programme.

2.4. Participants

Subjects were selected using non-probability sampling with the groups previously established. Individual pupils who were easily accessible were used for the sample.

The sample was composed of 173 5-year-old pupils from middle socio-economic background in the third year of the second cycle of pre-school education during the 2018/19 school year in educational institutions across Murcia (Spain). On one hand, the experimental group was composed of a total of 89 pupils who went through the EMOTI Programme and, on the other, the control group was composed of 84 pupils.

2.5. Instrument

The instrument employed was the questionnaire to assess pupils' social competence (Caruana and Tercero, 2011). The questionnaire is composed of 37 questions to assess different aspects relating to situations involving conflict and/or aggression in the social interactions of pre-school pupils at the age of 5, by detecting types of violence at school. It assesses variables relating to social interaction which reflect behaviour and characteristics involved in acquiring and sustaining acceptance, relationships, and friendships with other children and adults (Merrell, 2002). To assess all the pupils, the primary focus (Sierra, 2001) was on the data being collected exclusively by the researcher. The pupils answered the questionnaire individually using a numerical scale (0-3), answering with 'never,' 'hardly ever,' 'often,' and 'always.'

In terms of the internal consistency reliability of the instruments, the questionnaire on the pupils' social competence was measured using Cronbach's alpha, which assumes that the items are measuring the same construct and that there is a strong correlation between them. The result was good reliability, with a Cronbach's alpha value of 0.716.

Regarding validation, factor analysis was used, in which the principal component method was employed with Varimax Rotation, which assumes that the factors are independent of each other and minimises the number of variables with high factor loadings in one factor. In the factor analysis, a score of 0.769 for the Kaiser-Meyer-Olkin Measure of Sampling Adequacy was achieved and a significant p-value ($p<0.05$) was obtained in Bartlett's Test of Sphericity.

2.6. Data analysis

Previously descriptive and graphical analysis of the variables under consideration was performed, separated by groups. The quantitative variables were submit-

ted to the Kolmogorov-Smirnov and the Shapiro-Wilk Tests for Normality (depending on whether there were more than or fewer than 50 samples in each group) in order to determine if we should then use parametric or non-parametric tests in the objective test.

For this study, due to the sample size and the non-normality of our variables, the administration of non-parametric tests was always chosen, given that when the quantitative variable is not normally distributed in the different categories in the categorical variable, we will always administer non-parametric tests.

3. Results

All the questions asked in the questionnaire on social competence (Caruana and Tercero, 2011) were analysed together to see if there were significant differences (see table 1). There were none found. They were also analysed individually and separated by control group and experimental group, with differences found for some of the items. Furthermore, between the pre-test and post-test for each item on the questionnaire using a Likert Scale, an ordinal numerical variable (0 = never, 3 = always) was assigned, and inversely so for the items that were asked using a negative form.

TABLE 1. Tests for independent samples. The post-test questionnaire was administered to pupils to assess their social competence in the control group and the experimental group according to the total mean.

Group		Social Competence Pre	Social Competence Post
Control	Mean	64.7561	66.1786
	Dev. Deviation	4.55030	3.97632
Experimental	Mean	64.2584	65.2022
	Dev. Deviation	5.14456	4.36978
Total	Mean	64.4971	65.1618
	Dev. Deviation	4.86086	4.28726

Source: Own elaboration.

For this study, the data analysis was conducted using the software package SPSS (version 25.0). The non-parametric Wilcoxon Test was used to determine the possible differences in the 37 items between the pre-test and the post-test in both groups, and the non-parametric Mann Whitney U Tests for Independence were used to see if there were statistically significant differences between the different groups.

In general, in the pre- and post-social competence variable, there are no statistically significant differences in the control and experimental groups, but we can find significant differences in some of the items (see table 2).

TABLE 2. Tests for independent samples. The post-test questionnaire was administered to pupils to assess their social competence in the control and experimental groups.

	Group					
	Control		Experimental		Mann Whitney	
	Mean	Desv.	Mean	Desv.	Z	p
Q.4. If you see that somebody has a problem, do you tell your teacher?	.65	.857	1.04	.865	-3.164	.002
Q.5. If you see that somebody has a problem, do you tell your family?	.85	1.035	1.29	.894	-3.323	.001
Q.14. Take or hide their things	.61	.745	.39	.615	-1.958	.050
Q.22. They take or hide my things	.52	.871	.24	.477	-1.892	.050
Q.24. My classmates let me play with them	.71	.815	1.07	1.064	-2.074	.038
Q.28. I have insulted somebody in class	2.99	.109	2.85	.355	-3.225	.001
Q.29. I have insulted somebody at playtime	2.96	.187	2.80	.457	-3.035	.002
Q.31. I have hit somebody at playtime	2.93	.302	2.76	.501	-2.744	.006
Q.32. I have pushed somebody to annoy them in a queue	2.98	.153	2.82	.415	-3.192	.001

Source: Own elaboration.

In the results obtained, it is clear that there are significant values in favour of the experimental group, compared to the control group after administering the programme. The pupils in the experimental group have improved their communication with their adult role models, as they resort to the teacher when they have a problem and have learned to communicate more with their families. Furthermore, they ask their teacher and families for help if a classmate needs it, developing empathy and other social competencies necessary to interact with others. This is due to the fact that, through the 27 activities included in the implementation of the programme, work has been conducted with the pupils on aspects of communication that are very relevant to social interactions, such as how to express and become aware of our emotions and show interest in others, as well as active listening, turn-taking when speaking, respecting others, and sustaining good relationships.

In aggressive behaviour related to bullying at school, there is a significant improvement in the experimental group compared to the control group, in the areas of taking or hiding classmates' belongings, as well as not insulting, hitting, or pushing friends in class or at playtime and letting other classmates play, thereby improving their social competencies. This is due to the fact that, during training with the pupils through the programme, emphasis is placed on resolving conflicts in a positive way through rejecting violence, regulating impulses and unpleasant emotions, and tolerating frustration.

The following table shows the tests for paired samples in the experimental group relating to the use of the tests (pre- and post-test) of the questionnaire administered to pupils (see Table 3).

In the results obtained, it can be seen that there are only significant values in some of the items, so on a statistical level, an improvement cannot be said to exist that favours the post-test over the pre-test in the experimental group. On a descriptive level though, there are in fact better scores, which shows that the pupils in the experimental group, after the implementation of the programme, are better at communicating their problems to their adult role models and show more empathy to their classmates, helping them if they need it. Furthermore, they develop fewer aggressive behaviours associated to bullying, with significant differences being observed which imply improvement, in terms of not hitting or pushing classmates in class or in a queue. Furthermore, they improve in pro-social behaviour, such as not bothering classmates and instead letting them work, not taking or hiding their things, not spoiling their work, and letting them play with other classmates, as well as not remaining alone or isolated. It can also be seen that, after administering the programme, pupils improve in their interactions with their peers and do not use emotional blackmail as a strategy to interact with each other, since, if they want something from another classmate, they do not give them something in exchange.

TABLE 3. Tests for paired samples. The questionnaire was administered to pupils to assess their social competence in the experimental group.

Wilcoxon Experimental Group Means	Pre	Post	Z	P
Q.3. If you have a problem, do you leave without saying anything?	2.43	2.03	-2.445b	.014
Q.6. If you see that somebody has a problem, do you leave without saying anything?	2.53	2.21	-2.431b	.015
Q.10. Hit them in class	0.89	0.71	-1.950b	.050
Q.12. Push or annoy somebody in a queue	2.22	1.99	-1.921b	.050
Q.13. Bother them and stop them from working	1.99	2.25	-2.133b	.033
Q.18. They hit me in class	0.63	0.42	-2.234b	.025
Q.22. They take or hide my things	0.55	0.24	-3.434b	.001
Q.23. They spoil my work	0.55	0.28	-2.955b	.003
Q.25. My classmates do not want to sit with me	0.94	0.43	-3.402b	.001
Q.26. I have to play on my own at playtime	2.75	2.57	-2.189b	.029
Q.36. I have not let a classmate play with me	2.53	2.84	-3.787b	.000
Q.23. If I want something from a classmate, I give them something in exchange	0.62	0.36	-2.378b	.017

Source: Own elaboration.

Pre-school education assists pupils' social competence, even if they have not participated in any specific programmes. However, their development is greater if they do so (Monjas and González, 2000). These results show that the EMOTI programme encourages pupils' social competence since in general, in almost all the items, there was an improvement in the mean scores obtained in the experimental group compared to the control group. At a descriptive level, it can be interpreted that the pupils in the experimental group have achieved greater development of social competence and higher scores than the pupils in the control group.

4. Discussion

Very few studies with scientific evidence have been conducted during the pre-school educational stage, due to the high costs involved for the researcher, both physically and psychologically (Gelabert, 2014).

This study confirms that pupils that participate in the EMOTI programme improve in social competence, just as in other studies using programmes that foster the development of social skills and emotional intelligence in pupils. They show significant improvement in these abilities, as in the study conducted by Frías (2015), regarding students in the experimental group in the second cycle of pre-school education who improved in social competence, cooperation when playing, and daily interactions, as well as developing fewer problematic behaviours. It has been shown that children in the experimental group showed greater empathetic and affectionate behaviour towards their peers and adults, demonstrating interest and curiosity in relation to social situations, either through dialogue or play. The study conducted by Gelabert (2014) on pupils in the first cycle of pre-school education also demonstrated that they improved in terms of self-concept, interaction with classmates and adults, and expression of sentiments and affection.

Furthermore, we found that there was an improvement in the pupils in the experimental group in relation to adult role models, trusting their teachers and family more when they have a problem, since they have improved their ability to express their emotions. These results have been confirmed by the studies conducted by Lopes et al. (2003), which show that high emotional intelligence is connected to a stronger parental bond and a lower number of conflicts or negative interactions with close friends, and is also connected with more positive relationships with friends. In addition, the study conducted by Velásquez and Fabián (2020) has results showing that the pupils' aggression levels decreased after the formative assessment of a pedagogical intervention in the classroom aimed at developing social competencies. The pupils also improved in pro-sociality, teamwork, and the communication skills needed for satisfactory coexistence.

In this research, once the programme has been administered, the pupils in the experimental group develop fewer violent behaviours and are better able to resolve conflict situations in a more sociable way, which has a very positive effect on the pupils' development of socio-emotional competencies; the children fight less, they respect

their classmates, they play together in a more sociable way and in turn let their classmates play with them, and it is all to a greater extent than the children in the control group. These results are corroborated by the study conducted by Extremera and Fernandez-Berrocal (2002), which demonstrates that pupils with a lower tendency to justify aggressive behaviours have a greater ability to recognise their emotions, regulate negative emotions and sustain positive ones, and have higher scores for mental health, lower levels of impulsiveness, and a lower tendency to suppress negative thoughts.

As they develop social competence, children show a decrease in problematic behaviours due to the fact that they are in pre-school education. Different studies state that correctly learning the necessary skills to develop social competence through programmes is associated with a reduction in behaviour problems (Garaigordobil et al., 2014; López et al., 2020).

Proper social competence will become a protective factor against the appearance of problems or behavioural disorders throughout life (Bornstein et al., 2010).

Another study conducted by Garaigordobil and García de Galdeano (2006) found that participants with a high level of empathy showed many positive social behaviours (pro-sociality, assertiveness, consideration, self-control, leadership), few negative social behaviours (passiveness, aggression, antisociality, withdrawal), and many assertive interaction strategies. They also have a high self-concept, a high capacity to analyse negative emotions, high emotional stability, and a low level of aggressive behaviour, as well as many behaviours and traits of a creative personality. Furthermore, the Buitrago and Herrera study (2014) describes the influence of teachers' emotional intelligence in treating pupils' disruptive behaviour, so a necessary preliminary step in implementing school programmes on education in emotional intelligence is training the teachers who are going to be teaching these programmes (García 2021).

5. Conclusions

The results of this study demonstrate that the pupils who participate in the EMOTI programme showed fewer aggressive behaviours and greater social competence, as well as a greater ability to recognise and express their emotions and regulate their behaviour. Research by authors such as Hill et al. (2006) indicates that behaviour problems lessen over time until the subject reaches the age of 5 years, improving between 2 and 4 years. However, other authors believe that aggressive behaviours increase from the age of 6 years (Moreno, 2003).

Another important aspect is that, as children develop and mature, schooling and socialisation with other children naturally allow them to regulate their behaviour progressively. However, by implementing preventive programmes, this development can be improved (Fríasas, 2015; Rabal et al., 2021).

Intervention in behavioural problems using preventive programmes is a very valuable tool to combat risk factors and boost protection during early childhood. Later on,

intervention is less effective as many behavioural problems can become ingrained with the onset of mid-childhood (Webster-Stratton et al., 2012; Vergaray et al., 2021).

Therefore, once the programme has been completed, the pupils in the experimental group develop fewer violent behaviours and learn how to resolve conflict situations in a more empathetic way, which has a very positive effect on the pupil's emotional and social development. The children also play with their classmates and let their classmates play with them, all to a greater extent than the children in the control group.

As for the practical limitations, in order to conduct genuine self-analysis regarding this study, we have found the following:

1. The first limitation we have found is the virtual non-existence of validated questionnaires for use with children in pre-school education, which limits the options for usage in any research into this stage.

2. The implementation of the questionnaire as an assessment tool has been conducted orally and administered individually to children of five years old in the four educational institutions. This method of conducting the questionnaire is not used in other educational stages, as pupils are then capable of filling in the questionnaire by themselves and this is one of the reasons why, in general, there is a lack of variety in scientific studies in any academic field that refers to children of a young age, specifically regarding the study of the improvement of socio-emotional competencies in pre-school children. As a positive point, it may be noted that this aspect is at the same time a strong point of this study in relation to previous studies conducted.

3. The teachers' lack of training was initially a limitation, but it was possible to mitigate this by holding a training course for them on the programme which was going to be implemented in the classrooms.

As a final conclusion, we found that implementing the EMOTI programme with the pupils in the experimental group boosted the improvement of social competence as a variable in the study in pupils in the pre-school educational stage. It is necessary to pursue this line of investigation by implementing programmes which develop these competencies in pupils in order to improve our educational praxis.

Note

[1] Funded by the Department of Education and Culture of the Autonomous Community of Murcia, Resolution of 10 October 2018.

References

Alfaro, V., Bastias, J., & Salinas, F. J. (2016). Relación entre inteligencia emocional y notas de las áreas instrumentales en un grupo de tercero de Primaria [Relation betweem emotional intelligence and instrumental rupo marks in one rupo f third of first education]. *Revista electrónica de Formación del Profesorado*, *19* (3), 149-155. https://doi.org/10.6018/reifop.19.3.267301

Armas, M. (2007). *Prevención e intervención ante problemas de conducta: estrategias para centros educativos y familias [Prevention and intervention for behavioural problems: strategies for schools and families]*. Wolters Kluwer.

Bierman K. L., & Erath S. A. (2011). Programas de prevención e intervención que fomentan las relaciones positivas entre pares en la primera infancia [Prevention and intervention programmes promoting positive peer relations in early childhood]. In R. E. Tremblay, R. G. Barr, R. V. Peters, & M. Boivin (Eds.), *Enciclopedia sobre el desarrollo de la primera infancia* (pp. 43-47). Centre of Excellence.

Bisquerra, R. (2009). *Psicopedagogía de las emociones [Psychopedagogy of emotions]*. Síntesis.

Bisquerra, R., Pérez-González, J. C., & García, E. (2015). *Inteligencia emocional en educación [Emotional intelligence in education]*. Síntesis.

Bornstein, M. H., Hahn, C. S., & Haynes, O. M. (2010). Social competence, externalizing, and internalizing behavioral adjustment from early childhood through early adolescence: Developmental cascades. *Development and Psychopathology, 22* (4), 717-735. https://doi.org/10.1017/S0954579410000416

Buitrago, D., & Herrera, C. (2014). *La inteligencia emocional y el tratamiento de las conductas disruptivas en el aula de clase* [Master's thesis, Universidad del Tolima, Colombia]. Institutional Repository of the Universidad del Tolima - RIUT. https://goo.gl/0xs80S

Caruana, A., & Tercero, M. P. (2011). *Cultivando emociones: educación emocional de 3 a 8 años [Cultivating emotions: Emotional education from 3 to 8 years old]*. Conselleria d'Educació. Generalitat Valenciana.

Cerda, G., Pérez, C., Elipe, P., Casas, J. A., & Del Rey, R. (2019). Convivencia escolar y su relación con el rendimiento académico en el alumnado de Educación Primaria [School coexistence and its relationship with academic performance in Primary School pupils]. *Revista de Psicodidáctica*, *24*, 46-52.

Cruz, P., Borjas, M. P., & López, M. (2021). Ludoevaluación de la emoción del miedo en educación infantil [Ludo-evaluation of the emotion of fear and personal self-esteem in early childhood education]. *Revista Latinoamericana de Ciencias Sociales, Niñez y Juventud*, *19* (1), 20-40. https://doi.org/10.11600/rlcsnj.19.1.4184

Erath, S. A. (2011). *Programas de prevención e intervención que fomentan las relaciones positivas entre pares en la primera infancia [Prevention and intervention programmes that promote positive peer relations in early childhood]*. Enciclopedia sobre el desarrollo de la primera infancia. https://1library.co/document/z3lvkj8z-programas-de-prevencion-e-intervencion-que-fomentan-las-relaciones-positivas-entre-pares-en-la-primera-infancia.html.

Extremera, N. y Fernández-Berrocal, P. (2002). La evaluación de la inteligencia emocional en el aula como factor protector de diversas conductas problema: violencia, impulsividad y desajuste emocional [The assessment of emotional intelligence in the classroom as a protective factor for various problem behaviours: violence, impulsivity and emotional maladjustment]. En F. A. Muñoz, B. Molina y F. Jiménez (Eds.), *Actas del I Congreso Hispanoamericano de Educación y Cultura de Paz* (pp. 599-605). Universidad de Granada.

Frías, M, (2015). *Mejora de la competencia social en niños de 2º ciclo de educación infantil a través del programa "Aprender a Convivir" [Improvement of social competence in children in the 2nd cycle of infant education through the "Learning to Live Together" programme]*. [Unpublished doctoral dissertation]. Universidad de Zaragoza.

Garaigordobil, M., & De Galdeano, P. G. (2006). Empatía en niños de 10 a 12 años. *Psicothema*, *18* (2), 180-186.

Garaigordobil, M., Martínez-Valderrey, V., & Aliria, J. (2014). Victimization, perception of violence, and social behaviour. *Journal for the Study of Education and Development*, *37* (1), 90-116. https://doi: 10.1080/02103702.2014.881651

García, B. (2021). Competencia emocional en maestros de educación infantil y primaria: fuentes de variabilidad y sugerencias de mejora [Emotional competence in early childhood and primary education teachers: Sources of variability and improvement suggestions]. *Revista Electrónica Interuniversitaria de Formación del Profesorado*, *24* (2). https://doi.org/10.6018/reifop.450111

Gardner, H. (1983). *Frames of Mind: The theory of multiple intelligences*. Basic Books.

Gelabert, J. M. (2014). *Intervención psicopedagógica en inteligencia emocional en educación infantil [Psychopedagogical intervention in emotional intelligence in early childhood education]* [Doctoral dissertation, Universidad Complutense de Madrid]. Repositorio Institucional de la UCM. https://eprints.ucm.es/id/eprint/28583/

Goleman, D. (1995). *Inteligencia emocional [Emotional intelligence]*. Kairós.

Hill, A. L., Degnan, K. A., Calkins, S. D., & Keane, S. P. (2006). Profiles of externalizing behavior problems for boys and girls across preschool: The roles of emotion regulation and inattention. *Developmental Psychology*, *42* (5), 913-928. https://doi.org/10.1037/0012-1649.42.5.913

Hurtado, A., & Salas, N. (2019). *Programa Anual Emoti de Inteligencia Emocional para Educación Infantil 3-6 años. "EMOTI"*. Autoedición.

Lopes, P. N., Salovey, P., & Straus, R. (2003). Emotional intelligence, personality, and the perceived quality of social relationships. *Personality and Individual Differences*, *35* (3), 641-658. https://doi.org/10.1016/S0191-8869(02)00242-8

López, V., Zagal, E., & Lagos, N. (2020). Competencias socioemocionales en el contexto educativo: Una reflexión desde la pedagogía contemporánea [Socio-emotional competences in the educational context: A reflection from contemporary pedagogy]. *Revista Reflexión e Investigación Educacional*, *3* (1), 149-160. http://revistas.ubiobio.cl/index.php/REINED/article/view/4508

Mayer, J. D., & Salovey, P. (1997). What is emotional intelligence? In P. Salovey, & D. Sluyter (Eds.), *Emotional Development and Emotional Intelligence: implications for educators* (pp. 3-31). Basic Books.

Merrell, K. W. (2002). *Preeschool and kindergarten behavior scales*. PROD-ED.

Mestre, J. M., Pérez, N., Guil, R., González de la Torre, G., & Núñez, J. M. (2017). El desarrollo de la inteligencia emocional a través de la optimización de las capacidades cognitivas a través de la educación obligatoria [The development of emotional intelligence through the optimisation of cognitive skills through compulsory education]. *Contextos Educativos*, *20,* 57-75.

Monjas, I., & González, B. (Dirs.) (2000). *Las habilidades sociales en el currículo [Social skills in the curriculum]*. Secretaría General Técnica. Centro de Publicaciones. Ministerio de Educación, Cultura y Deporte.

Moreno, M. C. (2003). Desarrollo de la conducta social de los 2 a los 6 años [Development of social behaviour from 2 to 6 years of age]. In J. Palacios, A. Marchesi, & C. Coll. (Comps.), *Desarrollo psicológico y educación. 1. Psicología evolutiva* (pp. 305-323). Alianza Editorial.

Peinado, A., & Gallego, R. (2016). *Programa Arco Iris de educación emocional de 3 a 12 años [Arco Iris emotional education programme for 3 to 12 year olds]*. Noubooks.

Rabal, J. M, Perez, M., Ruiz, A., & Méndez, M. (2021). Organización escolar a través de las emociones en la etapa de Educación Infantil [School organization through emotions in Early Childhood Education]. *Brazilian Journal of Development, Curitiba*, *7* (1), 8848- 8869.

Resolution of the General Directorate of Attention to Diversity and Educational Quality by which instructions are given for the development of the experimental educational programme "Emoti Annual Programme of Emotional Intelligence for Infant Education" issued by the Regional Ministry of Education, Youth and Sports, of the Autonomous Community of Murcia, 10 October 2018. http://tramites.administracion.gob.es/comunidad/tramites/recurso/programa-educativo-emoti-de-inteligencia/e979c444-1a5e-4439-9cfc-170cbeab48ef

Resolution of the General Directorate of Educational Planning and Evaluation, by which the "Emoti Annual Programme of Emotional Intelligence for Early Childhood Education" is approved as curricular material for use in educational centres in Andalusia issued by the Ministry of Education and Sport of the Regional Government of Andalusia, 8 July 2019.

Rodríguez, M. F. (2013). La inteligencia emocional [Emotional intelligence]. *Revista de clases historia*, *7,* 1-12.

Romera, M. (2017). *La familia la primera escuela de las emociones [The family, the first school of emotions].* Ediciones destino.

Salas, N., Alcaide, M., & Hurtado, A. (2018). Programas de intervención en inteligencia emocional para la educación infantil. *Revista de Estilos de Aprendizaje, 11* (22), 137-165.

Sainz, V., & Serrada, A. (2019). *Autoestima, autoconcepto y rendimiento académico en alumnos de educación primaria [Self-esteem, self-concept and academic achievement in primary school students]*. Dikynson.

Salavera, C., Usán, P., & Jarie, L. (2017). Emotional intelligence and social skills on self-efficacy in Secondary Education students. Are there gender differences. *Journal of Adolescence*, *60*, 39-46. https://doi.org/10.1016/j.adolescence.2017.07.009

Sierra, B. (2001). *Técnicas de investigación social. Teoría y ejercicios [Social research techniques. Theory and exercises]*. Thomson.

Thorndike, E. (1920). Intelligence and its use. *Harper´s Magazine*, *140*, 227-235.

Velásquez, A. M., & Fabián, S. (2020). Transformación de las normas sociales de aula. Evaluación formativa de una intervención basada en juegos. Voces y Silencios. *Revista Latinoamericana de Educación, 11* (1), 89-111.

Vergaray, R. P., Farfán, J. F., & Reynosa, E. (2021). Educación emocional en niños de primaria: una revisión sistemática [Emotional education in primary school children: a systematic review]. *Revista Científica Cultura, Comunicación y Desarrollo*, *6* (2), 19-24.

Viloria, C. (2005*). La educación emocional en edades tempranas y el interés de su aplicación en la escuela. Programas de educación emocional, nuevo reto en la formación de los profesores [Emotional education at an early age and the interest of its application at school. Emotional education programmes, a new challenge in teacher training].* Universidad Autónoma de Madrid.

Webster-Stratton, C., Gaspar, M .F., & Seabra-Santos, M. J. (2012). Incredible Years Parent, Teachers and Children's Series: Transportability to portugal of early intervention programs for preventing conduct problems and promoting social and emotional competence. *Psychosocial Intervention, 21* (2) 157- 169. https://doi.org/10.5093/in2012a15

Webster-Stratton, C., Reid, M. J., & Stoolmiller, M. (2008). Preventing conduct problems and improving school readiness: evaluation of the Incredible Years Teacher and Child Training Programs in high-risk schools. *Journal of Child Psychology and Psychiatry*, *49* (5), 471-488. https://doi.org/10.1111/j.1469-7610.2007.01861.x

Author biographies

Noelia Salas Román is a Teacher with a Bachelor's Degree in Early Childhood Education, with 18 years' teaching experience in different stages of the education system. She holds a Master's Degree in Conflict Resolution in the Classroom. She has conducted several studies on emotional intelligence and is a trainer on courses for teachers on emotional intelligence.

http://orcid.org/0000-0002-0670-3271

Margarita Alcaide Risoto is an Associate Professor at the Universidad Camilo José Cela. Doctor and graduate in Psychopedagogy, University of Jaén. Teacher on the doctoral programme at the Ibero-American University Foundation, in the subject of Applied Didactics. Member of the 'Research and Educational Development in Orientation' research group in Jaén and member of the international scientific board of the REID journal.

https://orcid.org/0000-0002-3580-1233

Carlos Hue García was an Adjunct Professor for twenty years at the Universidad de Zaragoza. He graduated in Psychology (1974) and Pedagogy (1975) at the Universidad Complutense de Madrid. He has wide-ranging experience from working as a psychologist and pedagogist for the Regional Government of Aragón, Spain. Among other publications, those of note are *Pensamiento emocional: un método para el desarrollo de la autoestima y el liderazgo* (*Emotional thinking: a method to develop self-esteem and leadership*') (Mira, 2007) and *Bienestar docente y pensamiento emocional* (*Teacher well-being and emotional thinking*) (Wolters Kluwer, 2008). He gives courses, talks, and conferences at universities in Spain, Portugal, Peru, Colombia, Mexico, Chile, and Argentina.

https://orcid.org/0000-0001-6477-7044

Validation of the Ud-TIC scale on the problematic use of mobile phones and video games as mediators of social skills and academic performance

Validación de la escala Ud-TIC sobre el uso problemático del móvil y los videojuegos como mediadores de las habilidades sociales y del rendimiento académico

Adoración DÍAZ LÓPEZ, PhD. Associate Professor. Universidad de Murcia *(adoracion.diaz@um.es)*.
Javier Jerónimo MAQUILÓN SÁNCHEZ, PhD. Associate Professor. Universidad de Murcia *(jjmaqui@um.es)*.
Ana Belén MIRETE RUIZ, PhD. Associate Professor. Universidad de Murcia *(anabelen.mirete@um.es)*.

