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Studies

Moral education from Levinas: Another educational model

La educación moral a partir de Levinas: otro modelo educativo

Pedro ORTEGA RUIZ, PhD. Professor. Universidad de Murcia *(portega@um.es).*
Eduardo ROMERO SÁNCHEZ, PhD. Associate Professor. Universidad de Murcia *(eromero@um.es).*

Abstract:

This work takes Levinasian ethics and anthropology as sources to inspire a new pedagogical discourse and educational praxis in the field of moral education. In this paradigm, the human being is a historical, situational being that is open to the other from its vulnerability. Accordingly, moral education becomes a compassionate, welcoming response to the other in its situation of special need. The authors highlight the close link between education and a particular conception of the human being and how it relates to others. To ask about education is to ask about the human. Levinasian ethics do not back setting specific guidelines for educational action; they only justify the creation of an educational climate (*ethos*) in classrooms that favours openness to the other through action in the following areas of intervention: pupils' experience as a space of encounter; teachers' testimony; attention to students in their context; the need to examine the sense of responsibilty further; and the pedagogy of donation. Moral education, based on Levinasian ethics, can serve to increase alerity and humanise the school and society.

Keywords: ethics, anthropology, moral education, welcoming, educational climate.

Resumen:

Los autores parten de la ética y la antropología levinasiana como fuentes inspiradoras de un nuevo discurso pedagógico y praxis educativa en el ámbito de la educación moral. Desde este paradigma el ser humano es concebido como un ser histórico, situacional y abierto al otro desde su vulnerabilidad. De este modo, la educación moral se traduce en

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una respuesta de acogida compasiva al otro en su situación de especial necesidad. Los autores subrayan la estrecha vinculación de la educación a una determinada concepción del ser humano y su relación con los demás. Preguntar por la educación es preguntar por el hombre. La ética levinasiana no ampara la programación de pautas concretas de actuación educativa; solo justifica la creación de un clima educativo (*ethos*) en las aulas que favorezca la apertura al otro a través de una acción en los siguientes focos de intervención: la experiencia del alumno como espacio de encuentro; el testimonio del maestro; la atención al educando en su contexto; la necesidad de profundizar en el sentido de la responsabilidad; y la apuesta por la pedagogía del don. La educación moral, fundamentada en la ética levinasiana, puede servir para desarrollar la aleridad y para humanizar a la escuela y a la sociedad.

Descriptores: ética, antropología, educación moral, acogida, clima educativo.

1. Introduction

Discourse and praxis in moral education currently revolve around two principal focuses: ontological ethics inspired by Platonic idealism, and material ethics represented by Schopenhauer, the first generation of philosophers from the Frankfurt School (Horkheimer & Adorno, 2004), and Levinas. These two focuses differ in their conception of man and his relationship with the world and with others. Idealist ethics emphasise the individual dimension of the person; material ethics accentuate its relational dimension. While idealist ethics emphasise the person's transcendence, material ethics emphasise its immanence; if idealist ethics insist that "there is something" immutable in human beings that transcends the body and is independent of it, material ethics reaffirm it corporeality and contingency. This dialectic forms part of our vision of the human being and its relationship with the world and with others. These two currents form the structure of moral education at present on the basis of differing discourses and different educational practices.

Emmanuel Levinas has had a notable influence in the field of ethics and moral education. Although Levinas did not explicitly address the question of education as a "topic" to study, his philosophical thinking comprises a fertile source for "another mode" of educating from "another way" of understanding the relational structure of the human being.

The prevailing view of education as a project of producing rational autonomous subjects has been challenged by postmodern and poststructuralist critiques of substantial subjectivity. In a similar vein, Levinas, understands that subjectivity is derivative of an existentially prior responsibility to and for the other… This reframing of ethical responsibility as the precondition for subjectivity might offer a

new way of conceiving moral agency in education. (Chinnery, 2003, pp. 5-7)

For Levinas, the human being is only understood *from* the other and *for* the other. It is not an autonomous and independent being with its reason for being in itself. Instead, its way of existing is a constant appeal to the other on whom it depends to be called to a *human* existence. Nobody is human by himself or herself. It is the ethical relationship with the other, dependence on the other, that makes us human. This way of understanding human beings and their relationship with the world and with the other is the starting point for a new pedagogical discourse and a new educational praxis, which are expressed through welcoming the other in its particular situation. Hence, education, in line with Levinasian philosophy, is faithful to the historical condition of the human being and to the "circumstance" that envelops the life of each student.

While "moral education" can be inspired by many authors, we intend to base ours on the philosophy of Levinas.

2. Anthropology and ethics in Levinas

There are no ethics without anthropology, nor is there anthropology or education without ethics. A particular conception of the human being (anthropology) underlies each ethical model, even if at times there is an intention to ignore the essential dependence of education on the anthropological and ethical foundations that support it, stressing its link to students' processes of psychological development, to the detriment of the philosophical basis (Sánchez Rojo, 2019). An antipathy towards philosophy can easily be perceived in many pedagogical discourses, as though ethical and anthropological reflection were "alien" tasks for education. And there is no educational action that is not linked to a particular conception of the human being: "To educate is to create a person, and asking about education is to ask about the human being" (Delgado, 2010, p. 479). Some authors have expressed their concern about the positivist drift in pedagogical discourse and educational praxis: "The contemporary problem of the epistemological colonisation of pedagogy by cognitive-behavioural psychology is symptomatic of a process that has replaced pre-comprehensions and facilitated the replacement of the usual concepts" (Pagès, 2016, p. 272). The epistemological question is not the most urgent challenge that educationalists must address; it is not the control of the inputs that affect an educational process, but rather whether in education we are helping to form human beings who are responsible for the *other* and for the world.

For Levinas, the openness of the human being to the other "does not come as a supplement to a previous existential base; it is in ethics, understood as responsibility, that the very knot of the subjective is tied" (Levinas, 2015, p. 79). Levinas's original idea of subjectivity shatters many of the metaphysical foundations of the Being on which Western philosophy has been based

since the Enlightenment. For Levinas, it is fundamental to examine the ethical conditions at the heart of subjective interpellation as infinite responsibility based on key concepts such as substitution, hostage, and hospitality (Lee, 2019). For many philosophers of education (Lee, 2019; Matanky, 2018; Todd, 2016; Zhao, 2014; Mèlich, 2010), this interpretation of subjectivity is especially relevant in the field of education and particularly in moral education.

Levinas sets out to deconstruct Western philosophy centred on the Self. He explains this through the metaphor of Abraham and Ulysses. While the former left his land on a journey without return, Ulysses lives with the obsession of returning to Ithaca, a land he has never really left. Being human means being open to the other and living with others: we are human through others. That which is human in man involves being constantly focussed on the "outside," the other person, the inappropiable stranger. For Levinas "the way of being that is characteristic of man, more than being with the other (*mit sein*) is being for the other, which is not explained from itself and in itself, but from the other in an asymmetrical relationship that dispenses with or ignores all reciprocity between the I and the you" (Ortega, 2016, p. 251). The radical structure of man is openness to the other; being in a constant exit from himself that appeals to the other, the "stranger." Levinas expresses this in these terms: "The for itself of the identity is no longer for itself. The identity of the same in the "I" comes from outside despite itself, as a choice or an inspiration in way of the oneness of what is assigned. The subject is for the other, its being disappears for the other, its being dies in signification" (2011, p. 106).

Levinas turns away from the Platonic idea of the universal man, situating it in time and space. "The One of which Plato speaks in the first hypothesis of Parmenides is a stranger to definition and to the limit, to the place and time, to identity with itself and the difference with regards to itself, to similarity and dissimilarity, a stranger to being and to the knowledge of the fact that, furthermore, all of these attributes are categories" (Levinas, 1998, pp. 51-52). For Levinas, the human being is not a concept or an idea from which we make ourselves; but rather a historical, corporeal being. "Under the species of corporeality the ties are joined … for the other, reluctantly, from itself; the laborious nature of work in the patience of ageing, in the duty to give the other the bread from one's own mouth and the cloak from one's own shoulders" (Levinas, 2011, p. 110); the ethical relationship is only established between historical human beings, not imaginary ones: "Only when all are clothed and well-fed will the true ethical problem be visible" (Levinas, 2008, p. 42).

Idealist ethics have underestimated the corporeal dimension of the human being. Its openness to the other, from corporeality, has always been viewed with suspicion, if not scorned; and by overlooking corporeality, idealistic ethics are incapable of answering *for the* other. "We take it

for granted, as truth, that in the events of peoples, an ultimate purpose dominates, not the reason of a particular subject, but the divine and absolute reason" (Hegel, 2005, p. 98). The vulnerability of the human being, its exposure to suffering, does not find a historical response in Hegel, only in divine reason, and this response is outside of history. For material ethics, in contrast, corporeality is not a stranger, but rather its identifying mark: "That human beings are corporeal does not mean that everything is reduced to the body, but that everything we think, do or feel 'passes' through the body" (Mèlich, 2010, p. 100). The body is not the prison of the soul, nor a covering that hides the true reality of the human being; it is not simply the physical or material part of a person, something that can be separated from the other spiritual part. The body, for Levinas, is extreme passiveness, exposure to illness, to suffering and death; it is exposure to compassion and to help and care of the other. The body is the whole person insofar as it feels itself rooted in the world, living with others. *We are body*, and through it we can sympathise with the other, respond to its suffering and take responsibility for it. Without corporeality there is no ethics, because without it, there cannot be com-passion. Levinas accepts corporeality as the only possible way for the human being to live in time and space. And outside of this "circumstance" the human being disappears, is diluted in its context and its history.

For Levinas, subjectivity is the *experience* of the other as wholly other, that passively imposes itself on me and makes me liable for it without it being possible for me to decide to accept or reject this responsibility. Levinas expresses this in these terms: "Not being able to evade responsibility, not having as a hiding place an inner being in which one returns to oneself, moving forwards without consideration of oneself" (Levinas, 1998, p. 64). This openness to the other, being responsible for the other, affects the very composition of the subject as a human being. It is not my freedom of choice, but obedience to the invocation of the other from its position of need that confers the status of moral subject on me. "It is not, in effect, a matter of receiving an order, first perceiving it and then obeying it, in an act of will. The obligation to obedience precedes hearing the order in this proximity of the face" (Levinas, 2014, pp. 40-41).

In Levinasian anthropology, the human being is a being fractured by the presence of the other, which we cannot let go of without risking our own identities. The characteristic mode of existence and of being human is the un-condition of being a "stranger," being strange to oneself. "This tear in the very structure of the being of man … is what makes man a stranger to himself because he depends on others" (Ortega, 2016, p. 251), to the point that one cannot think without the presence of the other, without a relationship of radical dependence on the other. "The face of the other means for me an unchallengeable responsibility that precedes any free consent, any pact, any contract" (Levinas, 2011, p. 150). But the individual is not only open to the singu-

lar and concrete other, but to all human beings, to others. This is what Levinas (2014, p. 82) means with the expression of the "third": "The third is also a neighbour, a face, an unattainable otherness. Here is, based on the third, the proximity of a human plurality". Levinas categorically asserts openness to "others": " ...all men are responsible for one another, 'and I more than the others'." For me, this formula and this asymmetry are of the greatest importance: "all mean are responsible for one another and I more than any" (Levinas, 1993, p. 133), citing the words of Dostoievski "each of us is guilty before everyone for everyone, and I more than the others" (Toumayan, 2004, p. 55).

In the anthropology of Levinas, openness to the other goes beyond the confines of idealist anthropology and ethics, which ignored the structural ties that link us to humans and make us interdependent to exist as humans. Humankind is not a mass of isolated, self-sufficient individuals who are independent of one another, but rather it comprises structurally associated and interdependent beings whose existence as humans is linked to the unavoidable relationship with the other. This conception of the human being opens the door for us to another way of being in the world: it makes a new pedagogical discourse and educational praxis possible.

For Levinasian anthropology, the human being is a historical being subjected to contingency and uncertainty as unavoidable conditions of its existence. Far from building a world of absolute certainty and truth, Levinas makes circumstance, the contingent, and the ephemeral into the natural habitat of the life of human beings. It is not the permanent and definitive that characterises human beings, but rather the precarious and provisional, becoming and change. The subject in Levinas is not the transcendental being from Kantian ethics, but rather the historical being who is moved by and sympathises with the other in need of help; it is the negative experience of the suffering of the other as totally other, that makes the subject a moral subject when he answers for it. This experience of *exteriority* breaks the limited sphere of ontology to inscribe itself in the field of ethics, in other words, of responsibility towards the other. "Speaking about ethics from anthropology, and not from ontology, means starting from finitude and, therefore, from time and space, from history, from contingency, from memory, from relationality, and from otherness" (Mèlich, 2002, p. 129). This movement from ontology to ethics in the "I-you" relationship positions the you in history, in space and time, in a relationship of responsibility towards the specific other in need, not towards an imaginary being without biography or context. Levinas breaks with the Western philosophical tradition, which is strongly marked by ontology, by reduction of the Other to the Same. "This primacy of the Same was Socrates' teaching. To receive nothing of the Other but what was in me, as though from all eternity I was in possession of what comes to me from the outside" (Levinas, 1987, p. 65).

3. Ethics are a response to the demand of the other

Where is your brother? This is the question that persistently confronts us. The experience of the other's need breaks all of the barriers we might build to avoid answering this question. It is the mysterious voice from our interior that we cannot silence before the demand of the "stranger, the orphan and the widow," of the vulnerable other in its *human* condition. It is not the argumentative force of discourse that obliges us to respond to the demand of the other, but instead the authority of its vulnerable face. "Spontaneous agitation when faced with the suffering of others does not originate from self-legislating reason, but rather from physical distress and the feeling of solidarity with tortured and humiliated bodies. ... This spontaneous agitation manifests itself in urgency and impatience when faced with injustice. Both resist a deferral of action for reasons of rationalisation or substantiation" (Zamora, 2004, pp. 265-266). We should not interpret the Levinasian expression of the "stranger, the orphan and the widow" in a sociological sense – those abandoned by society – but rather in the anthropological sense: the human being is structurally fragile, vulnerable, in need of compassion. We are all suffering beings, subjected to suffering, pain, and death. This is the baggage that is always with us.

Levinasian ethics are responsibility before the *other* that is assigned to me and obliges me to put myself in its place without any possibility of rejecting its demand, of responding before being able to decide, before exercising my freedom. "Why does the other concern me? What's Hecuba to me? Am I my brother's keeper? These questions only make sense if it has already been assumed that the I only care for itself, is only care for itself. In effect, in such a hypothesis, the absolute outside of Me, the other who concerns me, is incomprehensible. That said, in the 'prehistory' of the I, positioned for itself, a responsibility speaks. The self in its full depth is a hostage in a much older way that is I, before the principles" (Levinas, 2011, p. 187).

For Levinas, the human being is dependence and subjection of the I to the Other. From Levinasian ethics, freedom breaks into an ethical situation that is unforeseen by nature. In contrast with moral codes that impose a particular behaviour, Levinasian ethics allow for the possibility of transgression that "opens the door to being in another way, to being another, to being different, not just with the world and with others, but also and, above all, with ourselves as we are, to a great extent, the result of this world. In short, for an ethics of compassion, there is only ethics if there is transgression" (Mèlich, 2010, p. 173). For Levinas, "the notion of freedom as autonomy is tied to an egocentered, self-enclosing subject and is the very part and parcel of the humanist subject. In critiquing the Western tendency to locate the origin of human subjectivity essentially in ego and consciousness, Levinas pro-poses freedom as heteronomy" (Zhao, 2014, p. 514).

Levinas's insistence on the responsibility of the I does not in any way lead to the development of an egological immanence to which Levinasian thinking is wholly opposed. Levinas (1993, pp. 130-131) expresses it thus: " ... what is affirmed in the relationship with the Face is the asymmetry: in the starting point, what another is with respect to me matters little to me, it is the other's business; for me, the other is above all one for whom I am responsible." Egology is the legacy received from Western philosophy in which "not just theoretical thinking, but all spontaneous movement of the conscience again appears to be directed at such a return to itself" (Levinas, 1998, p. 50).

Ethics is the response to the demand formulated by the injured man by the side of the road from Jerusalem to Jericho. Its attention is not focussed on the idea of obeying the law (morals), but on the need to help the other, to take care of it (ethics). From this ethical focus, the human being becomes *somebody* who moves us, who interpellates us. Responsibility in the response is framed in a circumstance, in a specific time and space, not in an ideal world without context; the demand of the other that calls on us to act by not obeying the law or the norm does not go unanswered. Sometimes, the response to the other is urgent and does not fit the mould of the established moral codes. This is what Waldenfels calls the "dark stain" of morals.

We encounter new frontiers when we subject to our consideration the criteria that underlie the judgement of actions. When someone refers to an existing order, whether it is legal or moral in nature. However, we must start from the supposition that any order is contingent from its very origins. ... But if every one of the orders has its frontiers, this suggests that judgements do indeed have arguments in favour of them, but not sufficient arguments. These would occur if, as Leibniz thought, we found ourselves in the best of worlds. (Waldenfels, 2015, p. 209)

There are situations in which it is not possible to turn to established moral codes, and a response becomes urgent. These are the dark areas or new frontiers of morality. "One of these 'dark areas' or new frontiers of morality is the situation of migrants adrift in the Mediterranean Sea who seek help in a host country but are turned away by laws passed in the countries they hope to reach" (Ortega & Romero, 2019, p. 193). Material ethics makes the situation of the other its own and responds with help and welcome, above or against the established moral codes. This responsible answer derives from the experience of need of the other, of concern for the fate of the other who appears before me without prior warning. The clearest example of the distinction between ethics and morals is the passage from the Gospel according to Luke (10, pp. 30-35). Ethical behaviour is represented by the Samaritan, moral behaviour by the priest and the Levite.

The ethical response in Levinas is not born from a reflection on the dignity of the human being and the consequent

obligation to act in accordance with this principle. Instead, it is an unwavering response to a specific situation of the other who demands our help and care. For the Lithuanian thinker, ethics are not born from a reflection on the dignity of the person. They are not born from reason, nor from universal and abstract principles, but rather from the absolute command of the "nakedness" of the vulnerable face of the other. It is the face of the "orphan and of the widow" that "orders" me to respond to its command. Nobody can respond for me. It is the other that interpellates me and accuses me while I cannot ignore the question of its fate. It is the feeling of compassion towards the other, the inability to be unconcerned about the other that precedes any attempt at motivation or rational justification. "The face of the other concerns me without the responsibility-for-with-other that he orders allowing me to return to the thematic presence of a being, which would be the cause or source of this order. It is not, in effect, a case of receiving an order perceiving it first and then obeying it in a decision, in an act of will. The obligation to obedience precedes hearing the order in this proximity of the face" (Levinas, 2014, pp. 40-41).

Ethics comprise the response to all that escapes from the realm of morals; they enter the "dark areas" of morality, which morals cannot reach, thus transcending codes of moral behaviour. In this passage to the dark areas of morality, nothing is prescribed or established in advance; it is necessary to respond from uncertainty and unease. Therefore, we will never know whether we have acted in accordance with the needs of the other, if we have been sufficiently responsible. In the ethical relationship we are always accompanied by the restlessness of conscience about the unfulfilled duty. The human being does not have a fixed homeland nor a firm ethical ground to tread. It lives provisionally, in uncertainty. This is the precarious baggage with which it must confront the task of living with others. Therefore, in the ethical relationship with the other there cannot be a calm conscience when faced with the fear of not having been sufficiently responsible towards it. If there were, this would involve placing limits on the ethical signification of the other. And the other, in the signification of its face, is inexhaustible, it evokes the Infinite: "The face of the other in proximity, more than representation, is the unrepresentable trace, the mode of the Infinite" (Levinas, 2011, p. 185).

For Levinas, "that which is human is the return ... to the bad conscience, to its possibility of fearing injustice rather than death, of preferring the injustice suffered to the injustice committed" (2014, p. 38). In Levinasian ethics there is no place for complacence with the duty done; we are always exposed to "shame" thanks to the fear that we have not responded adequately to the demand of the other in need. From Levinasian ethics, "one can never have a clear conscience. We will never be able to pass through the gates of heaven, and so it is not possible to know for sure if we have acted well, if we have acted correctly" (Mèlich, 2010, p. 153).

4. Another educational model

Levinasian ethics lead to "another way of educating," making its own the situation of the other in need of help and care, "the orphan, the stranger and the widow," in Levinas's words. If Levinasian ethics cannot dispense with their relationship with the other in the "nakedness" of its face, educational action also cannot free itself from the bonds that link it to the other as a historical subject. Abstract defence of human rights is not, therefore, the starting point in education. Instead it is the concrete situations that surround the life of each student. It is the experience of life that marks the framework of action of education.

Ethics, in Levinas, are always an unforeseen and singular response given to the other in a specific situation, here and now. Any *ethical* response is always situated, provisional, singular, and unrepeatable; it does not form part of our behavioural habits. It is always improvised, in contrast with *moral* behaviour which always refers to norms or codes of "good conduct," such as: respecting the rules of the road, paying taxes, rules for living together, and so on, behaviour that is indispensable for living in a society. The essential characteristic of the ethical response means that it is not appropriate to refer to a competence that is acquired or learnt for an ethical response. And so we can only speak of the creation of an educational climate that favours the development of feelings of openness to the other, sensitivity towards the demands of the other (Todd, 2016). In other words, favouring the creation of an educational *ethos* or environment that makes it possible "to foster spaces for coexistence among the students themselves, as well as between them and the teachers, with the aim of creating positive environments that provide for plans for welcoming, rituals of mutual respect, etc." (Pallarés, 2020, p. 23).

Levinasian ethics are resistant to an education that results in planning concrete guidelines for action. The educator is only permitted to create an educational climate in the classroom that encourages students to put themselves in the place of the other and welcome it, broadening ethical horizons to include the "third," expanding ethical interest in caring for nature and the most vulnerable. Developing these attitudes does not involve setting guidelines for action that can be extrapolated to other subjects and other contexts, since the ethical response, as the experience of each subject, is always original and unrepeatable. And experience is a necessary part of each educational process.

This way of understanding ethics calls for "another form of education," which results in an ethical response to the student in its specific situation. To educate is to welcome, to accompany the other in its process of personal construction; it is to answer *for the* other (Ortega, 2010). But each student, in its singularity, sets the pace of this process depending on its personal characteristics and on the contribution of its social and family setting. Individualising educational pro-

cesses is an inescapable requirement of education.

Cognitive pedagogy has centred on the learning of knowledge and competences, forgetting other essential dimensions of the training of the student. The idealist philosophy that reduces education to the development of the "higher" faculties of the human being is behind this educational model. Feelings are ignored, subordinated to an idealist conception of the human being. Educators' interests did not include corporeality as a form of existence and human life but instead they only deposited the knowledge that had to be transmitted. Sharon Todd in her book *Learning from the Other* (2003) argues that what is important is not so much knowing the other as learning from it. She focuses on empathy, love, guilt, and listening in order to underline the complex nature of learning about difference and the ethical possibilities of education. To do so she establishes an interesting dialogue, not without tension, between the thinking of Emmanuel Levinas and that of Sigmund Freud, Melanie Klein, Judith Butler, and Cornelius Castoriadis among others.

This educational model based on Levinasian ethics is linked to the creation of an educational *ethos* or classroom environment, associated with the following focal points for intervention:

4.1. Experience, meeting space

"Our life is not just a series of situations that follow on from one another, but rather we live our lives recounting them to ourselves. Our life is, inextricably, experience" (Pérez-Guerrero, 2016, p. 229). Students, in their lived realities, were just a pretext for transmitting what was previously prescribed. Without experience, education becomes an activity without meaningful content (Ortega & Romero, 2021). The subject of education is *somebody*, and this is inseparable from the experience of that person's life. The thread of the life of each student becomes the basic content of any educational process. It is not the students' intelligence or skills that must be formulated as a priority, but also the ethical values that make up the basic architecture of the building of the human being and the foundation of life in society. Without accepting the experience of the student as educational content, there is discourse alone, and no education. In such a situation, the student remains overlooked in the action of the teacher. The experience of the student is the only space in which teacher and student can meet in a dialogue that is fruitful for both.

4.2. The testimony of the teacher

The pedagogy of testimony (Standish, 2020) aims to transmit an experience of proximity and reception towards the other. It does not set out to show, nor to tell anyone what they must do, only to *show* an experience, to testify to a way of being a neighbour (proximate) to the other. *Teachers* are witnesses to what "is happening." They should not hide their responsibility towards the problems that affect the community of which they form part. Teachers cannot limit themselves to being good professionals, if they want their

students to be able to critique what is happening in their surroundings. They must also be *witnesses*. The story of the experience of healthcare workers during the Covid-19 pandemic could be one very effective way of conveying the experience of solidarity with people in need better than any discourse on human fraternity; or the story of the experience of immigrants on their journey to an unknown land could help students put themselves in the other's shoes. The story of an experience of suffering and receiving has the force of testimony, it is what interpellates us, what obliges us to think about "what is happening." And "it is not the experience of ideal models drawn from legend and literature that becomes an ethical experience; it is the close experiences, subject to contradictions, that reflect the life of individuals who are also real" (Ortega & Romero, 2021, p. 101, own translation). The authority of educational action lies in its credibility, in the testimony of someone who *displays* ethical values from the experience of his or her life. Values are learnt or appropriated by mimesis or imitation, not through discourse or reasoning.

4.3. Attention to the other in its circumstance or context

Educating demands acceptance of all of the human, all of what envelops the life of the other. We do not educate imaginary beings, but rather individuals who live in a context that shapes them in their essence. We are *circumstance*. But the human being that we know by experience is the corporeal being, vulnerable, in need of compassion, the "stranger, the orphan and the widow" of which Levinas speaks. This means that educational action cannot be confined to knowledge of virtue and reflection on human rights as basic strategies. In moral education, from Levinasian ethics, the life experience of the other, in *its* circumstance, is the starting point, and its reception the end point. Education, if it is such, cannot make the specific situation of each individual into an abstraction in order to take refuge in "neutral land." But "circumstance" is very different in each individual. All people, to some extent, make their situation or context their own, and it will mould or shape a particular way of being and living. "In education there are no educational processes or educational languages that are the same and work for everyone. There is no 'objective' world that is the same for everyone. This is a world that is necessarily *interpreted* in the way peculiar to each culture. To educate it is essential that educators emerge from themselves and take responsibility for the other in *all* of its reality, in which the student lives, because 'until they make a space for the other, even at the cost of their own survival, the ethical significance of the other will not be real'" (González R.-Arnáiz, 2002, p. 89).

4.4. Elaborating on the meaning of responsibility

The discovery of my responsibility before the other and the others. It is not my future as an individual that is in play; the fate of the other and of the others with me is also in my fate. "My life is implicated in other lives. My life is not

completely mine. We come into the world needing hospitality and this vulnerable condition cannot be avoided, it cannot be overcome" (Butler, 2006, p. 44). Bringing experiences of suffering caused by hunger and wars into the classroom makes it possible for the world of pain to come close to the lives of students, making them sensitive to another frequently forgotten reality; bringing the experience of suffering of immigrants and prisoners into the classroom can help students see them with other eyes, fostering the help and welcoming that make us regard them as *others* that belong to us. This is a means of breaking down the walls – sometimes insurmountable – that school has built, isolating itself from the reality of life. Beyond my interests and needs there is a "third" that also reclaims what belongs to it. It is the sense of belonging to a community that is linked to the awareness of my responsibility towards others and of the others. This is how to face up to a society of isolated individuals in an atomised society. The other forms part of me as question and answer.

4.5. A pedagogy of donation

Turning classrooms into spaces for encounter and disinterested help, in contrast with teaching centred on training individuals to compete, acritically and detached or indifferent to the good of the community. "Human education has more to do with contributing to different chains of altruism than with the solitary conquest of autonomy. … Pedagogy should direct itself towards processes of mutual help and contribution to the community through connection and service" (Martín et al., 2019, p. 58). The school should make space for the culture of donation. Coexistence in society is very difficult or impossible without relationships of freely-given trust, cooperation, and care and attention for the other. A society built only on the structures of justice would be uninhabitable, inhuman. Interhuman relations based on solidarity and giving-freely, on the culture of donation as a form of living, are necessary. "There is no society without donation, and there is no education without understanding the donation by educators and the capacity to give of students" (Martín et al., 2019, p. 14). But for there to be a donation, there must not be any payment or recognition of the gift received (Derrida, 1995). "The gift always resides in gratuity and even in the lack of reason" (Mèlich, 2021, p. 125). Educators should take the experience of donation as common behaviour in society and in places of educational into the classroom; they should help students name the behaviour of solidarity and fraternity that make society more human. It is ethical experiences in "normal" people that bring values within our reach, and help us to appreciate and imitate them.

5. Final considerations

The educational theorists who have considered the work of Levinas emphasise his importance for rethinking educational theory and praxis (Lee, 2019; Matanky, 2018; Biesta, 2010; Ortega, 2016). All of them underline the originality of his thinking and the need to elaborate another

educational discourse and praxis centred on the singularity of each subject, in *its* circumstance, and converting educational action into an action of receiving and caring for the other (Ortega, 2016). They also underline the role of educators as credible sources of what they transmit, and their responsibility for creating an educational climate that favours ethical behaviour. "Like Seneca, educators believe in what they teach, they express it in their behaviour, and if they use rhetorical *techne* it is so that the uttered truth forms the being of the listener" (Santos, 2013, p. 482).

Levinasian ethics do not turn to arguments based on reason to prescribe particular types of behaviour. It is not reflection based on discussion that leads us to receive the other. Instead, it is the ethical authority of the *other* that pulls us out of our indifference towards the other, from the confines of our "I". Compared with the moral world of Kantian ethics, which are predetermined, Levinasian ethics develop in uncertainty, in provisionality like the human being itself. Nothing is definitively conquered; we are obliged to invent ethical responses, because the ones already given only respond to the need of the other in a concrete, singular, and unrepeatable situation. Therefore, ethical competence is not possible. There will always be an unbridgeable gap between the need of the other and the ethical response given.

Ethics in Kant and in Levinas differs substantially in their starting point. For Kant the ethical question is: *what should I do?* Its reference point is the rule, the duty that must be fulfilled. For Levinas, the question is another very different one: *who is my neighbour?* The referent is not the rule, but the *other* in its concrete situation. A different ethics necessarily leads to an educational praxis that is also different. In this work, we might be expected to offer concrete strategies or guidelines for educational action that are already set in advance, as cognitive pedagogy does in moral education. Levinasian ethics do not contain a detailed programme, fixed in time, because the ethical response is always given to the unforeseen demand of the other. And the response is always linked to a unique, singular situation. It is not, therefore, possible to plan actions that prepare the individual for an ethical response. It is only possible to create an educational climate that favours openness to the other, sensitivity to the other in its situation. This is what makes the ethics of Levinas great and of value. The educational model proposed, starting from Levinas, takes the limitation and contingency of the human being from its structural need as its starting point, and compassionate reception as its end point.

Moral education, founded on Levinasian ethics, can serve to *humanise* the school and society. Being attentive to the other, listening to it and welcoming it, accompanying it in the adventure of the construction of *its* life project is an essential task of schools.

This entails … helping, from one's own uncertainty and testimony, the other to follow its own path without any certainty

of reaching the destination it seeks. It involves letting go of some 'certainties' that have accompanied us for too long and have made education an *in-significant* task, distanced from the life of each student (Ortega & Romero, 2019, p. 166).

It is necessary to create "another way" of educating that accepts the human reality of the student. Education, like ethics, does not contemplate idealised beings, lost in the skies of "beautiful ideas," but specific individuals shaped by *their* circumstances. "If being human is an ethical category and not just a biological one, learning to be so is the principal task all humans have throughout our lives" (Pérez-Guerrero, 2016, p. 238).

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Authors' biographies

Pedro Ortega Ruiz holds a doctorate in Pedagogy. He has studied pedagogy at the Università Pontificia Salesiana in Rome, the Universidad de Valencia and the Universidad de Murcia. He is a retired Professor of the Theory and History of Education at the Universidad de Murcia. He is co-author of books like: *La enseñanza de actitudes y valores [Teaching attitudes and values] (1986); La educación moral del ciudadano de hoy [The moral education of the citizen of today] (2001)* o *A la intemperie. Conversaciones desde la pedagogía de la alteridad [In the open: conversations from the pedagogy of otherness] (2019).* He holds the Education and Values Distinguished Chair at the Cetys-Universidad (Mexico) and is director of REDIPE (the Ibero-American Pedagogy Network).

https://orcid.org/0000-0002-3882-0544

Eduardo Romero Sánchez is Professor in the Department of Theory and History of Education at the Universidad de Murcia. He is a member of the Education in Values Research Group and coordinator of the Research Area of the Social Exclusion Observatory at the Universidad de Murcia. His principal academic contributions focus on the following lines: the philosophical and anthropological dimension of education; Levinasian ethics and the pedagogy of otherness; and processes of social and educational exclusion. He holds the Education and Values Distinguished Chair at the Cetys-Universidad (Mexico). He is currently taking part in the *Constellations of authoritarianism: memory and presence of a threat to democracy from a philosophical and interdisciplinary perspective* research project with the Institute of Philosophy of the CSIC (Spain's national research council).

https://orcid.org/0000-0001-5090-0961

At the dawn of humanisation: *Culture* casts a polyhedral shadow, the female gender and teaching practice

Al alba de la humanización: Cultura proyecta sombra de poliedro, género de mujer y práctica de magisterio

Joaquín GARCÍA CARRASCO, PhD. Professor. Universidad de Salamanca *(carrasco@usal.es)*.
Macarena DONOSO GONZÁLEZ, PhD. Associate Professor. Universidad Antonio de Nebrija *(mdonoso@nebrija.es)*.

Abstract:

The most commonly used meaning of the word *culture* relates to objects: the production-creation of cultural objects, knowledge, and institutions. The invention of the term involved a metaphorical transfer, which did not consider processes linked with child rearing; agents involved, especially women and teachers of basic skills, were forgotten. We argue that teaching of knowledge, skills and valuations are fundamental in the development of the human mind and come together in the concept of teaching or education. Women and teachers played a leading role in this scenario and patterns of development-upbringing were a fundamental stage. We have built our proof using overlapping historical and anthropological data that allow us to conclude that teaching is a distinguishing feature of the genus *Homo*. *Homo docens* might offer a perspective for the elaboration of an anthropology of education.

Keywords: anthropology of education, child rearing, teaching, women, culture.

Resumen:

El significado más atribuido a la palabra *cultura* es objetivo: la producción-creación de objetos culturales, conocimientos e instituciones. En la invención del término ocurrió una transferencia metafórica que no puso atención a procesos asociados a la crianza; olvidó actores, especialmente mujeres y docentes de primeras

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letras. Defendemos que la enseñanza de conocimientos, habilidades y valoraciones son primarias en el despliegue de la mente humana y se reúnen en el concepto *enseñanza* o en el de *educación*. En este escenario, las mujeres y los maestros ocuparon un lugar protagonista y los patrones de desarrollo-crianza un estadio fundamental. La demostración la construimos con datos históricos y antropológicos convergentes, los cuales permiten concluir que la enseñanza es un rasgo diferencial del género Homo. *Homo docens* puede constituir un punto de vista en la elaboración de una antropología de la educación.

Descriptores: antropología de la educación, crianza, magisterio, mujeres, cultura.

1. Introduction: the shadow of the polyhedron

Culture is the feature that best defines human nature. Defining terms involves setting limits on meaning to give a word relevance (Sperber & Wilson, 2005); to some extent it encloses the word, transforming it into a *term* for consistent reasoning. Kroeber and Kluckhohn (1952) collected and classified hundreds of definitions (Colom Cañellas, 1980; Bouche et al., 2002; Pérez Alonso-Geta et al., 2011; Colom Cañellas & Lizón, 2016). Why so many if the idea concept it refers to seems so clear?

Although the mind encounters facts and refers to them, it bases its interpretations on the shadow that the fact casts on it. This representation is fallible in all cases and can be improved by correcting or adjusting perspectives or viewpoints (Ortega y Gasset, 1970). *Human nature* is one of those terms we often see in writing and which everyone understands based on their own particular focus, perhaps because of the complexity of the trait we pay attention to when characterising the *human genus*. For this reason, practising philosophy is equivalent to constructing and developing hermeneutic transformations (Conill, 2018).

Nobody nowadays doubts that the genus *Homo* includes many species. According to C. J. Cela and F. Ayala, it comprises as many as five hominid genera, each of which is made up of multiple species; what is truly common to all *humans* is walking upright (2021, p. 19). Also, they are all cultural animals. These authors attempt to overcome the polysemy of the term culture by proposing a "strict meaning, that of the set of tools and techniques" (2021, p. 56)[1]. They go on to state that, when their use "becomes a common practice for a whole group, this is culture" (2021, p. 20).

From the point of view of pedagogy, these are two different systems comprising complex processes: the processes of creating and using cultural objects and the processes of transmitting skills and competences (Wenger, 2001). Which of these two processes can be used to define culture? To decide, we will go back in time in order to give as a perspective. This is what Sara Blaffer Hrdy (1946-), an anthropologist

and primatologist and professor emerita at the University of California, Davis, does: she examines the evolution of forms of behaviour. She does not ask *what* human beings are, but rather *how* we have become human beings. Therefore, she does not run into the artefact; instead she discovers the significance of empathy (Hrdy, 2016), a qualitative development that emerged long before the invention of the stone tool.

In contemporary writing on anthropology it is common to refer to culture with the sense of the creation of *cultural objects* and their collection-accumulation. The oldest meaning of the term referred to intersubjective teaching-learning processes, a social area of cooperation, and essential help for developing the mind. Here we argue for the pedagogical suitability of this perspective, as it does justice to the importance and merit of the actors in the development of this way of being.

1.1. Specific properties of our culture

When the chosen perspective — a pedagogical one — is the social field of the construction of the subject (Newman et al., 1998), the qualitative innovation that culture displays in all humans is that it establishes itself as a bio-ethological need: people cannot live outside this intersubjective scenario or the damage leaves them anthropologically unrecognisable (Curtiss, 1977; García Carrasco, 2007). With this focus, matters closely related to an anthropology of education become relevant: accessibility, availability, *sustainable* and *unsustainable culture*, cultural *circumstances* (such as those of emigrants or the abandoned), cultural *incidences* (such as invasions, pandemics, overpopulation), cultural *coincidences* (like multimedia culture), and cultural *eventualities*.

We define these eventualities as qualitative novelties that gave rise to true discontinuities in cultural evolution, such as the emergence of language, the invention of writing, or the invention of computing. We believe that the first great cultural eventuality linked to evolutionary divergence on the primate line must have been the emergence of teaching, the appearance of teaching-learning skills: a pedagogical eventuality. Within animal evolution, culture applies relevant processes of stimulus, mimetism, learning. On the hominid line, the qualitative novelty of teaching emerged: a planned intentional behaviour to ensure that another person learns, guided by motivation and perception of states of competence (Dennett, 2017). In this sense, M. Tomasello offers an anthropological approach to culture, taking cooperation as his framework of reference. In it he finds (Tomasello, 2010): "The cultural origins of human cognition", of thought and human morality (see also Tomasello, 2007, 2017, 2019). His approach revolves around the term *cooperation*; we have only found one explicit, incidental, reference to teaching in his discourse.

Many biologists affirm that biological evolution works in our species to "preserve and augment the human ability to create, absorb, and transmit culture" (Broswimmer, 2002, p. 13); other authors believe that culture turned sexual differences (sexual dimorphism) into qualitative gender attributes (Shlain, 2000).

2. The scenario of the culture of tools had to involve teaching

It was long thought that human ancestors from between 6 Ma and 3.4 Ma left no evidence of the creativity of their minds. This is precisely the epoch between Lucy (3.9-3 Ma, *Australopithecus afarensis*) (Johanson & Edey, 1993) and Toumai (6-7 Ma, *Sahelanthropus schadensis*) (Brunet, 2016, 2018). In 2011, an excavation led by Sonia Harmand (1974-) and her team, to the west of Lake Turkana (Kenya), discovered very crude stone tools dating to 3.3 Ma (Harmand et al., 2015): this is the oldest stone production site yet discovered. This is the Lomekwi-3 site, whose attributed date is even earlier than that proposed for the *Homo habilis* fossils. Until this moment, it was thought that the first stone tools were those from Oldowai, dated to 2.6 Ma.

J. E. Lewis and S. Harmand (2016) set out what they see as the implications of the Lomekwi-3 discovery regarding the creators of those artefacts: the requirement *for complex mental skills* in the artisans, such as *comprehension* of the fracture mechanics of the raw materials and choosing *preferred* sizes and shapes of the original blocks; sensory-motor *control* when applying force and precision in movements to remove the flakes; visual-spatial *comprehension* of locations and angles for striking, to make the best use of the core; *criteria for selection* of flakes according to their intended use. There is no doubt that the development of the use of tools in the genus *Homo* was unlike any other branch of animal evolution.

These stone artefacts were not found associated with bone remains. Species with similar antiquity that are known to have lived in the region in this period are *Australopithecus afarensis* with a cranial capacity of 380 to 450 cm^3, *A. deyiremeda*, and *Kenianthropus platiops*, all from the *Homo* family.

If the framework for deliberation is *culture*, thinking only of technical creativity with stone can be an obstacle or source of confusion, a prejudice.

It seems reasonable to view the early cutting sites as places where *teaching* of skills was practised and there was *motivation to learn them*. In short, processes that imply recognition of states in the mind of the other and motivation for planning help. The indications of the mental functions needed for teaching in the artisanal workshop must plausibly have evolved in certain hominid groups *before* the appearance of the culture of stone, while they practised cultures of gathering and exploiting vital resources, migrating through different territories. If processes of teaching could reasonably be used before Stone Age culture, the cultural role of the gatherer woman grows and the social fabric of childcare acquires epistemic prominence.

3. *Culture* has feminine gender, even though this was not counted in the stories

G. Hinojo, a renowned Latinist from Salamanca explains that the two major paths for inventing words are: *onomatopoeia* (from the Greek for *making names*) — a term that indicates with precision the process of invention — and *metaphor*, understanding one thing in the

terms of another (Hinojo, 2012). Metaphor is not just a poetic tool; it is an essential instrument for creating vocabulary and even for thought itself. Richter (1763-1825) went so far as to say that most of the expressions in a language are *faded metaphors*, and that *dead metaphors* remain hidden in many words.

3.1. Cicero coined the word *culture*

It is well known that the word culture derives from the participial form of the verb "*colo-colere-cultum*", whose meaning centred on "inhabiting" and "cultivating" the fields, the two most common actions among the rural village population. So, the root word recalls times of villages and peasant life, the birth of *agriculture*. Rodríguez López has shown that in ancient Rome, excellence in the way of life was "inextricably linked to the cultivation of the land" (Rodríguez López, 2002, p. 185). In the *officium* of the farmer, *vir bonus* included moral health and technical skill, but the protagonist of the story was the man. Senators and generals cultivated the earth with their hands; Cicero recommended farming as beneficial for the old and compatible with the life of a scholar (sage). In chapter XVII of *On Old Age* (Cicero, 2005), for example, he notes that Marcus Valerius Corvus was Consul six times over a period of 46 years and cultivated his land until the age of 100.

When Cato the Elder (234–149 BC) wrote the treatise *On Agriculture* (also known as *De Agri Cultura*) (Cato, 2012), the domain of *rebus rusticis*, the things of the fields, included the whole of the rural economy and peasant life (González Marrero & Ríos Longares, 2014). Even so, the space that Latin literature from this time generally dedicates to consideration of farm workers is limited. On this point, Cicero was an exception. The *tomb garden* confirmed the value attributed to the cultivation of the land (Rodríguez López, 2008).

3.2. The first and only Latin metaphorical transfer of agricultural *cultivation* to the culture of the spirit

Culture is a word (Doval, 1979) that derives from what Columella (4-70 BC) called *rural affairs* (Columella, 1988), *Re Rustica* and *Liber de Arboribus*. In the *Tusculan Disputations*, Cicero was the first, and perhaps only, person to transfer it metaphorically to refer to spiritual labours. This seems to be the first and probably only time that the word culture *was used metaphorically* in ancient Rome (Sobrevilla, 1998a). The term culture appears in *Book II, ch. 13* referring to cooperative work on the mind. Here is the complete quote:

> […] it is not every mind which has been properly cultivated that produces fruit; and, to go on with the comparison, as a field, although it may be naturally fruitful, cannot produce a crop without dressing, so neither can the mind without education [*sine doctrina animus*]; such is the weakness of either without the other. Whereas philosophy is the culture of the mind [*Cultura autem animi philosophia est*] (Cicero, 2005, p. 69).

The paragraph contains two statements. One is the famous and oft-repeated claim that philosophy is *culture of the mind*. The second, is no less categorical: the soul *without education* ("sine doctri-

na") ceases to produce; this is mentioned less. Between them, these two expressions exalt philosophical thought — the content that keeps the mind healthy and cured — and *teaching*, the intersubjective help that feeds minds, which, with the emergence of writing, is the paradigm of school teaching[2] and, much earlier, child rearing.

In the metaphors of Cicero, from our perspective, we note: (i) an implied *ontological framework* in which the human mind can be cultivated, improved, like farmland because it possesses a fertile plasticity; and (ii) an *epistemic framework*, which is also insinuated for this cultivation, which is an intersubjective relationship of teaching, *doctrine* as well, undoubtedly, *education*[3]. Terms directly referring to *child rearing*, to care in childhood. Saint Thomas Aquinas seems to have been the first to submit the concept to semantic analysis, attributing this function to the father.

Philosophy and philosophers, "the knowledge of things human and divine" (Prologue to Book II De Officiis) (Cicero, 2014, p.167) were present when the word culture was first given meaning, and it did not include raising children, nor were women and teachers in its setting.

Cicero presents an agricultural setting within an idyllic perception. The farm setting offered values for building a "model" for an essentially urban way of life, not for the illiterate peasants themselves but for the bourgeois, maintaining the aesthetic appreciation of working in the fields. The agricultural reference contributes to the reflection on the *paideia-humanitas* a cognitive framework with an emotional nature; this framework feeds the imagination to compose a conceptual system of culture as a sort of distinguishing work on minds.

The ontological and epistemic assumption we highlight here is a clear anthropological statement: the singularity of human beings lies in the fact that they need culture to live. The minds of human beings can be developed through culture. Learning from others, teaching is *like* cultivation of the mind, lessons *are like* working the fields of the mind. Whether this was a metaphor or an accepted meaning of the word culture, the expression was forgotten (Andrés-Gallego, 2006).

3.3. The imaginary package that was transferred was incomplete, women, child rearing, teachers, and basic skills were missing

Many things were hidden in the story. It turned out to be a metaphorical transference mutilated by what was omitted from its focus. The *domestic work* of raising children was missing along with its most important figures: mothers, grandmothers, "alloparental" carers (González Echeverría et al., 2020). In *Homo* species, cooperative child rearing is a bio-ethological identifying feature (Mateos, 2014).

The particular meaning given to the word culture when it comes into being leaves almost no space for women, despite their real participation in agricultural work; this silence about rural women continues to the present day. Literary production in classical Athens or in republican Rome was dazzling, but accounts of

women's participation were minimal in comparison with works on actions by men (Vera & Ribera, 1999). In the hundreds of pages Cicero devotes to agricultural activities, women are not mentioned once. The representation of this way of life is partial, and it is categorised as *uirilia officia* (men's work), making real female participation invisible and silencing any valuation of domestic work (Cañizar, 2012), privileging only reproductive value as an economic contribution (Rubiera, 2010). In the end, child rearing and teaching of basic skills (Molas, 2002) also fell through the same gap, hence the urgency of Pomeroy's question of what women were doing while men did the things that have fascinated classical scholars (Pomeroy, 1999).

The modern meaning of culture is described in a plethora of books. The *Enciclopedia Iberoamericana de Filosofía* dedicates a volume to the *Filosofía de la cultura* (philosophy of culture) (Sobrevilla, 1998b) and another to the *Filosofía de la Educación* (philosophy of education) (Hoyos Vázquez, 2008). Sobrevilla (1938–2014) opens his volume with a chapter that is rich in information. He attributes the "modern concept of culture" to the German jurist S. von Pufendorf (1632–1694), who uses the expression *cultura animae* to refer to all of the knowledge that enables us to transcend nature, and *cultura vitae* to "caring for every human being" (Pufendorf, 1989). Von Pufendorf contrasts the concept of "culture" with that of the *status naturalis*, assimilated to barbarism. He includes in the category of "culture" everything that is not provided for us by nature: on the one hand what we find and discover and on the other what we build and make. All of the activities that our initiative generates, including the care and cooperation we receive from other humans. Sobrevilla, like many other authors, regards the proposal of an objective meaning of culture – namely all of the creations and achievements of humankind – as one of the strengths of the Enlightenment, (Sobrevilla, 1998b).

Today, specialists in paleoanthropology and primatology link the meaning of "culture" to that of "cooperation". The concept of culture is not so much rooted in the productive activity of the artisan, the "axemakers" to many people (Burke & Ornstein, 2001), but rather teaching practices. The first human beings were not so much *Homo faber* as *Homo docens*.

J. Mosterín (1941-) dedicates an extensive book to human culture. In the prologue he states that "culture is information" and, at the start of the first chapter: "There is no life without information nor is there human life without culture". He then goes on to clarify that "human culture is a special type of culture" with extraordinary power (Mosterín, 2009, p. 45).

4. New chapters in the anthropology of education

D. Lestel, in a well-documented book, echoes many observations on the close relationships between chimpanzee mothers and their young and the mothers' mediation in learning. "The behaviour of the young is modelled through the signs that the mother directs at it, and to which it gradually learns to respond" (Lestel, 2003, p. 111).

These signs can be complex and multi-modal, and the child gradually learns the appropriate response. This learning involves making responses pertinent. The mother's gaze is an important element in her decision making. There has been increased observation of transmitted behaviour mediated by non-verbal communication between great apes with the mother as the preferred partner in the cultural relationship. A summary of the results of this body of research was published in *Nature* (Whiten et al., 1999).

S. Blaffer Hrdy (1946-), one of the best known researchers in the behaviour of female primates, regards empathy as key in human evolution (Hrdy, 2016). The word *empathy* refers to the capacity for awareness of others' states of emotion or intent (García-Carrasco, 2015).

> The way our bodies — including voice, mood, posture, etc. — are influenced by the bodies that surround us is one of the mysteries of human existence, but it provides the glue that keeps whole societies together (Waal, 2011, p. 91).

In 2016 a surprising emotional exchange happened: a "last embrace" between Mama, a dying chimpanzee, and Jan Van Hoff (1936-), a primatologist from Utrecht who had been her carer for many years. F. Waal reflects at length on the incident in *Mama's last hug*: a moving embrace of recognition. Normally nobody would dare enter the den of an adult chimpanzee (Waal, 2018, p. 25).

This paragraph briefly refers to surprising features of the primate cultural world that may have been present in the moments of the emergence of human culture.

4.1. The act of teaching might have been at the origin of human culture

Within the behavioural panorama of living beings, primates display *advanced sociability* in the sense of *highly personalised social relations*. This category of relations has been "a decisive context for the evolution of intelligence, at least in the psychological functions that are most directly involved in processing information" (Colmenares, 2002, p. 271). We would also add that this is the case with the evolution of affectivity and emotions (Waal, 2016), in other words, the evolution of the system of evaluating and assessing situations.

A K. Imanishi (1902–1992)[4] confirmed two of his ideas through observation of macaques. The first was that when a monkey grows up without the care of a mother, it does not acquire the normal behaviour of its community; not being sheltered and cared for by her leaves it behaviourally diminished and impaired. Hence Imanishi's second idea, which we could call the cultural efficiency of the mother and the vital need for her help to achieve the development of her offspring's ethogram.

The females invest considerably more time and energy than the males in sustaining the social structure. If anthropologists associate the importance of group life with learning and transmitting useful information and culture, the contribution of care in child rearing, where providing information is the permanent sustenance of learning, should be foregrounded.

In this context, the underlying fact is that the survival of the species depended

on the success of the child rearing care, assistance for the vulnerable children. In this circumstance, intelligence means the capacity for empathy, which the mother experiences as real interdependence.

Nonetheless, M. Tomasello believes that chimpanzees lack true representation of the emotional state and/or intentions of the other. He argues that they behave as though they were "autistic" as they do not have a theory of mind (Tomasello et al., 1993). Tomasello (2007), proposes the obscure abstraction of a process of *individual conventionalisation*. Other authors attribute to it a will for emotionally sustained *social anchoring* to copy the adult, as De Waal (2002) states. This is why they tolerate failure for so long in their attempts; they persist without an immediate connection with the reward. Riba Cano has done an interesting review of cognitive mechanisms in the social learning of chimpanzees (2016).

5. It is very probable that the first teaching was done by a female–mother and the first student was her offspring

It has been known for some time that chimpanzees in the Taï National Park (Côte d'Ivoire) have been observed breaking nuts by using an anvil stone and a hammer stone (Luncz et al., 2018) that they found far from the tree where they found the *Coula edulis* nuts. D. Lestel notes all of the interpretations and adds something surprising: "mothers who teach" (Boesch & Boesch, 1990) have been observed on at least two occasions, with two "undeniable" cases of teaching seen in the 1980s (Lestel, 2003).