Abstract:

In today's society, ICTs have become essential tools and supports in the daily life of adolescents, being present in all areas of their lives. They can make optimal use of them, but also an irresponsible or problematic use, especially in a stage of high vulnerability such as adolescence. To further examine the study of this social and educational problem, the following objectives are proposed: 1) to validate a dimension of an instrument on the problematic use of mobile phones, video games and the Internet; 2) to validate a dimension of a scale on social skills; 3) to describe the effect of problematic mobile phone use and video games on social skills and 4) to describe the effect of problematic mobile phone use and video games on academic performance. A sample of 195 participants from southern Spain (Murcia) was selected. A quantitative, non-experimental, survey type research design was used. The reliability and construct validity of

Revision accepted: 2022-06-23.
This is the English version of an article originally printed in Spanish in issue 283 of the revista **española de pedagogía**. For this reason, the abbreviation EV has been added to the page numbers. Please, cite this article as follows: Díaz-López, A., Maquilón Sánchez, J. J., & Mirete Ruiz, A. B. (2022). Validación de la escala Ud-TIC sobre el uso problemático del móvil y los videojuegos como mediadores de las habilidades sociales y del rendimiento académico | *Validation of the Ud-TIC scale on the problematic use of mobile phones and video games as mediators of social skills and academic performance. Revista Española de Pedagogía, 80* (283), 533-558. https://doi.org/10.22550/REP80-3-2022-06
https://revistadepedagogia.org/ ISSN: 0034-9461 (Print), 2174-0909 (Online)

the instrument were calculated and descriptive statistics were performed. The instrument achieved good reliability (α = .841 ICT dimension); (α = .781 social skills dimension). Regarding the construct validity, a 6-factor model was reached that explains 64.27% of the variance, (KMO = .813; Sig <.005 ICT dimension); (KMO = .554; Sig <.005 social skills dimension), in the same way, ICTs are pointed out as mediators of academic performance and social skills. The study concludes by pointing to the Ud-TIC as a valid and reliable instrument.

Keywords: ICT, Smartphone, video games, social skills, academic performance, adolescence, problematic use.

Resumen:

En la sociedad actual, las TIC se han convertido en herramientas y soportes imprescindibles en el día a día de los adolescentes, estando presentes en todas las áreas de su vida. De estas pueden hacer un uso óptimo, pero también irresponsable o problemático, especialmente, en una etapa de alta vulnerabilidad como la adolescencia. Para profundizar en el estudio de esta problemática de carácter social y educativo, se plantean los siguientes objetivos: 1) validar una dimensión de un instrumento sobre el uso problemático del móvil, los videojuegos e Internet; 2) validar una dimensión de una escala sobre las habilidades sociales; 3) describir la interferencia del uso problemático del móvil y los videojuegos en las habilidades sociales y 4) describir la interferencia del uso problemático del móvil y los videojuegos en el rendimiento académico. Se seleccionó una muestra de 195 participantes del sur de España (Murcia). El diseño de la investigación fue de carácter cuantitativo no experimental tipo encuesta. Se calculó la fiabilidad y validez de constructo del instrumento y se realizaron estadísticos descriptivos. El instrumento alcanzó una adecuada fiabilidad (α = .841 Dimensión TIC); (α = .781 Dimensión HHSS). En cuanto a la validez de constructo, se alcanzó un modelo de 6 factores que explica el 64.27 % de la varianza, (KMO = .813; Sig< .005 Dimensión TIC); (KMO =.554; Sig< .005 Dimensión HHSS). Del mismo modo, se señala a las TIC como mediadoras del rendimiento académico y de las habilidades sociales. Se concluye el estudio con la identificación del Ud-TIC como un instrumento válido y fiable.

Descriptores: TIC, móvil, videojuegos, habilidades sociales, rendimiento académico, adolescencia, uso problemático.

1. Introduction

The widespread use of Information and Communication Technologies (hereinafter ICTs) among young people has gone beyond the boundaries of leisure, crossing over into all areas of their life (Díaz-Vicario et al., 2019).

The problematic use of ICTs is defined as all actions associated with abandoning family, educational or social obligations to spend more time on the Internet and playing video games, a reduced academic performance, preferring virtual relationships over real relationships, showing con-

cern about not receiving messages or calls, sleep disturbance as a result of mobile use, aggressiveness or irritation at interruptions when using devices, getting nervous when Internet access is withheld, etc. (Beranuy et al., 2009; Díaz-López et al., 2020). In this respect, it is necessary to point out that the problematic use of video games has been recently accepted by WHO for its inclusion as an addiction within mental illnesses (Carbonell, 2020), under the name of Gaming disorder.

In the new emerging social context, the use of ICTs by adolescents represents new potentialities, but it is also associated with the emergence of new risks in the case of their dysfunctional use (Machimbarrena et al., 2018). In this sense, adolescents constitute a risk group for developing behaviours associated with the problematic use of ICTs, as they are in constant pursuit of new sensations and, given their biological and psychosocial characteristics, they are a particularly vulnerable group (Díaz & Aladro, 2016; Yang & Tung, 2007). Several undesirable consequences resulting from the improper use of ICTs among adolescents can be highlighted, such as anxiety, FoMO, nomophobia and sleep disturbances (Aznar et al., 2020), emotional dysregulation (Gioia et al., 2021), eating disorders (Ioannidis et al., 2021) and low quality of life (Masaeli & Billieux., 2022).

Furthermore, one of the concerns surrounding the improper use of ICTs is the vast amount of time that young people are spending in front of screens. In this respect, from an international perspective, review articles (Kokka et al., 2021) state that over 90% of adolescents in the United States and Japan and 72% in China use the Internet at all hours. Moreover, this widespread use now exceeds 20% for Indian and Iranian adolescents. In Spain, according to the results of the Digital Marketing Trends study (Rivero, 2016), adolescents dedicate over 40% of their daily time to the use of ICTs. Prevalence data on the problematic use of ICTs place the problematic use of smartphones among British adolescents at 10% (López-Fernández et al., 2014), 23% in the case of Chinese adolescents (Long et al., 2016), while other studies report a prevalence of problematic Internet use of 17% among Brazilian adolescents. In the Spanish context, previous studies among adolescents report a prevalence of 9.8% of problematic Internet use, 9% in the case of problematic mobile use and 10.7% of problematic video game use (García-Oliva et al., 2017). However, as far as we know, only one national study provides data on the prevalence of problematic ICT use, as a whole, with figures of problematic ICT use among Spanish adolescents of 10% (mobiles, game consoles and other devices with an Internet connection) (Díaz-López et al., 2020).

The problem addressed in this study is of particular importance and of grave concern among teachers, families and the scientific community, given the increase of minors who are neglecting other activities in their lives that should be a priority for their social and academic development, instead dedicating their time to ICTs (Vilca & Vallejos, 2015; Gómez-Gonzalvo et al., 2020).

Socially speaking, Sánchez-Díaz de Mera and Lázaro-Cayuso (2017) indicate that the use of ICTs has changed the way people communicate, arguing that ICTs occupy an almost fundamental place within the socialisation process, having an indisputable influence on the manner in which young people interact and communicate with their social network (Solano & Perugini, 2019; López-de-Ayala-López et al., 2022). Furthermore, ICTs have an impact on the behaviour and attitude of young people (García-Oliva et al., 2017; Gracia-Granados et al., 2020). In this vein, previous studies have shown how young people find major differences between face-to-face and virtual communication (Viñals & Cuenca, 2016). In this regard, Díaz-Vicario et al. (2019), maintain that virtual communication inhibits real encounters, and the widespread use of ICTs promotes a preference for contact through such channels, also analysing how, in the past decade, gatherings with friends are much less frequent, with friendships being abandoned to spend more time on the Internet.

With regard to the impact of ICTs in the academic sphere, in the last decade, Espinar and López (2009) already warned of the emergence of a lack of motivation towards studies as a result of technological over-stimulation, which, according to Rodríguez-Gómez et al. (2018), is counter-productive when employed for academic responsibilities. In the same vein, Lloret et al. (2017) stated that high levels of intensity and frequency of use of video games are inversely associated with school performance and with academic interests in general. Gómez-Gonzalvo et al. (2020) reported an inversely proportional relationship between academic performance and frequency of use of ICTs and Díaz- López et al. (2021) pointed out the existence of statistically significant connections between the high frequency of use of mobiles and video games and poor performance in instrumental subjects.

After conducting an extensive search for data collection instruments related to this problem in national and international scientific literature, several were found adapted to Spanish speaking students, but none that covered the problematic use of mobiles, video games and other devices during adolescence. Thus, some cover an age range that is not focused on adolescence (Labrador et al., 2013), in other studies, the questionnaires were performed ad hoc without including validity and reliability indicators (Díaz-Vicario et al., 2019), other instruments are focused exclusively on examining the problematic use of the Internet (Beranuy et al., 2009; Pulido-Rull et al., 2011; Rial et al., 2015), the problematic use of mobiles (Beranuy et al., 2009), or the problematic use of game consoles (Chamarro et al., 2014) and others employ Internet addiction questionnaires (Moral-Jiménez & Fernández-Domínguez, 2019). As a result, it was necessary to design and validate a scale to study the problematic use of ICTs, including the usual ICTs used among adolescents: mobile telephones, game consoles and other devices with an

Internet connection, such as computers and tablets. Furthermore, to meet the research objectives, it was necessary to include a scale on social skills and academic performance.

The apparent metamorphosis of the social and educational contexts with regard to ICT use by adolescents has become a cause for social concern in a high number of countries. This empirical study offers an approach to the issue, seeking to provide a valid and reliable instrument to address this problem. Four objectives were formulated, which are addressed in this article: 1) to validate a dimension of an instrument on the problematic use of ICTs; 2) to validate a dimension of a scale on social skills; 3) to describe the effect of problematic ICT use on social skills and 4) to describe the effect of problematic ICT use on academic performance.

2. Method

2.1. Participants

The selected sample was formed by a total of 195 participants (Table 1). The sample size is deemed to be sufficiently large for the statistical significance of an exploratory factor analysis (Tabachnick & Fidell, 2013).

TABLE 1. Distribution by gender and school year of participants.

		Frequency	Percentage
Gender	Male	111	56.9
	Female	84	43.0
	Total	160	100.0
Year	1st	59	30.0
	2nd	52	26.6
	3rd	47	24.1
	4th	37	18.9
	Total		100.0

Source: Own elaboration.

2.2. Research Design

A quantitative, non-experimental, survey type research design was used, in accordance with the ethical standards related to autonomy and privacy required for studies of this type (Pérez-Juste et al., 2012). Likewise, ethical considerations were taken into account and consent and informed assent documents were provided to participants.

2.3. Procedure

The procedure for the design of the Ud-TIC instrument followed the 5 phases described below:

1. Review of validated instruments:

   A search was conducted for instruments employed among the Spanish adolescent population related, on one hand, to ICT use and, on the other, to social skills. The following instruments were selected: a) CERI questionnaire, a questionnaire on Internet-related experiences (α = .776) (Beranuy et al., 2009); b) CERM questionnaire, a c on mobile telephone-related experiences (α = .805) (Beranuy et al., 2009); c) CERV questionnaire, a questionnaire on video game-related experiences (α = .870) (Chamarro et al., 2014, and e) CHASO, a social skills questionnaire (α = .880) (Caballo & Salazar, 2016).

2. Adaptation and reduction of the scales:

   The most relevant items were selected to fulfil the research purpose. Item selection was subject to the following criteria: a) level of adequacy to evaluate experiences related to ICT use and social skills; b) level of coherence of each of the elements with the dimension in which it is included and c) level of clarity of writing.

3. Introduction of new items:

   Socio-demographic items were included, related to academic performance and the effect of ICTs on school performance. Likewise, family supervision, technological stress and time restrictions on ICT access variables were collected. The Ud-TIC questionnaire has 3 dimensions:

- Dimension 1: socio-demographic and academic performance data.
- Dimension 2: problematic ICT use.
- Dimension 3: social skills.

The chosen title was "Ud-TIC, maladaptive use of information and communication technologies" (Annex 1).

4. Content validity:

   To calculate the content validity, the opinion of three experts in educational research methodology was sought (Table 2).

TABLE 2. Reformulation, modification, inclusion and elimination of items based on expert judgement.

Dimension 1. Sociodemographic data	Item V	Elimination of the item from the questionnaire.
	Item V	The Municipality item is added.
	Item XV	Modification of the answer options: Who supervises your Internet access? The answer option “grandparents” is added.

Dimension 2. ICTs	Item X	Modification of the wording of the item from "Do you suffer sleep disturbance due to aspects related to video game use?" to "Do you stay up late playing video games?".
	Item 4	Modification of the wording of the item from "you stop what you are doing to connect" to "you abandon what you are doing to connect".
	Item 14	Modification of the wording of the item from "How often do you say things on your mobile that you would not say in person?" to "Do you say things on your mobile that you would not say in person?".
	Item X	The item "Do you get angry or irritated when somebody bothers you while you are connected?" was deleted, as it is redundant with items 13 and 17 "Do you get angry or irritated when somebody bothers you while you are using your mobile?" and "Do you get angry or irritated when somebody bothers you while you are playing video games?", respectively.
	Item 10	Modification of the wording of the item: "To what extent do you feel anxious when you do not receive messages or calls?" To "Do you feel anxious when you do not receive messages or calls?".
Dimensión 3. Habilidades sociales (*estas modificaciones se realizaron tras la aplicación de la primera prueba piloto)	Item 20	Modification of the wording of the item "Apologise when my behaviour has bothered somebody" to "Apologise in person when my behaviour has bothered somebody".
	Item 21	Inclusion of the item: "Apologise online when I have hurt somebody's feelings".
	Item 23	Modification of the wording of the item "Say NO when I am asked to do something that I do not like to do" to "Say NO face-to-face when I am asked to do something that I do not like to do".
	Item 24	Inclusion of the item: "Say NO online when I am asked to do something that I do not like to do".
	Item 26	Inclusion of the item: "Keep calm online when I make a mistake".
	Item 27	Modification of the wording of the item "Express a different opinion" to "Express a different opinion face-to-face".
	Item 28	Inclusion of the item: "Express a different opinion online".
	Item 29	Modification of the wording of the item "Respond appropriately to criticism" to "Respond appropriately to criticism in person".
	Item 30	Inclusion of the item: "Respond appropriately to criticism online".

Source: Own elaboration.

5. Pilot study:

   A Secondary School was asked to participate in the study. Upon acceptance, the participating groups were selected. Informed consent documents were provided to parents, and informed assent documents to the minors (both endorsed by the Ethics Committee of the university).

The instrument was applied to eight groups of adolescents. A total of 195 adolescents from a Secondary School participated, of which 56.9% were males and 43% were females. With regard to distribution by school year, 30% were students from the first year of secondary education, 26.6% from the second year of secondary education, 24.1% from the third year of secondary education and 18.9% from the fourth year of secondary education. Application was in paper format and data collection was performed during tutorial sessions, in the presence of the responsible researcher and the tutor. Data analysis delivered insufficient internal consistency for dimension 3, social skills (α = .622), the minimum value of which must be .70 to be considered reliable (Grande & Abascal, 2003).

Finally, the opinion of the experts was once again consulted, and a distinction was made between face-to-face social skills and virtual social skills.

3. Data analysis

Data analysis started with the assessment of the adequacy of the sample by applying the Kaiser-Meyer-Olkin (KMO) test, with values exceeding 0.5, and Bartlett's test of Sphericity, with significant values. Likewise, to determine construct validity, an exploratory factor analysis was performed through the principal component method, the extraction of factors with own values above 1 and Varimax rotation (Lima-Rodríguez, et al., 2012). For reliability analysis, Cronbach's alpha coefficient was applied with values above .70. Finally, the descriptive statistics were calculated. Data analysis was conducted using the SPSS statistical package, version 24.

4. Results

To fulfil the first objective, related to the validation process of the ICT dimension, reliability analysis and construct validity were calculated. Data analysis delivered a high level of internal consistency for this dimension (α = .841). Likewise, the value of the "corrected item-total" correlation revealed the absence of zero or negative values. Thus, the statements correlate with the total (Table 3).

The Kaiser-Meyer-Olkin (KMO) sampling adequacy indicator obtained was .813, indicating the relevance of applying the exploratory factor analysis to the selected sample. Bartlett's test of Sphericity, for its part, showed a significance level of .000.

TABLE 3. Item-total statistics in the ICT dimension

	Scale mean if the item has been deleted	Scale variance if the item has been deleted	Corrected item-total correlation	Squared multiple correlation	Alfa if the item is deleted
1. How often do you use a game console?	46.32	137.657	.318	.518	.843
2. How often do you use a mobile telephone?	45.46	134.797	.380	.424	.836
3. How often do you use other devices with an Internet connection?	46.19	132.333	.495	.388	.831
4. How often do you abandon what you are doing to spend more time connected to the Internet?	46.91	135.004	.478	.513	.833
5. Do you think that your academic performance has been negatively affected by your Internet use?	46.78	133.002	.493	.455	.831
6. When you have problems, does connecting to the Internet help you escape from them?	46.56	128.452	.504	.390	.830
7. Do you get angry or irritated when somebody bothers you while you are connected?	46.75	129.350	.505	.555	.830
8. Do you find it easier to interact online or in person?	46.77	131.174	.432	.369	.834
9. Have you ever risked losing a relationship or an academic opportunity due to your mobile use?	47.53	135.512	.381	.357	.836
10. Do you think that your academic performance has been negatively affected by your mobile use?	46.99	131.917	.524	.519	.830

revista española de pedagogía
year 80, n. 283, Septembre-Dicember 2022, 533-558

11. To what extent do you feel anxious when you do not receive messages or calls?	47.27	131.932	.506	.442	.831
12. Do you suffer sleep disturbance due to aspects related to mobile use?	47.53	135.410	.434	.454	.834
13. Do you feel the need to spend increasingly more time on your mobile to feel satisfied?	47.20	129.522	.590	.586	.827
14. Do you get angry or irritated when somebody bothers you while you are using your mobile?	47.04	131.693	.518	.543	.830
15. How often do you say things on your mobile that you would not say in person?	46.78	134.199	.394	.477	.835
16. How often do you abandon what you are doing to spend more time playing video games?	47.22	135.584	.428	.488	.834
17. Do you think that your academic performance has been negatively affected by your video game use?	47.18	130.202	.585	.528	.828
18. Do you get angry or irritated when somebody bothers you while you are playing video games?	46.82	128.325	.441	.433	.834
19. Do you feel the need to spend increasingly more time playing to feel satisfied?	47.30	132.926	.483	.462	.832
20. Do you stop going out with friends to spend more time playing video games?	47.64	139.455	.275	.385	.839

Source: Own elaboration.

Furthermore, data analysis revealed six components that explain 64.27% of the total accumulated variance, the own values being above one in both cases (Table 4). After the analysis, those items with a greater factor loading were grouped into each factor, although they also saturate in other factors with a lower factor loading. These factors were classified as follows:

Factor 1 (Items 15, 8, 2, 11, 3). Mobile telephone-related experiences.

Factor 2 (Items 20, 19, 5, 17, 10, 18). Video game consumption-related experiences.

Factor 3 (Items 4, 6, 16). Abandonment of tasks and escaping from problems.

Factor 4 (Items 7, 14). States of irritability.

Factor 5 (Item 1). Game console frequency of use.

Factor 6 (Items 12, 9, 13). Sleep disturbance.

TABLE 4. Component matrix statistics in the ICT dimension.

Rotated component matrix[a]						
	Component					
	1	2	3	4	5	6
15. How often do you say things on your mobile that you would not say in person?	.7.25					
8. Do you find it easier to interact online or in person?	.649					
2. How often do you use a mobile telephone?	.613		.323			-.373
11. Do you feel anxious when you do not receive messages or calls?	.601					
3. How often do you use other devices with a connection?	.583				.422	
20. Do you stop going out with friends to spend more time playing video games?		.826				
19. Do you feel the need to spend increasingly more time playing to feel satisfied?		.567		.306		
5. Do you think that your academic performance has been negatively affected by your Internet use?	.308	.562	.494			

17. Do you think that your academic performance has been negatively affected by your video game use?		.557			.392	
10. Do you think that your academic performance has been negatively affected by your mobile use?	.396	.514	.396			
18. Do you get angry or irritated when somebody bothers you while you are playing video games?		.504		.500	.308	
4. How often do you abandon what you are doing to spend more time connected to the Internet?			.811			
6. When you have problems, does connecting to the Internet help you escape from them?	.354		586			
16. How often do you abandon what you are doing to spend more time playing video games?			.528	.331	.391	.305
7. Do you get angry or irritated when somebody bothers you while you are connected?				.815		
14. Do you get angry or irritated when somebody bothers you while you are using your mobile?	.307			.771		
1. How often do you use a game console?					.817	
12. Do you suffer sleep disturbance due to aspects related to mobile use?				.301	-.479	.460
9. Have you ever risked losing a relationship or an academic opportunity due to your mobile use?						.750
13. Do you feel the need to spend increasingly more time on your mobile to feel satisfied?	.481					.530

Source: Own elaboration.

To fulfil the second objective, related to the validation process of the social skills dimension, reliability analysis and construct validity were calculated. Data analysis delivered a high level of internal consistency for this dimension (α = .747). However, data analysis revealed three items with a corrected item-total correlation lower than .30. After detecting these items, they were deleted. As a final result, the value obtained by Cronbach's alpha coefficient for the dimension, which was .781 (Table 5).

TABLE 5. Item-total statistics in the social skills dimension.

	Scale mean if the item has been deleted	Scale variance if the item has been deleted	Corrected item-total correlation	Squared multiple correlation	Cronbach's alpha if the item has been deleted
1. Apologise online when my behaviour has bothered somebody.	46.57	60.252	.398	.372	.767
2. Apologise in person when I have hurt somebody's feelings.	45.57	63.723	.371	.476	.771
3. Express affection or support (hug, caress) when somebody close to me needs it.	45.69	59.339	.423	.458	.765
4. Say NO face-to-face when I am asked to do something that I do not want or do not like to do.	45.97	58.617	.413	.589	.766
5. Say NO online when I am asked to do something that I do not want or do not like to do.	45.54	57.373	.518	.548	.755
6. Keep calm online when I make a mistake in front of others.	46.20	60.753	.400	.591	.767

revista española de pedagogía
year 80, n. 283, Septembre-Dicember 2022, 533-558

7. Keep calm in public when I make a mistake.	45.97	62.852	.300	.309	.776
8. Express an opinion face-to-face different to that of the person who I am talking to.	45.80	61.224	.342	.291	.773
9. Express an opinion online different to that of the person who I am talking to.	45.86	61.185	.416	.314	.766
10. Respond (appropriately) in person to criticism that has bothered me.	46.11	56.692	.493	.711	.757
11. Respond (appropriately) online to criticism that has bothered me.	45.97	56.029	.536	.787	.752
12. Speak in public in front of strangers.	46.20	60.518	.335	.385	.774
13. Speak in public in front of people I know.	45.11	64.751	.377	.357	.772

Source: Own elaboration.

Data analysis indicated the relevance of applying the exploratory factor analysis to the selected sample (KMO=.554). Likewise, it showed an adequate significance level through Bartlett's test of Sphericity (.000 >.005). Five components were identified that explained 61.31% of the total accumulated variance, the own values being above one in both cases. In this respect, factor analysis established the grouping of the items around 5 factors. The component matrix includes how all the items group their highest weights around five components or factors (Table 6). Values over .45 were obtained in all cases.

These factors were called:

Factor 1: (Items 5, 4, 13, 1, 8, 9). Assertive Communication.

Factor 2: (Items 10, 11, 12). Interact with strangers in public.

Factor 3: (Items 3, 2). Express affection and apologise.

Factor 4: (Item 7). Keep calm in public.

Factor 5: (Item 6). Keep calm online.

TABLE 6. Component matrix statistics in the social skills dimension

Rotated component matrix[a]					
	Factor				
	1	2	3	4	5
5. Say NO online when I am asked to do something that I do not want to do.	.775	.032	.164	-.033	.173
4. Say NO face-to-face when I am asked to do something that I do not want to do.	.714	.011	-.002	-.080	.009
1. Apologise online when my behaviour has bothered somebody.	.552	.080	.179	.159	.195
13. Speak in public in front of people I know.	.550	.118	-.103	.093	-.314
8. Express an opinion face-to-face different to that of the person who I am talking to.	.473	.047	-.003	.125	-.020
9. Express an opinion online different to that of the person who I am talking to.	.454	.176	.152	-.218	-.122
10. Respond (appropriately) in person to criticism that has bothered me.	.079	.890	.118	.078	-.029
11. Respond (appropriately) online to criticism that has bothered me.	.100	.853	.214	.092	.035

12. Speak in public in front of strangers.	161	.395	-.047	.348	-.198
3. Express affection or support (hug, caress) when somebody close to me needs it.	.248	.060	.812	.510	-.117
2. Apologise in person when I have hurt somebody's feelings.	.044	.266	.742	-.199	-.050
7. Keep calm in public when somebody plays a joke on me/criticises me.	-.025	.179	.024	.832	.209
6. Keep calm online when somebody plays a joke on me/criticises me.	.094	-.039	-.141	.160	.971

Source: Own elaboration.

After this process, a validated version of the Ud-TIC instrument was obtained (Annex 1).

To fulfil the third objective, focused on describing the social skills of adolescents in person and online (Table 7), 34.6% of the minors reported that they find it easier to interact online than in person. Furthermore, 33.3% stated that they say things on their mobile that they would not say in person. With regard to the preference for virtual relationships over face-to-face relationships, 10% of the adolescents admitted that they had stopped going out with their friends in order to spend more time at home playing video games online, while 61% indicated that it had happened on occasion. As for expressing opposing opinions with another person (Table 7), similar scores were obtained, regardless of the form of communication; face-to-face interaction (M=3.91; Sd=1.24), and online interaction (M=3.86; Sd= 1.08).

TABLE 7. Descriptors in the "social skills" dimension.