The first case was documented in the Washoe Project, which was started in 1969 by the Gardners, a married couple (Fouts et al., 1986); in around month 51 of the project, a chimpanzee called Washoe was using 132 signs from the Ameslan language for deaf people. Between 1972 and 1976 the Gardners acquired another four chimpanzees, including Loulis, who gave his name to another experiment. The aim here was to demonstrate that a chimpanzee could acquire sign language without human tutoring through simple exposure and immersion in a context of communication with its adoptive mother, chimpanzee to chimpanzee (Fouts et al., 1978). At the age of 36 months it was already using 28 different signs and had learnt other skills from Washoe. Fouts and his team reported that they had observed a possible tutoring practice from Washoe. Researchers reported that these chimpanzees were undoubtedly using signs to converse with each other.

The *second case* of teaching was reported by C. Boesch (1951-) from the Max Planck Institute for Evolutionary Anthropology in Leipzig. His team rigorously documented a chimpanzee mother showing her child how to break nuts (Boesch et al., 2017). This was also observed in captive chimpanzees by Japanese primatologists in 1985 (Sumita et al., 1985).

Lestel concludes from the review of research that chimpanzee mothers from Taï clearly show that they observe the behaviour of their young and that they intervene in their activities. They display the ability to compare the clumsy behaviour of the young with the pattern they possess for

the activity. They repeat their intervention every few minutes putting the nut back on the anvil stone so that the juvenile repeats the operation. This "active teaching" is uncommon. These were the first observations and the only ones until 2003. The author deduces from the reports that,

> […] female chimpanzees from Taï practice six helping techniques that are found in human teaching: *recrutement* (the model attracts the youngster's attention to a task), *échafaudage* (the model simplifies the task by reducing the number of actions required to achieve the solution), *maintenance* of direction (the model maintains the interest of the youngster in searching for the solution), *marquage des caractéristiques critiques* (the model accentuates certain characteristics of the task), *contrôle de la frustration* (the model facilitates the search for the solution), *démonstration* (the model provides the youngster with information on how to do the action) (Lestel, 2003, p. 157).

Lestel also believes that it is interesting that while the young try a variety of methods for opening nuts, these are always taken from the range observed in the models. For example, they never try by stamping or using their teeth.

The conclusion we believe is most reasonable is that the culture of the anthropomorphic apes and human culture have a shared evolutionary history. Human evolution must have very early on explored a distinctive and particular ecological niche, that of social situations of teaching, which mothers in particular practised with their children during the period of dependency and care of their rearing. Our hypothesis is that this might have taken place after the split from the chimpanzees (around 7 Ma) and before the appearance of the stone culture (around 3.6 Ma). In this period hominids were obliged to migrate, explore, identify new sources of food. Being able to share experiences would be of great benefit.

In this empathetic framework, which was corporeally marked and included emotional signalling, teaching might have emerged and evolved. This enquiry is currently being carried out by various teams of scientists from prestigious universities, confirming that culture transformed our species by favouring specific mechanisms for cultural transmission (Boyd, 2018).

Chimpanzee mothers' care, assistance, and dedication to their young are based on affectivity, on emotionally sustained links. If caring for the young is excluded from a social system of animal cooperation, this social system will collapse. The whole social system is seemingly built to *maintain itself*, which is the same as saying to *reproduce itself*, *construct itself*, and also *repair itself*.

The emotional link lies at the root of the actor who feels stimulated by and *compassionate* towards the incompetence and failure of the learner; the emotional state, *empathy*, activates the simulation and gives value to the decision to show and/or communicate in this scenario. This point is absent from the approach of many authors who present the narrative of the evolutionary process as solely a process of cognitive change, when it is actually emotionally loaded (Tomasello, 2019).

J. L. Arsuaga (2019) notes that "the first of us" with no doubts about their filiation are Australopithecus, who inhabited much of Africa between just over 4 Ma and just under 2 Ma. The most famous Australopithecus remains are Lucy, 40% of a skeleton discovered in Ethiopia by D. Johanson (1943–) in 1974, catalogued as Al 288-1, from the species *Australopithecus afarensis*; Lucy is a female of around 3.2-3.5 Ma antiquity, 1.10 m in height, around 27 kg in weight and is estimated to have been around 20 years old when she died based on the development of her teeth (Johanson & Edey, 1993). Today we also have 94% of a skeleton called *Little Foot*, also female, of 1.30m in height and 3.67 Ma old, attributed to the same species, discovered by D. Clark in 1994 in the Sterkfortein cave, Johannesburg. These individuals lived in an environment of patchy woodland, while chimpanzees and gorillas stayed in the jungle. The biped posture is fully realised in Australopithecus and their hands are "basically like ours" with a great capacity for manipulation according to Arsuaga. These Australopithecus skeletons show that bipedal posture and manual dexterity both developed before the increase in size of the brain. They have a brain that is almost that of a chimpanzee while their bodies have a virtually human morphology.

It is important to note that the process of evolution from the appearance of upright walking until the first stone industry, took some four million years, as stated above. There must have been fundamental *pragmatic innovations* in this period, among them, cooperative teaching practices that happened without the mediation of language.

Those hominids perfected non-verbal communication. There are more than 200 species of primate, but only human eyes have a white sclera that leaves no doubt about where or at whom one is looking. In children, the direction of the gaze tells the mother about the position of the focus of attention. In 1998, C. Boesch and M. Tomasello published an article in which they argued that culture was present in many species but that in the genus *Homo* it acquired qualitative innovations, including language (Boesch & Tomasello, 1998). Language exponentially *increased* the efficiency of cultural transmission and made possible the cumulative development of culture. It acted as an efficient mechanism for transmission – a qualitative leap in the teaching process – and the appearance of a cumulative system of cultural experiences that facilitated cultural evolution, through what Boesch and Tomasello called the "ratchet effect" (1998).

6. Conclusion: *Homo docens* as a point of view or perspective

In 1972, J. Repusseau, a French inspector of schools, published a book about the training of primary school teachers. In the title he used the expression "*Homo docens*". It seems that the first person to use this expression with an anthropological meaning was S. Barnett (1915-2003) (1973); prior to this, he had argued that there was a bio-ethological innovation in the human evolutionary line, which he described as "The Instinct to Teach" (Barnett, 1968).

Finally, in 1994 he suggested changing the name *H. sapiens*, which Linnaeus had introduced, and renaming the species as *Homo docens* (Barnett, 1994). P. Gärdenfors asked in 2003 how *Homo* became *sapiens*, (Gärdenfors, 2006) and with Högberg he published an article in 2017 examining the archaeology of teaching and the evolution of *Homo docens* (Gärdenfors & Högberg, 2017). P. Gärdenfors develops this idea by suggesting the hypothesis that the practice of teaching may well have contributed to the emergence of language (2017).

S. Dehaene (1965-) is a neuroscientist whose research is very much focussed on the school scenario of learning (Dehaene, 2019). Since 1989 he has been director of the INSERM 562, Cognitive Neuroimaging Unit, which has a large team of researchers and important scientific output. In 2014 he was awarded The Brain Prize, along with G. Rizzolatti (mirror neurons), and T. Robins. He is currently head of France's Conseil Scientifique de l'Éducation Nacional.

On 07 February 2016 he was interviewed in the Argentine newspaper *Clarín* (Martyniuk, 2016). The headline highlighted a phrase of his: "Education is a much more potent force than genetics". So, education can, with some damage, reorganise the neuronal circuits that may have come genetically, from birth.

He emphasises the fact that the existence of synaptic plasticity is not sufficient to explain our species' eco-biological success as this plasticity is present in all of the animal kingdom. S. Dehaene deduces that our mental peculiarities do not depend solely or directly on neuronal plasticity, even if it is undoubtedly one of the foundations of them. "If we have become *Homo docens*, […] it is because the brain has a variety of additional tricks" (Dehaene, 2019, p. 201).

What defines the new ecological niche of *Homo docens* is the social context of *teaching and learning* with the potential capacity that development provides for increasing functional levels. This is equivalent to stating that the radical competence, which the human condition displays, is the capacity to teach rather than the skill of the artisan. "[…] inclusion of the social medium is necessary when considering the crucial question of cognitive change" (Newman et al., 1998, p. 23).

The foremost social setting for the cognitive change would be the context of teaching. *Homo docens* introduces the possibility that the foundational novelty of humankind was teaching. Before the genus *Homo*, this had never happened in the history of living beings. The activity of teaching requires higher-level mental functions, higher than imitation. Teaching presents a dual route for understanding: one path that goes from the learner to the intentions of the teacher as model and one that comes from the teacher to comprehend the circumstance of the learner. We propose that *the capacity and competence for teaching is undoubtedly something that sets apart the talent of the brains of the various Homo species*.

It is a talent for making another person's *hidden potential* flourish. This was

the case of women such as Helen Keller (1880-1968), who was deafblind from the age of nineteen months (Keller, 2019), and Marie Heurtin (1885-1921), who was deafblind from birth. Both of these women unleashed the potential of their minds through interaction with two other women who dedicated their skills to *teaching them*. Their *teachers* had to work out a means of communication and a code. Keller had Anne Sullivan (1866-1936) as her tutor. Sullivan had learnt a tactile alphabet with which she taught Keller to read and write, and even to speak by identifying sounds in the throat by touch. Heurtin found a guide in Sister Sainte Marie-Marguerite, of the nuns of the Daughters of Wisdom, at the Notre Dame de Larnay school, near Poitiers.

Dennett calls human beings *Gregorian creatures* after the British psychologist R. Gregory (1923-2010), arguing that they are creatures who can benefit from the *potential intelligence of instruments*, as Gregory regarded words as mental tools. Gregorian creatures:

> take a big step towards a human level of mental adroitness, benefiting from the experience of others by exploiting the wisdom embodied in the mind tools that these others have invented, improved and transmitted. (Dennett, 1996, p. 101)

So many words to say that Gregorian creatures can teach and that, when they learn to do something, they also learn how to teach it! These competences undoubtedly underwent a leap in quality with the emergence of language. However, there is an increasing number of arguments that confirm that the practice of teaching pre-dates linguistic communication. Language itself might well have appeared in the context fostered and stimulated by teaching practices. We may be mistaken, but it seems that teaching emerged before the appearance of language, and we are convinced that both competences — teaching and communication — played a decisive part in the evolution of hominids.

Notes

[1] *Homo faber* was an expression coined by the Roman Appius Claudius Caecus (340–273 BC): *Homo faber suae quisque fortunae* (maker of his own luck); a term H. Bergson used in his work *Creative Evolution*, as did Marx in *Capital*... and it was used in the title of a novel: Frish, M. (1957/2011). *Homo faber*. Barcelona, Seix Barral. Sennett, R. (1997/2009). *The Craftsman*. Anagrama.

[2] "The truth is that normal practice in this period was the use of *doctrina*, to refer to educational content, and of *institutio* and *instructio* for the act of educating. *Doctrina*, deriving from the verb *doceo*=to teach (causative of *disco*=to learn, which in turn comes from **di-de-se-o*, composed from the Indo-European root **dek*·=to be good, be fitting, from which the simple defective decet is preserved. *Doctrina* refers to cultural content that is worthy of conservation, that is good). For its part, *institutio* comes from *in-stituo* and this from *in-statuo*, derived through the suffix – first person singular – of **stii/sta*· =to be standing, support oneself; it refers to staying ahead of, pulling, taking from one state to another, to hetero-learning, but based on what the subject contributes of itself" (Doval, 1979, p. 119).

[3] For Doval Salgado there is no doubt. Education derives from the verb *educare*, which in turn has its origin through derivation and composition in the basic verb *dücere*. The first appearance of the term seems to be in the Rhetoric for Herennius, which for a long time was attributed to Cicero but is by an unknown author.

[4] Imanishi founded the Primate Research Institute in Kyoto. Matsuzawa, T. and McGrew, W. (2008). Kinji Imanishi and 60 years of Japanese primatology. *Current Biology*, 18(14), 587·R591. Imanishi, K. (2011). *Le Monde des êtres vivants: Une théorie écologique de l'évolution*. Wildproject.

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Authors' biographies

Joaquín García Carrasco is Professor of Pedagogy in the Faculty of Education at the Universidad de Salamanca. He has been Head of the Research Unit of the University Institute for Education Sciences and is Director of the Multimedia and Online Training Educational Design Laboratory. For 10 years he has been director of the *Revista Interuniversitaria de Teoría de la Educación*. He is now honorary director of *EKS-Education in the Knowledge Society*. In the European sphere, he has been Director of International Relations at the Universidad de Salamanca for 10 years, a representative on the Liaison Committee of the European University Association and a representative of the Universidad de Salamanca at the Coimbra Group of universities, among others. His recent publications centre on anthropology and philosophy of education, with a special interest in the concept of education and culture.

https://orcid.org/0000-0001-7809-8405

Macarena Donoso González has a Degree in Pedagogy and Doctorate in Education from the Universidad de Sevilla. She has been an FPU research trainee through Spain's Ministry of Education, Culture, and Sports in the Department of Theory and History of Education and Social Pedagogy at the Universidad de Sevilla and a visiting researcher at universities in Europe and Latin America. She is currently an Associate Professor in the Department of Education of the Universidad Nebrija on the Bachelor's in Early Years Teaching, as well as on the Master's in Teacher Training. She is also Coordinator of the University Master's in Educational Psychology at the same university. She is a member of the consolidated Universidad Complutense de Madrid research group, "Civic Culture and Educational Policies". Her most recent publications centre on the anthropology and philosophy of education, as well as engagement and stress in teachers.

https://orcid.org/0000-0003-0662-2508

Conceptions underlying the construction of knowledge: A model from history teaching*

Concepciones subyacentes a la construcción del conocimiento: un modelo desde la didáctica de la historia

Ana Isabel PONCE GEA, PhD. Assistant Professor. Universidad de Alicante *(anaisabel.ponce@ua.es).*
Noelia SÁNCHEZ-PÉREZ, PhD. Assistant Professor. Universidad de Zaragoza *(noeliasanchez@unizar.es).*

Abstract:

The aim of this article is, given the scarcity of studies in the field of education, to establish a model of the concepts underlying the methodological dimension of the construction of historical knowledge. To do so, we start by defining the operations of the historical method, which make up the empirical variables. We then consider the contributions from didactics to define the constructs. The initial model comprises two dimensions: structuring operations, which are defined as the operations essential for proceeding in accordance with the historical method, which entails methodical thought; and alternative operations, which provide divergence and multiplicity, in accordance with an avant-garde history. To verify the model, we designed an objective instrument with 44 items and carried out a study with 222 subjects, aged between 13 and 18. The data were analysed using a variety of procedures (Pearson correlations, CFA, descriptive statistics, etc.), using SPSS and MPlus statistical software. Among other interesting results, verifying the proposed model involves verifying a structure established in accordance with the nature of the operations, confirming the proposed dimensions. This configuration of the model has implications for the field of research as well as direct consequences for classroom practice.

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Keywords: conceptions, historical thinking, methodical thought, creative thought, secondary education.

Resumen:

En este artículo, y atendiendo a la escasez de estudios en el ámbito educativo, delimitamos como objetivo configurar un modelo de concepciones subyacentes a la dimensión metodológica de la construcción del conocimiento histórico. Para ello, en primer lugar, delimitamos las operaciones del método histórico, que constituyen las variables empíricas, considerando, en segundo lugar, las aportaciones desde la didáctica, para definir los constructos. El modelo inicial está constituido por dos dimensiones: operaciones estructurantes, definidas como operaciones imprescindibles para proceder acorde con el método histórico, lo que implica un pensamiento metódico; y operaciones alternativas, que aportan divergencia y multiplicidad, acorde con una historia vanguardista. Para la confirmación del modelo, diseñamos un instrumento objetivo, de 44 ítems, realizando un estudio con 222 sujetos, de entre 13 y 18 años. La información fue analizada mediante diferentes procedimientos (correlaciones de Pearson, CFA, estadística descriptiva...), utilizando los programas estadísticos SPSS y MPlus. Entre otros resultados interesantes, la confirmación del modelo propuesto implica la verificación de una estructura establecida según la naturaleza de las operaciones, confirmando las dimensiones propuestas. Esta configuración del modelo presenta implicaciones para el ámbito investigador, pero también consecuencias directas para el trabajo en el aula.

Descriptores: concepciones, pensamiento histórico, pensamiento metódico, pensamiento creativo, educación secundaria.

1. Introduction

The aim of this work is to configure a model of the conceptions that underlie the methodological dimension of construction of historical knowledge, taking the educational sphere as its context and contributions from and for the teaching of history.

According to Johnston et al. (2017), there are three types of knowledge: declarative, conceptual, and epistemic. The last of these is the only one to address how we are able to know what we know and how knowledge is constructed within the framework of each discipline (Miguel-Revilla et al., 2021). Since research into personal epistemology began, principally with the work of Perry (1970), which was followed by later more systematic studies (Hofer, 2004; King & Kitchener, 2002; Schommer, 1990), there has been growing interest in epistemic thinking relating to specific domains (Greene, 2016), in other words, the types proper to each discipline.

This consideration of specific domains recognises that each discipline has its own specific characteristics. In the case of history, these include the distance between the present and the past and the ambiguity of historical objects (Prats & Fernández, 2017). None of this is novel within the

discipline. However, these matters, which are the subject of much historiographic debate, have only recently been included in the educational field (Miguel-Revilla et al., 2021). This is despite the recognition that knowledge of substantive content and procedural concepts does not suffice for developing historical thinking competences: knowledge of the epistemology of the discipline is also needed (Mathis & Parkes, 2020). In other words, the teaching and learning of history cannot be separated from how it originates and how knowledge of it is validated.

In this regard, study, in the educational field, of the beliefs that comprise a particular type of disposition towards knowledge, considering both their nature and how they are constructed (Hofer, 2004), known as epistemological theories, has been relatively frequent in relation to perceptions of history as a school subject or discipline (Miguel-Revilla & Fernández-Portela, 2017; Suárez, 2012; VanSledright et al., 2011; among many others). Nonetheless, the field of conceptions, in relation to the teaching of history, cannot be restricted to general theories about the nature of history or the form in which knowledge is built in the abstract. Instead it involves considering concepts that underlie how students themselves process information. We are not then strictly speaking about the epistemology of history but rather of what conceptions or constructions should underlie the operations students perform to construct historical knowledge, or, to put it another way, we address the concepts that underlie the methodological dimension of the construction of historical knowledge. These conceptions, as well as their ideal, are defined by using as a basis a review of the history teaching–learning process from the didactic transposition of the skills of a researcher; or, in other words, in accordance with the approaches done under the framework of the development of historical thinking by the didactics of history (Lee & Shemilt, 2003; Seixas, 2017; VanSledright, 2015, among others).

The lack of studies on the conceptions underlying the methodological dimension of the construction of historical knowledge may partly be explained by the different focuses in research into the historical perspective and research into the historical method (Duquette, 2015) or what VanSledright (2015) calls, respectively, organising procedural concepts and strategic competences. So, while the former (evidence, historical perspective, etc.) have been analysed from their intrinsic conceptual perspective, resulting in models that provide reference points for the teaching of history and research into didactics (Lee & Shemilt, 2003; Seixas, 2017), the latter, centred on method, have focussed on measuring the development of skills and not so much on the underlying conceptions. And in any case, one or more operations have been analysed independently and not the process of construction of knowledge as a whole (Wiley et al., 2020).

In addition to the above there is the inherent difficulty of quantifying this object of study, meaning that most research has been qualitative (Kropman et al., 2019) and that there are very few instruments that are useful in their own right for general-

ising the results. Among others, we note the *Beliefs about History Questionnaire (BHQ)* (Maggioni et al., 2010), the *Historical Thinking Test (HTT)* (Smith, 2018), and the *One-Hour Test* (Seixas et al., 2015), which in no case consider the underlying conceptions for the process as a whole.

Within this framework, we set the objective of creating a model of the conceptions that underlie the methodological dimension of the construction of historical knowledge, a model that encompasses the set of operations involved in this construction, considering the development and application of a test for the construct as a whole.

1.1. Model of concepts underlying the construction of historical knowledge

There are two needs when configuring this model. Firstly, the operations involved in the construction of historical knowledge must be set out and defined so that they can be operationalised as empirical variables. Secondly, based on recent contributions from the didactics of history, hypotheses must be established regarding the different constructs that make up the model.

To delimit the operations, we review the literature about the historical method, considering three works with nuances that are of interest for establishing the variables. Aróstegui (1995), a reference point in the context of historiography, started description of the method in the construction of the first hypotheses, which is followed by observation of sources and an explanatory method, which considers the relationship between pieces of evidence, something that is essential in their positioning. Finally, he distinguishes a process which he calls *exposition*, focussed on solving the problem and elaborating of the historical discourse. Two decades later, in a relatively recent contribution, Alía (2016) distinguished similar operations, delimiting the selection of the topic and the justification as a preliminary step for constructing the first hypotheses. With regards to working with sources, he considered two different operations: description and systematic observation on the one hand and validation or checking on the other. The author gave the last of the processes he distinguished the name of explanation, in accordance with the importance of interpretation in its positioning. This process is equivalent to the exposition Aróstegui (1995) described, but is closer to analysis. The phases Ricoeur (2004) identified are of special interest owing to their vision of the historical method as a constructive process, in line with our postulates. The starting point for Ricouer's well-known proposal is the construction of historical knowledge as construction of discourses, understanding that the solution of any historical problem occurs in an ongoing way in three phases: the documentary phase, the explanation and understanding phase, and the representation. Some aspects of his description that are of interest for our proposal should be noted. Firstly, he identifies an explanation project as part of the documentary phase, which overlaps to some extent with the construction of the first hypotheses of Aróstegui (1995) and Alía (2016). In this documentary phase, sources are located and selected. Secondly, the representative phase is equivalent to the writing of the discourse. Therefore, the discourse is understood to be drawn up over the two

preliminary phases, with this last one being where the representation of the resolution is obtained. Finally, and in line with the above, the explanation–understanding phase is the cornerstone of the proposal, as it represents the step from the source to the elaboration of the discourse.

Having considered and compared these authors' definitions of operations, we opt for the definition of the operations in our model, understanding the process in its broadest sense and adopting names with didactic utility. On these lines, as shown in Table 1, the first operation we include is *Preliminary steps for formulating the problem*, considering the beliefs that influence the selection of the problem. We also adopt the title of *Formulating problems*, which includes the construction of the first hypotheses. Secondly, in relation to sources, we differentiate between *Searching for sources* (choice), *Reading sources* (evidence), and *Making inferences* (relations). Finally, we include the *Solving the question* and *Elaborating the discourse* operations, considering both the specific response to the problem and its justification, as well as the form and content of the discourse.

Having defined the operations in the model, it is necessary to establish hypotheses regarding the constructs that comprise the model, taking as a basis the definition of historical thinking from didactics, the concepts that underlie it, and the implication that the of the differentiation of dimensions for the teaching and learning of history.

Seixas and Morton (2013) define historical thinking as a creative process in which historians, through evidence from the past, generate stories about history. In one definition that is illuminating for our purpose, two elements are involved that are vital for the configuration of the model. On the one hand, thinking historically is linked to the creation of evidence-based accounts, positioning the historical method as cornerstone of any approach. In this regard, numerous formulations concerning historical thinking in the field of the didactics of history have taken the research method as a reference point to formulate the elements, dimensions, or concepts of historical thinking, approaching the idea of construction that we view as significant (for example, Smith et al. (2018) or Van Drie and Van Boxtel (2007)). In any case, developing historical thinking in students involves the development of skills in line with the scientific and critical thinking characteristic of the historian and the conception of knowledge as explained through methods, evidence, and arguments (Sakki & Pirttilä-Backman, 2019).

On the other hand, developing historical thinking entails elements of creative thinking, which Guerrero and Miralles (2017) reflect with the name of creative-historical thinking. Using this idea, some of the second-order concepts formulated in historical thinking are conceptualised and explained. So, the move from traces of the past, in the words of Rüsen (1994), to the construction of narrative involves gaps that necessarily require us to imagine how things we have no information about might have happened, locating the historical imagination as a fundamental component (Cooper, 2013). On the

same lines, comprehending the actions of the other in a past time – historical empathy – involves adopting perspectives that require us to imagine what the thoughts, feelings, and motivations of an agent from the past were in his or her context. Equally fundamental are the divergent elements when interpreting sources, not just creating unconventional relationships between pieces of evidence, but also posing creative questions about the source.

Consequently, historical thinking is conceived of as a type of higher-order thinking that tends towards reflection, relation and divergence in ideas, and a holistic perspective (Bartelds et al., 2020; Chapman, 2021; Cooper, 2013). Therefore, students are not just expected to act in accordance with the parameters of the scientific method, but also to include, as part of it, unconventional handling of information, creating original and diverse discourses that truly make knowledge progress.

Under this conceptual framework, in order to configure a model of the conceptions that underlie the methodological dimension of the construction of historical knowledge, we assume there are two types of operations, which make up the dimensions of the model, defined on the basis of the theoretical assumptions. On the one hand, there are structuring operations, defined as the operations vital for constructing historical knowledge based on the historical method. We undertake methodical thinking, in which there are principles that confirm the rigour of the arguments (López de la Vieja, 2009). On the other hand, there are some alternative operations (Chapman, 2021), which provide divergence and multiplicity when undertaking the construction of historical knowledge. Accordingly, these operations are not indispensable for a scientific process, understood in its most synoptic and general version, but are necessary for avant-garde history and propositions from didactics.

This differentiation between dimensions not only makes it possible to establish profiles in accordance with the conceptions underlying the construction of historical knowledge, something that makes it possible to classify students' conceptions into unscientific conceptions (if the conceptions linked to structuring operations have not been developed), scientific ones (if the conceptions linked to structuring operations are developed, but those linked to alternative ones are not), or avant-garde (if both are developed). It also makes it possible to eval uate the repercussions of a specific didactic proposal in line with its influence on the conceptual element, and, more importantly, to design future didactic interventions in line with students' needs. This question is of particular interest considering that a change in how a task is performed does not necessarily entail a modification of the underlying conceptions (Magionni et al., 2010), which is the ultimate aim of any intervention.

Based on this hypothesis, we regard each operation in the historical method as belonging to one or other of the dimensions, or to both, in which case the variable is duplicated, taking its methodical or creative character into account when defining it. Table 1 shows the initial model on which we carry out a first study, defining the dimensions and variables.

TABLE 1. Initial model of conceptions underlying the construction of historical knowledge.

Dimensions	Variables	Definition
Structuring operations	Formulating problems (methodical)	Evaluation of conceptions about the formulation of research problems (connection to the object of study, relevance, and materialisation) and the choice of the hypothesis for the start of the research process.
	Searching for sources (methodical)	Evaluation of conceptions about searching for diverse historical sources, justifying the validity of the sources through historical contextualisation, and considering multiple perspectives.
	Reading sources (methodical)	Evaluation of conceptions about the interpretation of the information offered by the source in its context as well as transformation in historical evidence.
	Making inferences (methodical)	Evaluation of conceptions about the selection of evidence relevant to the research problem, consideration of the complex relationships for making an inference and their evaluation with other discourses.
	Solving the question	Evaluation of conceptions about solving the problem, critique of the resulting discourse, and the conceptual change that the resolution implies.
	Elaborating the discourse	Evaluation of conceptions about the elaboration of the discourse are evaluated, understanding content and form as equally relevant in the resolution of the historical problem.
Alternative operations	Preliminary steps for formulating the problem	Evaluation of conceptions about the influence of prior conceptual schemes in the posing of problems and the questioning of official knowledge.
	Formulating problems (creative)	Evaluation of conceptions about the initial need to formulate multiple differing hypotheses, that might lead to the reformulation of the problem.
	Searching for sources (creative)	Evaluation of conceptions about the use of individual memories or unconventional information as a basis for searching for information, which entails identifying the perspectives on which sources can be constructed.
	Reading sources (creative)	Evaluation of conceptions about asking a variety of questions about sources, considering explicit and implicit aspects.
	Making inferences (creative)	Evaluation of conceptions about the creation of novel connections between pieces of historical evidence.

Source: Own elaboration.

2. Method

2.1. Participants

To analyse the structure of the model, we undertook an initial study with students from compulsory secondary education. Purposive non-probability sampling was used, choosing students from non-consecutive levels in order to represent possible differences in levels of thinking and ensure a figure greater than five students for each item in the test (Abad et al., 2011).

The sample initially comprised 311 subjects (148 male, 163 female), aged between 13 and 18, from the first and third years of Educación Secundaria Obligatoria (compulsory secondary education – ESO) from the Region of Murcia (Spain). However, 89 subjects were excluded during the application and analysis owing to incorrect or partial completion of the test. Consequently, the final sample comprised 222 participants (98 male, 134 female), studying in the first year (119 participants) and third year (103 participants) of ESO and aged between 13 and 18 (M = 14.15, SD = 1.10).

2.2. Data collection: instrument and procedure

The *Prueba sobre la Construcción del Conocimiento Histórico (Construction of Historical Knowledge Test–CONCONHIS)* was used and validated accepting the proposed model. This test is specifically intended to measure conceptions underlying the methodological dimension of the construction of historical knowledge by students aged between 12 and 16. This is a standardised, objective, non-verbal test, comprising 44 items divided into two parts. The two parts of the test include parallel items for each aspect of the meaured variable.

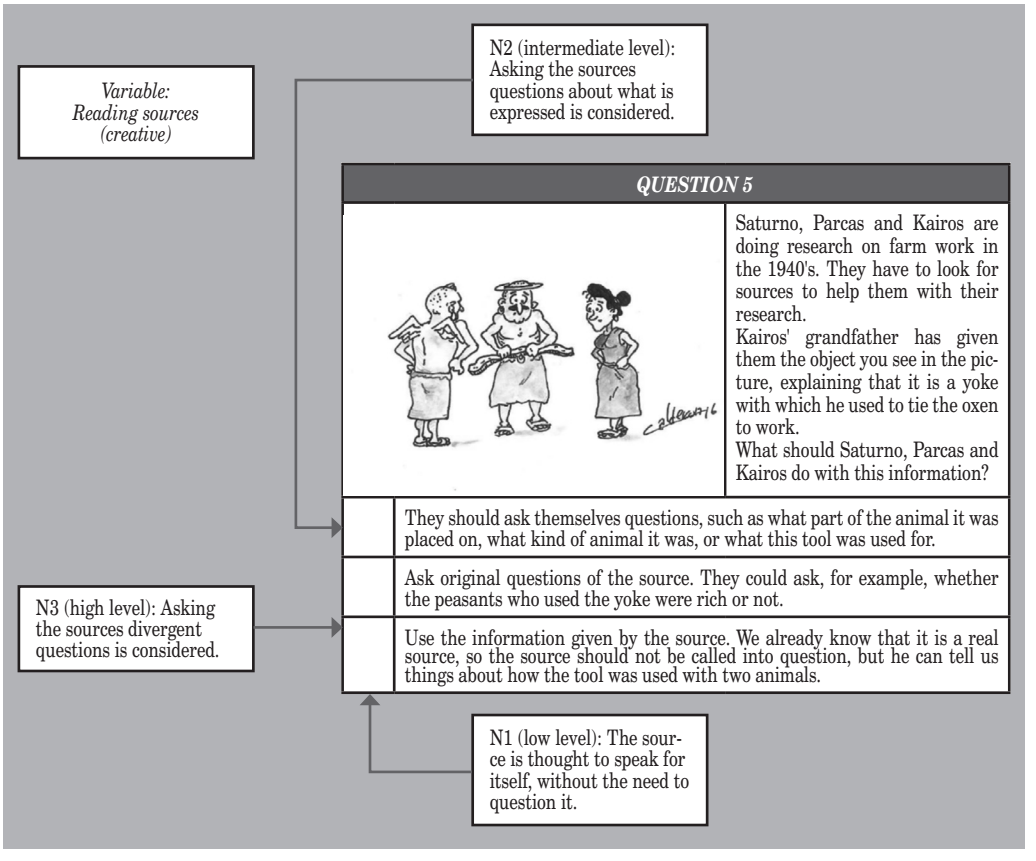
The items are all multiple-choice questions, with three answer options, from which the participants select the one they identify with the most. Their structure includes the situation before which subjects must position themselves in the statement, and each answer option corresponds to a level of development of the variable being measured. Furthermore, all of the items in the *CONCONHIS* test include an image alongside the statement and one or more of the characters (Saturn, Kairos, and the Parcas) that function as the main didactic axis of the test. Graph 1 shows one of the items and its operationalisation based on the *Reading sources (creative)* variable. The complete test and the extent of its validation process can be found in other works (Ponce, 2019).

Its application was done under a cooperation agreement between the Ministry of Education, Youth and Sport of the Autonomous Community of the Region of Murcia and the Universidad de Murcia. It had a favourable report from the university's ethics committee and informed consent from the research subjects, whose confidentiality was safeguarded.

The *CONCONHIS* test was applied collectively in the previously established groups in the educational centre, which ranged between 21 and 32 students. Data collection was done in two phases between two and three weeks apart, with one of the two parts of the test being applied in each one. The instructions were given in

writing, and participants were told orally to complete the tests individually and that there were no correct or incorrect answers. The participants had up to 50 minutes to complete each part, and had to write their answers in the test booklet itself.

GRAPH 1. Example of an item from the *CONCONHIS* test.



Source: Own elaboration.

2.3. Data analysis

The test score is obtained by calculating the mean of items from the same scale, with values ranging between 1 and 3, both for the variables and for the dimensions, included in Table 1. Values of 1, 2, and 3 are defined as low, medium, and high development in the corresponding underlying concepts. We consider a score of 2.50 to be the minimum required for each scale to be classed as developed.

However, interpretation of the scores differs depending on the dimensions of the model, as well as for the scales of the empirical variables that comprise them, in accordance with the theoretical framework: the higher the score for the *Structuring operations* dimension, the closer the underlying conceptions are to a historical procedure; the higher the score for the *Alternative operations* dimension, the closer the underlying conceptions are to a diverging process. Finally, both

dimensions must be developed if some of the conceptions are to be regarded as compatible with the development of historical thinking.

Data analysis was done in four consecutive steps. First, we calculated the descriptive statistics (means and standard deviations) and Pearson correlations for the scales in the questionnaire. We then analysed possible differences by age. Next, considering the conceptual bases and without performing a prior exploratory factor analysis (EFA), we carried out confirmatory factor analysis (CFA) to test the factor structure as a function of both latent variables with their respective scales. Finally, we examined the internal validity coefficients of the latent variables and calculated their descriptive statistics. To perform these analyses, we used the SPSS, version 24, and MPlus statistics programs.

3. Results

3.1. First-order variables: descriptive statistics and correlations

Firstly, we calculated skew and kurtosis coefficients to test whether the scores on the scales in the *CONCONHIS* test followed a normal distribution, and we also calculated the descriptive statistics (mean and standard deviation) for each scale (see Table 2).

As Table 3 shows, within the scales proposed for the *Structuring operations* latent variable, *Solving the question* and *elaborating the discourse* correlate positively and significantly (r = .35***) with *Formulating problems (methodical)* (r = .24*** and .22**, respectively), *Searching for sources (methodical)* (r = .28*** and .21**, respectively), and *Reading sources (methodical)* (r = .23** and .18**, respectively). Furthermore, there are positive and marginally significant correlations between the *Reading* and *Searching for sources* variables (methodical in both cases) (r = .13†) and between *Elaborating the discourse* and *Making inferences (methodical)* (r = .11†).

As for the scales proposed for inclusion in the *Alternative operations* latent variable, *Preliminary steps for formulating the problem*, *Formulating problems (creative)*, and *Searching for sources (creative)* are significantly and positively related (r = .32*** and .22**, respectively). In contrast, the *Reading sources (creative)* scale either does not correlate with the other scales included in *Alternative operations* (r = .08 for *Preliminary steps*) or does so at a marginal level (r = .11†, both for *Formulating problems (creative)*, and for *Searching for sources (creative)*), while *Making inferences (creative)* only correlates significantly with *Preliminary steps* (r = .16*).

3.2. First-order variables: differences by year

In order to establish possible differ ences by year in the scales relating to the construction of historical knowledge, we carried out Student's t test for independent samples for each of the scales. The analyses gave significant results for the scales of *Formulating problems (methodical)* (t(220) = -4.98***), *Formulating problems (creative)* (t(220) = -4.02***), *Searching for sources (methodical)* (t(211.11) = -4.35***), *Searching for sources (creative)* (t(219.30) = -4.58***), *Solving the question* (t(218.38) = -7.46***), and *Elaborating the discourse* (t(220) = -5.44***).

TABLE 2. Descriptive statistics for the scales in the *CONCONHIS* test

	Kurtosis	Skew	Overall	Y1 of ESO (n=119)	Y3 of ESO (n=103)
Preliminary steps for formulation	-.73	-.27	2.29 (.44)	2.26 (.43)	2.32 (.45)
Formulating problems (met.)	-.43	-.41	2.34 (.39)	2.23 (.39)	2.48 (.34)
Formulating problems (cre.)	-.92	-.39	2.22 (.68)	2.06 (.68)	2.41 (.63)
Searching for sources (met.)	-.43	-.44	2.36 (.32)	2.28 (.35)	2.46 (.25)
Searching for sources (cre.)	-.22	-.60	2.35 (.46)	2.23 (.48)	2.50 (.40)
Reading sources (met.)	-.21	-.47	2.45 (.34)	2.41 (.37)	2.50 (.30)
Reading sources (cre.)	-.49	-.17	2.01 (.47)	2.00 (.54)	2.02 (.39)
Making inferences (met.)	-.40	316	2.04 (.36)	2.04 (.37)	2.03 (.35)
Making inferences (met.)	-.44	.07	1.90 (.51)	1.90 (.55)	1.89 (48)
Solving the question	-.49	-.46	2.36 (.32)	2.22 (.32)	2.51 (.25)
Elaborating the discourse	-.99	-.20	2.25 (.60)	2.05 (.57)	2.47 (.55)

Source: Own elaboration.

TABLE 3. Pearson correlations between the scales of the *CONCONHIS* test.

		1	2	3	4	5	6	7	8	9	10	11
1	Preliminary steps	1										
2	Problem (met.)	.00	1									
3	Problem (cre.)	.32***	.17*	1								
4	Searching (met.)	.19**	.10	.20**	1							
5	Searching (cre.)	.22**	.19**	.26***	.19**	1						
6	Reading (met.)	.10	.06	.20**	.13†	.26***	1					
7	Reading (cre.)	.08	.06	.11†	.09	.11†	.01	1				
8	Inference (met.)	.03	-.04	.08	.10	-.10	.07	-.07	1			
9	Inference (cre.)	.16*	.02	-.05	.01	-.03	-.03	-.00	.08	1		
10	Solving	.21**	.24***	.27***	.28***	.36***	.23**	.10	.03	-.02	1	
11	Elab. discourse	.01	.22**	.16*	.21**	.21**	.18**	.00	.11†	-.02	.35***	1

Source: Own elaboration.

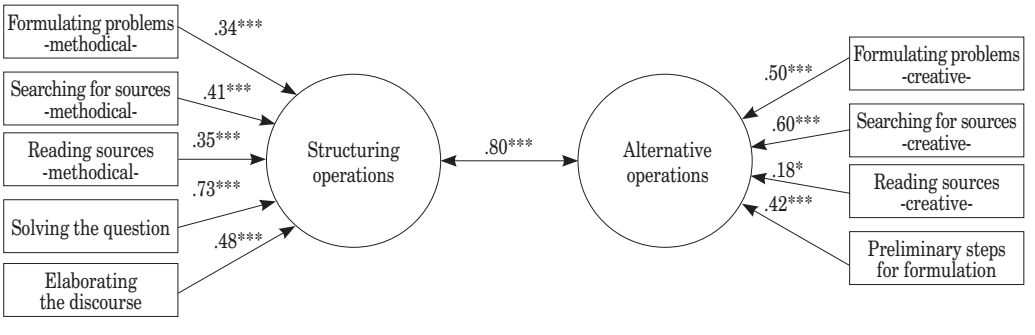
The results indicate that third-year students reported underlying conceptions that were closer to the ideal than those of the first-year students in formulating problems, looking for sources, and resolution of questions. No differences by level were found for preliminary steps, reading sources, or making inferences.

3.3. Confirmatory factor analysis

We performed a first CFA with two latent variables: *Structuring operations* (*Formulating problems -methodical-, Searching for sources -methodical-, Reading sources -methodical-, making inferences -methodical-, Solving the question and elaborating the discourse*) and *Alternative operations* (*Preliminary steps, Formulating problems -creative-, Searching for sources -creative-, Reading sources - creative - and making inferences -creative-*). The results of the CFA gave satisfactory values (CFI = .99, TLI = .99, RMSEA = .01, and SRMR = .04). As for the indicators of the latent variables, all of the scales have significant loadings in them, apart from the *Making inferences (methodical)* (*standardised beta* = 0.05, p = .506) and *making inferences (creative)* (*standardised beta* = -.02, p = .827) variables.

Having excluded these variables from the analyses, the model's indices of fit improved (CFI = 1, TLI = 1, RMSEA < .001, and SRMR = .04) and all of the scales had positive and significant loadings in the proposed latent variables (see Graph 2).

GRAPH 2. CFA of *CONCONHIS*.



Source: Own elaboration.

3.4. Second-order variables: internal validity, descriptive statistics, and differences by year.

Having verified the factorial structure of the questionnaire, we calculated the internal validity of the second-order variables using Cronbach's alpha. In the case of the *Structuring operations* variable (24 items), the α was .58. Analysing the item–test correlation showed that three items (9, 26, and 32) had a negative correlation, and so these were eliminated, giving an α level of .62 (21 items). In the case of *Alternative operations* (12 items), the α was .52. Two items (5 and 28) had an item–test correlation close to zero, and so were eliminated, giving an α of .56 (mean test–item correlation of .25). Subsequently, the indices of kurtosis, skew,

and descriptive statistics (mean and standard deviation) were calculated for the second-order variables (see Table 4).

Finally, we analysed the potential differences by year in these variables using Student's *t* test for independent samples. The results display significant differences in *Structuring operations*, $t(220) = -9.65^{***}$, and *Alternative operations*, $t(220) = -4.40^{***}$, in favour of third-year students.

TABLE 4. Descriptive statistics for the second-order scales in the *CONCONHIS*

	Kurtosis	Skew	Overall	Y1 of ESO (*n*=119)	Y3 of ESO (*n*=103)
Structuring operations	-.75	-.37	2.40 (.25)	2.28 (.22)	2.54 (.19)
Alternative operations	-.60	-.33	2.31 (.36)	2.21 (.35)	2.42 (.34)

Source: Own elaboration.

4. Discussion and conclusions

In view of the aim of creating a model of the concepts underlying the methodological dimension of the construction of historical knowledge, this empirical study offers results suitable for discussion in relation to verification of the model and its latent variables, the behaviour of empirical variables, and the differences between educational levels, always within a framework of statistical results that can be improved.

Firstly, verification of the proposed model involves the testing of a structure organised according to the nature of the operations, in two related dimensions: *Structuring operations* and *Alternative operations*. Consequently, characterising operations in accordance with the thinking with which they are associated is key when understanding how the underlying concepts are organised. This organisation of variables is in line with our starting hypothesis for configuring the conceptual bases of the construct, distinguishing the methodical and the creative as cornerstone of the proposal. Furthermore, the significant correlation between the second-order scales underlines the connection between structuring conceptions and alternative conceptions, consistent with the definition of historical thinking as creative thinking (Seixas, 2017), history as an exercise of freedom (Ramada, 2013), and, ultimately, the need to teach history creatively (Cooper, 2013).

Secondly, the behaviour of the first-order variables offers some more specific results with a particular impact at the theoretical level. On the one hand, eliminating the variable relating to making inferences stands out in the redefinition of the model. An internal review of the test detected an overlap with the items corresponding to the *Reading sources (methodical)* variable, with an identical formulation. Although the differentiation between evidence and

inference in educational measurement has been the subject of debate (Mislevy, 1994), both operations involve deductive process that are difficult to differentiate when expressed as items in a closed-response format. Notwithstanding any reformulation in later studies, we believe that removing this variable does not invalidate the model, as the epistemological concepts can be understood to be included in *Reading sources (methodical)*. On the other hand, when defining the construct, it is important to consider the importance of the variables that relate to solving the question, something that goes hand in hand with the definition of the construction of knowledge as the construction of discourse. On this line, the *Solving the question* and *Elaborating the discourse* variables are fundamental, with correlations between them and with the scales defined for formulating the research problem or searching for and reading sources. These empirical results again confirm the theoretical propositions: on the one hand, the content and form of the discourse are two inseparable realities when considering the discourse in the communicative framework (Domínguez-Rey, 2013); on the other hand, elaborating the discourse does not correspond with writing it, but instead is continuously related to the other procedures involved in knowledge construction (Ricoeur, 2004). For its part, the relationship between knowledge and prior experience and the type of problems and sources used is consistent with the principle of this study for which developing thinking is not simply a question that is procedural in nature but is also an attitude towards history (Thorp & Persson, 2020).

Thirdly and finally, there are differences in students' scores, with third-year students being closer to the ideal than first-year students. This matter is consistent with many studies carried out on the subject of the development of historical thinking, which, from a Piagetian base, reveal greater difficulties among children and adolescents owing to the abstraction required in temporal concepts (Pagès & Santisteban, 2010). Likewise, the fact that differences by level are greater for *Structuring operations* might be explained by the type of skills this discipline has traditionally paid the most attention to in the Spanish educational system, fundamentally through text books (Martínez-Hita & Gómez-Carrasco, 2018).

4.1. Limitations of the study

While carrying out this work, we observed limitations intrinsic to the object of study itself and others that are specific to our approach. Among the latter type, the results of this research suggest that a study with a larger and more heterogeneous sample of participants will make it possible to verify the model in different scenarios and obtain scores that can act as points of reference. Similarly, a review of problematic items in the test is needed to improve their internal consistency for more reliable work with the model. In any case, the reliability of the instrument is lower than is considered to be acceptable and the correlations observed are low or very low. This means that the results must be interpreted with the prudence that these data suggest, and also that future studies to improve these parameters should be undertaken.

5. Conclusion

In this study we set ourselves the aim of establishing a model for the conceptions underlying the methodological dimension of the construction of historical knowledge, in the framework of the teaching of history. In accordance with the results, we conclude that the bases for a model of conceptions about the construction of historical knowledge have been provided, based on the nature of the operations, albeit not without some need for improvement. This leads us to consider some ideas by way of conclusions.

Firstly, the results obtained underline the difficulty of quantifying a construct that is eminently qualitative and highly complex. In this sense, despite criticisms of quantitative research projects, it is vital to continue with this type of work, where there is a lack of studies. Establishing defined, empirically tested models with objective tests that enable their measurement is the only way to generalise results that can, sometimes, be seen as indispensable. This also makes it possible to obtain information rapidly, with the benefit this can provide for the teaching–learning process. All of this should be understood, and especially for the construct measured, as complementing a qualitative focus.

Secondly, in line with the above, careful definition of constructs is essential, clearly defining what the aim of the model is. On this line, the study is part of the measurement of conceptions that are linked to the methodological, viewing the process of construction of historical knowledge as a whole. In view of this, we accept the idea that if the ultimate intention of history is to prepare citizens for the society to which we aspire, then achieving a public history that is made by, for, and with the citizen (Torres-Ayala, 2020), then the application of skills without a coherent model of the underlying conceptions means that, at the very moment that individuals find themselves in unknown situations, they will frequently apply traditional patterns, which are far from being scientific (Fuentes, 2004). Therefore, we find ourselves before a learning of history, without effects for social transformation. Hence, the importance of working on the configuration of this sort of model.

Thirdly, if we truly want to support combining research and innovation, then models, even if they are operationalised in the plane of research, must be conceptualised in accordance with their usefulness in the classroom. This idea is also applicable to the design of instruments. In this sense, and despite the improvements identified for the model, the proposed configuration involves a basis for reflection on teaching practices and students' needs while also offering an attractive test that is suitable for partial use in specific didactic proposals. Promoting a teaching of history that goes beyond handling a technique in the framework of development of civic competence, is translated, in our proposal, into the development of the structural and alternative operations. The configuration of the model and delimitation of its variables allows the teacher to identify operations where work with students is more necessary to approach the ideal of conceptions. On the same lines, it makes it

possible to test the impact of the didactic proposals implemented, which contributes to well-founded teaching practices.

We, therefore, consider the contributions from this approach to the model to be a necessary step towards work on its filtering and improvement.

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Authors' biographies

Ana Isabel Ponce Gea. Graduate in Primary Education from the Universidad de Murcia. Doctorate in Education from the Universidad de Murcia and Doctorate in History from the Universidade do Porto. She is currently an Assistant Professor in the Department of General Didactics and Specific Didactics at the Universidad de Alicante. She is part of the "Spain in the 20th Century: 2nd Republic, Francoism and Democracy" research group and of the "University Institute for Latin American Social Studies" at the same institution. She also collaborates in the Transdisciplinary Culture, Space, and Memory Research Centre in the Faculty of Languages and Literature of the Universidade do Porto. Her main lines of research centre on the development of historical thinking, the construction of identities, the use of heritage as a source, and designing and validating tests.

https://orcid.org/0000-0003-0432-2595

Noelia Sánchez-Pérez. Doctorate in Psychology from the Universidad de. She is currently contracted as an Assis-

tant Professor in the Evolutionary and Educational Psychology Area of the Faculty of Social and Human Sciences at the Universidad de Zaragoza and is coordinator of the Degree in Early Childhood Teaching in this faculty. Collaborating researcher at the Basque Center on Cognition, Brain and Language and in the Cognitive Neuroscience Group of the Universidad de Murcia. Her research interests centre on study of self-regulation processes from a multidisciplinary perspective to establish the relationships between self-regulation during childhood and academic performance, or the development of cognitive training programmes for students to improve their cognitive and academic skills.

 https://orcid.org/0000-0002-6112-9639

Measuring students' algebra, trigonometry, and geometry skills on a differential calculus for engineering course

Medición de las habilidades algebraicas, trigonométricas y geométricas de los estudiantes en el curso de cálculo diferencial en ingeniería

Maximiliano DE LAS FUENTES-LARA, PhD. Associate Professor. Universidad Autónoma de Baja California *(maximilianofuentes@uabc.edu.mx).*

Wendolyn Elizabeth AGUILAR-SALINAS, PhD. Associate Professor. Universidad Autónoma de Baja California *(aguilar.wendolyn@uabc.edu.mx).*

Araceli Celina JUSTO-LÓPEZ, PhD. Associate Professor. Universidad Autónoma de Baja California *(araceli.justo@uabc.edu.mx).*

César Gonzalo IÑIGUEZ-MONROY, PhD. Associate Professor. Universidad Autónoma de Baja California *(cesar.iiguez@uabc.edu.mx).*

Abstract:

This research presents the results of a study that involved the construction and validation of a measuring instrument to evaluate the algebra, trigonometry, and geometry skills that university students possess when starting an engineering degree and which are critical for students to perform properly in calculus courses. The instrument was designed by faculty members from the field of mathematics, all of whom hold at least a master's degree and have taught calculus in the past. The study comprised of 40 items and its quality analysis was based on data collected from 875 incoming first-year students during the 2020-2022 academic cycle. Data analysis showed that items with medium difficulty and high discrimination have the highest predictive coefficient and correspond mainly to the field of geometry, specifically the topics of the straight line, circumference, and the cal-

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culation of surfaces and volumes of geometric shapes. The present research provides teaching staff with important elements to adapt or modify their instructional designs and improve the learning quality of higher education students in the field of calculus. Additionally, secondary school teachers may benefit from these results regarding the greater challenges students face when enrolling in engineering programs.

Keywords: calculus, evaluation, reliability, measuring instrument

Resumen:

Se presentan los resultados de una investigación que incluyó la construcción y validación de un instrumento de medición para determinar las habilidades algebraicas, trigonométricas y geométricas que los estudiantes universitarios tienen al ingresar a una carrera de ingeniería y que son fundamentales para desempeñarse adecuadamente en los cursos de cálculo. En el diseño del instrumento participaron los profesores de la academia de matemáticas, todos con al menos grado de maestría y experiencia docente en el área de cálculo. El instrumento de medición quedó integrado por 40 reactivos y su análisis de calidad se describe y se deriva de las respuestas emitidas durante el ciclo lectivo 2020-2022 por 875 estudiantes de nuevo ingreso a la carrera de ingeniería. Los resultados muestran que los reactivos con dificultad media y con alta discriminación, son los que cuentan con mayor coeficiente de predicción y corresponden mayormente al área de geometría, específicamente en los temas de la línea recta, la circunferencia y el cálculo de superficies y volúmenes de figuras geométricas. Esta investigación aporta a los docentes elementos importantes para considerar ajustar o modificar sus diseños instruccionales y mejorar la calidad del aprendizaje de sus estudiantes universitarios en el campo del cálculo, así como también la consideración de los profesores del nivel medio respecto de las mayores dificultades que presentan los estudiantes que pretenden ingresar a los programas de ingeniería.

Descriptores: cálculo, evaluación, fiabilidad, instrumento de medida.

1. Introduction

The study of mathematics provides a very important foundation in engineering; it makes it possible to model different scientific phenomena and interpret and communicate in precise language (Brito et al., 2011). It also favours the development of abstract reasoning, which is fundamental when training engineers (Ruiz et al., 2016; Morales, 2009). The importance for engineering students of studying and understanding differential calculus lies in the formation of a solid conceptual platform, handling functions as mathematical models to represent quantitative and qualitative features, and acquiring knowledge of and the ability to apply a set of mathematical tools for solving science and engineering problems (Iglesias & Alonso, 2017; Ruiz et al., 2016).

Differential calculus is especially important on engineering degrees and is a prerequisite for courses such as integral calculus, differential equations, multivari-

able calculus, numerical methods, hydraulics, heat and mass transfer, statics, dynamics, electricity and magnetism, electrical circuits, and others.