	Always	Almost always	Quite often	On occasion	Never	M	Sd	Md
Do you find it easier to interact online?	11.3 %	6.3 %	17 %	32.9 %	32.5 %	2.26	1.32	2
Do you say things on your mobile that you would not say in person?	6.35 %	8 %	19 %	36.3 %	30.3 %	2.24	1.15	2

Do you stop going out with friends to spend more time playing video games?	2 %	5 %	3 %	61 %	29 %	4	1.45	4
Express a different opinion face-to-face	8.6 %	2.9 %	20 %	25.7 %	42.9 %	3.91	1.24	4
Express a different opinion online	2.9 %	8.6 %	22.9 %	31.4 %	34.3 %	3.86	1.08	4

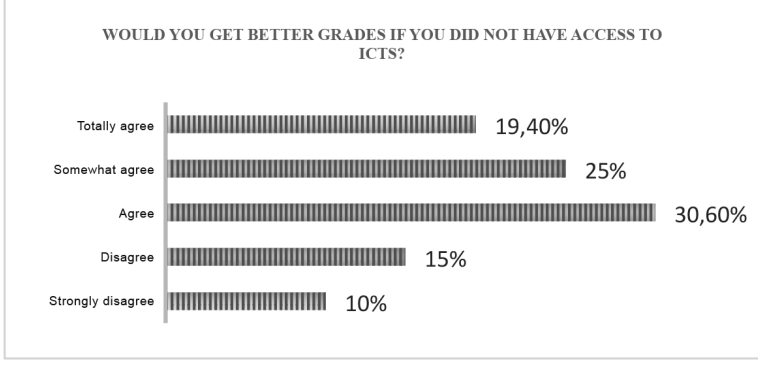
Source: Own elaboration.

In the case of the fourth objective, the impact of problematic ICT use on academic performance was assessed. It is worth noting that 75% of participants stated that they would get better grades if they did not have access to ICTs (Graph 1) (M=3.29; Sd=1.22; Md=3).

In this vein, 32% of the young people declared that their academic performance has been negatively affected by prolonged Internet use (M=2.24; Sd=1.04; Md=3). As a result, 23% admitted that they abandon their daily chores to spend more time on the Internet (M=2.12; Sd=.914; Md=2).

Finally, it is worth pointing out the statistically significant relationship between problematic mobile use and the abandonment of school work (x^2 (16) = 40.753, $p \leq 0.05$, V = 0.005). In this respect, data analysis showed that 52.8% of students who use their mobile *at all hours* abandon their school work for technology use, while, among the students who only use their mobile *when they need it,* cases of abandonment of school work dropped to 18.5%.

GRAPH 1. ICTs as mediators of grades.



Source: Own elaboration.

5. Discussion and conclusions

Research into the effects of mobile and video game use on the social relationships and academic performance of adolescents is not only relevant but also fundamental in today's society. Discussion of the results is first organised in relation to the validation of the Ud-TIC questionnaire, and, secondly, regarding the problematic use of ICTs and their impact on social skills and academic performance.

With regard to the validation process of the Ud-TIC questionnaire, in the case of the ICT dimension, on one hand, data were included in relation to the frequency of use of the three most widely used elements among adolescents; the mobile phone, Internet and game consoles (Fernández & Martínez, 2015), and, on the other hand, information regarding experiences related to the maladaptive use of each of them, in a clear, precise and concise manner. In terms of the psychometric properties of the Ud-TIC questionnaire, it delivered high reliability, similar to that found by the authors of the three scales on which the Ud-TIC is based (Beranuy et al., 2009; Chamarro et al., 2014). Furthermore, items were included related to the academic performance of adolescents, such as motivation towards their studies, dedication to study time, effort and dedication to their school work and their perception of how ICTs impact their school performance. Inclusion of this variable in the Ud-TIC questionnaire is one of the potentialities of this study, given that prior research was focused on analysing the role of mobile phones and video games in the improvement and sophistication of the learning processes and academic performance of adolescents (Tárraga-Mínguez et al., 2017; Altuzarra-Artola et al., 2018; García-Martín; Cantón-Mayo, 2019), disregarding the consequences of their abuse in academic terms. However, in recent years, the findings of the scientific community have started to be taken on board and mobiles and video games have been identified as one of the main distractions in terms of the correct academic performance of adolescents (Marín et al., 2018; Díaz-López et al., 2021; Gómez-Gonzalvo et al., 2020).

As for the social skills dimension of the questionnaire, its relevance can be appreciated given that social interaction models following the extensive use of the Internet require updated tools for their study (García, 2010; Segovia et al., 2016). In this respect, the dimension obtained high reliability and factor analysis established the grouping of the items around five factors, coinciding with the skills posed by Losada (2018). The indexes obtained are similar to Caballo and Salazar (2017). Based on these results, it can be stated that, following the analysis of the instrument's pilot project, optimal results were achieved in terms of the internal consistency and construct validity of the Ud-TIC.

Moreover, upon analysing face-to-face and virtual social skills, it was

found that three in ten adolescents find it easier to interact online than in person. These results are consistent with those found by Fondevila et al. (2014).

Analysis of the academic performance variable showed that three in four adolescents suffer the consequences of the problematic use of ICTs on their grades. These results are in line with Díaz-López et al. (2021) and differ from those found by Díaz-Vicario et al. (2019), in which less than half of the adolescents stated that ICT use makes them lose time that could be spent on their studies.

6. Limitations and future research

As for limitations and future research, it is worth noting that this study is part of broader research that culminated in the doctoral thesis of Díaz-López (2021). For the instrument design and validation, the adequate sample for the psychometric study of the instrument was employed, although it is true that as a germinal and reference study, it is necessary to expand the age range of the students, specifically from primary education to upper secondary education.

Likewise, as a limitation and future line of research, information must be collected from other sources, such as the family and teaching staff at schools, to thus triangulate the information and further examine the source of the problem.

As a line of research, we consider that procedures should be put in place to collect information on students, including genetic, family, social and cultural information. This would be very interesting to be able to interpret and justify the results obtained.

As future lines of research for this study, and as knowledge transfer, a parental training programme has been created and is being implemented in schools, families and town councils regarding the adaptive use of ICTs, given that family supervision has been shown to be a determining factor in the healthy relationship between young people and ICTs, as it is a mediator of frequency of use, technological stress and academic performance.

To sum up, we would like to highlight that the Ud-TIC questionnaire is a valid and reliable instrument, making it possible to approach the study of an unprecedented social and educational problem, enabling the collection of data, not only in terms of problematic ICT use, but also as to how this situation expands into the two most decisive contexts in the stage of adolescence, the social sphere and the educational sphere. This instrument and the research conducted by Díaz-López (2021) seek to shed light on this problem and help us to understand the consequences of the problematic use of technology in the young people of generation Z, who, as part of an entirely digitalised society, need ICTs for their social and educational survival.

ANNEXES

Annex 1

Ud-TIC questionnaire

[The following is the validated questionnaire in its original Spanish version]

Cuestionario Ud-TIC

*Es importante que rellenes este cuestionario con la mayor sinceridad posible. La información que des en el mismo será anónima. Su finalidad es contribuir a la realización de un estudio a nivel regional. Gracias por tu colaboración.

DIMENSIÓN 1. DATOS DE IDENTIFICACIÓN, SOCIODEMOGRÁFICOS Y ACADÉMICOS

Datos personales (Tacha con una X)

I. Edad: 11-12____13-14_____15-17____ II. Curso: 1º____2º____3º____4º____
III. Sexo: H___M____ IV. Tipo de centro: Público____Concertado____Privado____Municipio:

Datos escolares (Rodea con un círculo)

V. Nota de la última evaluación de Lengua	1	2	3	4	5	6	7	8	9	10
VI. Nota de la última evaluación de matemáticas	1	2	3	4	5	6	7	8	9	10
VII. Nota de la última evaluación de sociales	1	2	3	4	5	6	7	8	9	10
VIII. Nota de la última evaluación de inglés	1	2	3	4	5	6	7	8	9	10

	1.Muy en desacuerdo	2.En desacuerdo	3.Ni de acuerdo ni en desacuerdo	4.Bastante de acuerdo	5.Totalmente de acuerdo
IX. ¿Podrías sacar mejores notas?	1	2	3	4	5
X. ¿Dedicas tiempo suficiente al estudio?	1	2	3	4	5
XI. ¿Dedicarías más tiempo si no tuvieras acceso a tecnologías?	1	2	3	4	5

XII. ¿Supervisan tus padres el uso que haces de Internet oredes sociales? Sí___ No ___

XIII. ¿Supervisan tus padres el tiempo que dedicas a de jugar a videojuegos? Sí___ No ___

XIV. ¿Supervisan tus padres el tipo de videojuegos a los que dedicas tu tiempo? Sí___ No ___

XV. ¿Quién te supervisa el acceso a Internet? 1. Nadie 2. Mi madre 3. Mi padre 4. Mis padres 5. Mis abuelos 6. Otros_

XVI. ¿Cuándo tienes acceso a Internet? 1. Nunca_ 2. Por las tardes_ 4. Por las noches_ 3. Todo el día

XVII. ¿Te sientes estresado o nervioso cuando no tienes acceso a Internet? Sí___ No ___

DIMENSIÓN 2. USO DE LAS TICs (Indica que opción se ajusta más a tu situación)

	Nunca	Rara vez	Solo los fines de semana	Varias veces a la semana	Todos los días
1. ¿Con qué frecuencia haces uso de la videoconsola?	a	b	c	d	e
	Nunca	Solo cuando lo necesito	Con frecuencia	Mucho	A todas horas
2. ¿Con qué frecuencia haces uso del teléfono móvil?	a	b	c	d	e
3. ¿Con qué frecuencia haces uso de otros dispositivos con conexión a Internet?	a	b	c	d	e

	Nunca	Algunas veces	Bastantes veces	Casi siempre	Siempre
4. ¿Abandonas las cosas que estas haciendo para estar mas tiempo conectado a Internet?	a	b	c	d	e
5. ¿Piensas que tu rendimiento académico se ha visto afectado negativamente por el uso de Internet?	a	b	c	d	e
6. Cuando tienes problemas, ¿conectarte a Internet te ayuda a evadirte de ellos?	a	b	c	d	e
7. ¿Te resulta más fácil o cómodo relacionarte con la gente a través de Internet que en persona?	a	b	c	d	e
8. ¿Has tenido el riesgo de perder una relación o una oportunidad académica por el uso del móvil?	a	b	c	d	e
9. ¿Piensas que tu rendimiento académico se ha visto afectado negativamente por el uso del móvil?	a	b	c	d	e
10. ¿Te sientes inquieto cuando no recibes mensajes o llamadas?	a	b	c	d	e
11. ¿Te quedas despierto hasta tarde jugando a videojuegos o con el móvil?	a	b	c	d	e
12. ¿Sientes la necesidad de invertir cada vez más tiempo en el móvil para sentirte satisfecho?	a	b	c	d	e
13. ¿Te enfadas o te irritas cuando alguien te molesta mientras utilizas el móvil?	a	b	c	d	e
14. ¿Dices cosas por el móvil que no dirías en persona?	a	b	c	d	e
15. ¿Abandonas lo que estás haciendo para jugar más tiempo a videojuegos?	a	b	c	d	e
16. ¿Piensas que tu rendimiento académico se ha visto afectado negativamente por el uso de videojuegos?	a	b	c	d	e
17. ¿Te enfadas o te irritas cuando alguien te molesta mientras estás jugando a videojuegos?	a	b	c	d	e
18. ¿Sientes la necesidad de invertir cada vez más tiempo jugando para sentirte satisfecho?	a	b	c	d	e
19. ¿Dejas de salir con tus amigos para pasar más tiempo	a	b	c	d	e

DIMENSIÓN 3. HABILIDADES SOCIALES (indica qué opción es más característica de ti en cada una de las situaciones descritas)

	Muy poco característico de mi	Poco característico de mi	Moderadamente característico de mi	Bastante característico de mi	Muy característico de mi
20. Pedir disculpas en persona cuando mi comportamiento ha molestado a otra persona.	a	b	c	d	e
21. Pedir disculpas en Internet cuando he herido los sentimientos de alguien	a	b	c	d	e
22. Dar una expresión de afecto o apoyo (abrazo, caricia) cuando alguien cercano lo necesita	a	b	c	d	e
23. Decir a la cara NO cuando me piden algo que no quiero o no me gusta hacer	a	b	c	d	e
24. Decir NO en Internet cuando me piden algo que no quiero o no me gusta hacer	a	b	c	d	e
25. Mantener la calma cuando me equivoco delante de otras personas	a	b	c	d	e
26. Mantener la calma en Internet cuando me equivoco delante de otras personas	a	b	c	d	e
27. Expresar una opinión diferente a la de la persona con la que estoy hablando cara a cara	a	b	c	d	e
28. Manifestar una opinión distinta a la de la persona con la que estoy hablando a través de internet	a	b	c	d	e
29. Responder (adecuadamente) en persona a una crítica que me ha molestado	a	b	c	d	e
30. Responder (adecuadamente) a una crítica que me ha molestado a través de Internet	a	b	c	d	e
31. Hablar en público ante desconocidos	a	b	c	d	e
32. Hablar en público ante persona conocidas (compañeros, familiares…)	a	b	c	d	e

Source: Own elaboration.

References

Altuzarra-Artola, A., Gálvez, C., & González, A. (2018). Explorando el potencial de los dispositivos electrónicos y de las redes sociales en el proceso enseñanza-aprendizaje de los universitarios [Exploring the potential of electronic devices and social networks in the teaching-learning process of university students]. *Edutec. Revista Electrónica De Tecnología Educativa, 64*, 18-40. https://doi.org/10.21556/edutec.2018.64.1031

Andrade, A. L. M., Enumo, S. R. F., Passos, M. A. Z., Vellozo, E. P., Schoen, T. H., Kulik, M. A., & Vitalle, M. S. D. S. (2021). Problematic internet use, emotional problems and quality of life among adolescents. *Psico-USF*, *26*, 41-51. https://doi.org/10.1590/1413-8271202126010

Aznar, I., Kopecký, K., Romero, J. M., Cáceres, M. P., & Trujillo, J. M. (2020). Patologías asociadas al uso problemático de internet. Una revisión sistemática y metaanálisis en WoS y Scopus [Pathologies associated with problematic internet use. A systematic review and meta-analysis in WoS and Scopus]. *Investigación bibliotecológica, 34* (82), 229-253. https://doi.org/10.22201/iibi.24488321xe.2020.82.58118

Beranuy, M., Chamarro, A., Graner, C., & Carbonell, X. (2009). Validación de dos escalas breves para evaluar la adicción a Internet y el abuso de móvil [Validación de dos escalas breves para evaluar la adicción a Internet y el abuso de móvil]. *Psicothema, 21* (3), 480-485.

Caballo, V. E., & Salazar, I. C. (2017). Desarrollo y validación de un nuevo instrumento para la evaluación de las habilidades sociales: el cuestionario de habilidades sociales (CHASO) [Development and validation of a new instrument for the assessment of social skills: the social skills questionnaire (CHASO)]. *Psicología Conductual, 25* (1), 5-24. http://bit.ly/33eF2DO

Carbonell, X. (2020). El diagnóstico de adicción a videojuegos en el DSM-5 y la CIE-11: retos y oportunidades para clínicos [The diagnosis of video game addiction in DSM-5 and ICD-11: challenges and opportunities for clinicians]. *Papeles del Psicólogo, 41* (3), 211-218. https://doi.org/10.23923/pap.psicol2020.2935

Chamarro, A., Sánchez-Carbonell, X., Manresa, J. M., Muñoz-Miralles, R., Ortega-González, R., López-Morrón, M. R., & Toran-Monserrat, P. (2014). El cuestionario de experiencias relacionadas con los videojuegos (CERV) [The video game experience questionnaire (CERV)]. *Adicciones, 26* (4), 303-311. https://doi.org/10.20882/adicciones.31

Del Barrio, A., Ruíz, I. (2017). Hábitos de uso del Whatsapp por parte de los adolescentes [Habits of use of the WhatsApp by the adolescents]. *International Journal of Developmental and Educational Psychology, 2* (1), 23-30. https://doi.org/10.17060/ijodaep.2017.n1.v2.915

Díaz-López, A. (2021). *Uso problemático de las TIC en la adolescencia [Problematic use of ICTs in adolescence]* [Doctoral dissertation, Universidad de Murcia]. Digitum. https://digitum.um.es/digitum/handle/10201/113683

Díaz-López, A., Maquilón-Sánchez, J., & Mirete-Ruiz, A. (2020). Uso desadaptativo de las TIC en adolescentes: Perfiles, supervisión y estrés tecnológico [Maladaptive use of ICT in adolescence: Profiles, supervision and technological stress]. *Comunicar, 64*, 29-38. https://doi.org/10.3916/C64-2020-03

Díaz-López, A., Mirete-Ruiz, A. B., & Maquilón-Sánchez, J. (2021). Adolescents' Perceptions of Their Problematic Use of perceptions of their problematic use of ICT: Relationship with study time and academic performance. *International Journal of Environmental Research and Public Health*, *18* (12), 66-73. https://doi.org/10.3390/ijerph18126673

Diaz, R., & Aladro, M. (2016). Relationship between the use of new technologies and childhood overweight, as a public health problem. *RqR Community Nursing, 4* (1), 46-51.

Díaz-Vicario, A., Mercader, C. y Gairin, J. (2019). Uso problemático de las TIC en adolescentes [Problematic ICT Use in adolescents]. *Revista Electrónica Investigación Educativa, 21*(e07), 1-11. https://doi.org/10.24320/redie.2019.21.e07.1882

Espinar Ruiz, E., & López Fernández, C. (2009). Jóvenes y adolescentes ante las nuevas tecnologías: percepción de riesgos [Spanish adolescents' views of the uses and risks of new technologies]. *Athenea Digital.Revista De Pensamiento e Investigación Social, 16*, 1-20.

Fernández, Á. D. B., & Martínez, I. G. (2015). Las TIC: una mirada a los hábitos de los adolescentes que viven con sus abuelos [ICTs: A look at the habits of adolescents living with their grandparents]. *International Journal of Developmental and Educational Psychology. Revista INFAD de Psicología.*, *1* (1), 251-264.

Fondevila, J. F., Carreras, M., Mir, P., del Olmo, J. L., & Pesqueira, M. J. (2014). El impacto de la mensajería instantánea en los estudiantes en forma de estrés y ansiedad para el aprendizaje: análisis empírico [The impact of instant messaging on students in the form of stress and learning anxiety: an empirical analysis]. *Didáctica, innovación y multimedia, 30*, 1-1.

Gioia, F., Rega, V., & Boursier, V. (2021). Problematic internet use and emotional dysregulation among young people: A literature review. *Clinical Neuropsychiatry: Journal of treatment Evaluation*, *18* (1), 41-54.

Gálvez-Nieto, J. L., Vera-Bachman, D., Cerda, C., & Díaz, R. (2016). Escala de victimización entre adolescentes a través del teléfono móvil y de Internet: estudio de validación de una versión abreviada en estudiantes chilenos. *Revista Iberoamericana de Diagnóstico y Evaluación-e Avaliação Psicológica*, *1* (41), 16-27.

García, F. B. (2010). Usos de las TIC, relaciones sociales y cambios en la socialización de las y los jóvenes [ICT use, social relations and changes in young people's socialisation]. *Revista de estudios de juventud, 88*, 97-114.

García-Martín, S., & Cantón-Mayo, I. (2019). Uso de tecnologías y rendimiento académico en estudiantes adolescentes [Use of technologies and academic performance in adolescent students]. *Comunicar, 59, 73-81.* https://doi.org/10.3916/C59-2019-07.

García-Oliva, C., Piqueras, J. A., & Marzo, J. C. (2017). Uso problemático de Internet, el móvil y los videojuegos en una muestra de adolescentes alicantinos [Problematic use of Internet, mobile and video games in a sample of adolescents from Alicante]. *Salud y Drogas, 17* (2), 189-200. https://doi.org/10.21134/haaj.v17i2.331

Golpe, S., Isorna, M., Gómez, P., & Rial, A. (2017). Uso problemático de internet y adolescentes: el deporte sí importa [Problematic Internet use and adolescents: sport does matter]. *RETOS. Nuevas Tendencias En Educación Física, Deporte y Recreación, 31*, 52-57.

Gómez-Gonzalvo, F., Devís-Devís, J., & Molina-Alventosa, P. (2020). El tiempo de uso de los videojuegos en el rendimiento académico de los adolescentes [Video game usage time in adolescents' academic performance]. *Comunicar, 65*, 89-99. https://doi.org/10.3916/C65-2020-08

Gracia-Granados, B., Quintana-Orts, C., & Rey, L. (2020). Regulación emocional y uso problemático de las redes sociales en adolescentes: el papel de la sintomatología depresiva [Emotional regulation and problematic social network use in adolescents: the role of depressive symptomatology]. *Health & Addictions/Salud y Drogas, 20* (1), 77-86. https://doi.org/10.21134/haaj.v20i1.473

Grande, I., & Abascal, E. (2005). *Survey analysis.* Esic.

Ioannidis, K., Taylor, C., Holt, L., Brown, K., Lochner, C., Fineberg, N. A., Corazza O., Chamberlain, S. R., Roman-Urrestarazu, A., & Czabanowska, K. (2021). Problematic usage of the internet and eating disorder and related psychopathology: A multifaceted, systematic review and meta-analysis. *Neuroscience & Biobehavioral Reviews*, *125*, 569-581. https://doi.org/10.1016/j.neubiorev.2021.03.005

Kokka, I., Mourikis, I., Nicolaides, N. C., Darviri, C., Chrousos, G. P., Kanaka-Gantenbein, C., & Bacopoulou, F. (2021). Exploring the effects of problematic internet use on adolescent sleep: A systematic review. *International Journal of Environmental Research and Public Health*, *18* (2), 760. https://doi.org/10.3390/ijerph18020760

Labrador, F. J., Villadangos, S. M., Crespo, M., & Becoña, E. (2013). Desarrollo y validación del cuestionario de uso problemático de nuevas tecnologías (UPNT) [Development and validation of the questionnaire of problematic use of new technologies (UPNT)]. *Anales de psicología*, *29* (3), 836-847.

Lima-Rodríguez, J. S., Lima-Serrano, M., Jiménez Picón, N., & Domínguez Sánchez, I. (2012). Consistencia interna y validez de un cuestionario para medir la autoperceptción del estado de salud familiar. *Revista Española de Salud Pública, 86* (5), 509-521.

Lloret, D., Morell, R., Marzo, J. C., & Tirado, S. (2017). Validación española de la Escala de Adicción a Videojuegos para Adolescentes (GASA) [Spanish validation of Game Addiction Scale for Adolescents (GASA)]. *Atención Primaria, 50* (6), 350-358. https://doi.org/10.1016/j.aprim.2017.03.015

Long, J., Liu, T. Q., Liao, Y.-H., Qi, C., He, H. Y., Chen, S. B., & Billieux, J. (2016). Prevalence and correlates of problematic smartphone use in a large random sample of Chinese undergraduates. *BMC psychiatry*, *16* (1), 1-12. https://doi.org/10.1186/s12888-016-1083-3

López de Ayala-López, M. C., Catalina-García, B., & Pastor-Ruiz, Y. (2022). Problematic internet use: the preference for online social interaction and the motives for using the Internet as a mediating factor. *Communication & Society, 35* (2), 1-17. https://doi.org/10.15581/003.35.2.1-17

López-Fernandez, O., Honrubia-Serrano, L., Freixa-Blanxart, M., & Gibson, W. (2014). Prevalence of problematic mobile phone use in British adolescents. *CyberPsychology, Behavior, and social networking*, *17* (2), 91-98. https://doi.org/10.1089/cyber.2012.0260

Losada, L. (2018). Reflexión y construcción del conocimiento en torno a las habilidades sociales y la competencia social [Reflection and knowledge building on social skills and social competence]. *Revista Caribeña de Investigación Educativa (RECIE)*, *2* (1), 7-22. https://doi.org/10.32541/recie.2018.v2i1.pp7-22

Machimbarrena, J. M., Calvete, E., Fernández-González, L., Álvarez-Bardón, A., Álvarez-Fernández, L., & González-Cabrera, J. (2018). Internet risks: An overview of victimization in cyberbullying, cyber dating abuse, sexting, online grooming and problematic internet use. *International journal of environmental research and public health*, *15* (11), 2471. https://doi.org/10.3390/ijerph15112471

Masaeli, N., & Billieux, J. (2022). Is problematic internet and smartphone use related to poorer quality of life? A systematic review of available evidence and assessment strategies. *Current Addiction Reports*, 1-16. https://doi.org/10.1007/s40429-022-00415-w

Marín, M., Carballo, J., & Coloma, A. (2018). Rendimiento académico y cognitivo en el uso problemático de Internet [Academic and cognitive performance in problematic Internet use]. *Adicciones, 30* (2), 101-110. http://dx.doi.org/10.20882/adicciones.844

Moral-Jiménez, D. L. V. M., & Fernández-Domínguez, S. (2019). Uso problemático de Internet en adolescentes españoles y su relación con autoestima e impulsividad [Problematic Internet Use in Spanish Adolescents and Their Relationship with Self-Esteem and Impulsivity]. *Avances en psicología latinoamericana*, *37* (1), 103-119. http://dx.doi.org/10.12804/revistas.urosario.edu.co/apl/a.5029

Nobles, D., Londoño, L., Martínez, S., Ramos, A., Santa, G., & Cotes, A. (2015). Tecnologías de la comunicación y relaciones interpersonales en jóvenes universitarios [Communication technologies and interpersonal relations among university students]. *Educación y Humanismo, 18* (30), 14-27. http://dx.doi.org/10.17081/eduhum.18.30.1311

Pardo-Cueva, M., Chamba-Rueda, L. M., Gómez, A. H., & Jaramillo-Campoverde, B. G. (2020). Las TIC y rendimiento académico en la educación superior: Una relación potenciada por el uso del Padlet [ICT and academic performance in higher education: A relationship enhanced by the use of Padlet]. *Revista Ibérica de Sistemas e Tecnologias de Informação*, *28*, 934-944.

Pérez-Juste, R., Galán, A., & Quintanal, J. (2012). *Métodos y diseños de investigación en educación [Research methods and designs in education]*. Editorial UNED.

Pulido-Rull, M. A., Escoto-de la Rosa, R., & Gutiérrez-Valdovinos, D. M. (2011). Validez y confiabilidad del Cuestionario de Uso Problemático de Internet (CUPI) [Validity and reliability of the Questionnaire on Problematic Internet Use (CUPI)]. *Journal of behavior, health & social issues (México)*, *3* (1), 25-34.

Rial, A., Gómez, P., Braña, T. y Varela, J. (2014). Actitudes, percepciones y uso de Internet y las redes sociales entre los adolescentes de la comunidad gallega (España) [Attitudes, perceptions and Internet and social networks use among Galician teens]. *Anales de Psicología, 30,* 642-655. https://doi.org/10.6018/analesps.30.2.159111

Rivero, F. (2016). *Informe Mobile en España y en el Mundo 2016 [Mobile in Spain and the World 2016 Report].* https://ditrendia.es/informe-ditrendia-mobile-en-espana-y-en-el-mundo-2016/

Rodríguez-Gómez, D., Castro, D., & Meneses, J. (2018). Usos problemáticos de las TIC entre jóvenes en su vida personal y escolar [Problematic uses of ICTs among young people in their personal and school life]. *Comunicar*, *26* (56), 91-100. https://doi.org/10.3916/C56-2018-09

Sánchez Díaz de Mera, D., & Lázaro Cayuso, P. (2017). La adicción al Whatsapp en adolescentes y sus implicaciones en las habilidades sociales [Whatsapp addiction in adolescents and its implications for social skills]. *Tendencias pedagógicas*, 29, 121-134.