In Mexico, standards of mathematics are a significant problem, as shown by the poor performance students from various subsystems have shown in standardised tests carried out nationally and internationally (Encinas et al., 2016). Academic performance, dropout, and repetition of courses are major problems, especially on degrees that require abstract logical thinking such as engineering. In addition, there is a lack of connection between the secondary education and higher education curricula, and the average grades are sometimes lower than the minimum pass mark for calculus courses (Hernández, 2005).

In recent decades there has been growing interest in studying the problem of academic failure, students not progressing to the next level, and abandonment by first-year degree students in engineering (Arraiz & Valecillos, 2010; Zavaleta & Flores, 2009; Correa et al., 2009), as well as in large-scale evaluation of learning, as they permit better knowledge and profiling of students' educational achievements. Evaluations make it possible to identify the skills acquired by students as a result of the teaching, and in turn make it possible to create strategies and assistance programmes to remedy low performance by students, which is a generalised concern in universities (Posso, 2005).

A previous study (Aguilar-Salinas et al., 2020) constructed and implemented a valid and reliable instrument for measuring the algebra skills that engineering students require to perform adequately on the differential calculus course and found that the most important shortcoming in students' algebra skills relates to the topic of rationalisation, division of polynomials, and factorising sums and differences of cubes.

In view of this, it was determined that university students require other types of skills to perform adequately on a differential calculus course in engineering degrees at the Universidad Autónoma de Baja California (UABC). Therefore, this research refers to the construction and validation of an instrument for measuring algebra, trigonometry, and geometry skills.

Establishing what level of algebra, trigonometry, and geometry skills these students acquired during their previous education is crucial when designing strategies to improve these skills and promote students' academic success and performance on the calculus for engineering courses.

2. Methodology

The research carried out is, on the one hand, a descriptive study as it is motivated by carrying out a detailed analysis of the technical quality of the items that make up the test. On the other hand, it is also an exploratory study by virtue of its possible findings with regards to the algebra, trigonometry, and geometry skills engineering students possess, which are a fundamental part of their performance on mathematics for engineering courses.

2.1. Method

To construct the measuring instrument, we adopted the model of Nitko (1994) for developing curriculum-driven exams. This model is complemented by the methodology for constructing criterion-referenced tests of Popham (1990) and with methodological and operational contributions from Contreras (2000). The analysis of the quality of the measuring instrument was done in accordance with Classical Test Theory (CTT), so that the instrument designed enables measurement of the algebra, trigonometry, and geometry skills required for successful completion of the calculus modules on an engineering degree. In view of the above, it is necessary to determine its reliability, content validity, and criterion validity, as well as its difficulty index, discrimination index, and biserial correlation (Carmines & Zeller, 1987).

The reliability analyses make measuring the consistency or stability of the measurements when the measurement process is repeated possible (Prieto & Delgado, 2010), thus determining their ability to display stability in their results (García & Vilanova, 2008). In this case, the Kuder-Richardson KR-20 coefficient and the split halves method were used. The reliability analysis using the Kuder-Richardson coefficient (KR-20) makes it possible to establish the reliability of an instrument based on the data obtained in a single application. The items are evaluated dichotomously and are considered to have different difficulty indexes (Corral, 2009). In the analysis of reliability by the split halves method, the test is divided in half (even and odd) and is separated into two parallel tests, and the internal consistency coefficient is used with the Spearman-Brown formula (Reidl-Martínez, 2013). If the instrument is reliable, there should be a strong correlation between the scores in the two halves.

In addition, the Ferguson delta coefficient was calculated, which measures the discriminating power of a complete test. The range of this coefficient is [0, 1] and it is satisfactory when it is greater than 0.90 (Ding et al., 2006).

The content validity was also calculated for the quality analysis of the instrument. This is established on the basis of suitable selection and indicators and is related to the mathematical processes and the testing of the validity of the items through expert judgement (Alsina & Coronata, 2014). In this type of validity test, a panel of experts with at least 5 years' experience in the topics being validated is selected who analyse the coherence of the items with what they set out to evaluate, the complexity of the items, and the cognitive ability to be evaluated (Barrazas, 2007) as well as the sufficiency and pertinence of the items. Here the aspects of the construct which are relevant, included in the competences and indicators, are considered (Cisneros et al., 2012).

Given that the measuring instrument designed here sets out to test students' command of knowledge that relates to algebra, trigonometry, and geometry content or topics that are regarded as necessary for studying and handling calculus in engineering programmes, a review was carried out with the aim of determining whether

the items in the measuring instrument actually examine the topics and indicators of achievement established in the design specifications. This review was done by a panel of 5 university faculty members from the area of mathematics with a minimum of master's degree, who were not involved in the process of design and construction of the measuring instrument. The experts evaluated each of the 40 items from the measuring instrument, considering the parameters of pertinence, conceptual clarity, wording and terminology, scaling and codifying, and format. The choice of parameters and calculation of the content validity coefficient (CVC) were done in accordance with Hernández-Nieto (2002) and Gempp (2006) and also on the basis of the contributions of Urrutia et al. (2014) who recommend keeping items with a content validity coefficient equal to or greater than 0.80.

The criterion validity is determined through the correlation of the scores from applying the diagnostic measuring instrument studied here and the scores obtained with another external criterion (Hernández, Fernández & Baptista, 2006). In this case, the ordinary (final) grades that the students obtained in the differential calculus course in the 2020–2022 period were used as the external criterion.

The measuring instrument is a criteria-based test which sets out to measure skills in algebra, trigonometry, and geometry skills and so support the diagnosis of the instructional design for the calculus courses. The difficulty index (DI) is related to the proportion of students who correctly solve an item, and is calculated in accordance with Crocker and Algina (1986). There are parameters for accepting an item according to its level of difficulty. For CTT this index should be between 0.1 and 0.9. Backhoff et al. (2000) suggest that the values of the difficulty index should be distributed as follows: 5% very easy items ($0.87 < DI < 1$), 20% fairly easy ($0.74 < DI < 0.86$), 50% moderately difficult ($0.53 < DI < 0.73$), 20% fairly difficult ($0.33 < DI < 0.52$), and 5% very difficult ($DI < 0.32$).

The index of discrimination (IDC) of the item makes it possible to differentiate (discriminate) between students who obtained good marks on the test and one who obtained low marks. It is therefore related to a high likelihood that students who generally have very good performance on the test will correctly answer the item, and vice versa in the case of students with poor performance. In this analysis, 54% of population is considered, as 27% of the students with high performance are included as is an equal percentage of students with the lowest performance for each item reviewed.

Contreras and Backhoff (2004) and CTT, consider the discriminating power of the item appropriate if it is greater than 0.2. The scale of the IDC according to Backhoff et al. (2000) is: poor ($IDC < 0.20$), moderate ($0.20 < IDC < 0.30$), good ($0.30 < IDC < 0.40$), and very good ($D > 0.40$).

Another element considered to be important in the reliability and validity of the instrument relates to the correlation coefficient of the point biserial (rpbis), as this considers 100% of the population, not just 54% as in the case of the index of

discrimination. According to Henrysson (1971), this coefficient is an indicator of predictive validity, in which a student's response to an item is related to the result the student obtains from the test. It is calculated in accordance with the model of Backhoff et al. (2000) and the scale of values for this indicator is: low discrimination (rpbis < 0.14), moderate (0.15 < rpbis < 0.25), good discriminatory power (0.26 < rpbis < 0.35), and excellent discrimination (rpbis > 0.35).

In addition, this analysis includes the development of item profiles. To this end, we used cluster analysis (Bausela, 2005; Castejón et al., 2016; Dixson et al., 2017; Gonçalves et al., 2017). This analysis is a type of data classification that is done by grouping the elements analysed. The fundamental objective of this type of analysis is to classify n objects into k (k > 1) groups, called clusters, by using p (p > 0) variables. The type of classification was k-means, as this is a tool designed to assign cases to a fixed number of groups.

The database was analysed using Classical Test Theory (CTT) and cluster analysis with the IBM SPSS Statistics 23 program and Excel spreadsheets, with which the psychometric data for each item, difficulty index, index of discrimination, correlation coefficients for the point biserial, and item profiles were obtained.

2.2. Process of creation of the measuring instrument

Six faculty members participated in the construction of the measuring instrument: two on the instrument design team, two on the specifications development team, and two on the items development team. All of the participating faculty members had a master's or doctorate, as well as at least five years' teaching experience in the fields of algebra, trigonometry, geometry, differential calculus, and integral calculus.

The function of the measuring instrument design team is to analyse the curriculum of the area, detect and structure content that it is important to evaluate, construct a table of specifications for the instrument and draw up a document explaining its decisions. The construction of the measuring instrument is based on the minimum algebra, trigonometry, and geometry skills that the engineering students need to perform well on the calculus courses on the engineering degree. These skills were determined by the instrument design team and validated by the specifications development team and by the panel of experts. The mathematical concepts and procedures involved in the measuring instrument form part of the curriculum that the students have followed throughout their studies on the programme of the mathematics module, both in the general baccalaureate and on the technological baccalaureate (SEP, 2017).

The purpose of the measuring instrument is to establish the initial conditions of the incoming students on an engineering degree with regards to the algebra, trigonometry, and geometry knowledge and skills required to take the calculus

modules. To demonstrate these conditions, indicators of achievement were established for each specification and its respective item, which represent those traits of the student that make it possible to evaluate the degree of command of one of the skills described. The topics and indicators of achievement for each of the 40 items that comprise the measuring instrument are presented in Table 1.

TABLE 1. Topics and indicators of achievement for each item from the measuring.

Item Number	Topic Number	Topic	Indicator of Achievement
1	1	Exponential expressions	Multiplication of algebraic expressions, monomial by monomial, using the first law of exponents.
2	1	Exponential expressions	Multiplication of algebraic expressions, monomial by monomial, using the second law of exponents.
3	1	Exponential expressions	Division of algebraic expressions, monomial by monomial, using the fifth law of exponents.
4	1	Exponential expressions	Operations with radicals by rationalising the denominator or numerator.
5	1	Exponential expressions	Operations with radicals by rationalising the denominator or numerator.
6	1	Exponential expressions	Operations with radicals by rationalising the denominator or numerator.
7	2	Polynomials and special products	Simplifying algebraic expressions with like terms and grouping symbols.
8	2	Polynomials and special products	Multiplications with algebraic expressions, polynomial by polynomial.
9	2	Polynomials and special products	Divisions with algebraic expressions, polynomial by monomial.
10	2	Polynomials and special products	Divisions with algebraic expressions, polynomials by binomials.
11	2	Polynomials and special products	Multiplications with special products, squares of binomials.
12	2	Polynomials and special products	Calculating the multiplication of special products, conjugate binomials.
13	2	Polynomials and special products	Calculating the multiplication of special products, cubed binomials.

14	3	Factorising	Factorising using a common factor.
15	3	Factorising	Factorising difference of squares.
16	3	Factorising	Factorising with trinomials that are not perfect squares.
17	3	Factorising	Factorising sum of cubes.
18	3	Factorising	Factorising difference of cubes.
19	4	Rational expressions	Adding rational expressions.
20	4	Rational expressions	Multiplying rational expressions.
21	5	Trigonometry, angles and their measurement	Converting an angle from degrees to radians.
22	5	Trigonometry, angles and their measurement	Converting an angle from radians to degrees.
23	6	Trigonometric functions	Determining the value of the trigonometric function based on a right-angled triangle (sine, cosine, tangent).
24	6	Trigonometric functions	Determining the value of the trigonometric function based on a right-angled triangle (cosecant, secant, cotangent).
25	6	Trigonometric functions	Determining the value of the trigonometric function by constructing a right-angled triangle with special angles (sine, cosine, tangent).
26	6	Trigonometric functions	Determining the value of the inverse trigonometric function by constructing a right-angled triangle with special angles (arccotangent).
27	6	Trigonometric functions	Determining the value of the inverse trigonometric function by constructing a right-angled triangle with special angles (arccosine).
28	6	Trigonometric functions	Transforming a trigonometric function into its algebraic form.
29	6	Trigonometric functions	Resolving statements of problems by using right-angled triangles.

30	6	Trigonometric functions	Resolving oblique triangles using the law of sines.
31	7	The straight line	Calculating the distance between two points from two given points.
32	7	The straight line	Calculating the slope of a straight line from two given points.
33	7	The straight line	Determining the general equation of a straight line based on one point and the slope.
34	7	The straight line	Determining the equation of a straight line from two points.
35	7	The straight line	Representing a linear equation algebraically based on its graphical representation.
36	8	Conic sections	Determining the graphical representation of a circumference from its algebraic representation.
37	8	Conic sections	Determining the algebraic representation of a circumference from its graphical representation.
38	9	Perimeter, area, and volume of geometric figures	Calculating the perimeter of a geometric figure.
39	9	Perimeter, area, and volume of geometric figures	Calculating the area of a geometric figure.
40	9	Perimeter, area, and volume of geometric figures	Calculating the volume of a geometric figure.

Source: Own elaboration.

The design of each of the 40 items is based on its respective specification (Graph 1), which considers aspects such as the algebra, trigonometry, or geometry topic to which it belongs, the indicator of achievement, according to Zabala and Arnau (2008), a comment about the meaning and functionality of the content, the basis of the item, the vocabulary and type of information that will be used in this item, the characteristics of the distractors, the process for obtaining the correct response, a sample item, and the estimated completion time. The design of the specification for each item was done by the specifications development team.

GRAPH 1. Specification corresponding to item 32 from the measuring instrument.

1. Identifying details of the content to be evaluated.			
		1.1 Item:	**21**
1.2 Subject: Geometry		**1.3 Macro Content:** The straight line.	
1.4 Topic: Slope of a straight line.	**1.5 Subtopic:** Calculating the slope of a straight line.		
2. Attributes of the item.			
2.1 Clarifying comment about the sense of the content The slope of a straight line in a rectangular system of representation (on a Cartesian plane), is usually represented by the letter *m*, and is defined as the difference on the Y axis divided by the difference on the X axis for two different points on a straight line. This is described in the following equation: $m = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$			
2.2 Indicator of achievement	Calculating the slope of a straight line.		
2. Type of content	Concept ( )		Procedure (X)
2.4 Difficulty	Reproduction (X)	Connection ( )	Reflection ( )
3. Attributes relevant to the stimuli that will be presented to the students.			
3.1 Instructions for responding to the item Select the option that corresponds to the correct value of the slope between two points.			
3.2 Basis of the item Two points are given on the Cartesian plane to calculate the slope between them using the slope formula.			
3.3 Vocabulary and textual, graphic or tabular information to use: The information provided in this item is textual and includes both points on the Cartesian plane, so that the student can calculate the slope between them.			
3.4 Distractors The following distractors are suggested for this item: a) Presenting an incorrect calculation. b) Modifying the result based on common mistakes in the formula.			
3.5 Correct response The correct slope between the two points.			
4. Sample item and time taken to resolve the item.			
4.1 Sample item Calculate the slope of the straight line that passes through the points (-5.1) and (1.4). A) $\frac{1}{2}$ B) 2 C) $-\frac{3}{4}$ D) $\frac{5}{4}$			
4.2 Estimated time for completion 1 minute			

Source: Own elaboration.

The instrument comprises 40 items and is multiple choice as students are asked to choose the correct response from 4 possible options. Each item is independent, as they all contain the necessary information for stating and responding to it. The instrument is criteria-based, as its purpose is to evaluate learning by showing what the subject can and cannot do. The items were designed by the items development team based on the designed specifications.

3. Results and discussion

This section is divided into three parts: the first refers to the analysis of quality of the measuring instrument; the second part alludes to the analysis of the clusters of items; and the third and final one refers to the results students obtained in the diagnosis.

3.1. Analysis of the quality of the diagnostic measuring instrument

The measuring instrument was applied in the Mexicali Engineering Facul-

ty (FIM) at the UABC during the first week of the 2020-2022 study cycle. The instrument was applied to 876 newly-enrolled students at the FIM who were taking the differential calculus course. The reliability of the instrument calculated using KR-20 is $r = 0.95$, and by the split halves method it is $r = 0.93$, which are considered to be appropriate when they are equal to or greater than 0.85 in the case of large-scale standardised instruments (Muñoz & Mato, 2008; Contreras & Backhoff, 2004). The distribution of the total scores was calculated using Ferguson's delta, giving a value of 0.99, which fully satisfies the criteria established (Engelhardt, 2009; Ding et al., 2006).

The average of the difficulty index was 0.68 ± 0.15 (mean ± standard deviation). The percentage distribution resulting from the DI is as follows: very easy items (2 items) 5%, fairly easy (17 items) 42.5%, moderate difficulty (13 items) 32.5%, fairly difficult (8 items) 20%, and very difficult (0 items) 0%. The minimum difficulty value was 0.34 while the maximum value is 0.89, both of which are acceptable in accordance with CTT and with a similar distribution to that proposed by Backhoff at el. (2000).

It is calculated that 75% of the items have excellent discrimination and 25% have good discrimination. The average discrimination index is 0.52 ± 0.13 (mean ± standard deviation), which is within a category considered as excellent (greater than 0.40). The minimum value with regards to discrimination was 0.31 and all of the items comply with this psychometric indicator (Contreras & Backhoff, 2004).

The average of the biserial correlation coefficients of the test is 0.49 ± 0.076 (mean ± standard deviation). It is calculated that 97.5% of the items have excellent discrimination, and 2.5% have good discrimination. No item was found with moderate, low, or negative discrimination.

With regards to the content validity, five experts took part and a CVC average of 0.89 ± 0.07 (mean ± standard deviation) was obtained with a minimum coefficient value of 0.82. The numbers above fully meet the criteria considered in this research for each item (Urrutia, Barrios, Gutiérrez & Mayorga, 2014; Gempp, 2006; Hernández-Nieto, 2002).

To determine the criterion validity, the ordinary grade that the students obtained on their differential calculus course during the 2020–2022 period of study was extracted from the records system of the department of academic services of the FIM. Of the 876 students who took the diagnostic test, we have records of the ordinary grades of 764 students for differential calculus, and we calculated the Pearson correlation between the score obtained in the diagnostic measuring instrument and the ordinary grade for differential calculus. When comparing the grades, a Pearson correlation coefficient of $r = 0.313$ was obtained. This correlation is significant at a level of 0.01 and so it is classed as a moderate correlation on the scale of Hernández et al. (2018). In other words, the higher the students' scores on the diagnostic measuring instrument for algebra,

trigonometry, and geometry, the higher their ordinary grades on the differential calculus course. In addition, it was found that of the 764 students, 523 successfully completed the diagnostic instrument (a score equal to or greater than 60), of which 515 (98.5%) passed the differential calculus course.

3.2. Analysis of clusters of items

With the objective of establishing the significant features between psychometric indicators and the students' results, we carried out a k-means cluster analysis. The results were three profiles (Table 2) described below.

TABLE 2. Final cluster centres.

Psychometric indicators	Cluster		
	1	2	3
Difficulty index	0.81	0.46	0.62
Index of discrimination	0.42	0.47	0.65
rpbis	0.48	0.38	0.55
Number of items	17	6	17

Source: Own elaboration.

Cluster 1. This comprises 17 items, of which 70.6% are from algebra, 17.6% trigonometry, and 11.8% geometry. These are characterised by a higher difficulty index (0.81) and are classified as moderately easy. This group has the lowest indexes of discrimination (0.42) but have a fairly good predictive value (rpbis = 0.48). This shows that the algebra items (owing to their percentage value) have the lowest discrimination and are the easiest ones for the students to answer. This group mainly comprises items from the area of algebra relating to polynomials, special products, and exponential expressions, while in the area of trigonometry items referring to angles and their measurement are predominant.

Cluster 2. This comprises 6 items, of which 2 are from algebra and 4 from trigonometry. There are no geometry items. They are characterised by greater levels of difficulty (0.46). The discrimination (0.47) of the group is fairly acceptable and they have the lowest predictive value (0.38) although this is acceptable. This shows that the items from the trigonometry area are the ones that least predict students' success. The ones students find most difficult correspond to the application of the law of sines and solving problems through trigonometry of the right-angled triangle, while in the area of algebra, solving factorisation with difference of cubes and rationalising with rational expressions present students with the greatest difficulties.

Cluster 3. This comprises 17 items, of which 35.3% belong to the algebra area, 17.6% are from trigonometry, and 47% correspond to the geometry area.

The items in this group are characterised by being fairly difficult (0.62), by having a greater discrimination value (0.65), and by being items with the greatest prediction (0.55) compared to the rest of the clusters. It is apparent that the items that best predict students' success in the diagnostic measuring instrument are those from the area of geometry as 80% of the geometry items that make up the instrument are in this grouping. Straight lines, circumference, and calculating the perimeter, area and volume of geometric figures form part of the geometry subtopics with medium difficulty and the highest discrimination and prediction values.

3.3. Analysis of the results students obtained in the diagnostic instrument

In the first part of this analysis, the indicators of achievement and items that students have the most difficulties with solving correctly in the various areas that make up the measuring instrument were determined. In the second part, the difficulty by area of knowledge (algebra, trigonometry, and geometry) involved in the diagnostic instrument was established.

In the area of algebra: Item 6 (Graph 2), rationalising the numerator in an expression with a difficulty value of 0.34. It is considered that the difficulty of this item lies in the body of prior knowledge need and the application of rules to obtain the correct result, producing the conjugate, multiplying by the conjugate, and then simplifying are the series of steps that are normally required to rationalise an expression.

Item 10 (Graph 3), doing operations with algebraic expressions, polynomial by binomial, with a difficulty value of 0.46. The difficulty of this item is observed on the basis of the need to apply correctly the division algorithm (long procedure) and consider in this algorithm that the coefficient of the quadratic term is zero. Item 18, factorising with difference of cubes

GRAPH 2. Item 6 rationalising the numerator.

Question 6 — 2.5 points

What is the result of rationalising the numerator of the expression $\frac{\sqrt{4+x}-2}{x}$?

Choose at least one correct response.

A) $\frac{-1}{\sqrt{4+x}-2}$	
B) $\frac{x}{\sqrt{4+x}-2}$	
C) $\frac{x}{\sqrt{4+x}+2}$	
D) $\frac{1}{\sqrt{4+x}+2}$	*Correct response*

Source: Own elaboration.

GRAPH 3. Item 10, division of polynomial by binomial.

Question 10 2.5 points

What is the remainder from dividing $x^3 - 7x + 6$ by $x - 2$?

Choose at least one correct response.

A) 0	*Correct response*
B) 12	
C) -12	
D) 6	

Source: Own elaboration.

In the area of trigonometry, item 24 (DI = 0.37) and item 29 (DI = 0.41) stand out for their difficulty. The former refers to obtaining the value of the inverse trigonometric function of sine, cosine, or tangent of an angle, which initially involves fully calculating the right-angled triangle and then applying the definition of the trigonometric functions, specifically their reciprocals. The latter (Graph 4) relates to solving statements of problems using the right-angled triangle. Specialists have identified great difficulties for students in the case of problems from real life where solving them involves translation from natural language to algebra (Areaya & Sidelil, 2012).

GRAPH 4. Item 29, resolving statements of problems by using right-angled triangles.

Question 29 2.5 points

An escalator has an angle of 45º with the floor and lifts people by a vertical distance of 5 metres. If a person takes 20 seconds to go from the bottom of the escalator to the top, How fast is the escalator moving?

Choose at least one correct response.

A) $\sqrt{2}\ m/s$	
B) $4\ m/s$	
C) $\frac{4}{\sqrt{2}}\ m/s$	
D) $\frac{\sqrt{2}}{4}\ m/s$	*Correct response*

Source: Own elaboration.

In the field of geometry, item 39 (DI = 0.39) refers to calculating the area of a geometric figure (Graph 5) and is the most difficult for the students.

This is followed in difficulty by item 33 (DI = 0.47), which relates to determining the equation of the straight line based on a point and the slope (Graph 6). The difficulty of this item lies in the correct application of the point slope equation and of algebra skills, as the product, simplification, and finding the solution, given that it is an algorithm with a sequence of steps that is rather long for the student; the conventional path to reach the solution involves knowing and using the point slope equation, developing, simplifying, and making equal to zero.

GRAPH 5. Calculating the area of a geometric figure.

Question 39 2.5 points

The cylinder shown below has a height of $h = 5$ metres and a radius of $r = 2$ metres. What is the total surface area of cylinder?

$$h = 5$$
$$r = 2$$

The surface area S is 2 times the area of the base + the side area.

Choose at least one correct response.

A) $10\ \pi\ m^2$
B) $20\ \pi\ m^2$
C) $24\ \pi\ m^2$
D) $28\ \pi\ m^2$ *Correct response*

Source: Own elaboration.

GRAPH 6. Determining the general equation of a straight line based on one point and the slope.

Question 33 2.5 points

What is the equation for the straight line that passes through point $P(-3,1)$ and has a slope of 2?

Choose at least one correct response.

A) $y - 2x - 7 = 0$ *Correct response*
B) $y - 2x - 5 = 0$
C) $y + 2x - 7 = 0$
D $y + 2x + 5 = 0$

Source: Own elaboration.

In addition, the difficulty indexes by area of knowledge were calculated and no significant difference was found between the areas of trigonometry (DI = 0.66) and geometry (DI = 0.65), while the area of algebra was simpler for the students, as a difficulty of 0.72 was found, almost on the limit for classifying the area of algebra as fairly easy. This happens when the difficulty index is greater than 0.74 (Backhoff et al., 2000). Although the discrimination and prediction values are acceptable in all of the areas of knowledge, they are highest in geometry.

4. Conclusions

We constructed a valid and reliable instrument with the aim of determining the extent to which newly enrolled students on an engineering degree have the algebra, trigonometry, and geometry skills needed to take and successfully complete the differential calculus module, and of predicting the likelihood of success in this module.

A panel of experts evaluated whether the content of the items examined the proposed algebra, trigonometry, and ge-

ometry topics and whether the items are indicators of what they set out to measure. The judgements of the professionals were favourable in relation to the diagnostic possibilities of the measuring instrument. To determine the criterion validity, students' final grades from the differential calculus course were used as the criterion. Comparing the grades from the instrument with the criterion, gave a Pearson correlation coefficient $r = 0.313$, which is significant at the 0.01 level. Accordingly, high scores on the measuring instrument are translated into high grades on the differential calculus course, and successfully taking the diagnostic measuring instrument predicts that 98.5% of the students will go on to pass the differential calculus course. Consequently, this measuring instrument is regarded as a predictor of student performance on their differential calculus course for engineering degrees.

The reliability of the instrument calculated using KR-20 is $r = 0.95$, and by the split halves method it is $r = 0.93$. Therefore, the instrument is highly reliable and its use can be considered for large-scale application.