Segovia, B., Mérida, R., Olivares, M. A., & González, M. E. (2016). Procesos de socialización con redes sociales en la adolescencia [Processes of socialisation with social networks in adolescence]. *RELATEC: Revista Latinoamericana de Tecnología Educativa*, *15* (3), 141-154.

Solano, A. C., & Perugini, M. L. L. (2019). Perfiles diferenciales de usuarios de internet, factores de personalidad, rasgos positivos, síntomas psicopatológicos y satisfacción con la vida [Differential profiles of Internet users, personality factors, positive traits, psychopathological symptoms and life satisfaction]. *Revista Iberoamericana de Diagnóstico y Evaluación Psicológica*, *4* (53), 79-90. https://doi.org/10.21865/RIDEP53.4.06

Tabachnick, B. G., & Fidell, L. S. (2013). *Using multivariate statistics*. Pearson.

Tárraga-Mínguez, R., Sanz-Cervera, P., Pastor-Cerezuela, G., & Fernández-Andrés, I. M. (2017). Análisis de la autoeficacia percibida en el uso de las TIC de futuros maestros y maestras de Educación Infantil y Educación Primaria [Analysis of the perceived self-efficacy in the use of ICT of pre-service primary and preschool teachers]. *Revista Electrónica Interuniversitaria de Formación del Profesorado, 20* (3), 107-116. https://doi.org/10.6018/reifop.20.3.263901

Vilca,L., & Vallejos, M. (2015). Construction of the risk of addiction to social networks scale [Construcción de la escala de riesgo de adicción a las redes sociales]. *Computers in Human Behaviour, 48,* 190-198. https://doi.org/10.1016/j.chb.2015.01.049

Viñals, A., & Cuenca, J. (2016). Ocio entre pares en la era digital: percepción del ocio conectado juvenil [Peer-to-peer leisure in the digital age: perceptions of youth connected entertainment]. *Revista de Psicología del Deporte, 25* (4), 0061-65.

Yang, S. C., & Tung,C. J. (2007). Comparison of Interne addicts and non-addicts in Taiwanese High school. *Computer in Human Behavior. 23* (1), 79-96. https://dx.doi.org/10.1016/j.chb.2004.03.037

Authors' biographies

Adoración Díaz López holds a PhD in Education from the Universidad de Murcia, is Associate Professor in the Department of Didactics and School Organization of the Faculty of Education at the same university and Postdoctoral Researcher at the Universidad Internacional de la Rioja (UNIR). Her research interests are related to bullying and cyberbullying, problematic use of ICT and truancy.

https://orcid.org/0000-0002-8841-3701

Javier Jerónimo Maquilón Sánchez holds a PhD in Pedagogy from the Universidad de Murcia and is Associate Professor in the Department of Research Methods and Diagnosis in Education at the UM. He has participated in 18 teaching innovation projects, six of them as director, and has published more than 60 papers (Scopus/JCR) and 31 book chapters. His research interests are related to bullying and cyberbullying, problematic use of ICT, learning strategies and motivations in students, teacher teaching approaches and teaching innovation.

https://orcid.org/0000-0002-8089-5144

Ana Belén Mirete Ruiz holds a PhD in Educational Psychology from the Universidad de Murcia and is Associate Professor in the Department of Research Methods and Diagnosis in Education in the Faculty of Education at the same university. Her lines of research include those related to attention to diversity, storytelling for educational inclusion, teaching and learning approaches, as well as the use of ICT in education.

https://orcid.org/0000-0001-6011-8826

Perceived parenting style and quality of life related to health among adolescents

Percepción del estilo parental y calidad de vida relacionada con la salud entre adolescentes

Rosalía JÓDAR MARTÍNEZ, PhD. Lecturer. Universidad Internacional de la Rioja *(rosalia.jodar@unir.net)*.
María del Pilar MARTÍN CHAPARRO, PhD. Lecturer. Universidad de Murcia *(mpmartin@um.es)*.
María Dolores HIDALGO MONTESINOS, PhD. Professor. Universidad de Murcia *(mdhidalg@um.es)*.
Juan Pedro MARTÍNEZ RAMÓN, PhD. Lecturer. Universidad de Murcia *(juanpedromartinezramon@um.es)*.

Abstract:

The interaction between health-related quality of life and parenting styles can give rise to perceptions that influence behaviour in adolescents. It is thought to affect key elements in the emotional development of students at a very important stage. Therefore, the aim of this study was to explore the relationship between health-related quality of life and perceived parental educational style as a function of parental gender. A total of 253 adolescents aged 11 and 18 years were selected from secondary schools in a region of south-eastern Spain. The Scale of Norms and Demands Children's Version (ENE-H by its Spanish acronym) and the Short Form-36 Health Survey (SF-36) were used. This was a quantitative research project and data mining was used for data analysis. The results showed that the inductive parenting style is related to physical role, emotional problems, vitality, emotional well-being, pain and general health. We also observed that the rigid style is negatively related to physical role, vitality, emotional well-being, social functioning, pain and general health. Finally, the indulgent style is negatively related to pain. The findings shed light on the need to provide health-related training programmes that consider family characteristics.

Keywords: adolescence, health-related quality of life, perceived parental styles, family, gender.

Revision accepted: 2022-07-11.
This is the English version of an article originally printed in Spanish in issue 283 of the **revista española de pedagogía**. For this reason, the abbreviation EV has been added to the page numbers. Please, cite this article as follows: Jódar Martínez, R., Martín Chaparro, M. P., Hidalgo Montesinos, M. D., & Martínez Ramón J. P. (2022). Percepción del estilo parental y calidad de vida relacionada con la salud entre adolescentes | *Perceived parenting style and quality of life related to health among adolescents. Revista Española de Pedagogía, 80* (283), 559-581. https://doi.org/10.22550/REP80-3-2022-07
https://revistadepedagogia.org/ ISSN: 0034-9461 (Print), 2174-0909 (Online)

Resumen:

La interacción entre la calidad de vida relacionada con la salud y los estilos parentales puede dar lugar a percepciones que influyen sobre el comportamiento de los adolescentes. Se considera que puede afectar a elementos clave en el desarrollo emocional del alumnado en una etapa de gran trascendencia. Por ello, el objetivo fue estudiar la relación entre calidad de vida relacionada con la salud y el estilo educativo percibido de los padres en función del género. Un total de 253 adolescentes de 11 y 18 años fueron seleccionados de centros de enseñanza secundaria de una región del sureste de España. Se administró la Escala de Normas y Exigencias - versión (ENE-H) y el Cuestionario de Calidad de Vida relacionada con la Salud (SF-36). Se trató de una investigación de enfoque cuantitativo y para el análisis de datos se utilizó la minería de datos. Los resultados mostraron que el estilo parental inductivo se relaciona con el rol físico, problemas emocionales, vitalidad, bienestar emocional, dolor y salud general. Observamos que el estilo rígido se relaciona de forma negativa con rol físico, vitalidad, bienestar emocional, funcionamiento social, dolor y salud general. Por último, el estilo indulgente se relaciona de forma negativa con el dolor. Las conclusiones arrojan luz acerca de la necesidad de poner en marcha programas formativos relacionados con la salud.

Descriptores: adolescencia, calidad de vida relacionada con la salud, estilos parentales percibidos, familia, género.

1. Introduction

The family is the most important context in which the process of socialisation takes place, norms are internalised and personality and social skills are developed (Haslam et al., 2020), contributing to the development of expectations and perceptions in adolescents (Martínez & Julián, 2017; Jahng, 2019; Willroth et al., 2021). Some of the key aspects in family relationships are the type of communication (for example, acceptance or rejection, closeness or distance) and the parents' approach to guiding the behaviour of their children (for example, autonomy or control, indulgence or strictness) (Delvecchio et al., 2020; Moreno et al., 2020). If adolescents feel supported by their mothers and fathers, they are more likely to develop a positive sense of self and display prosocial behaviours (Bagan et al., 2019). In this respect, parenting style is associated with emotional development during adolescence (Bahmani et al., 2022; Carlo et al., 2010; Maccoby & Martin, 1983; Setiyowati et al., 2019), and its influence can extend into adulthood (Marčinko et al., 2020). To explain this, Musitu and García (2001) designed a theoretical model of childrearing based on two dimensions: acceptance/involvement (receptiveness and dialogue) and strictness/imposition (punishment). These authors also defined four parenting styles by combining these two dimensions: *inductive* (consisting of a high level of acceptance, also known as involvement, as well as strictness and the imposition of rules and boundaries),

indulgent (consisting of a high degree of acceptance and involvement, and a low degree of strictness and imposition), *strict with low involvement* (in this case, a high degree of strictness and imposition and a low degree of acceptance) and finally *neglectful* (a low degree of acceptance and involvement, contrasting with strictness and imposition). Other theories have since continued in a similar vein, suggesting that the combination of aspects related to affection, communication and conduct produces the four parenting styles (Martínez et al., 2019; Queiroz et al., 2020), thus enriching and expanding the original model (Estlein, 2021; Louis, 2022; Pinquart & Gerke, 2019). As such, families who adopt an inductive style (associated with respect) share skills such as the ability to guide their children in developing healthy goals and a fair distribution of household responsibilities (Fan & Chen, 2020), better socio-economic skills and academic performance (Haslam et al., 2020, Newman et al, 2015) and optimal health, subjective well-being and a good quality of life (Alonso-Stuyck, 2020; Heinze et al., 2020; Wittig & Rodríguez, 2019; Zarra-Nezhad et al. 2020). In contrast, a strict upbringing is associated with greater emotional maladjustment (King et al., 2016) and violent behaviours (Moreno-Ruiz et al., 2018), while an indulgent upbringing has been linked to drug-taking (Liu et al., 2022).

That said, bearing in mind the variable of gender, not all parental educational styles are applied with the same frequency. For example, mothers tend to use the inductive and indulgent styles more often than the negligent or strict styles; while fathers tend to make greater use of the strict and negligent styles (García, 2020). A study by Jahng (2019) showed the importance of the parenting style adopted by mothers in their children's perception of emotions and satisfaction. In a review that covered over 15 countries, Yaffe (2020) concluded that mothers tend to be seen as indulgent while fathers are seen as stricter, and that this perception was passed down from generation to generation. However, Kuppens and Ceulemans (2019) found that sometimes there are more similarities than differences in the parenting styles of mothers and fathers, with perhaps a slight discrepancy in the implementation of rules and the application of discipline, mainly observed in mothers and fathers, respectively.

However, health-related quality of life (HRQL) is a concept that covers not only physical but also psychological health and social adjustment (Guevara et al., 2021; Kim et al., 2021; Motamed-Gorji et al., 2019; Wallander & Koot, 2016). HRQL consists of various indicators such as social relationships, social support, depressive moods and the perception of cognitive performance. It can also help with the early detection of deficiencies in personal well-being and the most at-risk groups (Barlow et al., 2020). There are some variables, such as socio-familiar circumstances, that can affect how adolescents perceive HRQL (Baña, 2015; Kim et al., 2021). In general, a positive perception of intrafamily relationships is related to a better quality of life in adolescents, associated with greater psychological

well-being. In turn, a negative perception of intrafamily relationships is linked to feelings of abandonment (Chávez-Flores et al., 2018) and poor emotional adjustment (Gorostiaga et al. 2019). A link has also been found between the development of parental autonomy and HRQL in adolescents (Jiménez-Iglesias, et al., 2014). Similarly, variables such as rejection from the mother or the father or having an overprotective mother have also been closely linked to the HRQL of children (Xu et al., 2017).

In terms of the analysis of this phenomenon, artificial intelligence and the related methodologies are currently developing at great pace, allowing for the study of complex relationships between different variables (Luan et al., 2020; Morales-Rodríguez et al., 2021); however, there is still room for growth in the field of education in comparison to other areas (Chen et al., 2020).

That said, the general aim of this study is to establish a link between perceived parental educational style and HRQL, as a function of the gender of the parents and the children. The specific objectives of the study were as follows: (1) to analyse the link between educational style and HRQL in adolescents; and (2) to determine if there are any gender-based differences. The starting hypotheses were as follows: (H1) we expected to find a link between certain parenting styles and the HRQL of the respective children, insofar as children with a higher perceived HRQL will have families with more functional styles based on the analysed literature; and (H2) we expected to find gender-based differences in terms of parenting styles and perceived HRQL, depending on the role of mother, father, son or daughter.

2. Method

2.1. Participants

A total of 368 adolescents took part in the study; 179 boys and 189 girls aged 11–19 (mean = 14.30, *SD* = 1.59), enrolled at state secondary schools in the south-east of Spain. In general, from a socio-economic and cultural perspective, the families could be considered as middle or middle-to-upper class. Prior to the data analysis, the data was pre-processed and any participants with one or more pieces of information missing in an item were removed from the dataset. In the end, there was a total of 253 participants aged 11–18 (mean = 14.43; *SD* = 1.51), with 53.4% girls (mean = 14.6; *SD* = 1.5) and 46.6% boys (mean = 14.2; *SD* = 1.5). Of this total, 80.24% (203) were in compulsory secondary education and the remaining 19.76% (50) were in their first year of *bachillerato* studies (non-compulsory post-secondary education for students aged 16–18).

2.2. Instruments

The Scale of Norms and Demands (Escala de Normas y Exigencias – ENE-H), in its original Spanish version (Bersabé et al., 2001), was used in this study. The ENE-H is used to evaluate the educational style of parents and there are two versions of the scale; the children's version was used in this study. In each sub-scale (dimension), the predicted reliability for

internal consistency was sufficient. A self-report scale was used to evaluate the parenting styles, including the following three factors: inductive, strict and indulgent. There are 10 items for the first two factors and 8 items for the third factor, featuring a Likert-type scale with five degrees of frequency (never, rarely, sometimes, often and always). There was good internal consistency with Cronbach's alpha of 0.85, 0.73, 0.60, 0.80, 0.72 and 0.64 for Factor I-father, Factor II-father, Factor III-father, Factor I-mother, Factor II-mother and Factor III-mother, respectively. Cronbach's alpha would decrease as items are eliminated, which is indicative of the respective contribution. It is also important to note that the corrected item-total correlation was >0.40.

The Short-Form Health Survey (SF-36) (Ware y Sherbourne, 1992), which is used to evaluate HRQL, was also used in this study. The SF-36 consists of 36 questions that evaluate physical and mental health and quality of life. It was translated into Spanish by Alonso et al. (1995). The psychometric properties of the Spanish adaptation were similar to those of the original survey (varying between 0.78 and 0.94), except for the reliability of the 'social function' dimension, which was lower (<0.70). It has 36 items and different scales: Physical functioning, physical health, pain, energy/fatigue, social functioning, emotional well-being, emotional problems and general health. It includes both items with two possible responses and items with Likert-type scales featuring different degrees of intensity or frequency depending on the item. Internal consistency (Cronbach's alpha) is 0.8 for all the scales.

2.3. Process

Firstly, a telephone call was made to the selected secondary schools to present the study and invite them to take part. Following initial agreement from the school, the research plan was emailed to the school management, guidance counsellors, teachers, parents and legal guardians, highlighting the importance of emotional education in our health and overall development. Given the age of the students, informed consent was also requested. After selecting the classes, days and times for completing the surveys, a team of researchers was sent to the schools. In the classroom, there was a brief presentation of the study and the survey, guaranteeing the confidentiality and anonymity of all responses. There was also a presentation to teachers with the opportunity to raise any questions or doubts. The surveys were completed in 45 minutes. The data were collected before the COVID-19 pandemic. The study took into account all applicable legislation in Spain and, in particular, Law 3/2018, of 5 December, on the Protection of Personal Data, which establishes the need for the legal guardians of minors to expressly consent to the minors participating in a research study. This study was approved by the University's Ethics Committee.

2.4. Data analysis

Several types of data analysis were performed: univariate descriptive analysis, means and standard deviations;

t-test to compare the means of independent samples; analysis of the relationship between different parenting styles, measured using the ENE-H scale and the SF-36 dimensions of quality of life, using the Pearson product-moment correlation coefficient. The associated probability level and effect size were used to analyse the correlation values (< 0.30 weak; 0.30–0.49 moderate; >0.49 strong). To explore the relationship between the dimensions of quality of life and the perceived parenting styles, a range of multiple linear regression analyses were performed. Each dimension of quality of life was the dependent variable and the perceived parenting styles were used as the independent variables.

Lastly, data mining was used to find patterns and correlations between the ENE-H items and the SF-36 dimensions of quality of life. Given that, to date, there are no interpretation rules or cut-off points to classify the dominant type of parenting style, data mining was used to relate these aspects, which began by examining the ENE-H results per item.

The use of items and the combination of items allowed for very specific relationships to be studied not only between macro-aspects (HRQL and parenting styles) but also between specific dimensions. In general, given the six dimensions of parenting style (three dimensions for each parent) and the eight dimensions of HRQL, a total of 8*3 different problems arose. Each problem focused on studying whether a specific dimension of parenting style influenced a specific dimension of HRQL. The process involved (a) selecting the items that corresponded to a dimension of parenting style (for example, the inductive style), (b) associating them with a dimension of HRQL (for example, physical functioning) and (c) studying the relationship. Firstly, we looked at whether there was a lineal relationship between the associated aspects. From the total number of problems, we selected problems with at least a moderate correlation coefficient of 0.3, using Cohen's criteria (1988). Then, for problems that were selected because the correlation was significant, we performed a discretization of the predicted variable (in our example, physical functioning) into 2, 3 or 4 classes, using equal-frequency binning. The PART classifier (Quinlan, 1993) was used to see whether the items that measured parenting style (in our example, the inductive style) allowed us to predict the class to which the variable belonged (for example, low or high) with sufficient precision. Evidently, in this process, the expressiveness of the language used to describe the problem was reduced, in exchange for greater precision and ability to explain the findings. The regression phase and the successive classification were both performed in full training mode (to establish the existence of a relationship) and in 10-fold cross-validation mode (to guarantee the stability of the findings).

For problems with a classification precision of over 0.5, the most significant prediction rules were selected for interpretation. The 0.5 threshold was chosen

because, after equal-frequency binning, there were always problems with classification balance. The rules were selected in the final stage based on their confidence/support relationship. In some cases, the combination resulted in correlations of less than 0.3. However, these can give rise to significant rules with low support, which could indicate that there are special circumstances to be considered. All analyses were performed using the open-source software WEKA (version 3.8, University of Waikato) and the open-source software libraries NumPy (Oliphant, 2006) and SciPy (Jones et al., 2001).

3. Results

3.1. Quality of life and parenting styles

Table 1 shows the different means and standard deviations for each of the variables used in this study. These results are presented for total participants and according to gender, including the results of the *t*-test for the differences between the means for boys and girls. Statistically significant differences ($p < 0.05$) were found in the SF-36 dimensions of emotional problems, vitality, emotional well-being, bodily pain and general health, where in all cases girls scored lower than boys.

TABLE 1. Means and standard deviations in ENE-H and SF-36.

	Total N=253	**Girls N=135**	**Boys N=118**	**Difference between means**
	Media (*DT*)	**Media (*DT*)**	**Media (*DT*)**	*p*
SF-36				
Physical functioning	92.5 (13)	91.44 (12.39)	93.68 (13.62)	.086
Physical role/physical health	82.9 (27.8)	82.22 (28.0)	83.7 (27.6)	.338
Emotional problems	75.9 (34.8)	70.4 (37.7)	82.2 (30.1)	.003*
Vitality	62.5 (20.7)	58.7 (20.2)	66.7 (20.6)	.001*
Emotional well-being	68.70 (19.1)	65.8 (18.4)	72 (19.3)	.005*
Social functioning	84.6 (19.6)	82.9 (18.8)	86.5 (20.3)	.068
Bodily pain	77.4 (22.4)	74.4 (22.5)	80.8 (21.8)	.011*
General health	74.6 (18.7)	71.7 (18.5)	77.9 (18.4)	.004*
ENE-H				
Inductive-Father	37.3 (8.1)	37.8 (7.9)	36.7 (8.4)	.143
Inductive-Mother	38.5 (7.8)	39.2 (7.6)	37.8 (8.1)	.083
Strict-Father	26.8 (7.8)	26.6 (8.2)	27.1 (7.4)	.310
Strict-Mother	28.0 (7.8)	27.8 (8.1)	28.2 (7.5)	.330
Indulgent-Father	17.7 (5.8)	17.6 (5.4)	17.8 (6.1)	.409
Indulgent-Mother	18.1 (5.6)	18.0 (5.1)	18.2 (6.3)	.431

Note. SF-36: Short Form-36 health-related quality of life survey. ENE-H: Scale of parental educational styles, children's version. *SD*: Standard deviation.

Source: Own elaboration.

Table 2 shows the correlation between the scores for each parenting style evaluated using the ENE-H scale and the SF-36 dimensions of quality of life. Statistically significant positive correlations were found between inductive parenting styles in fathers and mothers and the dimensions of emotional well-being and general health. Statistically significant positive correlations were also found between the inductive style in fathers and vitality and bodily pain, and between the inductive style in mothers and physical role and emotional problems. In contrast, statistically significant negative correlations were found between strict parenting styles in fathers and mothers and the dimensions of emotional well-being, vitality and general health. Statistically significant negative correlations were also found between the strict style in mothers and physical role, social functioning and bodily pain. However, the effect size of all statistically significant correlations is low.

Table 3 presents the results of the linear regression models adjusted to each of the dimensions of HRQL. The parenting styles were included in each model as potential explanatory variables.

In general, all the obtained models showed a low percentage of variance. The model for the emotional well-being dimension presented the best fit, where the selected variables were the perceived strict educational style in fathers and the inductive style in mothers.

TABLE 2. Correlation between parenting styles (EHE-H) and quality of life (SF-36) (N=253).

	Inductive-Father	Inductive-Mother	Strict-Father	Strict-Mother	Indulgent-Father	Indulgent-Mother
Physical functioning	.087	.111	.038	-.036	-.023	.041
Physical role	.076	.106*	-.073	-.129*	.033	.036
Emotional problems	.103	.123*	.020	-.092	-.049	-.030
Vitality	.133**	.112	-.200**	-.191**	-.035	-.044
Emotional well-being	.162**	.184**	-.224**	-.204**	-.051	-.060
Social functioning	.087	.103	-.082	-.142*	-.115	-.043
Bodily pain	.142*	.096	-.117	-.195**	-.094	-.108*
General health	.177**	.167**	-.127*	-.161**	-.047	-.070

Note. * $p < .05$ ** $p < .01$.
Source: Own elaboration.

TABLE 3. Results of the stepwise linear regression analysis.

Quality of life dimensions	Parenting styles (explanatory variables)	β	t	*p*	R^2-adj
Physical functioning	-----				
Physical health	Strict-Mother	-.13	-2.07	.040	.013
Emotional problems	-----				
Vitality	Strict-Father	-.20	-3.23	.001	.036
Emotional well-being	Strict-Father	-.22	-3.54	<.001	.073
	Inductive-Mother	.17	2.84	.005	
Social functioning	Strict-Mother	-.14	-2.27	.024	.016
Pain	Strict-Mother	-.20	-3.16	.002	.034
General health	Inductive-Father	.16	2.57	.011	.043
	Strict-Mother	-.14	-2.28	.023	

Note. *p*: Significance.
Source: Own elaboration.

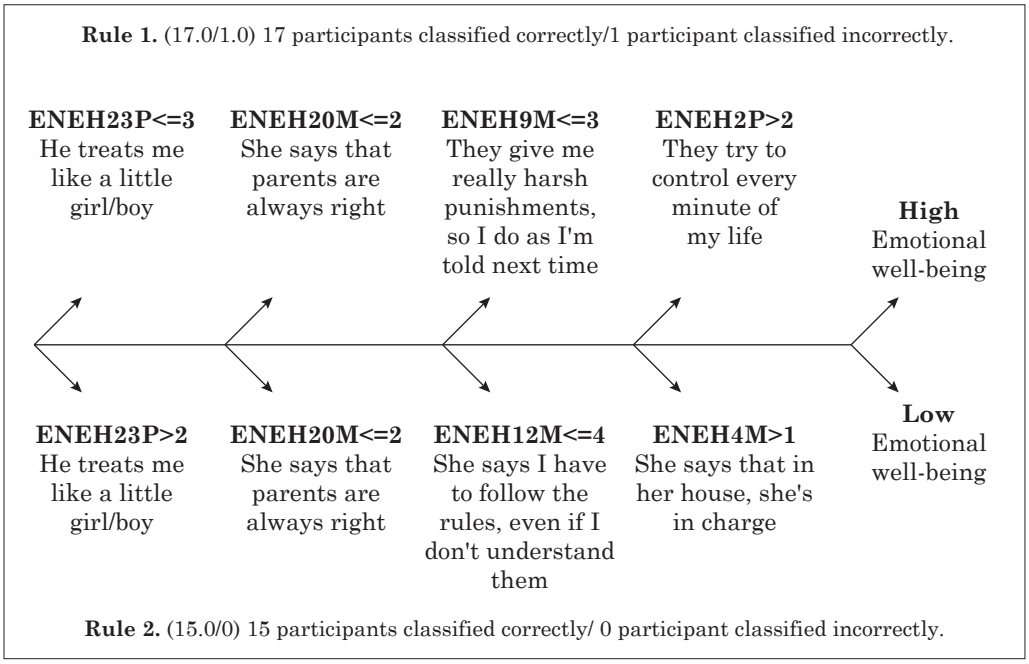
3.2. Patterns of relationships between the ENE-H items and the SF-36 dimensions

As mentioned in the data analysis section, data mining was used to explore correlations and patterns between the EHE-H items and each of the dimensions of HRQL. The most significant rules in each case (those with the best support/confidence relationship) were extracted from the various analyses. As such, when considering the total sample group, the rule of strict parenting style versus emotional well-being proved significant (see Graph 1). In this rule, of the 253 participants, 16 out of 17 (94%) showed high levels of emotional well-being. In addition, 15 participants (100%) showed a low level of emotional well-being.

Graph 1. Rules for strict parenting style/emotional well-being in the total sample group.In addition, when considering the variable of the group according to gender, the following rules were identified. For girls, the significant extracted rules were: father with an indulgent parenting style versus physical functioning (see Graph 2); father with an indulgent parenting style versus emotional well-being (see Graph 3); father with a strict parenting style versus emotional problems (see Graph 4); father with a strict parenting style versus pain (see Graph 5); mother with an indulgent parenting style versus physical functioning (see Graph 6); and mother with a strict parenting style versus energy (see Graph 7).