Rationalising rational expressions, dividing polynomials by binomials, solving problems that involve the trigonometry of right-angled triangles, calculating areas of geometric figures, and determining the general equation of a straight line are the topics that caused students the most problems in the diagnostic instrument and they follow the pattern that solving them requires prior knowledge and the application of successive rules.

Cluster analysis identified one cluster whose items better predict the success of students in the diagnostic instrument. In this cluster, items from the area of geometry predominate, the topics being: straight line, circumference, and calculating the perimeter area, and volume of geometric figures. The items from this cluster have medium difficulty and the highest discrimination values.

With the results from the application of this measuring instrument it is possible to identify the algebra, trigonometry, and geometry topics that students starting engineering degrees who will go on to take calculus modules find most difficult. At the same time, these results makes it possible to design the form and timing of the strategies needed to ensure that students have the algebra, trigonometry, and geometry skills required to complete the differential calculus module, as acquiring such skills directly affects students' academic performance.

The results of this research provide teachers with important elements to consider adjusting or modifying their instructional designs and improve the quality of their university students' learning in the field of calculus, as well as for secondary education teachers to consider regarding the greater difficulties presented by students who wish to enter engineering programmes.

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Authors' biographies

Maximiliano de las Fuentes-Lara holds a Doctorate in Higher Education in Engineering from the Universidad Autónoma de Baja California. He is currently Associate Professor and Coordinator of the Integral Calculus and Differential Equations modules in the Mexicali Faculty of Engineering at this university. His research interests focus on the problem of teaching, learning, and assessing mathematics for engineering.

http://orcid.org/0000-0002-1001-4663

Wendolyn Elizabeth Aguilar-Salinas has a Doctorate in Sciences from the Universidad Autónoma de Baja California. She is currently an Associate Professor and Director of the basic stage at this university's Mexicali Faculty of Engineer-

ing. Her research interests are centred on learning and teaching of mathematics, teaching techniques and technologies, and on educational modalities.

http://orcid.org/0000-0003-2223-9234

Araceli Celina Justo-López has a Doctorate in Engineering from the Universidad Autónoma de Baja California. She is currently an Associate Professor and is head of the Mexicali Faculty of Engineering at this university. Her research interests centre on educational technologies.

http://orcid.org/0000-0002-6911-2065

César Gonzalo Iñiguez-Monroy has a Doctorate in Engineering from the Universidad Autónoma de Baja California. He is currently an Associate Professor and is head of the chemistry academic area in the Faculty of Engineering at this university. His research interests focus on teaching and learning of chemistry for engineers and STEM+A education.

https://orcid.org/0000-0002-7101-0738

Notes

Reasons for an educational pact in Spain within the framework of decentralised government administration

Razones para un pacto educativo en España en el marco de una administración descentralizada

Encarnación SÁNCHEZ LISSEN, PhD. Associate Professor. Universidad de Sevilla *(eslissen@us.es)*.

Abstract:

Every time a new political party has taken office in Spain in recent decades, it has fully or partially repealed the education law enacted by the previous government and, almost simultaneously, there has been renewed talk of an educational pact. However, unlike legislation, the pact never materialises, leading to disagreements within the political class and great frustration among members of the educational community.

Among the difficulties that prevent a pact from being reached, ideological and political reasons have been cited and the model of educational administration has also been blamed, with claims that it interferes negatively and arguments that its decentralised nature prevents unity in the field of education. This article highlights some of its strengths and suggests they might be good advocates for reaching an education pact in Spain. In this respect, each autonomous community must meet certain minimum requirements as an intermediate step towards correcting the overall data. The following reasons for an educational pact are priorities: reducing school dropout rates, improving the number of students in vocational training, improving the figures for education spending, and, with regards to teachers, strengthening processes for selecting students to train as teachers as well as the social status of this profession. If territorial differences are reduced by improving educational indicators, it seems more likely that a consensus can be reached as a prelude to an education pact.

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Keywords: school dropout, decentralised administration, education expenditure, education pact, teaching profession.

Resumen:

En las últimas décadas, cada vez que un nuevo partido político llega al gobierno de España, directamente se deroga en todo o en parte la ley educativa promulgada por el gobierno anterior y, casi al mismo tiempo, se vuelve a hablar de un pacto por la educación. No obstante, a diferencia de la ley, el pacto nunca llega a materializarse, lo que provoca desencuentros en la clase política y grandes frustraciones entre los miembros de la comunidad educativa.

Entre las dificultades que impiden alcanzar un pacto se han citado motivos de carácter ideológico y político, pero también se ha culpado al modelo de administración educativa, indicando que interfiere negativamente porque su carácter descentralizado entorpece para que haya unidad en materia de educación. Este artículo muestra algunas de sus fortalezas y las reivindica como buenas intercesoras para alcanzar un pacto educativo en nuestro país. En torno a él, cada comunidad autónoma debe cumplir unos objetivos mínimos, como paso intermedio para corregir los datos globales. Entre las razones que motivan un pacto educativo priorizamos las siguientes: disminuir las cifras de abandono escolar, mejorar los datos de estudiantes en formación profesional, reforzar las cifras relacionadas con el gasto en educación y, en torno al profesorado, fortalecer los procesos de selección a la carrera, así como la consideración social de esta profesión. Si reducimos las diferencias territoriales mejorando los indicadores educativos, parece más probable que podamos alcanzar un consenso, antesala de un pacto por la educación.

Descriptores: abandono escolar, administración descentralizada, gasto educativo, pacto educativo, profesión docente.

1. Introduction

To begin again [*Volver a empezar*]. These words — the title of the film that gave José Luis Garci the Oscar for the best foreign language film in 1983 — may sound good, but if we use them to talk about an *educational pact* rather than cinema, not only does their intonation change, but so too does our expression, turning into a cry of unease like Munch's famous *Scream*. Sadly, this situation occurs every time the term of office of a new government of a different colour to the previous one begins, as they seek with some excitement to revive hopes of a pact. When this moment arrives, we all accept with resignation, and perhaps some enthusiasm, this desire to begin again!

What is it that happens in Spain that makes it so difficult or even almost impossible to achieve an educational pact that provides a quality educational system with solidity over time? There is no single answer, nor is there a simple response. It is striking that, as López Serrano notes (2019, p. 559), while "more than 65% of or-

ganic laws have passed with the consensus of the opposition; in the case of education acts: none". If opportunities for consensus are scarce in matters of educational legislation, this leads us to think that an educational pact, which unavoidably requires signatories to be capable of agreeing and collaborating, will struggle to achieve its task under these circumstances.

There have been many pacts over the history of civilisation, some relating to education, but many others being social, economic, political, or religious in character. In all cases, even in those that differ in condition and scope, they have been crafted through understanding, compromise, and respect. In Spain, looking towards the twentieth century, a variety of pacts shaped much of the country's trajectory its achievements. However, none of them related exclusively to education, and so we turn to the *Moncloa Pacts* of 1977 and the *Spanish Constitution* of 1978 itself, given their symbolic value. While the former is a document that very much focussed on economic matters, with the aim of improving the country's beleaguered indicators, it did include a section on education, namely Chapter IV on educational policy. This chapter, which set out various principles and criteria, revolves around democratising the education system, a gradual roll-out of free education, the diversity of languages and cultural content, training of teaching staff, cooperation between the central government and the institutions of the autonomous communities, and policies regarding the acquisition of land, among others (Congress of Deputies, 1977). Therefore, without being a strictly educational pact, it was of great importance for education as, among other things, it set in motion a Special Plan for Education (Hernández Beltrán, 2002).

The latter, the Spanish constitution of 1978, has been viewed as the foremost pact or the first major pact, as its Article 27 has been described as "a true academic pact" (Puelles Benítez, 1992, pp. 318-319), although, as this author himself suggests, while the constitutional consensus of Article 27 might have been a necessary condition, it was not a sufficient one (Puelles Benítez, 2016). Indeed, various nuances and more than a few limitations have prevented the "dialogue" that this topic requires from being achieved (Puelles & Menor, 2018).

Liberty, equality, rights, and democratic principles of coexistence are the most important values set out in Article 27 and they should form the backbone of any educational pact. Nonetheless, they are also controversial values and both the right to education and equality and the freedom to choose schools (Fernández Soria, 2007) have been interpreted in ways that have caused significant ideological disputes.

After these two documents, between the 1980s and the current decade of the 2020s, the signing of no other educational pact has been achieved, even though there have been various attempts. The closest moment probably came when Ángel Gabilondo was minister for education (2009-2011), but this did not lead to anything definitive. Indeed, the famous phrase of "*agreed, but not signed*"

went down in history, uttered by Adolfo González, the universities spokesperson of the Partido Popular's grouping in Spain's Congress (Bedera Bravo, 2018) at a moment where a State Pact had "almost" been agreed. Along the way, and almost in parallel, there have been academic articles and books, opinion pieces on the subject, and descriptive studies, as well as theoretical, philosophical, pedagogical, and historical essays (Cámara, 2007; Fernández Enguita, 2019; Tedesco, 2004; Viñao, 2020). In addition, various reports have been published by associations and foundations (Colectivo Lorenzo Luzuriaga, 2015; Fundación Encuentro, 1997). And many experts from the university sector and education have contributed rigorous studies (Daros, 2005; Fernández Enguita, 2019; Guaita, 2018; Marina et al., 2016; Merchán Iglesias, 2020; Novella, 2020; Puelles, 2016), all with the intention of considering this topic in greater depth and moving it forwards, in every case recognising the strengths and weaknesses of an educational pact in Spain. As this topic is so sensitive and at the same time so multifaceted, it has been studied from various perspectives and from its different dimensions, and, while we might find a certain unanimity in the need for a pact, there is more disagreement if we pause to consider the why, what for, or how of this process. It seems hard to believe that the different groups share the desire to achieve a pact and, at the same time, a wish to prevent any successful agreement being reached. In general, it is a desire held by most members of the educational community and also by the managers and political leaders, but they themselves are unable to reach an agreement, and so the differences regarding the content of this pact, its form, and even the meaning it should express, seem to be a chimera.

We might ask whether the lack of a pact is because of political, religious, and ideological differences between governing parties, whether the reasons have more to do with economics, whether it is to do with linguistic diversity, or if it relates to particular curriculum content. In fact, seemingly none of these reasons can be rejected and they are probably all compelling, although other elements relating to the current educational administration model in Spain are of value, with the different ways it is managed in autonomous communities and the disparity of data and positions between them.

Throughout this article we will consider a number of indicators, but we will especially focus on evaluating the strengths of Spain's educational administration model and its effect on the signing of a pact. Diversity should not hinder improvements to the quality of education in the country and it should boost the progress of each autonomous community. This leads us to agree with Jiménez (2004) who notes that the problem is not so much that different regional subsystems exist, but that there is a deep gap between some communities and others. Therefore, respecting differences and for the sake of freedom of management, the educational pact could be presented as a unifying instrument that will guide regional policies, seeking to improve the figures of each of them.

2. A decentralised educational administration model does not impede the objectives of a pact for education

Part IV of Spain's constitution mentions the decentralised model of public administration that also applies to educational administration. Nonetheless, given the political and management characteristics, some people prefer to speak of *educational recentralisation* (García Rubio, 2015), in view of the coordinating role that the state plays along with the important competences, some relating to identity, entrusted to the autonomous communities. And we could even speak of a model of *pericentralised educational administration*, when we consider that there is a central ministry and, around it there are the various regions, local administrations, educational centres, educational community, movements, and associations, etc. that manage and implement the various teaching and learning processes.

We might initially think that this model increases the difficulty of unifying standards and achieving a pact, but this is not so. For example, this model is not an obstacle to developing a *common national curriculum* whose construction takes into account the diversity of Spain's territories and their distinctive features, and integrates the most important challenges of each region. Considering the international setting, we find cases like Finland, which, despite its decentralised model, has maintained a common curriculum since the *Basic Education Act* of 1983 that combines autonomy for schools with input from the centre and common objectives. Or the case of Estonia, also decentralised, which has legislative benchmarks that unify academic decisions in the country. The national standards connect all of the content, competences, and expectations of the country's educational model. Unity is not at odds with valuing plurality.

We might initially think that achieving a pact is easier in countries with a centralised administration, where there is greater concentration of ideas and objectives, where decision making appears to be more harmonious and more uniform than in other decentralised ones, but it is also necessary to know how to take advantage of the benefits and advantages of this option. A common complaint in Spain is that there are seventeen educational systems and that this situation is a hindrance when standardising criteria, but if a pact requires unity, failure to achieve this is not so much a fault of the model but rather of the lack of skill at reaching agreements of those to whom it is entrusted.

Decentralised models generally enjoy good health, but it is necessary to know how to cultivate their values. Some of their benefits relate to acquiring greater autonomy, stimulating demand for higher-quality education, ensuring that local priorities and values are reflected in schools (Barrera-Osorio et al., 2010), arguments about efficiency, greater proximity to educational needs (Esteller & Solé, 2005), contributing to more innovation in the field of education (Bonal et al., 2005), and these benefits also relate to merely competitive motives. Indeed, knowing the differences that characterise Spain, in its administrative and educational situa-

tion, it would make sense to speak of a *territorial pact*, as Tiana (2020) argues.

By its very nature, a pact should involve all parties (the Ministry of Education and Vocational Training (MEFP), families, teachers, social actors, unions, councils, etc.) as agreements are built between all of them; indeed, as the title of this section notes, a decentralised model of educational administration does not hinder the objectives of a pact for education and nor should it. The comments of Fernández Enguita (2019, p.4) regarding decentralisation of the educational system could reinforce this idea when he advises "not just clear rules, but also commonly accepted boundaries and a certain shared orientation". Perhaps we should not lose sight of the epic character of the act of educating, where a great diversity of elements, circumstances, and opportunities are in play that can alter this function and, therefore, the desirability of reinforcing through a pact, those things that unite them, that provide greater strength.

Understanding a country's model of educational administration and who is responsible for each academic and educational decision is no small matter because a pact also involves making decisions and reaching a consensus, even if also it is necessary to train beliefs (Damgaard & Nielsen, 2018). In many cases, both in countries with centralised models and in other decentralised ones, what has actually prevailed has been a model of *deconcentration*. When does this occur? When important decisions are still taken by the central government, but functions of management — only strictly management — are delegated to other administrations. This model of deconcentration is very characteristic of France, although in this case, in the framework of a centralised government. But in this process, both parties, the government and autonomous communities, must reach a balance knowing that there are educational, social, and economic indicators that differentiate the autonomous communities, create inequalities between them and, in turn, obstruct agreements to achieve a pact for education.

3. Improving the educational indicators of each autonomous community: the prelude to an educational pact

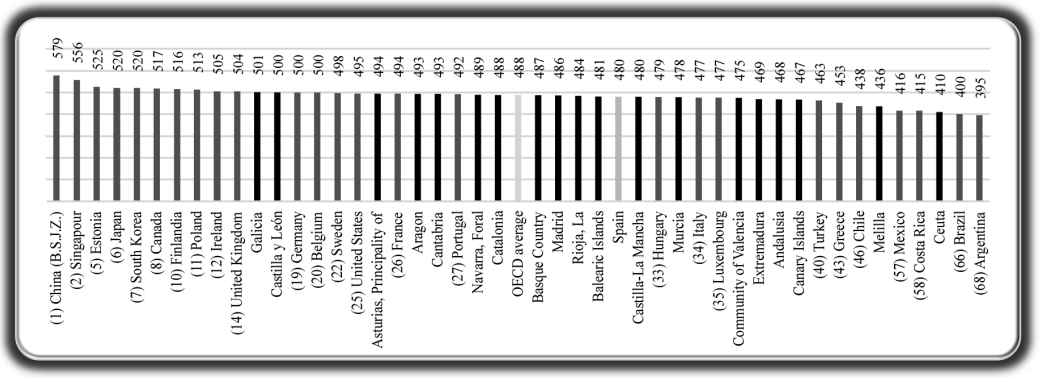
If we look at Spain's autonomous communities, we find wealth, great wealth, but we sometimes also see some disorder in the figures relating to education. This situation leads us to consider the importance of partial educational indicators as a guarantor of a national agreement. Continuing with the line we have been supporting, to make progress in constructing a pact, it is first necessary to improve the figures and educational results of each autonomous community, improving performance indicators and resources among other items and leaving certain ideological questions in the background. Secondly, it is necessary to achieve a fair and balanced coordination between all of the autonomous communities, and finally it is necessary to achieve what in Germany — in another order — is known as *federal loyalty*, which permits a voice that acts and manages from a position of trust, putting forward

communal efforts and efforts of individual communities in the same direction.

Analysis of the results of the most recent international evaluations reveals the deficiencies of the educational model and, consequently, the need to improve on many of the educational indicators. Nevertheless, we also find interesting data among various autonomous communities, which have impressive results that are similar to those of countries that are in leading positions in the ranking. These differences should be the *leitmotiv* of a pact, acting as a tool for consensus at the same time as for stimulus. The Programme for International Student Assessment (PISA) indicates that if autonomy is combined with responsibility and this is done in a balanced, objective, and intelligent way, it will lead to better performance by the students (OECD, 2016).

Since the results of the PISA programme started to be published in 2000 and, more specifically, since larger samples of students from each autonomous community started to be used to provide more representative data and allow comparisons between communities, Spain's score has remained below the OECD mean except for PISA 2015, Spain's best result, when it was the same. However, we have also been able to confirm that not all of the autonomous communities would be below the international mean, indeed, the results of some of them are very notable and even very close to those of countries in the top twenty in the ranking. In PISA 2015, the autonomous communities obtained better scores than in this more recent edition. Looking at the figures from PISA 2018 we can see that only three of the best placed, namely Galicia (501), Castilla y León (500), and Asturias (494), are among the top 25 ranked countries. And in the case of Spain, twelve autonomous communities are above the Spanish mean (480). The worst performing are the autonomous communities of Murcia, the Community of Valencia, Extremadura, Andalusia, the Canary Islands, and the autonomous cities of Melilla and Ceuta, with scores placing them among countries such as Italy, Luxembourg, Chile, Mexico, Costa Rica and Colombia, among others. We should also note the marks obtained by Galicia for scientific competencies (510) and Navarra for mathematical competencies (503), which put both autonomous communities among the top 12 countries in the ranking. With similar scores, we can mention the example, on the sciences scale, of Poland (511), which is in 11th place among the 78 participating countries. And Finland (507) is in 16th place for mathematical competencies. If we review the global ranking, considering the three competences analysed, we can see that the results for Spain's autonomous communities are uneven and approximate to the data from other countries. This can be seen in Graph 1, which shows the leading countries, such as China (Beijing, Shanghai, Jiangsu, Zhejiang), Singapore, Estonia, and Japan, as well as others in lower positions. We have included autonomous communities in this list, which, as we can see, are in very different places among the participating countries. We show a selection of countries that participated in this edition (OECD members and associated countries) and we have added Spain's autonomous communities and the autonomous cities of Ceuta and Melilla according to the scores they achieved.Furthermore, as well as the name, we have added their position in the ranking, considering the mean scores obtained.

Graph 1. Scores from PISA 2018.



Source: Own elaboration based on PISA 2018 (MEFP, 2019a).

Looking at Graph 1, we could say that Spain, as a whole, needs to improve its performance, and that some autonomous communities that have a greater need to do this, as there are notable differences between them. To improve the educational outcomes of the country as a whole, particular indicators should be focussed on, some national and others relating to individual autonomous communities. The length of this article does not allow us to consider these indicators in depth, but considering the priorities — looking towards both administrations — we are inclined towards the following propositions:

- At the autonomous community level: it would be beneficial to reduce early school leaving figures, improve public spending figures in relation to GDP and to total budgets, and expand the integration of places in dual vocational training.

- At a national level: to improve selection processes for teachers and their initial training.

All of these should guide the construction of an educational pact in Spain.

4. Prioritising indicators that open the door to a pact for education

At the risk of neglecting many indicators, we will focus on four that reflect the quality of education in the country and which each autonomous community should take care of, review, and improve. These are:

a) *Early school leaving*

"Reducing early school leaving and improving educational results" (European Commission, 2019) has been a thought-provoking but at the same time resounding recommendation, with the aim of reducing the figures for Spain as well as the disparities between autonomous communities.

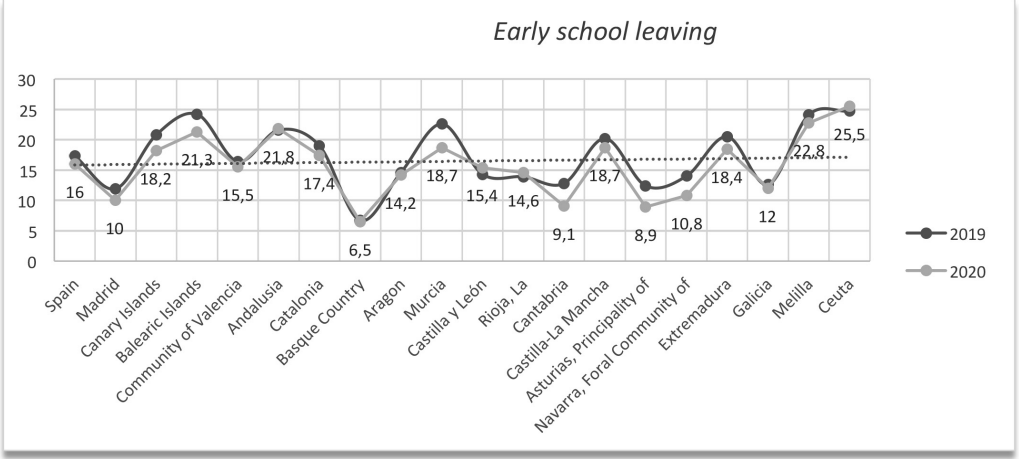
The 2020 figures show a small reduction compared to the figures from 2019, falling from 17.3% to 16%. It is admittedly true that in view of these figures Spain has not

achieved the objective set by the EU of reducing the early school leaving rate to 10% or less in 2020 and it has not even reduced them to 15%, which is what Spain was permitted given its high starting point. Nonetheless, it is fair to recognise that not all communities were above this average; some comply with this recommendation, like the Basque Country, whose early school leaving figure is 6.5%; Asturias, with 8.9%; Cantabria, with 9.1%, and Madrid, with 10%.

In contrast, rates of early school leaving are strikingly high in Ceuta (25.5%), Melilla (22.8%), Andalusia (21.8%), and the Balearic Islands (21.3%), among others. These are very worrying figures are they are incompatible with the good progress of a country.

These values are not unimportant, as they not only affect education but also have an impact on many other sectors of the country, for example, economic factors, capacity for growth and optimisation, and social factors. High early school leaving rates reduce the economic opportunities of any country and especially weaken the level of qualifications of its young people, but what can an educational pact do face with figures like these?

GRAPH 2. Early school leaving in Spain (2019-2020).



Source: Own elaboration based on MEFP (2020).

To give one example, it could set out strategies to help all autonomous communities prevent high rates of early school leaving and it could also mould other indicators that do not affect or help provoke this early school leaving (Villardón-Gallego et al., 2020). In truth, reducing these figures is more of an achievement than a reason, strictly speaking. Nevertheless, an educational pact includes content that enables the articulation of alternatives and favours solutions.

b) *Vocational training*

As noted above, early school leaving rates have fallen somewhat, although not to the extent required or wanted.

In any case, part of this fall is due to an increase in enrolment rates recorded in vocational training (Table 1), which is an essential stage that strengthens the work environment and opens up new prospects for young people. Each autonomous community should carry out an exhaustive analysis of students' needs and of the opportunities in their environment.

The current path not only supports traditional vocational training, but it also recognises *professional learning* as one of the principal reference points of education and training systems in Europe (CEDEFOP, 2021). A good showing in this training will be a good pathway for students' own development and for the better growth of a country and of each of its regions. Similarly, it should contribute to improving rates of employment and early school leaving rates, with this training providing an outlet that is useful, practical, and attractive for all. In this sense the briefing note by CEDEFOP from March 2021 suggests professional learning "as a short-term solution to youth unemployment and a useful response to companies' skill needs in the longer term" (CEDEFOP, 2021, p.1).

TABLE 1. Students enrolled in vocational training.

Region	2017-2018	2018-2019
Spain	22,616	26,340
Andalusia	3,357	3,605
Aragón	136	134
Asturias	120	109
Balearic Islands	245	281
Basque Country	1,673	1,851
Canary Islands	378	730
Cantabria	58	50
Castilla y León	217	353
Castilla-La Mancha	878	1,66
Catalonia	6,253	6,827
Community of Madrid	5,932	5,977
Community of Valencia	1,662	2,245
Extremadura	201	213
Galicia	735	1,037
La Rioja	134	166
Navarra	607	784
Region of Murcia	30	318

Source: Fundación Bankia por la Formación Dual (2021).

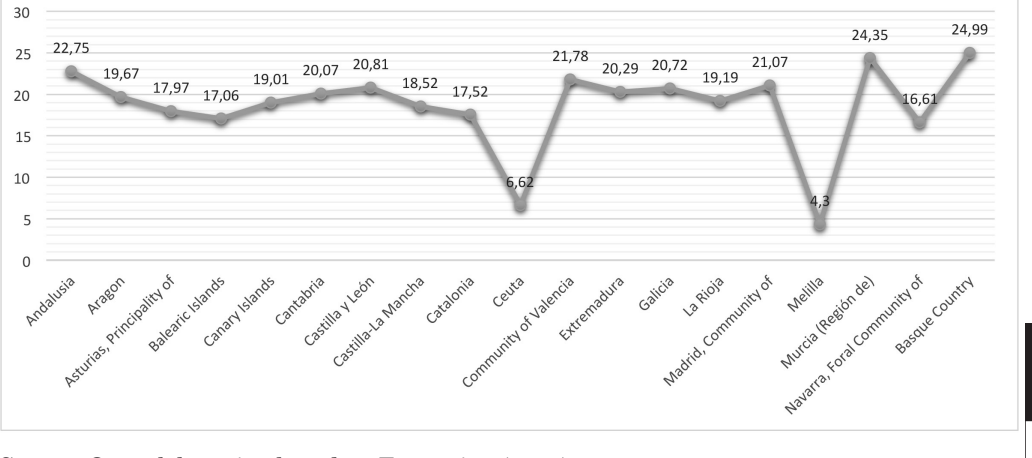
c) *Public spending on education*

We might initially think that when it comes to funding, more is better, but this might not always be the case, or might not always happen with the same intensity or the same results. How this economic provision is managed seems to be as important as its size, and specifying how funds are allocated and shared out might actually shape the spending incurred. To test this efficacy we can examine whether countries that spend more on education also have better results in the PISA report. The reality is that countries like Japan, Ireland and Germany are ahead of Spain in student performance according to PISA 2018 (520, 505, 500 points respectively), but all three spend less than Spain on education: 4% in Japan, 3.4% in Ireland, and 4.2% in Germany. We can also give the opposite example and identify countries whose spending as a percentage of their GDP is somewhat higher but which have poor academic results. This is the case with Chile, which spends 6.3% of its GDP on education and yet its score on PISA is 438.