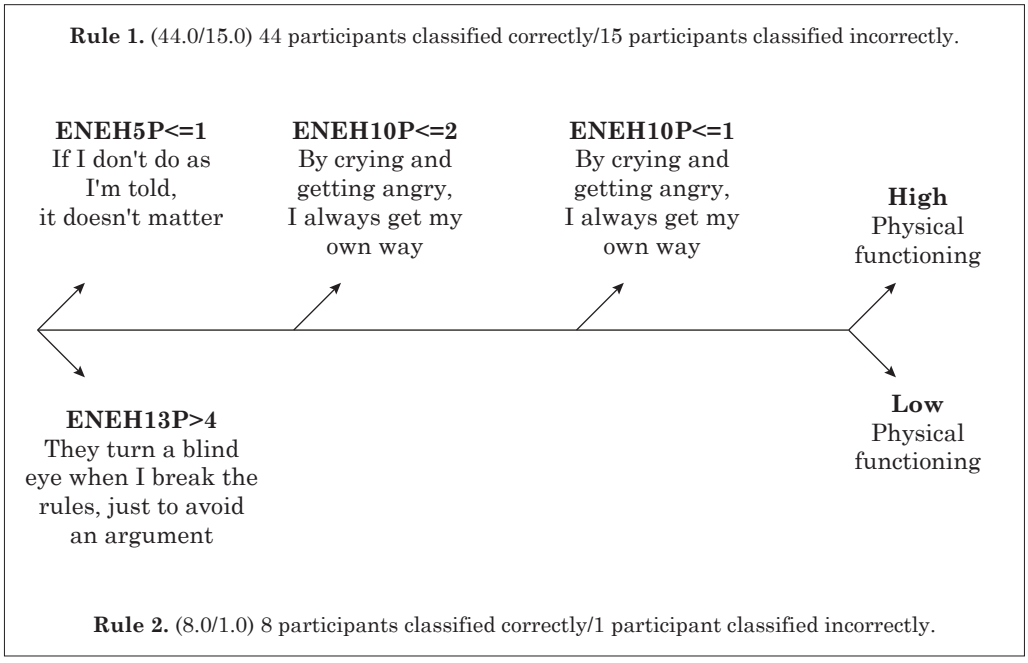
The following rules were identified for boys: father with an indulgent parenting style versus emotional well-being (see Graph 8); father with a strict parenting style versus pain (see Graph 9); mother with an indulgent parenting style versus physical functioning (see Graph 10); mother with a strict parenting style versus social functioning (see Graph 11); and mother with a strict parenting style versus pain (see Graph 12).

GRAPH 1. Rules for strict parenting style/emotional well-being in the total sample group.



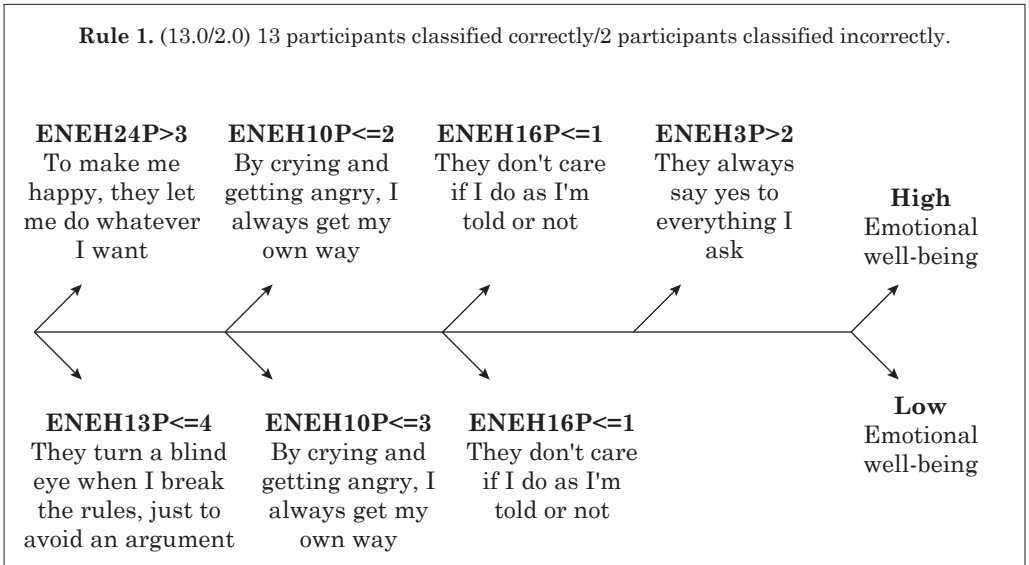
Source: Own elaboration.

GRAPH 2. Classification rule: daughter-indulgent father/physical functioning.



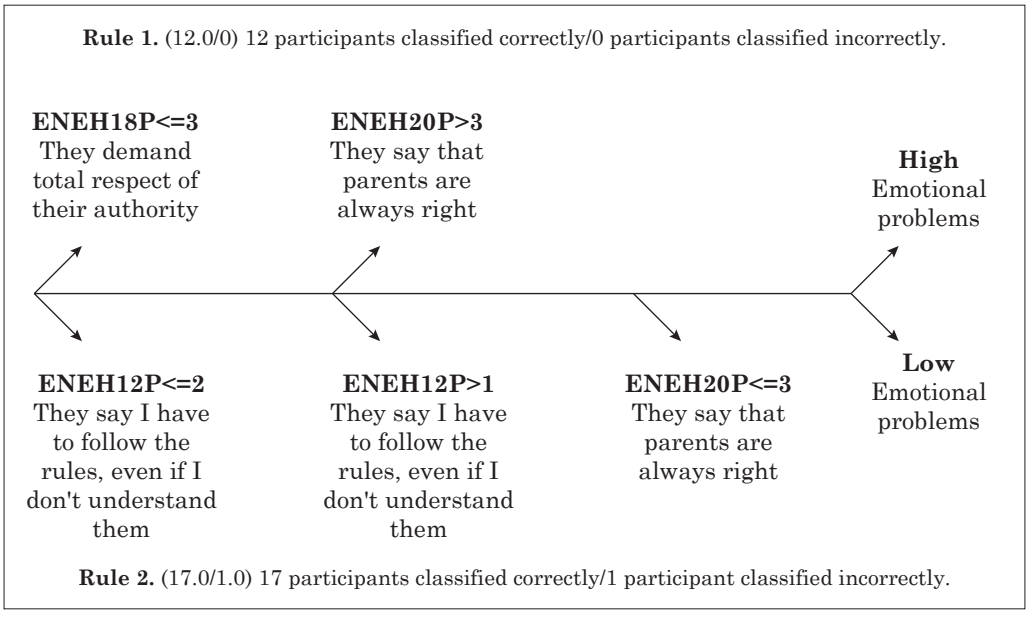
Source: Own elaboration.

GRAPH 3. Classification rule: daughter-indulgent father/emotional well-being.



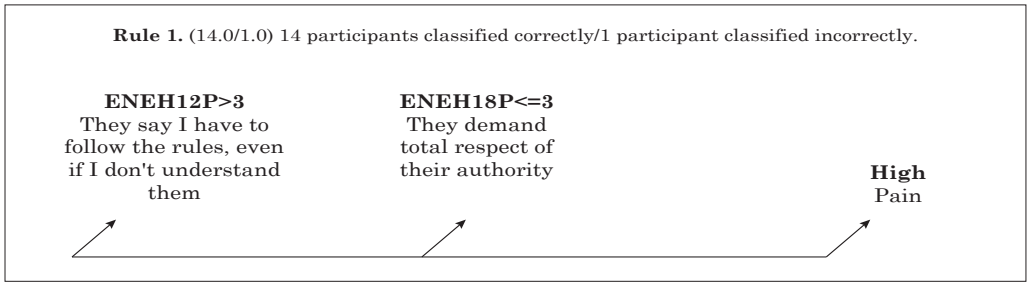
Source: Own elaboration.

GRAPH 4. Classification rule: daughter-strict father/emotional problems.



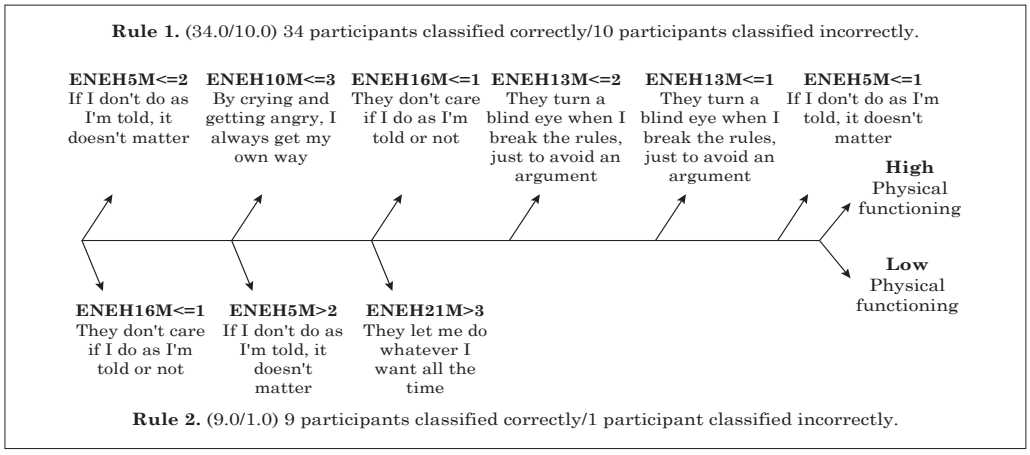
Source: Own elaboration.

GRAPH 5. Classification rule: daughter-strict father/pain.



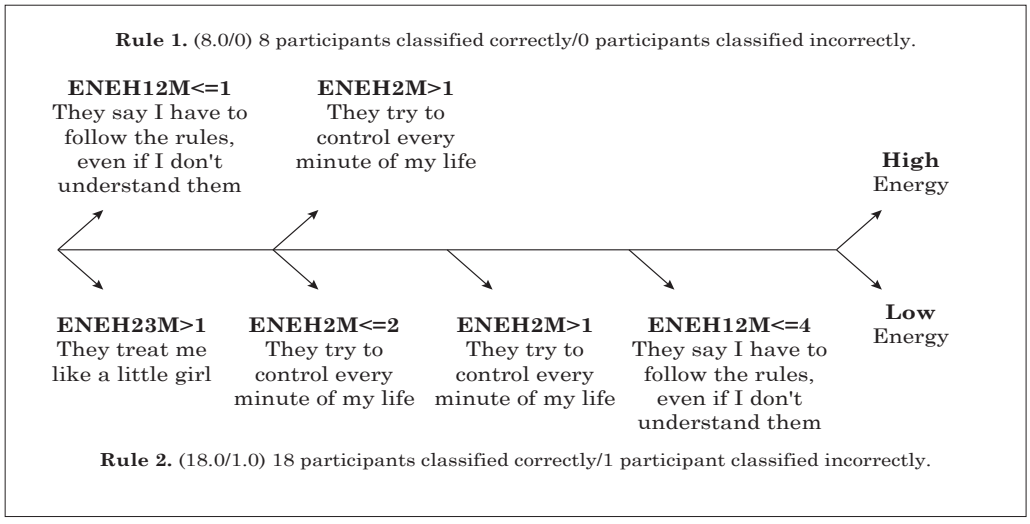
Source: Own elaboration.

GRAPH 6. Classification rule: daughter-indulgent mother/physical functioning.



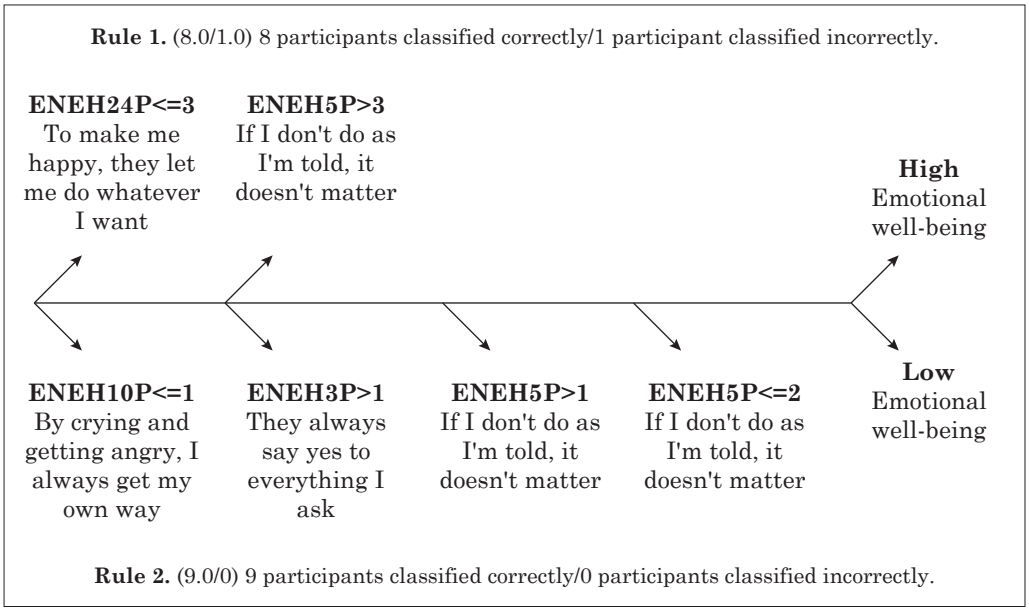
Source: Own elaboration.

GRAPH 7. Classification rule: daughter-strict mother/energy.



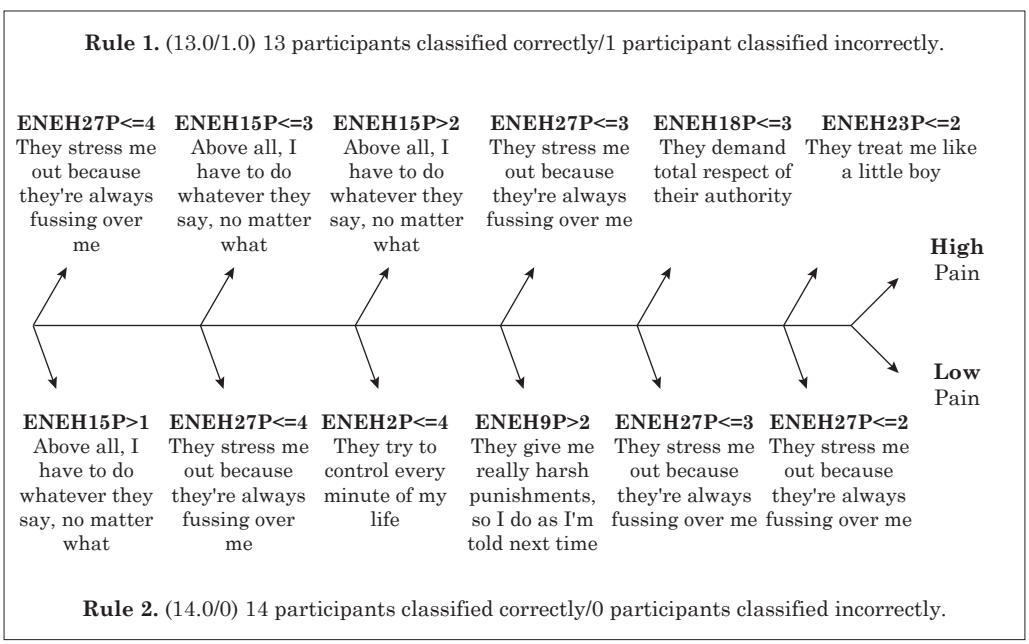
Source: Own elaboration.

GRAPH 8. Classification rule: son-indulgent father/emotional well-being.



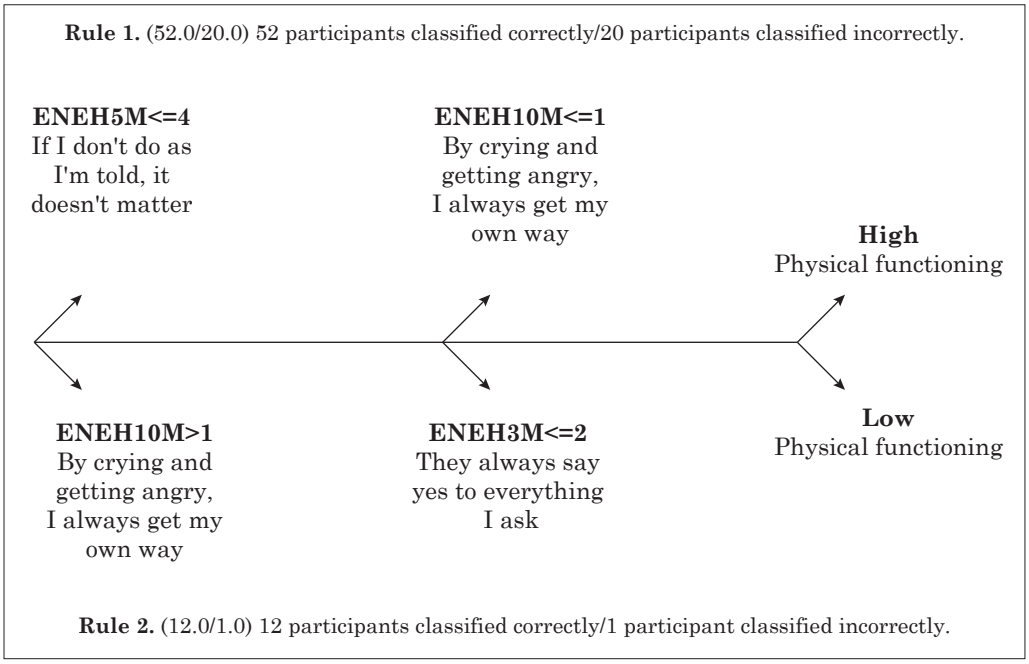
Source: Own elaboration.

GRAPH 9. Classification rule: son-strict father/pain.



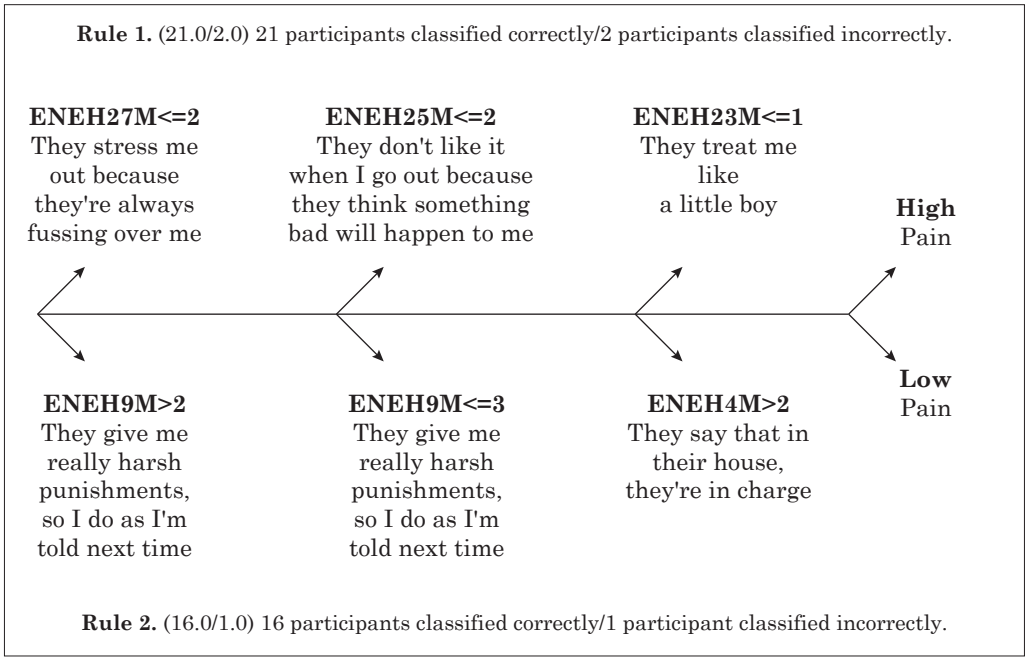
Source: Own elaboration.

GRAPH 10. Classification rule: son-indulgent mother/physical functioning.



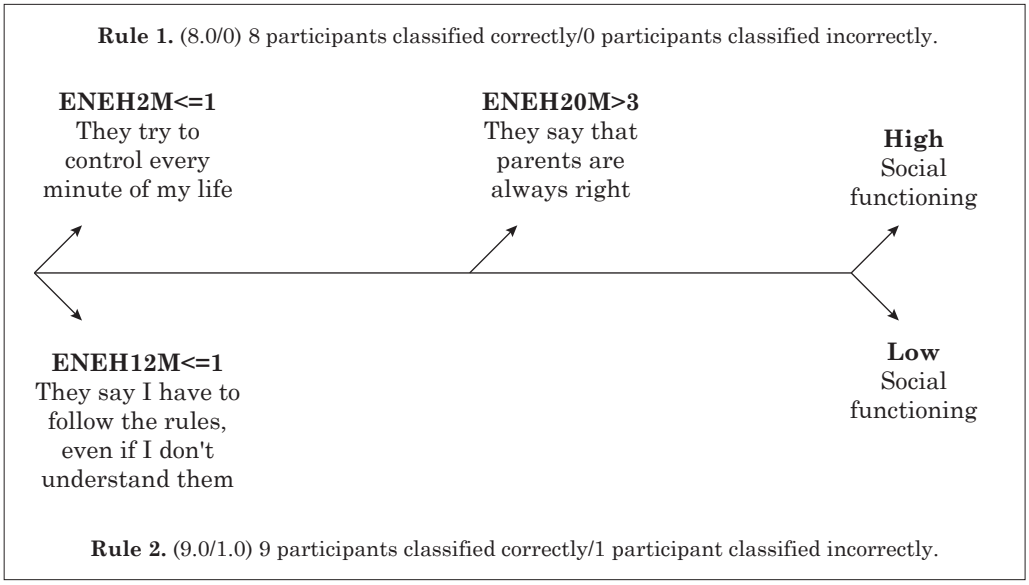
Source: Own elaboration.

GRAPH 11. Classification rule: son-strict mother/pain.



Source: Own elaboration.

GRAPH 12. Classification rule: son-strict mother/social functioning.



Source: Own elaboration.

In the different classification rules, we can see how the specific combination of certain items with a specific score on the scale of parenting styles can result in higher or lower levels of different dimensions of HRQL.

4. Discussion

4.1. Relationship between educational styles and quality of life

With regard to H1, we found a link between the strict parenting style and emotional well-being, thereby partially confirming this hypothesis. However, the relationship was more complex in that the association between strict parenting style and levels of emotional well-being was ambiguous, as it was only specific items that were associated with levels of well-being. The participants felt that it was important to lay down rules but that these rules should be applied with greater flexibility than those set under the strict educational style. In contrast, the findings of Gorostiaga et al. (2019) showed that psychological control and strict parental control were positively related to anxiety, depression and suicidal tendencies and thoughts in adolescents. León-del-Barco et al. (2019) also showed that strict control and psychological control were linked to more internalising symptoms in children and adolescents, while behavioural control has been linked to fewer internalising symptoms (Pinquart, 2017). These findings could explain why we found a link between strict parenting style and emotional well-being in this study, as we can distinguish between psychological and behavioural control. This is linked to the findings of Gorostiaga et al. (2019),

which suggested that parental warmth, behavioural control and the granting of autonomy were inversely related to internalising problems, especially depression, in adolescents. In contrast, psychological control and strict parental control have been positively related to adolescents in the variables of anxiety, depression and suicidal thoughts (Leung & Shek, 2020). Achieving emotional stability in adolescence is essential in the development of coping strategies and for its buffering effect in the face of adverse experiences (Cabecinha-Alati et al., 2020; Cohrdes & Mauz, 2020). In essence, the family is a pivotal element in the comprehensive development of children (Delvecchio et al., 2020; Li et al., 2020; Moreno et al., 2020).

4.2. Gender differences in parenting styles and quality of life

With regard to H2, we found gender differences in terms of perceived parenting styles and HRQL in adolescents, in line with previous studies (Jahng, 2019; Xu et al., 2017). Specifically, Feeney et al. (2016) found that HRQL was positively related to the warmth of parents and the general health in children and negatively related to maternal depression. Other authors have also found gender differences in parenting styles (García, 2020; Zvara et al., 2020). In this study, we found a negative relationship between physical health and a strict parenting style in mothers, whereby with strict rules and limited communication, physical health can be low. We also found a negative relationship between energy/fatigue and a strict parenting style in fathers, whereby the stricter the father, the less energy the child will have. In terms of emotional well-being, we found a negative relationship with a strict parenting style in fathers; while, in contrast, an inductive educational style in mothers resulted in higher emotional well-being. We also found that when mothers adopt a strict style, this is associated with lower scores for social functioning and higher scores for pain. Lastly, general health was linked to the inductive style in fathers and proved to have a negative relationship with the strict style in mothers. Therefore, the scores for health will be high when fathers set suitable rules and boundaries and low when mothers adopt a strict educational style with limited communication.

In the group of boys, the strict educational style seemed to be associated with pain both when we differentiated between the educational style in fathers and mothers individually and fathers and mothers when analysed together. This suggests that when the rules are not too strict and a certain degree of independence is allowed, the levels of pain are lower. In the group of girls, we found a link between the indulgent educational style and physical functioning. The adolescents who scored highest in physical functioning were those where both the father and the mother favoured bidirectional communication, set rules and allowed a certain degree of independence. In contrast, when families do not set boundaries, daughters showed

higher levels of emotional problems. Educational styles have proven to be directly linked to health habits and quality of life (Diggs et al., 2017). In addition, there is a greater transfer of habits in people of the same gender (Gottfredson et al., 2017).

In turn, daughters expressed emotional problems and high levels of pain in relation to the strict educational style of their fathers. The last significant link that was found refers to the strict educational style in mothers and energy in the group of girls. In this respect, the daughters felt that their mothers' approach to setting rules should have been relaxed and consensual. In relation to this, previous studies have highlighted the importance of the maternal role in the acquisition of perceptions (Jahng, 2019; Xu et al., 2017).

4.3. Implications

One of the contributions of this study is that it shows the views of adolescents on the highly important topic of their perception of health and parenting styles. In addition, this study has contributed new data about how an adolescent's perception of their parents' educational style can influence such an important aspect as their health-related quality of life. This could provide a reference point for comparative studies with other groups on a national or even international level. Lastly, the intelligent data analysis methods that were used in this study highlight a commitment to exploring innovative forms of analysis, thereby contributing to the development of knowledge within the fledging field of artificial intelligence (AI) (Chen et al., 2020). The information obtained in this study could be used to design training plans for future teachers in line with Hawkins et al. (2020) and even to develop schools for parents. As such, these data serve both a scientific and a practical purpose, and they can be useful in the management of resources based on policies that consider the perception of quality of life and parenting styles in adolescence.

4.4. Limitations and future research

This study is not without limitations such as the difficulty of generalising the findings as they focus on a group of adolescents from a specific region and who are also in a unique developmental stage (adolescence), although this does span from the age of 11 to 18. However, during the study, homogeneity was assumed in the sociocultural and economic status of the families, insofar as the schools were homogeneous in this respect due to their location and characteristics, which could affect the perception of HRQL in some adolescents (Kim et al, 2021), and even the perception of teaching staff who could also be mediating between the family and the adolescent (Guevara et al., 2021). Lastly, the study did not consider the presence of cultural variables that could have affected the findings.

In terms of future research, it would be interesting to increase the number of participants, increase the age and include other socio-demographic variables such

as the parents' age (Zondervan-Zwijnenburg et al., 2020). It would also be interesting to consider monitoring over a longer period of time (Willroth et al., 2021).

5. Conclusions

The results show a link between the strict parenting style and emotional well-being in adolescents. Certain parental educational styles allow children to develop high levels of emotional well-being, maintain psychological balance and facilitate social functioning. The information derived from this study could be used to design programmes that are a better fit for the characteristics of different parenting styles and the perception of health in adolescents, and it could even be of use in health promotion.