These are only really a sample, but they show that there is no direct relationship between higher spending and better results.

Spain, which spends a total of 4.3% of its GDP on education (according to figures from 2017 (MEFP, 2020)), should climb in both rankings: economic and performance evaluations. But just as not all autonomous communities have the same budget, their classification in relation to the educational success of their students is not the same. It is worth noting that Spain's decentralised model plays a vital role in the distribution of public funds, as more than four fifths of funds allocated to education, 82%, come from the governments of the autonomous communities, 12% is provided by the Ministry, and the remaining 6% by local governments (MEFP, 2020). It should be noted, for the analysis of the data from Graph 3, that education in Ceuta and Melilla is administered by the Ministry. Consequently, these two autonomous cities only function as municipal administrations.

GRAPH 3. Education spending by total budget.



Source: Own elaboration based on Expansión (2021).

The analysis of these figures, which omits the autonomous cities of Ceuta and Melilla for the reason given above and because they have little economic and demographic weight, reveals a certain correspondence between autonomous communities' spending on education and their place in the evaluations. But we also observe that the communities with the highest budget are not the best placed ones in the PISA 2018 ranking (Galicia, Castilla y León, Asturias, and Aragón) (MEFP, 2019a). In contrast, Murcia and Andalusia stand out for spending but not for academic performance. It is clear that as well as being determined by economic investment, educational performance is also shaped by other factors that are harder to measure.

d) *Teachers: initial training in faculties of education*

In our view, there are a number of indicators associated with the training of teachers in education faculties that should directly or indirectly be part of an educational pact. Among others, it is worth reviewing their skills, the professional development pathway, access to teacher training programmes at university, placement programmes, and the induction programmes that comprise the teaching career. These are all relevant if our objective is to improve education in Spain. Within this variety of areas, we emphasise the following ones:

The first is to improve performance on indicators relating to selection of teaching staff and the capacity to attract good candidates and the best prospective teachers into the profession (Barber & Mourshed, 2008; Manso & Ramírez Carpeño, 2011; OECD 2005; Vaillant, 2006). A pact for education should envisage a model of access to training that provides for greater rigidity in these processes, creating a *career plan* (López Rupérez, 2021) that takes into account different knowledge, skills, abilities, and attitudes; all of which are relevant to the profile of a teacher and are necessary for excellence in professional development.

In a decentralised model like Spain's, this measure requires synchronisation of efforts between the ministry and the autonomous communities.

If we look towards the countries that stand out in international evaluations, we find that Singapore, Japan, Estonia, and Finland have very rigorous processes for selecting students for initial training (Malinen et al., 2012; Ro, 2020) and apart from Singapore they all have a decentralised model as in the case of Spain.

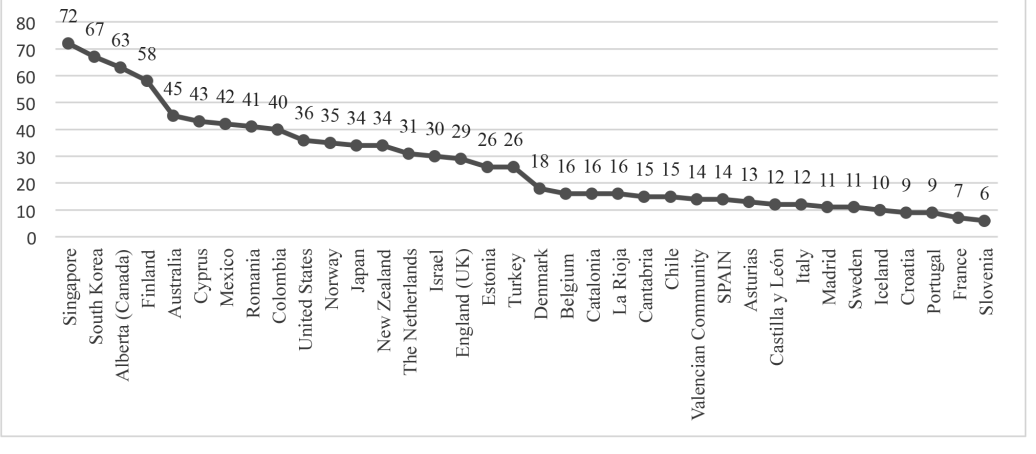
Encouraging this rigour is consistent with the importance of the teaching profession, with the value of teaching, and with the training of teachers: three very important elements for the matter that concerns us. Thinking about a decentralised administration like Spain's, the number of new places offered each year should be in line with the number of active professionals, with the rate of replacement, with the need to cover retirements, and with the data provided by relevant prospective studies. This would avoid the major mismatches that exist between the graduate population and number of professional positions.

And the second major challenge: to improve the image and social prestige of teachers. A number of studies have recognised the importance of raising the social status of the profession (Egido Gálvez, 2021; Luchenko, 2021), indicating that each region should seek the appropriate strategies to improve it and optimise this.

The teaching profession being well regarded by society means, on the one hand, that many students wish to enter this profession and, on the other, that it is possible to retain the best in teaching. Quality of teaching and social recognition (Sanz Ponce et al., 2020) should create a strong alliance or, as Hoyle (2001) observed, *prestige, status, and esteem* are three key factors in the model of teacher training. An educational and social pact should contribute to this objective.

Graph 4, which is based on the results from the TALIS 2018 report (MEFP 2019b), shows the differences between countries and between Spain's autonomous communities. It illustrates the greater or lesser degree to which teachers believe that they are valued. Looking at the participating autonomous communities (not all of them are included), the ones where the profession is valued highest are Catalonia (16%), La Rioja (16%), and Cantabria (15%), the three that are above the mean in Spain (14%). Teachers from Madrid, Castilla y León, Asturias, and the Community of Valencia give this lower scores.

GRAPH 4. Teachers' opinion of how society values teaching as a profession.



Source: Own elaboration based on the TALIS 2018 report (MEFP, 2019b).

Spain is a long way off the countries that are in the lead. This process of increasing the status of the profession should be backed by the central administration and so should be part of a pact, but it also requires commitment from each autonomous community, which should be capable of increasing the prestige of their teachers so that they, in turn, do not yield in the face of the frictions they might encounter in the course of their work. The initiative of Roldán and Cabrales (2020) who proposed

the Plan PROFES+ with measures to promote teaching as a career might continue to open pathways on this line.

5. In conclusion

An educational pact should comprise a set of properly sequenced and predicted aims, mainly long-term, that will make it possible to meet and cover the needs of a growing, advancing, and diverse society. But to achieve each of these goals, it is necessary to establish an equitable educational system that can, on the one hand, reduce socio-economic inequalities and on the other, foster equality of opportunities, to "guarantee that [students'] academic performance will be determined by their effort and ability, independently of their social, economic, and family context" (Sicilia & Simancas, 2018, p. 9).

The educational administrations that have good results should be the inspiration and reference point for the others, although their successes are not the consequence of one single indicator but rather of a balance between them and of emphasising structural elements. In reality, a pact does not in itself improve the quality of an educational system, but it does lay the foundations for improving figures, optimising scenarios, and solidifying the objectives.

In general, the best placed autonomous communities have implemented strategies that, for example, reduce levels of truancy as a way to increase performance (López Rupérez et al., 2018), they have launched compensatory policies that have improved disadvantaged environments, they have tuned the efficiency of spending, and they have consolidated territorial policies that have benefited the resources and the management of the centres. In any case, to understand and explain these data, we must not lose sight of the demographic diversity among Spain's communities, the funding, the complex educational and school organisation, the different levels of pay for teachers in different communities, or the provision of money to education capital depending on the number of schools and pupils. In a study of regional differences in education, the BBVA Foundation notes and explains many of the reasons behind these differences (Pérez García et al., 2019).

The model of decentralised administration is not an obstacle to achieving a pact in Spain, and indeed it could even facilitate it. There are excellent reasons for moving towards this objective. Given this situation we suggest the following proposals:

Creating a *pact culture* in Spain. And our decentralised model — precisely because of its structure — can provide the best conditions for achieving this goal. That said, there must be the ability to want to make a pact, a firm will to reach agreements, an interest in making pacts, and even a flair for making pacts. All of this probably did occur with the Moncloa Pacts. In the case of Spain, it seems necessary to find a leader or leaders who know how to agree, who know how to hold on to but also let go of certain personal interests, in benefit — always — of education.

By its very nature, a pact must include everyone to find areas of agreement and so everyone should play an active part: the Ministry of Education and Vocational Training, representatives of families, of teachers, social stakeholders, and unions, and representatives of state, private, and state-funded independent sectors. All of them should have a place in this process.

The pact and identity should go hand in hand. The educational pact should guarantee a balance between everyone that backs and constructs an identity. In this regard, Fernández Cruz (2008) recognised that social and territorial cohesion is a key issue in the construction of a shared identity and in the guarantee of an equitable and supportive offer of basic services for all citizens. Therefore, strengthening identity gives a country solidity and strengthens the foundations of an educational pact.

Putting together a pact whose backbone is a *common national curriculum*. A curriculum which, with this decentralised character, is built taking into account the diversity of the regions and their particular features and integrating the most important challenges of each of them. Sharing a *common national curriculum* is not incompatible with freedom of action for the different agents involved in education.

The *national and international evaluations* make the risks of some data apparent. Among other indicators, autonomous communities need to improve rates of enrolment and early school leaving, spending on education, and others factors relating to teachers: their selection, governance, and accountability.

Given the difficulties encountered, we should perhaps not insist on making a pact of maximum aspirations — which is plagued with ideological clashes — but instead an agreement of minimum requirements, which is inclusive in character and is constructed from a collection of intentions, with *Will, Imagination, Dialogue and Agreements*, which in Spanish gives the acronym VIDA (*Voluntad, Imaginación, Diálogo and Acuerdos*) or LIFE. Because, ultimately, a pact is creation, it is survival, it is life.

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Author biography

Encarnación Sánchez Lissen is Associate Professor in the Department of Theory and History of Education and Social Pedagogy at the Universidad de Sevilla. She is a member of the Comparative Education Research Group of Seville (GIECSE) and her teaching and research activity focuses mainly on comparative

and international education. Most of her publications are framed within an international perspective of teacher training and educational policies. She has made several stays in foreign institutions and was a visiting professor at The University of Virginia's College at Wise (USA) in the academic year 2009-2010.

 https://orcid.org/0000-0002-0625-7996

Rhetoric in teaching and e-learning in university education

Retórica docente y enseñanza online en la educación universitaria

Santiago LÓPEZ NAVIA, PhD. Associate Professor. Universidad Internacional de La Rioja *(santiagoalfonso.lopeznavia@unir.net).*

Abstract:

E-learning is a special rhetorical environment that requires teachers to use communicational skills and strategies that take advantage of its possibilities and compensate for the limitations of the virtual classroom in the interest of educational effectiveness and their ability to persuade. This study is the result of a review of literature that focusses on the characteristics of teachers' discourse and its distinctive features in online teaching environments, as well as reflection and analysis drawing on the author's experience of systematic observation of his own rhetorical practice and that of teachers from his own field in the online university sphere. The main results focus on: testing the validity of the qualitative principles of *puritas*, *perspicuitas*, *ornatus*, and *aptum* in teachers' online discourse, with particular attention to the case of *perspicuitas*; the need for special mastery of certain elements of strategic importance in verbal and non-verbal (oral and non-oral) composition; controlling certain rhetorical vices; and properly management of the time aspects of its execution and the resources that guarantee and strengthen feedback. This study considers several theses: the need to increase the *auctoritas* of online teachers in relation to their responsibility as a model of public communication in their professional practice, the advantages and disadvantages of using certain resources and supports, questions deriving from students' "criterion of presence," and the asymmetric manifestations of the relationship of communication online.

Keywords: electronic learning, virtual classrooms, classroom communication, teacher competences, rhetoric.

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Resumen:

La enseñanza *online* define un entorno retórico singular que hace necesario que el docente despliegue habilidades y estrategias comunicativas que aprovechen las posibilidades y compensen los condicionantes propios del entorno presencial-virtual en aras de la eficacia didáctica y la capacidad persuasiva. El presente trabajo es el resultado de la revisión de la bibliografía centrada en las características del discurso docente y sus peculiaridades en el entorno de enseñanza en red, así como de la reflexión y el análisis derivados de la experiencia del autor en la observación sistemática de su propia práctica retórica y la de los profesores de su mismo segmento en el ámbito universitario *online*. Los principales resultados se centran en la demostración de la vigencia de los principios cualitativos de *puritas, perspicuitas, ornatus y aptum* en el discurso docente en red, con especial atención al criterio de *perspicuitas,* así como en la necesidad de dominar especialmente ciertos elementos que cobran una importancia estratégica en su construcción verbal y no verbal (oral y no oral), controlar ciertos vicios retóricos y gestionar adecuadamente los aspectos temporales de su ejecución y los recursos que garantizan y refuerzan la retroalimentación. En el estudio se discuten diversas tesis, entre las que destacan la necesidad de abonar la *auctoritas* del docente *online* en relación con su responsabilidad como modelo comunicativo público en el ejercicio de su profesión, las ventajas y los inconvenientes del empleo de ciertos recursos y apoyos, los aspectos derivados del «criterio de presencia» de los alumnos y las manifestaciones asimétricas de la relación comunicativa propia de la enseñanza en red.

Descriptores: enseñanza *online*, clase virtual, comunicación docente, competencias del profesor, retórica.

1. The profile of the communicator teacher and its special importance in online teaching

All university teachers should, thanks to their training and the demands of their professional practice, have the necessary rhetorical competence to manage the different situations that arise in their work, especially in a global educational setting. For this reason, Valcárcel (2005) places communicative competences among the basic competences for training teachers in the process of European convergence. However, experience seems to suggest that this is not the case, and there is a need to define and improve the communicative skill of higher-education professionals, who do not always receive adequate instruction. The place and usefulness of rhetoric can be understood in this training requirement, which often suggests a shortcoming, especially the rhetoric of orality in the service of the variety of online learning situations. Good communication and clarity in teachers' explanations are two of the initial three items (eloquence is the third) that are clearly rhetorical in the *Questionnaire for the Evaluation of Online*

University Lecturers (QEOU) (Cañadas & de la Cuétara, 2018). However, it is striking that these items did not, in the first exploratory analysis, reach the minimum discrimination indices for validation in the subsequent version, despite being such important features in online and face-to-face teaching.

The evidence for this need is even clearer, if this is possible, at a time when circumstances and needs require teachers to demonstrate their versatility when combining face-to-face and online teaching, which is ever more widespread even beyond the circumstances deriving from such significant factors as the Covid-19 pandemic, in the midst of the inevitable clash between the archaic and the emergent that Soto Aguirre (2020) recalls, using the paradigms of identity developed by Williams (1980). It is, ultimately, a matter of online teachers accepting with renewed vigour their responsibility to be a model in the intellectual, ethical, and aesthetic elaboration of their discourse and, according to Salmerón et al. (2010), accepting the relevance and impact of the communicative aspects of their work. This attitude benefits teachers' *auctoritas*, as their credibility and influence are based on their knowledge, their exemplary status, and their communicative style, in which the qualitative principles of *puritas* (correctness), *perspicuitas* (clarity), *ornatus* (elegance), and *aptum* (appropriateness), as set out by Cicero (I a.C./2002) and Quintilian (c. 95/1999), remain decisive and will continue to be so.

We speak of *communicator* teachers, not *transmitter* teachers, and the difference is quite clear (López Navia, 2010). The communicator teacher opts for a "Socratic" communicative relationship rather than a "Demosthenic" one, in accordance with the rhetorical models of classical antiquity complemented by the now well-established contributions from the last decades of the 20th century and the start of the 21st century. Consequently, as Stubbs (1984) notes, the conversational dimension of teaching remains an exercise in social and personal relations, and Bain (2007), when defining the characteristics that support excellence in teachers, identifies the need for participatory exchange of ideas, agreeing with what Shor and Freire noted some time ago when they asserted the need to act *with* students and not *at* them (Shor and Freire, 1986) and to exercise leadership, which, as noted in the contributions by the Holmes Group, involves teachers' being able to "make their students do," on the same line as Smyth's comments when referring to "involvement in a joint search for knowledge" (Smyth, 1994, p. 244).

Online teaching clearly draws on all of these components, but it also adds others that make it possible to speak of a distinctive rhetorical space where, in line with what Adell and Sales (2000) observed, the tools and technical instruments that mediate communication between teachers and students do not increase but instead reduce the "transactional distance" between educators and students in the sense proposed by Moore (1990), in other words, the distance shaped by the role of dialogue between the educational agents and the structuring of the design of the content

delivered. We could, accordingly, claim that transactional distance is directly proportional to how structured the course is and inversely proportional to the quantity and quality of the dialogue established. Indeed, Aguaded and Cabero (2002) focus on the favourable outcome online teaching has in overcoming the unidirectionality of communication and encouraging real-time interaction, with the considerable benefit of all of this for constructing knowledge.

In line with the above, and as Salinas (2004) and Chaparro (2016) have observed, these technical elements lead to a new teacher profile, with instructors who can observe and reflect on their actions and who enable and motivate their students to learn through discovery, stimulating their intellectual development and their creative capacity, impulses that continue to demonstrate the undoubted importance of teachers' attitude of engagement in the process. Indeed, as García-Peñalvo acutely observes, it is necessary to "eliminate any relic or myth linked to viewing this educational mode as a second-class process or one requiring less commitment and effort from teachers than in an equivalent situation in a face-to-face context" (García-Peñalvo, 2020, p. 49). On the contrary, the wide variety of technologically mediated spaces in which teachers must practise requires significant effort. Otherwise, according to Osuna-Acedo et al. (2018), it would not be possible to tackle effectively the challenges of sMOOCs (Social Massive Open Online Courses) – which require a high level of interaction, are shaped by ubiquity, and lend themselves to integration in students' lived experience – or tMOOCs (Transfer Massive Open Online Courses), where full involvement of teachers is a prerequisite for approaching their transmediality, globalising impact, and condition as fertile ground for collaborative work "as a commitment to public engagement" (Osuna-Acedo et al., 2018, p. 112).

The consequences of teachers' engagement with their tasks online were very aptly summarised by Gros and Silva: "keeping communication spaces 'alive', facilitating access to content, encouraging dialogue between participants, helping them share their knowledge and building new knowledge" (Gros & Silva, 2005, p. 4). Imbernón et al. make a similar point when they mention the need to "elicit the development of competences in reasoning, planning, reflexive learning, knowledge creation, and communication" (Imbernón et al., 2011, p. 114).

2. The distinctive rhetorical features of online teaching

2.1. The special value of the maxim of *perspicuitas*

It is no surprise that Quintilian said that clarity is the first virtue of eloquence (Quintilian, c.55/1999, II, 3, 8), and the maxim of clarity (the criterion of *perspicuitas*) is especially important in the rhetoric of online teaching for very obvious reasons:

1. The attention students potentially pay in an online class is not subject to the factors of physical proximity that can be linked to the capacity for direct control teachers exercise. This could mean that

there is a greater risk of being distracted more easily by external stimuli outside the communication channel than in face-to-face teaching.

2. The fact teachers cannot make direct visual contact with every student or perform a constant visual sweep of all of the students denies them the possibility to dynamize the phatic or contact function, which regulates the principle of feedback. In other words: teachers miss real-time expressions of doubt (or confidence in comprehension), disagreement (or assent), or lack of interest (or otherwise) by their students, which they would notice if they were physically present and which they could interpret to redirect their discourse in pursuit of greater intelligibility. This does not mean that the chat function, common in virtual classrooms, cannot be a reliable instrument for registering assent or raising doubts (in fact, some students' communicative profile benefits from the sensation of distance when interacting in the lesson), but not, of course, with the degree of immediacy and efficacy that derives from visual contact.

3. It is important to keep in mind that students' concentration or the quality and intensity of the attention with which they perceive difficulties comprehending the teacher's discourse in real time can be tempered or even harmed by the certainty given by the fact that the class is being recorded so that people who cannot follow it synchronously can follow it later. All of this influences students' reactions when managing difficulties. Motivated by embarrassment or convenience, they might give in to the temptation (and hence the risk) of putting off the problem until they rewatch the recorded class instead of expressing their uncertainty in real time.

4. Teachers must take special care to ensure that the criterion of *perspicuitas* does not suffer from the variety in the use of media, concurrent use of different technological applications, and possible difficulties typical of the effective management of the multimedia setting.

Consequently, clarity in discourse is especially necessary in online teaching, both in its formulation and in its structure. Maximum intelligibility and order in the arrangement and implementation of lesson plans guarantee not only didactic efficacy but also credibility. Indeed, the connection between disorder and loss of credibility was underlined some time ago in the conversations between Gerald Miller and David Addington (in Monroe & Ehninger, 1976). On the same lines, and in a broad sense that transcends online teaching, Camacho and Sáenz (2000) note that the form of the didactic message must have appropriate levels of clarity, precision, and exactness, and Zabalza (2003) and García Nieto (2008) make it clear that the profile of the university teacher needed in the European Higher Education Area demands a comprehensible appropriately organised explanation. With regards to online education, Alvarado determines that teachers' communication skills must include "clarity, veracity, relevance, quality, appropriate quantity, and structure" (Alvarado, 2014, p. 62).

2.2. Verbal and non-verbal preparation of teachers' discourse

2.2.1. Verbal language

The qualitative principle of *puritas* should determine the proper discourse for any mode of teaching (face-to-face or online), starting from the premise inherent to the role all teachers should aspire to as models for their students. This involves structuring and execution that are subject to norms (López Navia, 1997, 1998, 2010). This approach starts with especially clear vocalisation, which will have a very favourable impact on the attention students pay to teachers and the trust they inspire[1]. Care for nuanced articulation, which is perfectly compatible with the distinctive dialectal features of Spanish, is especially necessary in e-learning as this format is more sensitive to potential disruptions from the channel than face-to-face teaching. It is also important to consider that there is a clear relationship between careless pronunciation that is peppered with confusion and the loss of teachers' credibility, as Baker (1965) showed in his pioneering studies in this area.

With regards to lexical correctness, online teaching requires a rich and varied vocabulary, something that is not in any way at odds with the maxim of *perspicuitas* and which draws upon the lexical wealth of the Spanish language, a wealth that is sometimes neglected because of the false prestige (often bordering on snobbishness) associated with frequent use of English words to express concepts that can very well be stated in Spanish[2]. Similarly, any responsible and well-prepared discourse by a teacher will require selection of the appropriate words, especially when rounding off a sequence that aims to be comprehensible, rejecting any imprecision or ambiguity and avoiding a lack of words that sometimes results from relying on students making inferences, an omission that can have especially negative consequences in online teaching. In addition, the mediation of online channels in no way justifies teachers allowing their vocabulary to stray away from formality in order to temper possible feelings of distance, and while a considered concession to informality might sometimes be acceptable, using colloquial expressions to reinforce complicity with the students, teachers should always opt for a formal register of expression.

The same could be said about the necessary observance of the norms in the morphosyntax characteristic of online teaching rhetoric. It is precisely because of this sensation of distance caused by the mediating elements of the channel that greater concentration is needed when preparing the teachers' real-time discourse, in which it is relatively easy to engage in anacoluthon, which, as we know, comprises syntactical incoherence when setting out the elements of a sequence as they do not combine properly. Anacoluthon is a very common error in spoken language, not just when the speaker fails to maintain the necessary concentration, but also when too many subordinate clauses are concatenated, losing their connection to the principal predication of which they form part. In online teaching, syntactical periods should preferably be of moderate length to avert this risk.

Only on the basis of a discourse that is subject to the norm does it make sense for teachers to make an effort to go further when expressing themselves in an especially elaborate, creative, and original style (maxim of *ornatus*) in which they employ whatever expressive resources they deem appropriate, albeit with the understanding that they will be more effective the more natural and clearer they are, so that, once again, in accordance with the maxim of *perspicuitas*, the intelligibility of the discourse is not undermined.

Teachers' difficulties in the course of their oral interventions are often made apparent by the use of signs of a verbal nature that can reveal insecurity and limited command of the discourse. These signs do not cause problems when used in a controlled and judicious way. Indeed, they naturally form part of the phatic function of language (Jakobson, 1975), directed at keeping alive the dialogue between participants in the session. This is the case with teachers who, from time to time and without uncontrolled repetition, check on their students' attention or level of understanding[3]. This precaution is highly advisable, and online teachers must train their students, as soon as possible, to comment in the chat only if they have a doubt. Otherwise a recurrent "phatic noise" develops through the accumulation of verbal responses of assent which can, in real time, be distracting.

The case that concerns us, however, is that of pseudo-phatic signs of a verbal nature (López Navia, 1997, 2010). These consist of words, usually formulated at the end of certain sequences, with an interrogative intonation and that teachers do not in any way control[4]. They are especially common in online teaching to compensate for the lack of feedback received through the verbal-oral and non-verbal responses (both oral and non-oral) typical of face-to-face teaching, and they can become a constant expressive vice if teachers do not increase conscious control of their discourse.

2.2.2. Non-verbal language

Within the oral dimension of non-verbal language, paralinguistic elements are especially important in online teaching. In view of this, teachers who are not conscious of the importance of correct rhetorical execution should pay attention to the tone, intensity, and *tempo* of their discourse and their intonation, in accordance with the following practical guidelines:

1. Although it is not necessary to say it explicitly for obvious reasons, teachers should not force their natural tone of voice, whether it is high, low, or somewhere in between.

2. With regards to intensity, and in terms of didactic efficacy, a certain level of tension – that is to say, a moderately lively and clearly audible volume which denotes interest and dynamism while never becoming vehement – is better than a low intensity that can be associated with timidity or a lack of certainty by the teacher and so might undermine students' perception of his or her authority (in the aforementioned sense of *auctoritas*) and negatively affect their attention. As Urbina and Forteza (in Gallego, 2008) note, clarity and firmness in the voice of the teacher not

only benefit the communicative climate that is established, but they also compensate for any possible technical problems that might occur. On the other hand, it is clear that intensity must be combined appropriately in line with the conditions of amplification common in online teaching: a high-pitched tone, for example, does not benefit from excess intensity.

3. Regarding intonation, online teachers must make a special effort to formulate their sequences with the expressive nuances characteristic of the different melodic profile (declaratory, interrogative, exclamatory, and imperative). Didactic efficacy and persuasiveness are lost if this seemingly basic precaution is not taken, and the risk of students momentarily switching off increases proportionately, something that is more common, as we saw above, in this form of teaching. It is very important to consider that intonation is richer and more expressive the less the speaker depends on the medium for presenting the content (PowerPoint, for example). One error that is all too common in online teaching is for teachers to base their discourse on simply reading word for word the text on the screens of the device, an attitude that is opposed to any attempt at rhetorical skill and educational utility.

4. Finally, regarding *tempo*, teachers must avoid a fast pace of exposition, as experience shows that excess speed usually results in a reduction in the sharpness of articulation: the faster the exposition, the worse the vocalisation and the more errors in articulation, with a consequent negative impact on the quality of attention and on the teacher's credibility. It goes without saying that an excessively ponderous *tempo* is just as inappropriate for maintaining tension in the educational dialogue.