Ethical statement

This study has been reviewed and approved by the ethics committee. During the study, confidentiality, anonymity and the voluntary nature of participation were upheld at all times, following the guidelines of the Helsinki Declaration.

Conflict of interests

None.

5.1. Funding statement

This study has received no funding from any organisations, neither from the commercial nor the not-for-profit sector.

Author contribution

All authors contributed in a significant manner to the reported study, in terms of drafting the introduction and the data analysis and discussion of the results, they also approved the presented manuscript and agree to its presentation. Lastly, all authors contributed to forming the main conclusions of the study.

References

Alonso, J., Prieto, L., & Anto, J. (1995). La versión española del SF-36 health survey (cuestionario de salud SF-36): un instrumento para la medida de los resultados clínicos [The Spanish version of the Short Form 36 Health Survey: A decade of experience and new developments]. *Medicina Clinica, 104* (20), 771-776.

Alonso-Stuyck, P. (2020). Parenting and healthy teenage lifestyles. *International Journal of Environmental Research and Public Health, 17*. https://doi.org/10.3390/ijerph17155428.

Bagan, G., Tur-Porcar, A. M., & Llorca, A. (2019). Learning and parenting in Spanish environments: Prosocial behavior, aggression, and self-concept. *Sustainability 11*, 51-93. https://doi.org/10.3390/su11195193

Bahmani, T., Naseri, N. S., & Fariborzi, E. (2022). Relation of parenting child abuse based on attachment styles, parenting styles, and parental addictions. *Current Psychology*. https://doi.org/10.1007/s12144-021-02667-7

Baña Castro, M. (2015). El rol de la familia en la calidad de vida y la autodeterminación de las personas con trastorno del espectro del autismo [The role of the family in the quality of life and self-determination of persons with autism spectrum disorder]. *Ciencias psicológicas, 9* (2), 323-336

Barlow, M. A., Wrosch, C., & McGrath, J. J. (2020). Goal adjustment capacities and quality of life: A meta-analytic review. *Journal of Personality, 88* (2), 307-323. https://doi.org/10.1111/jopy.12492.

Bersabé, R. M., Fuentes, M. J., & Motrico, E. (2001). Análisis psicométrico de dos escalas para evaluar estilos educativos parentales [Psychometric analysis of two scales for assessing parental educational styles]. *Psicothema, 13* (4), 678-684.

Cabecinha-Alati, S., Malikin, H., & Montreuil, T. C. (2020). Emotion regulation and personality as predictors of mothers' emotion socialization practices. *Family Relations: Interdisciplinary Journal of Applied Family Science*. https://doi.org/10.1111/fare.12501

Carlo, G., Mestre, M. V., Samper, P., Tur, A., & Armenta, B. E. (2010). Feelings or cognitions? Moral cognitions and emotions as longitudinal predictors of prosocial and aggressive behaviors. Personality and Individual *Differences, 48* (8), 865-962. https://doi.org/10.1016/j.paid.2010.02.010

Chávez-Flores, Y. V., Hidalgo-Rasmussen, C. A., & Muñoz Navarro, S. (2018). Relaciones intrafamiliares y calidad de vida relacionada con la salud en adolescentes mexicanos que se autolesionan sin intención suicida [Intrafamilial relationships and health-related quality of life in Mexican adolescents who engage in self-harm without suicidal intent]. *Salud and Sociedad, 9* (2), 130-144. https://doi.org/10.22199/S07187475.2018.0002.00001

Chen, L, Chen, P., & Lin, Z. (2020). Artificial intelligence in education: A review [La inteligencia artificial en la educación: una revisión]. *IEEE Access*, *8*, 75264-75278. https://doi.org/10.1109/ACCESS.2020.2988510

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*. Lawrence Erlbaum Associates, Publishers.

Cohrdes, C., & Mauz. E. (2020). Self-efficacy and emotional stability buffer negative effects of adverse childhood experiences on young adult health-related quality of life. *Journal of Adolescent Health, 67* (1), 93-100. https://doi.org/10.1016/j.jadohealth.2020.01.005

Delvecchio, E., Germani, A., Raspa, V., Lis, A., & Mazzeschi, C. (2020). Parenting styles and child's well-being: The mediating role of the perceived parental stress. *Europe`s Journal of Psychology, 16* (3), 514-531. https://doi.org/10.5964/ejop.v16i3.2013

Diggs, O. N., Neppl, T. K., Jeon, S., & Lohman, B. J. (2017). The association of harsh parenting, parent-child communication, and parental alcohol use with male alcohol use into emerging adulthood. *Journal of Adolescent Health, 61* (6), 736-742. https://doi.org/10.1016/j.jadohealth.2017.06.025

Estlein, R. (2021). Parenting as a communication process: Integrating interpersonal communication theory and parenting styles conceptualization. *Journal of Family Theory & Review, 13* (1), 21-33.https://doi.org/10.1111/jftr.12407

Fan, J., & Chen, B. B. (2020). Parenting styles and co-parenting in China: The role of parents and children's sibling status. *Current Psychology, 39*, 1505-1512. https://doi.org/10.1007/s12144-019-00379-7

Feeney, R., Desha, L., Khan, A., Ziviani, J., & Nicholson, J. M. (2016). Speech and language difficulties along with other child and family factors associated with health related quality of life of Australian children. *Applied Research in Quality of Life, 11* (4), 1379-1397. https://doi.org/10.1007/s11482-015-9443-6

García, A. E. (2020). Estilos de socialización parental en una muestra de adolescentes chilenos [Parental socialisation styles in a sample of Chilean adolescents]. *Revista de Psicología Clínica con Niños y Adolescentes*, *7* (1), 46-51. https://doi.org/10.21134/rpcna.2020.07.1.6

Gomes A. C., Rebelo, M. A. B., de Queiroz, A. C., de Queiroz, A. P. C., Herkrath, A. P. C., Herkrath, F. J., Rebelo, J. M., Pereira, J. V., & Vettore, M. V. (2020). Socioeconomic status, social support, oral health beliefs, psychosocial factors, health behaviours and health-related quality of life in adolescents. *Quality of Life Research, 29,* 141-151. https://doi.org/10.1007/s11136-019-02279-6

Gorostiaga, A., Aliri, J., Balluerka, N., & Lameirinhas, J. (2019). Parenting styles and internalizing symptoms in adolescence: A systematic literature review. *International Journal of Environmental Research and Public Health, 16*, 3192. https://doi.org/10.3390/ijerph16173192

Gottfredson, N. C., Hussong, A. M., Ennett, S. T., & Rothenberg, W. A. (2017). The role of parental engagement in the intergenerational transmission of smoking behavior and identity. *Journal of Adolescent Health, 60* (5), 599-605. https://doi.org/10.1016/j.jadohealth.2016.11.004.

Guevara, R. M., Moral-García, J. E., Urchaga, J. D., & López-García, S. (2021). Relevant factors in adolescent well-being: Family and parental relationships. *International Journal of Environmental Research and Public Health*, *18* (14), 7666. https://doi.org/10.3390/ijerph18147666

Haslam, D., Poniman, C., Filus, A., Sumargi, A., & Boediman, L. (2020). Parenting style, child emotion regulation and behavioral problems: The moderating role of cultural values in Australia and Indonesia. *Marriage & Family Review, 56* (4), 320-342. https://doi.org/DOI10.1080/01494929.2020.1712573

Hawkins, A. J., Clyde, T. L., Doty, J. L., & Avellar, S. (2020). Best practices in family life education program evaluation. *Family Relations: Interdisciplinary Journal of Applied Family Science, 69*, 479-496. https://doi.org/10.1111/fare.12420

Heinze, J. E., Hsieh, H. F., Aiyer, S. M., Buu, A., & Zimmerman, M. A. (2020). Adolescent family conflict as a predictor of relationship quality in emerging adulthood. *Family Relations: Interdisciplinary Journal of Applied Family Science, 69* (5), 996-1011. https://doi.org/10.1111/fare.12493

Jahng, K. E. (2019). Exploring pathways to middle school students' life satisfaction. *Child Indicators Research, 12*, 1643-1662. https://doi.org/10.1007/s12187-018-9602-z

Jiménez-Iglesias, A., Moreno, C., Ramos, P., & Rivera, F. (2014). What family dimensions are important for health-related quality of life in adolescence? *Journal of Youth Studies, 18*, 53-67. https://doi.org/10.1080/13676261.2014.933191

Jones, E., Oliphant, E., & Peterson, P. (2001). *SciPy: Open Source Scientific Tools for Python*. https://www.researchgate.net/publication/213877848_SciPy_Open_Source_Scientific_Tools_for_Python

Kim, K. W., Wallander, J. L., Depaoli, S. Elliot, M. N., & Schuster, M. A. (2021). Longitudinal associations between parental SES and adolescent health-related quality of life using growth curve modeling. *Journal of Child and Family Studies, 30*, 1463-1475. https://doi.org/10.1007/s10826-021-01970-y

King, K. A., Vidourek, R. A., & Merianos, A. L. (2016). Authoritarian parenting and youth depression: Results from a national study. *Journal of Prevention & Intervention in the Community, 44* (2), 130-139. https://doi.org/10.1080/10852352.2016.1132870

Kuppens, S., & Ceulemans, E. (2019). Parenting styles: A closer look at a well-known concept. *Journal of Child and Family Studies, 28*, 168-181. https://doi.org/10.1007/s10826-018-1242-x

León-del-Barco, B., Mendo-Lázaro, S., Polo-del-Río, M. I., & López-Ramos, V. M. (2019). Parental psychological control and emotional and behavioral disorders among Spanish adolescents. *International Journal of Environmental Research and Public Health*, *16*, 507. https://doi.org/10.3390/ijerph16030507

Leung, J. T. Y., & Shek, D. T. L. (2020). Parental sacrifice, filial piety and adolescent life satisfaction in Chinese families experiencing economic disadvantage. *Applied Research in Quality of Life, 15* (1), 259-272. https:/doi.org/10.1007/s11482-018-9678-0

Li, Y., Wang, J., & Luo, L. (2020). Family migration and educational outcomes of migrant children in China: the roles of family investments and school quality. *Asia Pacific Education Review, 21,* 505-521. https://doi.org/10.1007/s12564-020-09639-9

Liu, L., Meng, W., & Liu B. (2022). The mediating role of social support in the relationship between parenting styles and adolescent drug abuse identification. *Frontiers in Psychology, 12.* https://doi.org/10.3389/fpsyg.2021.802408

Louis, J. P. (2022). The young parenting inventory (YPI-R3), and the Baumrind, Maccoby and Martin parenting model: Finding common ground. *Children*, *9* (2), 159. https://doi.org/10.3390/children9020159

Luan, H., Geczy, P., Lai, H., Gobert, J., Yang, S., Ogata, H., Baltes, J., Guerra, R., Li, P., & Tsai, C. C. (2020). Challenges and future directions of big data and artificial intelligence in education. *Frontiers in Psychology*, *11*, 580820. https://doi.org/10.3389/fpsyg.2020.580820

Maccoby, E. E., & Martin, J. A. (1983). Socialization in the context of the family: Parent– child interaction. In P. H. Mussen (Ed.), *Handbook of child psychology Vol. 4* (pp. 1–101). Wiley.

Marčinko, D., Jakšić, N., Rudan, D., Bjedov, S., Rebernjak, B., Skopljak, K., & Bilić, V. (2020). Pathological narcissism, negative parenting styles and interpersonal forgiveness among psychiatric outpatients. *Psychiatria Danubina, 32*, 395-402. https://doi.org/10.24869/psyd.2020.395

Martínez, E., & Julián, A. (2017). Relación entre los estilos educativos parentales o prácticas de crianza y la ansiedad infanto-juvenil: una revisión bibliográfica [The relationship between parenting styles or parenting practices, and anxiety in childhood and adolescence: a systematic review]. **revista española de pedagogía**, *75* (267), 337-351. https://doi.org/10.22550/REP75-2-2017-10

Martínez, I., García, F., Fuentes, M. C., Veiga, F., Garcia, O. F., Rodrigues, Y., Cruise, E., & Serra, E. (2019). Researching parental socialization styles across three cultural contexts: Scale ESPA29 bi-dimensional validity in Spain, Portugal, and Brazil. *International Journal of Environmental Research and Public Health*, *16* (2), 197. https://doi.org/10.3390/ijerph16020197

Morales-Rodríguez, F. M., Martínez-Ramón, J. P., Méndez, I., & Ruiz-Esteban, C. (2021). Stress, coping, and resilience before and after COVID-19: A predictive model based on artificial intelligence in the university environment. *Frontiers in Psychology*, *12*. https://doi.org/10.3389/fpsyg.2021.647964

Moreno, M. J. H., Espada, S. J. P., & Gómez, B. M. I. (2020). Role of parenting styles in internalizing, externalizing, and adjustment problems in children. *Mental Health, 43* (2), 73-84. https://doi.org/10.17711/SM.0185-3325.2020.011

Moreno-Ruiz, D., Estévez, E., Jiménez, T. I., & Murgui, S. (2018). Parenting style and reactive and proactive adolescent violence: Evidence from Spain. *Journal of Environmental Research and Public Health, 15* (12), 26-34. https://doi.org/10.3390/ijerph15122634

Motamed-Gorji, N., Qorbani, M., Nikkho, F., Asadi, M., Motlagh, M. E., Safari, O., Arefirad, T., Asayesh, H., Mohammadi, R., Mansourian, M., & Kelishadi, R. (2019). Association of screen time and physical activity with health-related quality of life in Iranian children and adolescents. *Health and Quality of Life Outcomes, 17* (1), 2. https://doi.org/10.1186/s12955-018-1071-z

Musitu, G., & García, F. (2001). ESPA29: Escala de estilos de socialización parental en la adolescencia *[ESPA29: Parental socialization scale in adolescence]*. Tea.

Newman, J., Gozu, H., Guan, S., Lee, J. E., Li, X., & Sasaki, Y. (2015). Relationship between maternal parenting style and high school achievement and self-esteem in China, Turkeyand U.S.A. *Journal of Comparative Family Studies, 46* (2), 265-288. https://doi.org/10.3138/jcfs.46.2.265

Oliphant, E. (2006). *A guide to NumPy*. Trelgol Publishing.

Organic Law 3/2018, of 5 December, on the Protection of Personal Data and Guarantee of Digital Rights. *Spanish Official State Gazette, 294*, 6 December 2018, pages 119788 to 119857. https://www.boe.es/eli/es/lo/2018/12/05/3

Pinquart, M. (2017). Associations of parenting dimensions and styles with internalizing symptoms in children and adolescents: A meta-analysis. *Marriage & Family Review, 53* (7), 613-640. https://doi.org/10.1080/01494929.2016.1247761

Pinquart, M., & Gerke, D. C. (2019). Associations of parenting styles with self-esteem in children and adolescents: A meta-analysis. *Journal of Child and Family Studies*, *28* (8), 2017-2035. https://doi.org/10.1007/s10826-019-01417-5

Queiroz, P., García, O. F., García, F., Zacares, J. J., & Camino, C. (2020). Self and nature: Parental socialization, self-esteem, and environmental values in Spanish adolescents. *International Journal of Environmental Research and Public Health, 17,* 10. https://doi.org/10.3390/ijerph17103732

Quinlan, R. (1993). *C4.5: Programs for machine learning*. Morgan Kaufmann Publishers.

Ruth, B., Astor, R., Pineda, D., DePedro, K., Weiss, E., & Benbenishty, R. (2017). Parental involvement and perceptions of school climate in California. *Urban Education, 56* (3), *393-423*. https://doi.org/10.1177/0042085916685764

Setiyowati, E., Hanik, U., & Affandi, M. (2019). The correlation between parenting style and child creativity development. *Journal of Public Health in Africa, 10* (s1). https://doi.org/10.4081/jphia.2019.1207

Yaffe, Y. (2020). Systematic review of the differences between mothers and fathers in parenting styles and practices. *Current Psychology.* https://doi.org/10.1007/s12144-020-01014-6

Wallander, J. L., & Koot. H. M. (2016). Quality of life in children: A critical examination of concepts, approaches, issues, and future directions. *Clinical Psychology, 45*, 131-143. https://doi.org/10.1016/j.cpr.2015.11.007.

Ware, J., & Sherbourne, C. D. (1992). The MOS 36-item short-form health survey (SF-36): I. conceptual framework and item selection. *Medical Care, 30* (6), 473-483.

Willroth, E. C., Atherton, O. E., & Robins, R. W. (2021). Life satisfaction trajectories during adolescence and the transition to young adulthood: Findings from a longitudinal study of Mexican-origin youth. *Journal of Personality and Social Psychology, 120* (1), 192-205. https://doi.org/10.1037/pspp0000294

Wittig, S. M., & Rodriguez, C. M. (2019). Emerging behavior problems: Bidirectional relations between maternal and paternal parenting styles with infant temperament. *Developmental Psychology, 55* (6), 1199-1210. https://doi.org/10.1037/dev0000707

Xu, F., Xing, H., Yu, W., Chen, S., & Li, H. (2017). Health-related quality of life and influencing factors among migrant children in Shaoxing, China. *Health and Quality of Life Outcomes, 15* (1), 100. https://doi.org/10.1186/s12955-017-0679-8.

Zarra-Nezhad, M., Viljaranta, J., Sajaniemi, N., Aunola, K., & Lerkkanen, MK. (2020). The impact of children's socioemotional development on parenting styles: the moderating effect of social withdrawal. *Early Child Development and Care, 192* (7), 1032-1044. https://doi.org/10.1080/03004430.2020.1835879

Zondervan-Zwijnenburg, M. A., Veldkamp, S. A., Neumann, A., Barzeva, S. A., Nelemans, S. A., van Beijsterveldt, C. E., Branje, S. J., Hillegers, M. H., Meeus, W. H., Tiemeier, H., Hoijtink, H. J., Oldehinkel, A. J., & Boomsma, D. I. (2020). Parental age and offspring childhood mental health: A multi-cohort, population-based investigation. *Child Development, 91*, 964-982. https://doi.org/10.1111/cdev.13267

Zvara, B. J., Lathren, C., & Mills-Koonce. R. (2020). Maternal and paternal attachment style and chaos as risk factors for parenting behavior. *Family Relations, 69*, 233-246. https://doi.org/10.1111/fare.12423

Authors' biographies

Rosalía Jódar Martínez holds a PhD in psychology. She works as a Lecturer in psychology at the Universidad Católica de Ávila and is the work placement coordinator for the master's degree in general health psychology. Her main research interests include emotional intelligence, social and health psychology, educational psychology and artificial intelligence.

https://orcid.org/0000-0002-5819-5483

María del Pilar Martín Chaparro holds an undergraduate degree in psychology, a master's degree in clinical and health psychology and a PhD in psychology (Universidad de Granada). She is currently secretary of the School of Psychology Practice and lecturer at the Department of Psychiatry and Social Psychology at the Universidad de Murcia. She has worked as a visiting research scholar at the University of Connecticut (USA) and has participated in numerous national and international. Her main research interests are resilience and health in the fields of psychology, public relations, mental health, family and suicide prevention. conferences.

https://orcid.org/0000-0002-0405-3455

María Dolores Hidalgo Montesinos holds a PhD in psychology. She is currently a Professor in psychometrics at the Psychology Department at the Universidad de Murcia. Some of her work has focused on the transcultural adaptation of scales of social anxiety and interpersonal difficulties in adolescents and on the development of new tools in health psychology. Her primary areas of research are differential item functioning (DIF), item response theory (IRT), transcultural test adaptation and the development of evaluation tests and surveys.

https://orcid.org/0000-0002-6256-718X

Juan Pedro Martínez Ramón holds a degree and a PhD in psychology, a degree in educational psychology and a master's degree in neurophysiology and education. He has worked for around 15 years on guidance teams and in secondary schools in the field of educational guidance. He is currently a Lecturer at the Department of Developmental and Educational Psychology at the Universidad de Murcia. His main research interests include coexistence and educational psychology, with a special focus on artificial intelligence, stress, bullying, coping and resilience.

https://orcid.org/0000-0003-1770-6598

Construct validity of an instrument to assess assertive feedback in initial teacher training

Validez de constructo de un instrumento para evaluar la retroalimentación asertiva en la formación inicial del profesorado

María de la Luz BERLANGA RAMÍREZ. Lecturer-Researcher. Escuela Normal Superior del Estado de Coahuila *(mtra.luzberlangarmz@gmail.com).*

Luis Gibran JUÁREZ HERNÁNDEZ, PhD. Lecturer-Researcher. Centro Universitario CIFE *(luisgibrancife@gmail.com).*

Abstract:

Feedback in the evaluation process has become more important in teaching practice since the start of the Covid-19 pandemic. The aim of the present study is to analyse the construct validity and reliability of the Socioformative Analytical Rubric for the Assessment of Assertive Feedback (RASERA). This instrument was applied to a sample of 525 students from normal schools in Mexico. Exploratory and confirmatory factor analysis were used to analyse its construct validity. Its reliability was analysed using Cronbach's alpha. The results of the first analysis revealed the formation of two factors; the first, we called execution of assertive feedback and the second, representativeness of assertive feedback. These two factors explained more than 65% of the variance and all of the items with significant factor loadings were found in them (FL > 0.50). For its part, the CFA revealed a good fit of this model (Ratio χ^2/df: 2.284; GFI: 0.909; RMSEA: 0.068; RMR: 0.035; CFI: 0.966; TLI: 0.955). For each factor, the average variance extracted, and the composite reliability were pertinent (AVE > 0.50 and CR > 0.70) and each item showed an adequate standardised factor load (SFL > 0.50). The reliability analysis gave optimal factor values (Cronbach's alpha and McDonald's omega > 0.85). We conclude that the RASERA instrument has adequate psychometric properties.

Keywords: factor analysis, assertiveness, evaluation, teacher training, feedback, validation.

Revision accepted: 2022-06-23.

This is the English version of an article originally printed in Spanish in issue 283 of the **revista española de pedagogía**. For this reason, the abbreviation EV has been added to the page numbers. Please, cite this article as follows: Berlanga Ramírez, M. L., & Juárez Hernández, L. G. (2022). Validez de constructo de un instrumento para evaluar la retroalimentación asertiva en la formación inicial del profesorado | *Construct validity of an instrument to assess assertive feedback in initial teacher training. Revista Española de Pedagogía, 80* (283), 583-600. https://doi.org/10.22550/REP80-3-2022-08

https://revistadepedagogia.org/ ISSN: 0034-9461 (Print), 2174-0909 (Online)

Resumen:

La retroalimentación en el proceso de evaluación cobró mayor relevancia en las prácticas docentes durante la pandemia de COVID-19. El objetivo del presente estudio fue realizar un análisis de la validez de constructo y confiabilidad del instrumento «Rúbrica Analítica Socioformativa para la Evaluación de la Retroalimentación Asertiva» (RASERA). El instrumento se aplicó a una muestra de 525 discentes de escuelas normales en México. Para el análisis de validez de constructo se empleó el análisis factorial exploratorio y confirmatorio, y el análisis de confiabilidad se efectuó mediante el Alfa de Cronbach. Los resultados del primer análisis mostraron la conformación de dos factores; el primero se denominó Ejecución de la retroalimentación asertiva y el segundo Representatividad de la retroalimentación asertiva. Ambos factores explicaron más 65 % de la varianza y en donde se encuentran incorporados todos los ítems con cargas factoriales significativas (CF>0.50). Por su parte, el AFC reveló un buen ajuste de este modelo (Razón $\chi 2/gl$: 2.284; GFI: 0.909; RMSAE: 0.068; RMR: 0.035; CFI: 0.966; TLI: 0.955). Se especifica que, para cada factor, la varianza media extraída y la confiabilidad compuesta fue pertinente (VME>0.50 y CC>0.70) y cada ítem manifestó una carga factorial estandarizada adecuada (CFE>0.50). Concerniente al análisis de confiabilidad, se obtuvieron valores óptimos por factor (Alfa de Cronbach y Omega de McDonald>0.85). Se concluye que el dispositivo RASERA posee propiedades psicométricas adecuadas.

Descriptores: análisis factorial, asertividad, evaluación, formación del profesado, retroalimentación, validación.

1. Introduction

Educational research has studied various aspects of evaluation: its evolution, defined through evaluation models, its application, and its methodology. During the Covid-19 pandemic, studies have centred on feedback resulting from evaluation in virtual education (Castro et al., 2020; Miguel, 2020; Temesio et al., 2021) owing to its importance in decision making by teachers to ensure that students meet learning targets. García-Jiménez (2015) defines feedback as the relevant information for learners to ensure that they are aware of their learning progress, can become conscious of it, and can take decisions about which metacognitive strategies to apply to improve their performance by improving evidence of learning. Furthermore, a range of types of feedback have been described: retroactive-proactive, intrinsic-extrinsic, corrective-indicative, assertive, specific-general, content-based, product-based, process oriented, self-regulation centred, and centred on the person itself, evaluative, descriptive and returnable, prescriptive, informative, confrontational, cathartic, catalytic and supportive, evaluative-descriptive, and negative-positive (Berlanga & Juárez, 2020a).

Of those listed, we focus here on assertive feedback. This entails consist-

ently, respectfully, and cordially evaluating the learner's performance throughout all of the learning process and, is given in an appropriate way for undertaking the corresponding improvements (Berlanga & Juárez, 2020b). This new feedback proposal has its genesis in socioformative evaluation, which includes stages of diagnosis, continuous appraisal, and feedback, the aim of which is to achieve the established goals by developing the learner's talent (Tobón, 2017).

In contrast, Sadler (1989) posits the importance of involving learners in feedback making available the information obtained to improve their performance. On the same lines, Bordas and Cabrera (2001) refer to forming evaluation, distinguishing it from formative evaluation because the feedback emanates from the learner's initiative and reflection.

This being so, assertive feedback corresponds to what is outlined in forming evaluation and its use offers a variety of benefits, such as fostering self-evaluation and self-regulation of learning because the learner has a more active role and can lead the evaluation, as it generates metacognitive mechanisms. Likewise, it facilitates consensual and participatory evaluation and quality information to guide learners in improving their learning (Berlanga & Juárez, 2020a). Another advantage of adding assertiveness to feedback, is that the teacher creates a positive classroom environment, and so helps provide a solid and integrated foundation for the learner's education (Monje et al., 2009; Triana & Velásquez, 2014).

Tobón (2013) has set out the requirements for implementing assertive feedback. The first is that it should be offered immediately while carrying out the evaluated activity; the second is that it is important to start by underlining achievements and positive aspects, with the purpose of accentuating motivation, as Mejía and Pasek de Pinto (2017) note. Other requirements are that the teacher must guide learners with reasoning and respect, while simultaneously giving them the opportunity to make improvements, so that feedback does not become a series of instructions.

Berlanga and Juárez (2020a) affirm that associating assertive feedback with feedforward (García-Jiménez, 2015) establishes a systematic and optimal process for evaluating learning. Nonetheless, it is advisable to incorporate the stages of the feedback for learning model proposed by Quezada and Salinas (2021): literacy, signification, construction, comparison, reworking, and visualisation.

Assertive feedback is understood from its perspectives as a dialogic and sustainable activity. The first perspective derives from the interaction between the teacher and the learner; while the second is because when it is combined with feedforward, there is an effort to improve the current evidence and identify future learning needs (Quezada & Salinas, 2021).

There are a number of instruments for examining feedback in higher education,

but despite the importance of feedback in education, we found no contributions for evaluating assertive feedback. In view of the above, Berlanga and Juárez (2020a) proposed the Socioformative Analytical Rubric for the Assessment of Assertive Feedback (RASERA), a teacher-training instrument that makes it possible to analyse various aspects of assertive feedback: its focus, execution, and representativeness in the initial training of teachers. It also provides data that give information for improving teachers' performance in evaluating, for example, establishing the degree of assertiveness in the evaluation process, because learners are more likely to feel confident in expressing doubts, confusions or concerns when this is given respectfully and cordially and so are more likely to be capable of leading their feedback themselves (Tobón, 2017), and identifying other types of feedback in teaching practices and identifying features they share with assertive feedback and how they differ from it (Tunstall & Gipps, 1996; Torrance & Pryor, 1998; Randall & Thornton, 2005; Hattie & Timperley, 2007; Farahman & Masoud, 2011; Evans, 2013; Jonsson, 2013; García-Jiménez, 2015; Contreras & Zuñiga, 2019).

Similarly, it provides information about the circumstances in which feedback is given with the aim of recognising which ones facilitate or hinder its realisation (Wiggins, 2011; Padilla & Gil, 2008; Wiliam, 2011; Martínez-Rizo, 2013; García, 2015; López & Osorio, 2016). When describing, analysing and evaluating a process of evaluation such as feedback in teaching practice, meta-evaluation is elicited, a key element of the socioformative focus, which involves reviewing the process of evaluation and its effects (Díaz, 2001).

The instrument considers the aspects of the focus, execution, and representativeness of assertive feedback. It includes 16 items and was constructed in the format of a socioformative analytical rubric, meaning that for each item there are levels of action, each of which comprises one descriptor. Socioformative analytical rubrics are tools that facilitate detailed evaluation of the performance of an individual in resolving a conflict that has to be solved in a given context. In accordance with socioformative evaluation, the levels that represent the progression of the competences go from the basic to the most complex. The specific and qualitative features of the activities to be evaluated in each domain are connected to the descriptors. For these elements the socioformative taxonomy was taken as a basis. This is a set of actions centred on meeting the challenges of the knowledge society, and so the levels of action of the socioformative focus were also considered: preformal, receptive, problem-solving, autonomous, and strategic (Tobón, 2017).

After the design of the rubric, it was subjected to a process of review by experts and expert judgement, which confirmed its face validity and content validity (Berlanga & Juárez, 2020a). This process established that the elements of the instrument are appropriate, rele-

vant, pertinent, and representative of the attribute or target construct (Connell et al., 2018; Koller et al., 2017). Carvajal et al. (2011) note that evaluating the psychometric properties of an instrument is an essential criterion for determining the quality of its measurement. Construct validity stands out among them and is regarded as the principal type of validity (Pérez-Gil et al., 2000; Messick, 1980) as it determines the link in the instrument between theory and the conceptualisation that supports the construct, and also verifies whether the structure of the instrument truly reproduces that of the proposed construct (Lagunes-Córdoba, 2017). This property is defined as the integral validation that "subsumes the relevance and representativeness of the content, as well as the relations with the criteria, as both give meaning to the scores of the tests" (Martínez, 1995, p.335, own translation). For its part, reliability refers to the capacity to obtain measurements with minimal error (Jabrayilov et al., 2016).

Consequently, as a result of the significance and relevance of the psychometric properties set out, the aim of the present work was to analyse the construct validity and reliability of the RASERA instrument for evaluating assertive feedback provided by teachers.

2. Material and Methods

2.1. Type of study

We carried out an instrumental study, which included the development of instruments and analysis of the psychometric properties of an instrument (Ato et al., 2013).

2.2. Process

The study of the validity and reliability of the instrument was done in the following phases:

1. Instrument. The RASERA instrument (Berlanga & Juárez, 2020a) comprises 16 items, which include aspects relating to the focus, execution, and representativeness of feedback. The rubric was first subjected to face validation through expert review and content validation through expert judgement. Pilot testing of the instrument was carried out, through which an initial analysis of the reliability and suitability of the instrument for the target population was performed (Berlanga & Juárez, 2020a). Consequently, the instrument was validated in terms of face and content validity, and through the piloting, it was determined that the understanding of instructions and items was optimal. In this pilot trial, the reliability was optimal (Cronbach's alpha: 0.906; 95% CI: 0.818 ± 0.963) (Berlanga & Juárez, 2020a).

After the process of review, expert judgements, and implementation of the pilot trial, the RASERA instrument was as shown in Table 1 (Berlanga & Juárez, 2020a).

TABLE 1. Socioformative Analytical Rubric for Evaluation of Assertive Feedback (RASERA).

Item
What is the purpose of the feedback the teacher provides?
What is the focus of the feedback received?
What type of feedback does the teacher provide?
Is the feedback received at a time that is appropriate and in line with the level of complexity of the learning outcome evaluated?
How often is feedback given?
Is feedback generated on the basis of an evaluation instrument?
What information does the teacher's feedback provide?
Is the process of feedback done to foster self-regulation?
Does the teacher propose evaluation targets?
Does the teacher set evaluation standards?
How is the communication by the teacher during the feedback?
What is the attitude of the teacher when a student disagrees with the evaluation or has doubts about it?
When the teacher provides me with feedback, what is my role?
As a student, how do I use the feedback provided by the teacher?
As a student, what relevance do I give the feedback?
Is the feedback meaningful for my teacher training?

Source: Berlanga & Juárez (2020a).

2. Selection of the sample population for application of the instrument. The instrument was applied in normal schools in the state of Coahuila, Mexico. The tool was applied to trainee teachers from ongoing semesters without prior notice, and so non-probability convenience sampling was used. A total of 525 respondents was obtained from the Escuela Normal Preescolar, Benemérita Escuela Normal de Coahuila, Escuela Normal Superior, Escuela Normal Regional de Especialización, and Escuela Normal de Educación Física. The sample comprised 77.5% women and 22.5% men, with a mean age of 26.95 years and with a mean of 2.8 years of study of teacher training. With regards to the place of origin of the sample, 390 learners were from the municipality of Saltillo in the state of Coahuila and 135 from other municipalities in the same state. There were also four learners who were from cities in other states of Mexico as a result of the student exchange in some of the country's normal schools. At the same time as the application of the rubric, the "Instrument satisfaction

questionnaire" (CIFE, 2018) was applied with the purpose of evaluating how easy the instrument is to complete. In order to comply with ethical research criteria, the participants were informed of the aim of the instrument, informed consent was sought, and personal data was protected (General Law on the Protection of Personal Data Held by Obligated Parties, 2017).

3. Construct validity and reliability analysis. Firstly, the fit of the items to the normal distribution was analysed by calculating skew and kurtosis with items with a value greater than ± 2 being eliminated (Bollen & Long, 1993). The item–test correlation was also examined with the aim of identifying items with a value lower than 0.20 or greater than 0.90, which were eliminated (Tabachnick & Fidell, 2001).

The sample was then divided into two equal parts to perform a cross validation (Brown, 2015). The first part was analysed using exploratory factor analysis (EFA) and the second with confirmatory factor analysis (CFA). It is important to note that the sample was divided by a process of randomisation. This was used to avoid any bias or pattern, using random numbers through an electronic spreadsheet. To proceed with the exploratory factor analysis, the relevance of the data was verified using the KMO index and Bartlett's test (Howard, 2016; Yong & Pearce, 2013). Having checked that the items fit the normal distribution, exploratory factor analysis was performed, selecting the maximum likelihood method (Howard, 2016; Yong & Pearce, 2013). The number of factors to retain is based on the Guttman-Kaiser criterion, scree plot, explained variance, and the eigenvalue > 1 criterion (Henson & Roberts, 2006). Following the analysis of the factor matrix, if factor complexity was found, the matrix was rotated using the most appropriate algorithm.

As with the factor structure obtained through EFA, CFA was carried out on the second subsample using the maximum likelihood estimation method. With regards to sample size, we followed the guidance of Kline (2015), who suggests a sample size of between 200 and 400 participants. Specifically, the goodness of fit of the model was evaluated using chi-squared, the chi-squared/degrees of freedom ratio (χ^2/df), and indices of fit (goodness) of fit index (GFI); root mean square error of approximation (RMSEA), root mean square residual (RMR); comparative fit index (CFI); and Tucker-Lewis index (TLI), considering the criteria proposed by Yuan (2005) and Blunch (2013). Subsequently, the average variance extracted and composite reliability were calculated in accordance with Fornell and Larcker (1981), taking as the threshold for the former values greater than 0.50 and for the latter 0.70 (Hair et al, 2014). Based on what Hair et al. (2014) state, for each factor we checked whether the standardised factor loadings by item were greater than 0.5, the average variance extracted greater than 0.5, and the composite reliability greater than 0.7. Finally, we calculated reliability using Cronbach's alpha coefficient (Cronbach, 1951)

with 95% confidence intervals (Koning & Frances, 2003), as well as the omega coefficient of reliability (McDonald, 1999). The criteria established by Taber (2018) were used for the values obtained from these coefficients.

The skew, kurtosis, item–test correlation, Cronbach's alpha coefficient, McDonald's omega coefficient, and the exploratory and confirmatory factor analysis were calculated using JASP version 0.11.1 (JASP Team, 2019) software.

3. Analysis and results

3.1. Analysis of construct validity and reliability

According to the analysis, as Table 2 shows, none of the items broke the criteria established for skew and kurtosis, and so the data can be assumed to have a normal distribution. No item had a value lower than 0.20 or greater than 0.90 on the item–test–correlation indicator, and so there was no need to eliminate any of them.

TABLE 2. Skew and kurtosis of the items.

Item	Skew	Kurtosis	Item–test correlation
1	0.473	-0.922	0.673
2	0.492	-1.041	0.609
3	0.509	-0.989	0.664
4	-0.005	-0.957	0.752
5	0.34	-1.037	0.681
6	0.462	-1.219	0.691
7	0.677	-0.816	0.556
8	0.53	-1.119	0.727
9	0.004	-1.526	0.666
10	0.062	-1.577	0.751
11	-0.206	-1.385	0.739
12	-0.069	-0.993	0.554
13	0.433	-1.156	0.618
14	0.037	-1.248	0.606
15	-0.17	-1.429	0.719
16	-0.339	-1.466	0.732

Source: Own elaboration.

The Kaiser–Meyer–Olkin test (KMO: 0.961) and Bartlett's test of sphericity ($X2$: 3751.286 df: 120; $p < 0.00001$) were used to test the relevance of the data to be analysed through EFA. The matrix of communalities represents all of the items within the factor model as Table 3 shows. The factor extraction found divergences with regards to the theoretical model, as two factors with an eigenvalue greater than 1 were found, which together explain more than 65% of the variance. It is worth noting that two items were found with factor loading in more than one factor, and so the matrix was rotated and the loadings were clarified. The factor structure obtained specifically indicates that items 1 to 12 were represented in factor one, and so we called this Execution of feedback. Factor two included items 13, 14, 15 and 16, and so we named it Representativeness of feedback. Table 3 shows the factor structure of both factors.

TABLE 3. Communalities and factor loadings.

Item	Communality	Factor Loading	
		Factor 1	Factor 2
1	0.629	0.820	.
2	0.565	0.674	.
3	0.622	0.631	.
4	0.718	0.661	.
5	0.687	0.750	.
6	0.839	0.834	.
7	0.573	0.763	.
8	0.818	0.892	.
9	0.638	0.771	.
10	0.771	0.657	.
11	0.638	0.608	.
12	0.447	0.709	.
13	0.611	.	0.583
14	0.573	.	0.776
15	0.686	.	0.719
16	0.707	.	0.732

Source: Own elaboration.

The confirmatory factor analysis revealed a good fit for the two-factor model. In particular, optimal values were apparent in the value of the ratio between chi-squared and degrees of freedom (c2/df: 2.284), goodness of fit index (GFI: 0.909), root mean square error of approximation (RMSEA: 0.068, 90% CI: 0.057 ± 0.080, p > 0.005), root mean square residual (RMR: 0.035), comparative fit index (CFI: 0.966), and Tucker-Lewis index (TLI: 0.955).

The composite reliability, average variance extracted by factor, and standardised factor loading by item are presented in the summary of the model in Table 4. Each factor fulfilled the condition of the standardised factor loading by item (SFL > 0.50), average variance extracted (AVE > 0.50), and composite reliability (CR > 0.70). The above is shown in Table 4 and Graph 1. Finally, the reliability (alpha and omega) by factor was optimal (Table 4).

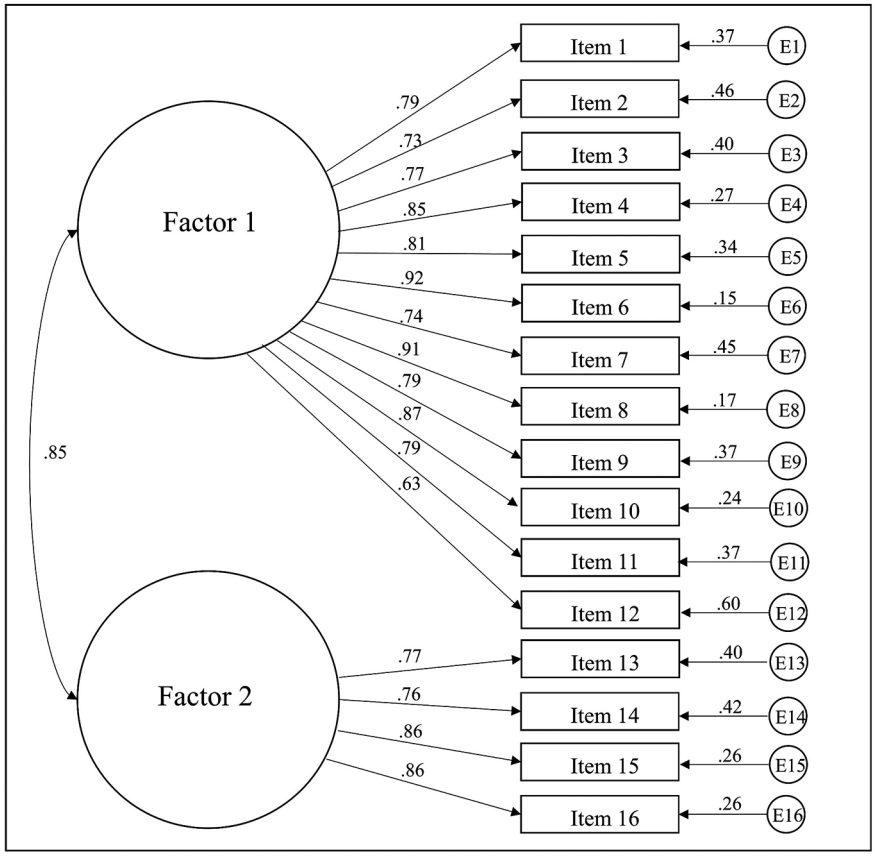
With regards to the analysis of feasibility of the instrument (Table 5), it can be seen that the perception of the respondents regarding comprehension of instructions and items and satisfaction with the instrument was evaluated as excellent.

TABLE 4. Summary of the model.

Factor	Number of items	Standardised factor loadings	Average variance extracted	Composite reliability	Cronbach's alpha (95% CI)	McDonald's omega
Execution of feedback	12	I1 (0.79), I2 (0.73), I3 (0.77), I4 (0.85), I5 (0.81), I6 (0.92), I7 (0.74), I8 (0.91), I9 (0.79), I10 (0.87), I11 (0.79), I12 (0.63)	0.646	0.955	0.95 (0.940 ± 0.958)	0.922
Representativeness of feedback	4	I13 (0.77), I14 (0.76), I15 (0.86), I16 (0.86)	0.662	0.886	0.88 (0.853 ± 0.902)	0.851

Source: Own elaboration.

GRAPH 1. Representation of the Confirmatory Factor Analysis of the Two-Dimensional Model.



Source: Own elaboration.

TABLE 5. Analysis of satisfaction with the instrument.

Questions	Low degree (%)	Acceptable degree (%)	Good degree (%)	Excellent degree (%)
Understanding of instructions	0.6	5.7	37.9	55.8
Understanding of items	0.4	6.9	40.2	52.6
Satisfaction with instrument	0.4	5.5	32.8	61.3

Source: Own elaboration.

4. Conclusions

Assertive feedback, defined through socioformative evaluation, makes it possible to evaluate the entire process of acquiring learning and developing competences, thus offering an opportunity to make the necessary adjustments to facilitate reorientation of learning (Tobón, 2017). This shows its importance in the education and learning process, since it enables the development of cognitive mechanisms in the student (Shute, 2008), which result in self-regulation of the learning process, thus making learners self-educating (García-Jiménez, 2015).

Evaluating assertive feedback in initial and continuing teacher training has a dual advantage on the basis of the results achieved. Theoretical-methodological elements complement one another and a taxonomy and instruments emerge that are more in line with the professional and disciplinary competences of the teacher for evaluating his or her performance from the socioformative focus. The other advantage lies in promoting assertive feedback in teacher training, given that it is one of the pillars for evaluating competences (Tobón, 2017).

As stated above, evaluation of the psychometric properties of an instrument is a fundamental criterion for determining the quality of its measurement (Carvajal et al., 2011). The proposed RASERA instrument was initially subjected to a process of review by experts and content validation by expert judgement, which firstly established the pertinence of the items to the phenomenon, their relevance, their wording, and whether they are understandable for the target population (Connell et al., 2018). The analysis of the content validity also showed that the items from the instrument cover the domain of content of the construct, indicating its pertinence, relevance, and representativeness (Koller et al., 2017).

This process was highly significant given that content validity is a fundamental component of construct validity (Messick, 1980). This property is regarded as fundamental because it determines the relevance of the items to the objective that has been designed as well as how much each of them represents the construct evaluated (Messick, 1980). In this respect, Furr (2020) asserts that construct validity is the degree to which the relations expected under the theory and the definitions that support the construct are confirmed.

Regarding the analysis of this property in the present work, we carried out a cross validation process, which corresponds with the classical, greatest relevance recommendation (Brown, 2015; Lloret-Segura et al., 2014). The first approach was done through exploratory factor analysis, which has the objective of identifying the factor structure underlying the items (Lloret-Segura et al., 2014) and observing the correspondence of the resulting factor structure with the theoretical proposal. The second approach was done with confirmatory factor analysis to validate the sustainability of the factor structure obtained with EFA and, consequently, the validity of the theoretical inferences made from it (Leyva, 2011).

The results of the EFA revealed discrepancies with what was theoretically proposed, as a one-dimensional model was initially considered but a model with two dimensions (factors) was found. This fit is functional in nature given that the theoretical elements listed directly and represented in the items were concentrated sequentially. For example, factor one (Execution of feedback) includes items that target aspects of focus (García-Jiménez, 2015; Tobón, 2017), information on the conditions in which it is created (Martínez -Rizo, 2013; Padilla & Gil, 2008), types (Tunstall & Gipps, 1996; Torrance & Pryor, 1998; Randall & Thornton, 2005; Hattie & Timperley, 2007; Farahman & Masoud, 2011; Evans, 2013; Jonsson, 2013; García, 2015; Contreras & Zuñiga, 2019), time (Tobón, 2017), frequency (García-Jiménez, 2015; Wiggins, 2011), implementation (Tobón, 2017), information created based on feedback (Jónsson et al., 2018; Anijovich & Cappelletti, 2017; García-Jiménez, 2015), self-regulation of the learner (García-Jiménez, 2015; Tobón, 2017; Quezada & Salinas, 2021), setting of evaluation targets, establishing evaluation rules, and interaction between teacher and learner during feedback (Tobón, 2017).

Meanwhile, factor two (Representativeness of feedback) addressed the role of the learner in the feedback, its use, and the importance given to it in their teacher training (Tobón, 2017). Both factors explained more than 56% of variance and there was representativeness and correspondence of 100% of the items from the tool, indeed, in all cases they displayed significant factor loadings (FL > 0.50), reflecting their significance and representativeness in the construct evaluated (Lagunes-Córdoba, 2017).

Evaluation through CFA provided elements of confirmation of the fit of the model to the data, which make it possible to validate the empirical sustainability of the proposed theoretical model (Herrero, 2010; Yuan, 2005) since the χ^2/df ratio, and the indices of fit used displayed optimal values. One significant aspect contributed by this analysis is the value of the standardised factor loadings (SFL > 0.50), composite reliability (CR > 0.70), and average variance extracted (AVE > 0.50). This set of results makes it possible to verify the empirical sustainability of the proposed model, and to note that the proposed indicators adequately measure this factor (Cheung & Wang, 2017; Fornell & Larcker, 1981).

Regarding the reliability analysis (Cronbach's alpha, McDonald's omega, and composite reliability), optimal values were obtained for each factor, indicating that at least 70% of the variance in the measurements in the instrument is free from error (Cho & Kim, 2015; Viladrich et al., 2017). Likewise, an optimal value was obtained with the pilot group (Cronbach's alpha: 0.906, 95% CI: 0.818 ± 0.963) (Berlanga & Juárez, 2020a). It is important to note that this calculation was done with 15 students and, as Charter (2003) states, the potential and consistency of the coefficient is determined by the sample size. On similar lines to the above, and with the sample size, in the present study, the value of the reliability was optimal and according to the confidence intervals, greater stability in the measurement is indicated.

With regards to this, it is appropriate to note the position of Jabrayilov et al. (2016) who argue that the reliability of an instrument refers to its ability to obtain measurements with minimal error and, shows the correlation between the items and the concept studied (Gliner et al., 2001).

One very important aspect analysed is the degree of satisfaction with the instrument or its feasibility (Carvajal et al., 2011), which considers elements associated with the instrument's ease, length, and time needed to complete it; the degree of comprehension of instructions and items; and the clarity of the wording (Conell et al., 2018; Halek et al., 2017). It is notable that the instrument presented here obtained an excellent evaluation regarding comprehension of instructions and items, as well as satisfaction with the instrument. Carvajal et al. (2011) underline that these aspects are relevant because they are threats to the validity, reliability, and precision of the instrument.

The methodological process followed means we can state that the RASERA mechanism is optimal given that its content and construct are valid and it is also reliable. The demonstration of the psychometric properties analysed in the present work means we can state that the instrument provides valid and reliable information (Mendoza-Mendoza & Garza, 2009). Based on this, we note that the proposed RASERA instrument provides a valid and reliable diagnostic tool.

We propose expanding its use owing to the benefits obtained in the execution and significance of assertive feedback, given that it has an influence on the improvement of the performance of the teacher and the learner. In relation to the action of the teacher, we propose its use because it would facilitate identification of the degree of assertiveness in the guidance given during evaluation, and because of its repercussion in the development of competences, the conditions in which it is provided: time, conduct, context (Canabal & Margalef, 2017), the implementation of evaluation, and the level of information (García-Jiménez, 2015; Jónsson et al., 2018). Regarding learner performance, when teachers incorporate assertive feedback into their educational praxis, this also has an impact on the cognitive and emotional realm of the learner.

Meanwhile, the evaluation of assertive feedback by learners is of value given that the information gathered comes into play in their performance and in the performance of the teacher. It is also important to note that knowledge of the teacher's perception would consolidate a complete meta-evaluation and would facilitate self-evaluation with the intention of contributing to the improvement of educational praxis relating to the process of evaluation. Consequently, a future line of research would be to construct an instrument that enables teachers to self-evaluate the degree of assertiveness in their feedback and the conditions in which it is executed. Furthermore, in the present work we did not consider the application of any other instrument that includes an aspect of assertiveness, whether as behaviour or communication, which limits understanding of the convergent and concurrent validity of the measurement instrument presented here.

References

Anijovich, R., & Cappelletti, G. (2017). *Más allá de las pruebas: la retroalimentación en la evaluación como oportunidad* [*Beyond testing: Feedback. in the evaluation as an opportunity*]. Paidós.

Ato, M., López, J., & Benavente, A. (2013). Un sistema de clasificación de los diseños de investigación en psicología [A classification system for research designs in psychology]. *Anales de Psicología, 29* (3), 1038-1059.

Berlanga Ramírez, M. L., & Juárez Hernández, L. G. (2020a). Diseño y validación de un instrumento para evaluar la retroalimentación asertiva en educación normal [Design and validation of an instrument to evaluate assertive feedback in Normal Education]. *IE Revista de Investigación Educativa de la REDIECH, 11*, e-791. https://doi.org/10.33010/ie_rie_rediech.v11i0.791

Berlanga Ramírez, M. L., & Juárez Hernández, L. G. (2020b). Paradigmas de evaluación: del tradicional al socioformativo [Evaluation paradigms: From the traditional to the socio-formative]. *Diálogos sobre educación. Temas actuales en investigación educativa*, *21*, 1-14. https://doi.org/10.32870/dse.v0i21.646

Blunch, N. (2013). *Introduction to structural equation modeling using IBM SPSS statistics and AMOS*. Sage.

Bollen, K. A., & Long, J. S. (1993). *Testing structural equation models*. Sage.

Bordas, M. I., & Cabrera, F. Á. (2001). Estrategias de evaluación de los aprendizajes centrados en el proceso [Learning assessment strategies focused on the process]. **revista española de pedagogía**, *59* (218), 25-48.

Brown, T. A. (2015). *Confirmatory factor analysis for applied research*. Guilford publications.

Canabal, C., & Margalef, L. (2017). La retroalimentación: la clave para una evaluación orientada al aprendizaje [The feedback: A key to learning-oriented assessment]. *Profesorado. Revista de Currículum y Formación de Profesorado, 21* (2), 149-170.

Carvajal, A., Centeno, C., Watson, R., Martínez, M., & Sanz Rubiales, A. (2011). ¿Cómo validar un instrumento de medida de la salud? [How to validate a health measurement instrument?]. *Anales del Sistema Sanitario de Navarra, 34* (1), 63-72.

Castro, S., Paz, L., & Cela, M. (2020). Aprendiendo a enseñar en tiempos de pandemia COVID-19: nuestra experiencia en una universidad pública [Learning to teach in times of the COVID-19 pandemic: Our experience at Universidad de Buenos Aires]. *Revista Digital de Investigación en Docencia Universitaria*, *14* (2), e1271.

Charter, R. A. (2003). A breakdown of reliability coefficients by test type and reliability method and the clinical implications of low reliability. *The Journal of General Psychology, 130* (3), 290-304. https://doi.org/10.1080/00221300309601160

Cheung, G. W., & Wang, C. (2017). Current approaches for assessing convergent and discriminant validity with SEM: Issues and solutions. *Academy of Management Proceedings, 2017* (1), 12706. https://doi.org/10.5465/AMBPP.2017.12706abstract

Cho, E., & Kim, S. (2015). Cronbach's coefficient alpha: wellknown but poorly understood. *Organizational Research Methods, 18* (2), 207-230. https://doi.org/10.1177/1094428114555994

CIFE (2018). *Instrumento «Cuestionario de satisfacción con el instrumento» [Instrument "Questionnaire of satisfaction with the instrument"].* Centro Universitario CIFE. https://docs.google.com/forms/d/e/1FAIpQLSc8-jOiWYwG64QbnhRyGAg1ElTggq2aP1XiSg45pyN9XLbXNQ/viewform

Connell, J., Carlton, J., Grundy, A., Taylor Buck, E., Keetharuth, A. D., Ricketts, T., Barkham, M., Robotham, D., Rose, D., & Brazier, J. (2018). The importance of content and face validity in instrument development: Lessons learnt from service users when developing the Recovering Quality of Life measure (ReQoL). *Quality of life research: an international journal of quality-of-life aspects of treatment, care, and rehabilitation, 27* (7), 1893-1902. https://doi.org/10.1007/s11136-018-1847-y

Contreras, G., & Zúñiga, C. G. (2019). Prácticas y concepciones de retroalimentación en formación inicial docente [Practices and conceptions of feedback in initial teacher training]. *Educação e Pesquisa*, *45*, 1-22. https://doi.org/10.1590/s1678-4634201945192953

Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests [Coeficiente alfa y la estructura interna de pruebas]. *Psychometrika*, *16* (3), 297-334. https://doi.org/10.1007/BF02310555

Díaz, L. (2001). La metaevaluación y su método [Meta-evaluation and its method]. *Revista de Ciencias Sociales* (Cr), *II-III (*93), 171-192. https://www.redalyc.org/articulo.oa?id=15309314

Evans, C. (2013). Making sense of assessment feedback in higher education. *Review of Educational Research, 83* (1), 70-12. https://doi.org/10.3102/0034654312474350

Farahman, F., & Masoud, Z. (2011). A comparative study of EFL teachers' and intermediate High School students' perceptions of written corrective feedback on grammatical errors. *English Language Teaching, 4* (4), 36-48. http://dx.doi.org/10.5539/elt.v4n4p36

Fornell, C., & Larcker, D. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research, 18* (1), 39-50. https://doi.org/10.2307/3151312

Furr, R. M. (2020). Psychometrics in clinical psychological research. In *The Cambridge handbook of research methods in clinical psychology* (pp. 54–65). Cambridge University Press. https://doi.org/10.1017/9781316995808.008

García-Jiménez, E. (2015). La evaluación del aprendizaje: de la retroalimentación a la autorregulación. El papel de las tecnologías [Assessment of learning: From feedback to self-regulation. The role of technologies]. *Relieve: Revista Electrónica de Investigación y Evaluación Educativa, 21* (2), 1-24. http://dx.doi.org/10.7203/relieve.21.2.7546

General Law on the Protection of Personal Data Held by Obligated Parties. *Official Journal of the Federation,* 26 January 2017. Chamber of Deputies of the H. Congress of the Union. United Mexican States. https://www.diputados.gob.mx/LeyesBiblio/pdf/LGPDPPSO.pdf

Gliner, J. A., Morgan, G. A., & Harmon, R. J. (2001). Measurement reliability. *Journal of the American Academy of Child y Adolescent Psychiatry, 40*, 486-488. https://doi.org/10.1097/00004583-200104000-00019

Hair, Jr., William, C. B., Barry, J. B., & Anderson, R. (2014). *Multivariate data analysis*. Pearson

Hattie, J., & Timperley, H. (2007). The power of feedback. *Review of Educational Research, 77* (1), 81-112. https://doi.org/10.3102/003465430298487

Halek, M., Holle, D., & Bartholomeyczik, S. (2017). Development and evaluation of the content validity, practicability, and feasibility of the Innovative dementia-oriented Assessment system for challenging behaviour in residents with dementia. *BMC health services research*, *17* (1), 1-26.

Henson, R. K., & Roberts, J. K. (2006). Use of exploratory factor analysis in published research: Common errors and some comment on improved practice. *Educational and Psychological measurement*, *66* (3), 393-416. https://doi.org/10.1177/0013164405282485

Herrero, J. (2010). El análisis factorial confirmatorio en el estudio de la estructura y estabilidad de los instrumentos de evaluación: un ejemplo con el cuestionario de autoestima CA-14 [Confirmatory factor analysis in the study of the structure and stability of assessment instruments: An example with the self-esteem questionnaire (CA-14)]. *Intervention Psychosocial, 19* (3), 289-300. https://doi.org/10.5093/in2010v19n3a9

Howard, C. M. (2016). A review of exploratory factor analysis decisions and overview of current practices: What we are doing and how can we improve? *International Journal of Human–Computer Interaction*, *32* (1), 51-62. https://doi.org/10.1080/10447318.2015.1087664

JASP Team (2019). JASP (Version 0.11.1) [Computer software].

Jabrayilov, R., Emons, W. H. M., & Sijtsma, K. (2016). Comparison of classical test theory and item response theory in individual change assessment. *Applied Psychological Measurement, 40* (8), 559-572. https://doi.org/10.1177/0146621616664046

Jonsson, A. (2013). Facilitating productive use of feedback in higher education. *Active Learning in Higher Education, 14* (1), 63-76. https://doi.org/10.1177/1469787412467125

Jónsson, I. R., Smith, K., & Geirsdóttir, G. (2018). Shared language of feedback and assessment. Perception of teachers and students in three Icelandic secondary schools. *Studies in Educational Evaluation*, *56*, 52-58. https://doi.org/10.1016/j.stueduc.2017.11.003 Kline, P. (2015). *A handbook of test construction (psychology revivals). Introduction to psychometric design*. Routledge.

Koller, I., Levenson, M. R., & Glück, J. (2017). What do you think you are measuring? A mixed-methods procedure for assessing the content validity of test items and theory-based scaling. *Frontiers in Psychology*, *8*, 126. https://doi.org/10.3389/fpsyg.2017.00126

Koning, A. J., & Frances, P. H. (2003). Confidence intervals for Cronbach's Coefficient Alpha values. *ERIM Report Series Reference* No. ERS-2003-041-MKT. http://hdl.handle.net/1765/431

Lagunes-Córdoba, R. (2017). Recomendaciones sobre los procedimientos de construcción y validación de instrumentos y escalas de medición en la psicología de la salud [Recommendations about procedures for construction and validation of scales in health psychology]. *Revista Psicología y Salud, 27* (1), 5-18.

Leyva, E. (2011). Una reseña sobre la validez de constructo de pruebas referidas a criterio [An overview of the construct validity of criterion-referenced tests]. *Perfiles Educativos*, *33* (131), 131-154. https://doi.org/10.22201/iisue.24486167e.2011.131.24238

Lloret-Segura, S., Ferreres-Traver, A., Hernández-Baeza, A. & Tomas-Marco, I. (2014). El análisis factorial exploratorio de los ítems: una guía práctica, revisada y actualizada [The exploratory factor analysis of the items: A practical guide, revised and updated]. *Anales de Psicología, 30* (3), 1151-1169. http://dx.doi.org/10.6018/analesps.30.3.199361

López, A., & Osorio, K. (2016). Percepciones de estudiantes sobre la retroalimentación formativa en el proceso de evaluación [Student perceptions about formative feedback in the evaluation process]. *Actualidades Pedagógicas, 68*, 43-64. http://dx.doi.org/10.19052/ap.2829.

Martínez, M. (1995). *Psicometría: teoría de los tests psicológicos y educativos* [*Psychometry: Theory of psychological and educational tests*]. Síntesis.

Martínez-Rizo, F. (2013). Dificultades para implementar la evaluación formativa: revisión de literatura [Difficulties in implementing formative assessment: Literature review]. *Perfiles educativos, 35* (139), 128-150. http://www.scielo.org.mx/pdf/peredu/v35n139/v35n139a9.pdf

McDonald, R. P. (1999). *Test theory: A unified treatment*. Lawrence Erlbaum Associates, Inc.

Mejía, M., & Pasek de Pinto, E. (2017). Proceso general para la evaluación formativa del aprendizaje [General process for formative assessment of learning]. *Revista Iberoamericana de Evaluación Educativa, 10* (1), 177-193. https://doi.org/10.15366/riee2017.10.1.009

Mendoza-Mendoza, J., & Garza, J. B. (2009). La medición en el proceso de investigación científica: Evaluación de validez de contenido y confiabilidad [Measurement in the scientific research process: Content validity and reliability evaluation]. *Innovaciones de Negocios, 6* (11), 17- 32.

Messick, S. (1980). Test validity and ethics of assessment. *American Psychologist, 35* (11) 1012-1027. https://doi.org/10.1037/0003-066X.35.11.1012

Miguel, J. A. (2020). La educación superior en tiempos de pandemia: una visión desde dentro del proceso formativo [Higher education in times of pandemic: A view from within the training process]. *Revista Latinoamericana de Estudios Educativos*, *50* (ESPECIAL), 13-40. https://doi.org/10.48102/rlee.2020.50.ESPECIAL.95

Monje, V., Camacho, M., Rodríguez, E., & Carvajal, L. (2009). Influencia de los estilos de comunicación asertiva de los docentes en el aprendizaje escolar [Influence of teachers' assertive communication styles on learning in schools]. *Psicogente, 12* (21), 78-95.

Padilla, M. T., & Gil, J. (2008). La evaluación orientada al aprendizaje en la educación superior: condiciones y estrategias para su aplicación a la docencia universitaria [Learning-oriented assessment in higher education: conditions and strategies for its application in university education]. **revista española de pedagogía**, *66* (241), 467-486.

Pérez-Gil, J. A., Chacon-Moscoso, S., & Moreno-Rodríguez, R. (2000). Validez de constructo: el uso del análisis factorial exploratorio-confirmatorio para obtener evidencias de validez [Construct validity: The use of factor analysis]. *Psicothema, 12* (2), 442-446. https://www.psicothema.com/pdf/601.pdf

Quezada, S., & Salinas, C. (2021). Modelo de retroalimentación para el aprendizaje: Una propuesta basada en la revisión de literatura [Feedback model for learning: A proposal based on literature review]. *Revista mexicana de investigación educativa, 26* (88), 225-251.

Randall, M., & Thornton, B. (2005). *Advising and supporting teachers*. University Press.

Sadler, D. (1989). Formative assessment and the design of instructional systems. *Instructional Science*, *18*, 119-144. http://dx.doi.org/10.1007/BF00117714

Shute, V. J. (2008). Focus on formative feedback. *Review of Educational Research*, *78* (1), 153-189. https://doi.org/10.3102/0034654307313795

Tabachnick, B. G., & Fidell, L.S. (2001). *Using multivariate statistics*. Allyn y Bacon.

Taber, K. S. (2018). The use of Cronbach's alpha when developing and reporting research instruments in science education. *Research in Science Education, 48* (6), 1273-1296. https://doi.org/10.1007/s11165-016-9602-2

Temesio, S., García, S., & Pérez, A. (2021). Rendimiento estudiantil en tiempo de pandemia: percepciones sobre aspectos con mayor impacto [Student performance in times of pandemic: Perceptions of aspects with the greatest impact]. *Revista Iberoamericana de Tecnología en Educación y Educación en Tecnología*, *28*, e45. https://doi.org/10.24215/18509959.28.e45

Tobón, S. (2017). *Evaluación socioformativa. Estrategias e instrumentos* [*Socioformative evaluation. Strategies and instruments*]. Kresearch. https://cife.edu.mx/recursos/wp-content/uploads/2018/08/LIBRO-Evaluaci%C3%B3n-Socioformativa-1.0-1.pdf

Tobón, S. (2013). *Evaluación de las competencias en la edcación básica* [*Evaluation of competencies in basic education*]. Santillana.

Torrance, H., & Pryor, J. (1998). *Investigating formative assessment. Teaching, learning and assessment in the classroom*. Open University Press.

Triana, A., & Velásquez, A. (2014). Comunicación asertiva de los docentes y clima emocional del aula en preescolar [Assertive teacher communication and emotional classroom climate in preschools]. *Voces y Silencios: Revista Latinoamericana de Educación, 5* (1), 23-41.

Tunstall, P., & Gipps, C. (1996). Teacher feedback to young children in formative assessment: A typology. *British Educational Journal, 22* (4), 389-404. https://doi.org/10.1080/0141192960220402

Viladrich, C., Angulo-Brunet, A., & Doval, E. (2017). A journey around alpha and omega to estimate internal consistency reliability. *Annals of Psychology, 33* (3), 755-782. https://doi.org/10.6018/analesps.33.3.268401

Wiggins, G. (2011). Giving students a voice: The power of feedback to improve teaching. *Educational Horizons, 89* (3), 23-26. https://doi.org/10.1177/0013175X1108900406

Wiliam, D. (2011). *Embedded formative assessment*. Bloomington, Solution Tree Press.

Yong, A. G., & Pearce, S. (2013). A beginner's guide to factor analysis: Focusing on exploratory factor analysis. *Tutorials in quantitative methods for psychology*, *9* (2), 79-94. https://doi.org/10.20982/tqmp.09.2.p079

Yuan, K. H. (2005). Fit indices versus test statistics. *Multivariate Behavioral Research, 40* (1), 115-148. https://doi.org/10.1207/s15327906mbr4001_5

Authors' biographies

María de la Luz Berlanga Ramírez. Doctoral candidate at the Centro Universitario CIFE. Professor-Researcher at the Escuela Normal Superior del Estado de Coahuila. Her current research interests are in the field of evaluation in teacher training.

https://orcid.org/0000-0001-9088-3991

Luis Gibran Juárez-Hernández. Doctor of Biological and Health Sciences from the Universidad Autónoma Metropolitana. Professor–Researcher at the Centro Universitario CIFE. His current research interests are the fields of evaluation instruments, sustainable development, and ecology.

https://orcid.org/0000-0003-0658-6818

Book reviews

López Rupérez, F. (2021).
La gobernanza de los sistemas educativos. Fundamentos y orientaciones [The governance of educational systems: Foundations and orientations]
(Ismael Sanz Labrador).

Álvarez-Castillo, J. L. & García-Cano, M. (Eds.) (2022).
Diversidad e inclusión en la Universidad. La vía de la institucionalización [Diversity and inclusion in the university: The route of institutionalisation]
(Anabel Moriña Díez).

Book reviews

López Rupérez, F. (2021).
La gobernanza de los sistemas educativos. Fundamentos y orientaciones [The governance of educational systems: Foundations and orientations].
Narcea ediciones·Stamp UCJC. 220 pp.

"It is not acceptable to demand things from the lower levels of the educational system that the higher levels are not in a position to offer"

La gobernanza de los sistemas educativos. Fundamentos y orientaciones is a very necessary and opportune book in these years in which we have seen how evidence-based educational policies are gaining ground in the countries of the developed world. Francisco López Rupérez's book is an important contribution to help ensure that this trend of incorporating the conclusions from rigorous, scientific studies into decision making will also, with all of its force, reach the steps taken in education in Spain.

The conclusions of *La gobernanza de los sistemas educativos. Fundamentos y orientaciones* are very relevant. In particular, chapter 8 of the book includes the reflections of Olibie (2013) on the curriculum:

> The emergent curriculum trends call for new skills, knowledge and ways of learning to prepare students with abilities and competencies to address the challenges of an uncertain, changing world. … Such skills include: Critical thinking and problem solving; collaboration across networks and leading by influence; agility and adaptability; initiative and entrepreneurialism; effective oral and written communication; accessing and analyzing information; curiosity and imagination.

In 2020, I had the chance to edit the issue of *Papeles de Economía Española* on "Human capital in the digital economy" and in the introduction to it, I noted that

> Increased digitalisation will deepen changes in demand for skills and competences in the job market. Jobs that are based on routine tasks that can be automated will vanish or be transformed. Indeed, 21.7% of jobs in Spain are at risk of disappearing because of robotisation and a further 30.2% of jobs will undergo substantial changes in the tasks they entail (*OECD, Employment Out-*

look 2019). In other words, a total of 51.9% of jobs in Spain will be significantly affected by robotisation, an impact that is somewhat higher than the OECD average (45.6%) and which will have more of an impact on people with a low educational level. But new jobs deriving from new technologies will also be created, which will produce goods and services and will depend on the enterprising initiative of societies and on a suitable provision of human resources generated by educational systems. If machines replaced hands in earlier industrial revolutions, they are now starting to replace minds. The fourth industrial revolution, characterised by full connectivity, instant access to enormous volumes of information, the internet of things, robotics, bionics, and artificial intelligence, will create many jobs. To make the most of these opportunities, young people must be trained in transversal competences that are not easily automated such as the capacity for analysis, problem solving, creativity, critical thinking, team work, leadership, and social interrelations. It is also important to teach students non-cognitive skills such as perseverance, determination, the capacity to adapt to changes, and self-control in an ever more globalised and dynamic world. The citizen of the 21st century will face an increasingly complex and challenging setting in which there is an undisputed need for training that can develop non-routine tasks and provided added value to processes of automation.

Human capital and technological progress are two fundamental and interrelated factors that are at the core of economic development, as two of the 2019 winners of the Nobel Prize in Economics, Abhijit Banerjee and Esther Duflo, recently observed in *Good economics for hard times* (2019):

> Firms in Silicon Valley are very similar to the firms in Solow's world except in one important way: they use less of what we usually think of as capital (machines, buildings) and more of what economists call human capital, essentially specialized skills of different kinds. Many Silicon Valley companies invest in clever people in the hope they will come up with some brilliant and marketable idea, and sometimes this indeed happens.

To face the major challenge that automation and robotisation pose for the educational system, it is important that the people responsible for educational policies in Spain are aware of the digitalisation process of the economy in which we are immersed. It is vital that the leaders of the Ministry of Education and the education ministries of Spain's Autonomous Regions have training, competences, and skills at the level that the challenge we are facing demands. As Francisco López Rupérez states,

> Without adopting a scientific-rational focus when formulating and implementing policies, given that they are essential components of the governance of educational systems, this governance would be fruitless when responding to the elevated expectations that accompany the context of the 21st century.

Ultimately, "it is not acceptable to demand things from the lower levels of the educational system that the higher levels are not in a position to offer" (p. 198).

José García Montalvo, from the Universidad Pompeu Fabra, stated in 2013 in the State School Council's journal *Participación Educativa*, then chaired by López Rupérez himself, that the educational

measures implemented must be based on empirical evidence and not on prejudices or justifications that are taken for granted before applying them at scale. Research-based educational interventions that have a scientific basis using rigorous methodologies. As I myself added in the introduction to the issue of *Papeles de Economía Española*, it is a matter of evaluations based on experimental design with controlled and randomised or pseudo-experimental tests using, for example, instrumental variables, difference in differences, regression discontinuity, or counter-factual analysis. Identifying effects of education that take into account the endogenous character of training and the existence of variables that are not always observable, such as cultural factors, or the spirit and resolve that each individual displays to improve his or her educational level. Initiatives such as the Education Endowment Fund in the United Kingdom provide a good example of the advances that have occurred in some countries in the implementation of educational reforms evaluated using quantitative methodology. This provides scientific evidence about what works and what does not work in the field of educational interventions. A solid foundation for identifying, testing, and then applying at scale measures and programmes that make a real lasting difference in the educational achievements and results of children and young people. On this particular line, *La gobernanza de los sistemas educativos. Fundamentos y orientaciones* explicitly backs the adoption of a scientifically-inspired approach, that brings us close to the "science of policies" (p. 198).

"If you can't measure it, it doesn't exist," as they say in the English-speaking world. Measuring educational systems is not without its problems, but it has a virtue that few would question. But the worst thing of all would be if we did not have proven evidence for the educational measures that mean that students acquire better knowledge and competences. Without the evaluations, we would not be able to identify the good practices that have led students from some countries to know more. It is a matter of improving education by providing robust data with which to take better decisions. In this regard, chapter 6 of the book, "Modelos para una gobernanza educativa" ["Models for educational governance"], describes the features that high-performance educational systems share. "All of them adopted a scientifically inspired approach to defining and implementing the policies, and they gave a greater importance to the role of people and knowledge" (p. 199).

Indeed, López Rupérez identifies the practices in questions of educational governance that successful educational systems implement, concentrating on Portugal, Finland, and Singapore. It is revealing the manner in which Portugal has used benchmarking, which involves "comparing themselves with other organisations that, starting in this case from worse positions, have been able to advance significantly; in order then to try to work out how they did it" (p. 166). In fact, the excellent development of the educational system in Portugal until very recently is a good "rebuff" for Spain given that

> Geographically, culturally and linguistically close, Portugal is a brother country of intermediate size, which, like Spain, has suffered the effects of a military dictatorship; it has carried a greater historical delay; it has a lower level of wealth measured by GDP per capita, and at a lower socio-economic and cultural index level. And despite all of these comparative disadvantages, Portugal has been able to change for the better over recent decades and obtains better results than those of Spain, measured by different indicators that are considered key on the international panorama. (p. 166)

The conclusion with which he ends the book is a brilliant coda to *La gobernanza de los sistemas educativos. Fundamentos y orientaciones*, and is indispensable for anyone who is interested in educational policies. López Rupérez recalls the words of the 19th-century Franco-Dutch writer, Joris-Karl Huysmans "Reality does not forgive those who scorn it; it takes revenge by shattering their dreams, trampling them and flinging the shards onto a mud heap."

Banerjee, A. V., & Duflo, E. (2019). *Good economics for hard times*. Public Affairs.

García Montalvo, J. (2013). Evaluación de la eficacia de la políticas educativas y transparencia: la importancia de los experimentos aleatorizados [Evaluating the effectiveness of education policies and transparency: the importance of randomised experiments]. *Participación educativa, 2* (3), 75-82.

OECD (2019). *Employment Outlook*. OECD.

Olibie, E. (2013). Emergent global curriculum trends: Implications for teachers as facilitators of curriculum change. *Journal of Education and Practice*, *4* (5), 161-167.

Sanz, I. (2020). El capital humano en la economía digital [Human capital in the digital economy]. *Papeles de Economía Española, 166*, 1-5.

Ismael Sanz Labrador ■

Álvarez-Castillo, J. L., & García-Cano, M. (Eds.) (2022).

Diversidad e inclusión en la universidad. La vía de la institucionalización [Diversity and inclusion in the university: The route of institutionalisation].
Narcea. 253 pp.

Progressing towards inclusive universities is a challenge for higher-education institutions. The path towards achieving this involves adopting the principles of inclusive education, recognising and valuing diversity, consolidating inclusion policies, mobilising cultures to transform concepts and practices, and promoting actions that ensure the presence, participation, and success of all students.

Studying at university and obtaining a university qualification is no small matter, since, as previous studies have shown, it is an opportunity to improve people's training, social, employment, and life opportunities. This is fundamental for any student, but especially so for those who have not traditionally accessed higher education and are more vulnerable. Nonetheless, the opportunities that university settings can offer are not guaranteed just by accessing the institution or "being there". On the contrary, access without the appropriate support can result in students dropping out, and so, it is not regarded as an opportunity.

Therefore, the inclusion, equity, and diversity policies of higher-education institutions have a key role to play in accessing, continuing, and successfully completing any university qualification.

In this sense, *Diversidad e inclusión en la universidad*, edited by José Luis Álvarez-Castillo and María García-Cano Ernesto, is a contribution that helps rethink, design, and build more inclusive university spaces.

This work conceptually and empirically explores the inclusion policies in relation to diversity of different universities with a practical approach. One of the strengths of this book is that it is the result of an R&D&I project and involves eight Spanish universities.

To tackle something as complex as inclusion in the university, the work is structured in 15 self-contained chapters, spread over four sections, starting with an initial conceptual approach to inclusion policies and practices and ending with approaches for institutionalising these policies in universities. This is followed by section two, which tackles diversity and inclusion from the perspectives of different university actors and a third section that includes actions and good practices linked to inclusive education at university.

The book starts with a first section containing a single chapter that provides a general conceptualisation of the content that the different sections will cover. It conceptualises the policies and practices of university systems regarding diversity, emphasising the concepts of inclusion, equity, and justice.

The second section comprises seven chapters, which analyse the different institutional documents that reflect universities' diversity and inclusive education policies. These chapters also give voice to the different actors from the university context about their perception of diversity and inclusion in the university (leaders, teachers, administration and services staff, and students). These contributions reveal light and shadows in the university panorama, as while there has been progress in inclusive policies and practices, there is still a long way to go, since there are still barriers that hinder the retention of particular students. A university that recognises and values diversity requires profound changes in the system as a whole, including teaching practices.

The book continues with a third section that contains five chapters. They present a variety of different actions in favour of inclusion that have been explored and evaluated in the research project, as well as proposals for institutionalising it in various areas (teaching innovation, curriculum, combining curriculum with innovation, teacher training, and training of institutional leadership). These chapters approach areas as vital as teaching innovation for attention to diversity from equality, proposals to encourage teaching innovation in the field of training in inclusive global citizenship, the application of universal design for learning (UDL) to content, the methodology and evaluation of a subject, and, at the same time, the design, development, and evaluation of a training activity for teachers in UDL. The section ends with a chapter on the implementation and evaluation of an action centred on the training of student representatives.

This third section therefore offers guidelines, experiences, and examples that can inspire other universities committed to inclusion. UDL, which is so recognised in higher education, but so unknown in university practice, deserves special mention. Through UDL, multiple forms of representation, expression, and involvement are provided, recognising different forms of learning and needs, and offering flexibility and diversity of resources, methodologies, and evaluations. This teaching focus invites us to act proactively and the diversity of options is contemplated when planning teaching projects. These approaches centred on learning and UDL have proven to be effective in inclusive contexts.

The book concludes with a fourth section comprising two chapters, which sets out a proposal for institutionalising attention to diversity in higher education. These two chapters both consider the institutionalisation of inclusion to incorporate inclusive principles to all of the dimensions of institutional operation (philosophical, political, and practical). Specifically, the first one provides a guide to the process of institutionalisation, a proposal comprising five phases: diagnosis, emergence, development, institutionalisation, and evaluation. The second chapter offers precise guidelines so that the institutionalisation of attention to diversity can become a reality in higher education.

One cross-cutting idea that is repeated all though the work is the need for training in diversity and inclusion for the university community, and especially, teachers. Indeed, most of the research done so far has concluded that the teacher is a key element in the success and sustainability of the inclusive focus. These studies might lead us to think that without training or guidance for teachers about how to respond to the needs of the students or plan inclusive practices based on UDL, it will be hard to go from theory to action. With training and awareness raising for teachers, it is possible to initiate processes of change and transformation that promote inclusive university contexts. Nonetheless, we know that the path is not simple because teachers are immersed in a bureaucratised university with high research demands that are accompanied with uncertainties and pressures. However, we are also aware of the responsibility and commitment of the university in a society with high expectations about it and with students who are seeking an opportunity to progress personally, educationally, socially, and professionally.

Ultimately, this book provides an exhaustive analysis from different perspectives on inclusion in the university and provides theoretical, empirical, and practical evidence that consolidates the value of inclusion in the university. In conclusion, this book is of use to any member of the university community concerned with making the university a welcoming space for all, and with transforming policies, cultures, and practices in favour of diversity. This useful and practical book is easy to read, and invites us to reflect, imagine, and build a university that is committed to people and society.

Anabel Moriña Díez ■

Table of contents of the year 2022

Studies and notes

revista española de pedagogía
year 80, n. 283, Septembre-Dicember 2022, 609-615

rep

613 EV

Book reviews