Online teachers must be particularly attentive to the rhetorical vice of frequently using pseudo-phatic and para-reflexive signs (López Navia, 1997, 2010) of a non-verbal oral nature, which do not formally comprise words, but rather sounds, and which seriously deface the teachers' discourse. One very common pseudophatic sign is recurrent and uncontrolled utterance of a prolonged bilabial nasal sound (sometimes close to the vowel *-e-*)[5]. With an elongated intonation, this sound can become a para-reflexive sign whose frequent use denotes insecurity, lack of preparation in the topic, or lack of practice.

Directly related to the above, it seems clear that one thing that is truly challenging in the discourse of the teacher (and in the practice of oratory in general) is appropriately managing silence (López Navia, 2006-2007). In general, teachers, above all as a consequence of the mediating elements typical of online teaching, often give in to fear of silence, replacing the natural pauses typical of reflection with para-reflexive signs. This fear is perhaps accentuated in teachers, who often associate silences in their discourse (both in the face-to-face modality and online) with the risk that the students will interpret them as a lack of knowledge or competence. However, the most effective practice is to maintain the tension of the silence above all in two very common situations in online discourse of the teacher:

1. The necessary reflection when preparing an answer to a question a student has made in the chat function. Reflexive pauses are better than giving in to the *horror vacui* of silence with para-reflexive signs.

2. The necessary wait for a response by students either through the chat (more commonly used), or using the microphone or even video (more effective for stimulating speaking freely), as discussed below.

With regards to the non-oral dimension of non-verbal language and its performative importance, it is necessary to start from the fact that the computer is in principle an unavoidable proxemic barrier that online teachers must compensate for so that the students perceive the weight of their presence in the absence of a direct contact in the sense that Marín et al. note (2013) when listing the drawbacks of this teaching modality. Indeed, the terminology used at the Universidad Internacional de La Rioja refers to "virtual face-to-face classes" to emphasise the fact that the teacher is giving a class in real time (which might also be viewed at a later time) and constantly redirecting it on the basis of interventions by the students. In the inherently dialogic act of online communication between teacher and learner, the former must display a special interest to neutralise or at least temper the physical distance from the latter with the certainty that students' motivation is directly related to the transmission of emotions (Alvarado, 2014).

So, given that the online teachers normally speak while seated at their desks in front of the computer, in principle eschewing the pleasant and effective possibilities of peripatetic communication, it is vital that they maintain the necessary formality in their posture and the use of certain gestures and movements that are indeed expressive, but perhaps more limited than those used when speaking while standing, a posture that allows a greater kinesic range. Without forgetting the need to adopt an upright and respectful posture, moderate forward movements that reflect the intention (or the effect) of the teacher drawing close to the students with complicity are sometimes very advisable. Trusting in the expressiveness of hand movements is also of the greatest importance. These should preferably be free, and teachers should try not to raise their hands above shoulder height to attenuate potential displays of vehemence. Teachers who are starting out in online teaching, given the desirability of keeping their hands in view, can adopt a starting point for gestures that permits kinesic progression. This involves intertwining their hands without ceasing to move them. Starting from this position, it is easier to free one or both hands in gestures that are sometimes symmetrical and sometimes parallel, and are highly suited to regulating the pace of the discourse. Ultimately, according to Vázquez (2001), it is a matter of properly controlling adaptive gestures, which reveal the speaker's nerves, and of correctly using illustrator gestures, which have a descriptive intention.

Obviously, online teachers will avoid folding their arms in front of the screen as this posture accentuates distance and sometimes displays insecurity and even a

certain degree of hostility. In any case, according to Urbina and Forteza (in Gallego, 2008), the kinesic display of online teachers must tend towards smooth movements in the interests of image quality.

As they cannot do the visual sweep that is a customary part of non-verbal communication in face-to-face teaching, online teachers must direct their gaze at the camera, without looking above it or below the level their eyes occupy in the on-screen image while seeking in students' individual perception of the teacher the virtue teachers manifest when, as Bain (2007) states, they are truly dedicated to excellence in their work and consequently seek to attract each and every one of their students, whatever the place they occupy. Nonetheless, as Feenberg very appositely observes, we have to accept the phatic, sociodynamic, and affective limitations of online teaching in this sense, compared with the face-to-face modality, which makes it possible to "catch the teacher's eye and exchange a fleeting glance in which boredom or attention are tacitly expressed" (Feenberg, 2004, p. 126). Teachers can also use head movements to emphasise and expressively give nuances to the discourse and will adopt facial gestures of receptivity and interest when students reply to their questions or ask ones themselves. According to Castellà et al (2007), these elements are all fundamental for encouraging student participation.

2.3. Some comments on time management and basic auxiliary elements

Just as the rhetoric typical of online teaching has distinctive paralinguistic, kinesic, and proxemic factors, the chronemic aspects that shape teachers' discourse are also important, given that the appropriate use of time is a clear display of rigour, skill, command of the topic being covered, and courtesy to the students. The mediation represented by the technical elements in the educational dialogue between the agents who participate in the process requires precautions to avoid connectivity problems and the subsequent loss of time that these cause. Experience shows that the sense of punctuality that should decide the boundaries of an online teaching session is usually apparent at the moment of connection, but not always at the moment of disconnection, as though the breadth of the virtual space that teacher and students share justifies the laxity with which the ends of classes are sometimes administered.

To end, we should also mention the supports and distractions typical of online teaching. Just as students follow the class from their personal space, online teachers deliver classes in a setting of security and confidence provided by the familiar and recognisable objects and elements of their surroundings. However, it is important to ensure that the guarantees of that physical comfort zone are not shaped, and much less disturbed, by nearby items that might become distractions.

With regards to supports, one of the most effective for maintaining constant interaction with students is the chat function, and teachers should pay constant attention to it in order to monitor in real time the expressions of feedback by the students: their spontaneous comments, the doubts they express, and their

answers to any questions raised. The importance of what we could very well call the "criterion of presence" of the students requires teachers to show very clearly that they are paying attention to these manifestations, making periodic interventions and addressing students who participate by name so that they are expressly aware that they are the object of special interest at that moment, a requirement whose importance Urbina and Forteza (in Gallego, 2008) identify as one of those that benefit didactic communication online.

In any case, to adjust for the asymmetry of the communicative relationship in the virtual classroom (oral in the case of the teacher and written in the case of the students) and in pursuit of effective educational communication, it is of the greatest strategic importance for the teacher to encourage students to participate through the microphone and, if students agree to it, in front of the camera. All of this, is clearly to be done while respecting the people's understandable sense of embarrassment, especially when using the camera, because the "criterion of presence" we mentioned above is also resolved in another form of potential asymmetry that relates to the form of physical perception of the agents. The heteroperception of teachers is public: they are present before their students, all of whom can see the teacher, and this shapes their communicative performance, from clothing to non-verbal non-oral language. Students' preferred self-perception is private, even though it has a public projection through their interventions, but displaying their own images projected into heteroperception – horizontal (student/student) or vertical (teacher/student) – can represent a greater intrusion into their privacy than sharing their voices.

None of the above, of course, has a negative effect on the efficacy of merely written interaction in the chat function that is typical of the synchronous communicative relationship and as a complement to the virtual face-to-face classes through asynchronous chats or formal communication by email. As Feenberg notes, "the practice of writing imposes discipline and helps to focus thoughts. Teachers learn to understand students' ideas at a deeper level when they communicate with them electronically" (Feenberg, 2004, p. 119). Similarly, as Chaparro (2016) observes, teachers' written communication skills also are also favourably affected by this form of interchange between educational agents, which should be intense and continuous (Area & Adell, 2009), and interaction and dialogue between students increases, with positive effects on the construction of knowledge (Gros & Silva, 2005), especially from the conscience of diversity typical of the group–class universe, which justifies the versatility and adaptation of teachers' discourse in accordance with the maxim of *aptum*. The greatest of care must be taken in this interchange, using both synchronous and asynchronous resources, although in this case "teachers should set maximum response times so that students can receive the necessary feedback without it preventing the teacher from pursuing the learning objectives" (García-Peñalvo, 2020, p. 50).

3. Conclusions

The communicative skills of university teachers must be improved given the particular features of e-learning. This is a rhetorical setting that needs communicator professionals whose participation in a common interactive process of knowledge construction helps to advance it by surmounting the conventions typical of mere transfer of specialised knowledge.

Online teachers' execution of discourse makes it especially necessary to strengthen observance of the classical maxim of *perspicuitas* (clarity) to compensate for one of these distinctive features: the risk of students becoming distracted by external stimuli. Reinforcement of natural limits in feedback and dissuading students from putting off their possible doubts is equally necessary. The qualitative principle of *perspicuitas* is expressed through the formulation of teachers' discourse with the maximum intelligibility and in accordance with a solid and coherent structure.

The elaboration and formal execution of teachers' discourse must also respect the maxim of *puritas* (correctness), which requires care for nuanced articulation, the necessary lexical correctness, preferably using a formal register, and structuring sequences to avoid common errors such as anacoluthon in teachers' discourse, in general and particularly online. Only by complying with the criterion of *puritas* does an original and creative elaboration of the discourse (*ornatus*) make real sense.

In the execution of their discourse, online teachers must take particular care with pseudophatic oral signs (verbal and non-verbal) and effectively administer paralinguistic elements (tone, intensity, *tempo*, and intonation) to support their didactic efficacy and their persuasive capacity, upholding their credibility (characteristic of *auctoritas*) and inspiring higher quality attention by students. Appropriate management of silence will avert reliance on rhetorical vices such as para-reflexive signs, which reduce the trust teachers inspire in their receptors.

Another distinctive feature of online teaching is the natural proxemic barrier created by the computer. This should inspire teachers to neutralise the feeling of distance by reinforcing the necessary performative dynamism in which, notwithstanding the necessary postural formality, expressive hand movements, visual projection that reaches each student through the camera in the absence of a visual sweep that takes in the group, and the use of facial expressions that denote the receptivity and interest of the teacher are all essential. Other enhancements also contribute to the efficacy of teachers' online discourse. These include balanced time management, neutralising distractions, and above all constant encouragement of feedback based on the certainty of the students' "criterion of presence" and its implications in didactics with a dialogic basis that can temper the two common forms of asymmetry that characterise the communicative relationship in online teaching: the contrast between the teachers' orality and the students' preferred writing in the chat function, and the public character with which students perceive the teacher compared with the un-

derstandable shelter of a certain degree of privacy that is characteristic of them.

Conscious implementation of the strategies we propose would make it easier to improve the communicative skills that any university teacher should display when facing their different receptors and in the different situations that arise in their practice (maxim of *aptum*), among which online teaching opens a path with ever clearer force. The rest, as Quintilian, with his great lucidity, said, lies in "hard work and assiduity of study, by a variety of exercises and repeated trial, the highest prudence and unfailing quickness of judgement" (Quintilian, c. 95/1999, II, 13, 15-17). Something that ultimately is in no way foreign to the professional commitment inherent to the practice of teaching.

Notes

1 To give two examples of habitual errors in Spanish, excessive relaxation of pronunciation of post-tonic syllables is very common, especially in the last syllable of words that have the stress on the antepenultimate syllable, and teachers often yield to the temptation to elide the *-d-* between vowels in past participles ending in *-ado* (although not in the case of participles ending in *-ido*).

2 Such is the case, among many other possible examples, of "schedule" in place of *programa*, "timing" in place of *horario*, and "input" in place of *señal*.

3 With questions such as "*¿entendéis?*" ("do you understand?"), "*¿me explico?*" ("am I being clear?") and "*¿alguien tiene alguna duda*?" ("does anyone have any doubts?")

4 "*¿Verdad?*" ("right?"), "*¿entendido?*" ("understood?"), "*¿visto?*" ("do you see?"), and, very frequently, "*¿vale?*" ("okay?").

5 We could transcribe these approximately as [¿mmm?] or [eeeh].

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Author biography

Santiago López Navia has an undergraduate degree and a doctorate in Philology and a doctorate in Philosophy and Educational Sciences. He is an Associate Professor at the Universidad Internacional de La Rioja, where he is the Vice-dean for research in the Faculty of Education and is the Academic Director of the University Masters in Rhetoric and Oratory. He holds the Felipe Segovia Martínez Chair in Humanistic Studies at the Universidad SEK (Santiago de Chile) and is an advisory member of the Board of Trinity College Group of Spain. One of his main research interests is rhetoric, with special attention on the organisation and execution of expository discourse typical of formal situations, especially in the academic field, and its application in teaching and in defining the rhetorical profile of the communicator teacher compared to the transmitter teacher.

https://orcid.org/0000-0001-5074-0208

Spanish educational production in the *Social Sciences Citation Index* (2010-2020). III

Producción educativa española en el Social Sciences Citation Index (2010-2020). III

Antonio FERNÁNDEZ-CANO, PhD. Professor. Universidad de Granada *(afcano@ugr.es).*
Alfonso FERNÁNDEZ-GUERRERO. Architect. Universidad de Granada *(alfonsofernandezguerrero@gmail.com).*

Abstract:

In 1999 and 2011, the revista española de pedagogía published two similar studies reviewing the Spanish production in the field of education indexed in the Social Sciences Education Index (SSCI) database. The first study covered the period 1988-1997 and the second 1998-2009. Once enough time had passed, a quasi-replica study of the previous ones was undertaken for the period 2010-2020.

Objectives: To carry out a scientometric review of Spanish production in educational research indexed in the SSCI database of the Web of Science (WoS) in the period from 2010 to 2020. The intention is to inform the Spanish educational community of its research achievements with visibility and international impact and to draw supported scientometric conclusions about Spanish educational research.

Method: A descriptive-quantitative (scientometric) design has been used on an operating sample of 7016 documents (articles and reviews) recovered after an advanced search in the SSCI database by deliberate or purposive sampling. This study may also be characterized as secondary, since documents are used which have already been published, and revisional as regards research production.

Results: Results related to productivity and citation are provided. The diachronic production shows an increasing trend fitted to a polynomial function. English (68.5%) and Spanish (30.3%) are the main languages of expression of such production. The most common subject

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areas of the Web of Science with educational areas are linguistics, and also Rehabilitation and Developmental Psychology. The institutional production is mostly of university origin, with the top ten universities listed in the following order: Barcelona, Autónoma Barcelona, Valencia, Granada, País Vasco, Sevilla, Autónoma Madrid, Nacional a Distancia, Complutense and Oviedo. International collaboration is mainly established with the following countries: USA (5.01%), England (3.9%), Chile (2.32%), Portugal (2.02 %) and the Netherlands (1.56%).

The citation results give a Hirsch *h* index of 89, with an increasing diachronic trend fitted to both a polynomial and an exponential model. Documents were also recovered that are citation classics, with more than 200 citations; the journal *Computers & Education* being the body where the most quoted Spanish educational research is published. The most active research fronts are inferred from the citation classics and by means of a word cloud of terms included in the titles; specifically: General Education, Educational Computing and Educational Evaluation.

Discussion: The results obtained and their adaptation to general laws of Scientometrics bear witness to the fertility of Spanish educational research and its adjustment to patterns typical of science. Taking into consideration two studies prior to this one, and after successive comparisons, Spanish achievements are considered to be optimistic given their abundance, impact and international visibility.

Conclusion: The way in which Spanish educational research, from very limited initial stages, has followed a complex path of improvement to achieve scientometric patterns which are comparable to those of other scientific disciplines is confirmed.

Keywords: Spain, educational research, Social Sciences Citation Index database, 2010-2020, productivity and citation indicators, Scientometrics.

Resumen:

En los años 1999 y 2011, la revista española de pedagogía publicó dos estudios similares en los que se revisaba la producción española del campo de la educación indexada en la base *Social Sciences Education Index* (SSCI). El primer estudio comprendía el periodo 1988-1997 y el segundo 1998-2009. Pasado un tiempo suficiente se acomete un estudio cuasi de réplica de los anteriores para el periodo 2010-2020.

Objetivos: Realizar una revisión cienciométrica de la producción española en investigación educativa indexada en la base SSCI de la *Web of Science* (WoS) en el periodo 2010 a 2020. Se pretende informar a la comunidad educativa española de sus realizaciones investigadoras con visibilidad e impacto internacional y extraer conclusiones cienciométricas fundamentadas sobre la investigación educativa española.

Método: Se ha utilizado un diseño descriptivo-cuantitativo (cienciométrico) sobre una muestra operante de 7016 documentos (artículos y revisiones) recuperada tras una búsqueda avanzada en la base SSCI por muestreo intencional o a propósito. También puede caracterizarse este estudio como secundario, pues trabaja con documentos ya publicados, y revisional de la producción investigadora.

Resultados: Se aportan resultados relativos a productividad y citación. La producción diacrónica muestra una tendencia creciente ajustada a una función polinómica. Inglés (68.5 %) y español (30.3 %) son mayoritariamente los idiomas de expresión de tal producción. Las áreas temáticas de la *Web of Science* más comunes con las educativas son las lingüísticas, y también Rehabilitación y Psicología Evolutiva. La producción institucional es en su mayoría de origen universitario, siendo por este orden las diez primeras universidades: Barcelona, Autónoma Barcelona, Valencia, Granada, País Vasco, Sevilla, Autónoma Madrid, Nacional a Distancia, Complutense y Oviedo. La colaboración internacional se establece principalmente con estos países: USA (5.01 %), Inglaterra (3.9 %), Chile (2.32 %), Portugal (2.02 %) y Holanda (1.56 %).

Los resultados relativos a citación ofrecen un índice *h* de Hirsch de 89, con una tendencia diacrónica creciente ajustada tanto a un modelo polinómico como exponencial. También se recuperan documentos que son clásicos de citación, con más de 200 citas; siendo la revista *Computers & Education* el órgano donde se publica la investigación educativa española más citada. A partir de los clásicos de citación y mediante una nube de palabras de términos contenidos en los títulos, se infieren los frentes de investigación más activos; en concreto: Educación General, Informática Educativa y Evaluación Educativa.

Discusión: Los resultados obtenidos y su adecuación a leyes generales de la cienciometría testimonian la fertilidad de la investigación educativa española y su ajuste a patrones propios de la ciencia. Tomando en consideración dos estudios previos a éste, y tras sucesivas comparaciones, se infiere una visión optimista de las realizaciones españolas por abundante, de impacto y con visibilidad internacional.

Conclusión: Se confirma como la investigación educativa española, desde unos estadios iniciales muy limitados, ha recorrido una compleja senda de mejora hasta alcanzar patrones cienciométricos homologables a los de otras disciplinas científicas.

Descriptores: España, investigación educativa, base de datos *Social Sciences Citation Index*, 2010-2020, indicadores de productividad y citación, cienciometría.

1. Introduction

22 years ago, an article entitled *Spanish educational production in the Social Sciences Citation Index* (1988-97) signed by this author (Fernández-Cano, 1999) appeared in the revista española de pedagogía (*REP*). In this study an excursion was carried out though this database of the former *Institute for Scientific Information* [hereinafter ISI] of Philadelphia, USA, with the intention of finding articles by authors residing in Spain. In 2010 a replica of this article appeared, *Spanish educational production in the Social Sciences Citation Index (1998-2009). II*, in which progress was compared to the previous stage (Fernández-Cano, 2011).

Over 30 years have passed since the WoS databases could only be accessed using yearly CDs. Significant changes have tak-

en place to improve access, availability and additional features of the *Web of Science* [hereinafter WoS] as a powerful platform of the ISI of Philadelphia based on the Web.

In parallel with these revisional-quantitative articles in the revista española de pedagogía, the community of Spanish educational researchers became highly concerned about the quality and impact of their research productions which could be read in seminal works on methodologies of educational research and their implementation in the Spanish sphere (Fernández-Cano, 1995, 1997).

Terms such as "impact journal", "impact factor", "quartile in the *Journal Citation Reports* [hereinafter, JCR for short]", "*Social Sciences Citation Index* [hereinafter SSCI] database", "productive ranking", "citation classic" and others, which will be seen in this study, now form part of the colloquial language of Spanish educational researchers. Spanish educational research, which has traditionally been self-contained, set out on a path to overcome this deeply-rooted isolation.

1.1. Literature records

Revisional-quantitative studies started to be carried out in the early 1990s; these were coined with the more successful term of scientometric studies1. All studies referred to, quoted and indexed below are a type of notarial X-ray which describe what has been carried out, who has conducted the studies, both individuals and institutions, how these have been carried out and the outcome according to citation impact. These studies bear witness to a great concern for both the analysis of production and the evaluation of Spanish educational research; thus, these have intended to establish the adjustment to standards typical of Big Science, as defined by Price (1986), in order to indicate the quality of the studies conducted and dispel the insidious belief of an unfounded low quality of Spanish educational research.

There is now a rather long list of scientometric studies which have been conducted since then and which are specifically focused on a dimension or aspect of Spanish educational research. Thus, Expósito and Fernández-Cano (2002) investigated the productivity of research on the evaluation of Spanish educational programmes (1975-2000). Bueno and Fernández-Cano (2003) carried out a scientometric analysis on productivity in the *Revista de Investigación Educativa*. Torralbo et al. (2004) analysed the methodology of the Spanish production of doctoral theses on Mathematics Education (1976-1998). The detection of citation patterns in Spanish research in mathematics education was published by Vallejo et al. (2006). A scientometric review and a prospective analysis on the Spanish production in doctoral theses on Pedagogy (1976-2006) may be found in Fernández-Cano et al. (2008). Fernández-Bautista et al. (2014) made a longitudinal analysis of Spanish doctoral theses on education (1841-2012). Curiel and Fernández-Cano (2015) carried out scientometric analysis on Spanish doctoral theses on Didactics of Social Sciences (1976-2012). A scientometric analysis of Spanish doctoral theses on high capacities and giftedness may be found in Padial and Fernández-Cano (2019).

Other than the aforementioned, scientometric studies on Spanish educational research have continued to be abun-

dant; to quote the most recent studies in the last four years; on works on music education (Morales et al., 2017); doctoral theses on education (Ramos-Pardo & Sánchez-Antolín, 2017); sociocultural/socioeducational disadvantage (Sánchez-Castro & Pascual, 2019); didactics of social sciences (Gómez-Carrasco et al., 2019); studies on community environmental education (Prosser & Caro, 2021); the use of Spanish PISA results in scientific publications (González-Mayorga et al., 2022) or deaf education in Spain according to the related doctoral theses (Schiavon & Hayashi, 2020); the last piece of work mentioned was conducted by female Brazilian authors and was published in a journal in Brazil.

The abundant and notable work carried out by the vast group of educational researchers, who do not always agree2, since 1989 has been obliged after seeing their research production subjected to examination every six years by the Spanish National Commission for the Assessment of Research Activity (CNEAI*)* by means of an assessment initially regulated by a Royal Decree (Ministry of Parliamentary Affairs and Government Registry, 1989) and by consecutive yearly ministerial orders, all with similar content. Some of these regulatory documents that acted as referential milestones include: Ministry of Science and Innovation (2008) and Ministry of Universities (2022). Government entities such as the Spanish National Agency for Quality Assessment and Accreditation (ANECA, 2021), which is responsible for promoting lecturers through its ACADEMIA programme, have stressed the importance of assessing the quality of the research of applicants in their accreditation work in order to evaluate with one key criterion: articles indexed in the WoS databases and published by quality journals which have been accredited by means of rigorous peer review processes and are included in the JCR database. Although in studies prior to this one (Fernández-Cano, 1999, 2011), the remoteness of evaluative criteria typical of the international scientific community and inferable criteria of data from the WoS, and also subsequently from the European database Scopus, were indicated and questioned, it was from 1989 onwards that these criteria started to be used to evaluate the research of lecturers and of the Scientific Research Council (CSIC), for both the evaluation of their six-year research period by the Spanish National Commission for the Assessment of Research Activity (CNEAI) and years later for the evaluation of curriculums of the lecturers by the above-mentioned ANECA.

We therefore consider that a new review of the Spanish educational research indexed in the SSCI database, a third submission for the 2010-2020 period, is advisable and necessary in order to inform the Spanish educational community of its research achievements with visibility and international impact and to draw supported scientometric conclusions about Spanish educational research.

Thus, the general objective of this study is to carry out a scientometric review of Spanish production in educational research indexed in the SSCI database of the Web of Science (WoS) in the period from 2010 to 2020. Consequently, the specific objectives to be achieved are as follows:

– Find out the similarity between subjects of Spanish educational research and other subject categories of the WoS.

- Diachronically analyse the time series of production in this period (years 2010-2020) and verify its fit to scientometric models; and by extension, to the 1990-2020 time series too.
- Show the institutional production, particularly the most productive universities in educational research for the considered period (2010-2020).
- Identify the publishing journals which publish Spanish educational research indexed in the SSCI database in this time frame (2010-2020).
- Infer the international collaboration pattern of Spanish production of educational research in the period under consideration.
- Explore general citation data of both cross-sectional (until 31 December 2020) and longitudinal Spanish educational research for the eleven years of the series.
- Determine which Spanish educational research documents may be considered citation classics in order to infer research fronts of Spanish educational research from the aforementioned.

2. Method

2.1. Design

The design of this study may be described in various ways:

- Descriptive as it describes the characteristics of a series of documents (articles and reviews) on Spanish educational research.
- Quantitative and more specifically scientometric as it quantifies documents taken from a database (SSCI), it categorizes them according to their constituent parts and verifies their fit to widely accepted regulatory patterns of science; furthermore, it makes plausible evaluative inferences without intending to make incisive considerations (Gingras, 2016).
- By deliberate or purposive sampling: choosing a sample which is conceptually well defined from an available population on which no sampling selection whatsoever is carried out afterwards.
- Secondary revisional as it revises documents which have already been published and it investigates them in order to extract inferences on their content based on productivity and citation indicators.

The variables considered in this study are those relating to production and citation; specifically, the production variables are: publication language of the documents, diachronic production (documents published yearly), institutional production (documents according to the centres of the authors), production according to publishing journals (documents published by each journal) and collaborating countries (documents common to authors from Spain and other countries).

The variables relating to citation are diverse: diachronic citation (quotations received yearly for all documents), quotations from citation classics and terms from recovered citation classic titles.

The data analysis techniques are those typical of descriptive statistics; counting of

frequencies, percentages, correlations (R^2, coefficient of determination), regression models and functions for deterministic adjustment (polynomial and exponential) and word cloud.

2.2. Search string and operating sample

At the end of December 2021 and start of January 2022, an advanced search was made on the Web of Science-Core collection, only operating in the SSCI database with the following string:

WC [categories of the WoS] = (education & educational research or special education or educational psychology) and AD [address] = Spain; refined for articles and reviews; covering (customized) the time frame: 2010-01-01 to 2020-12-31; it would not be appropriate to include the year 2021 because the publication was still not finalised in enough journals and the SSCI database would not therefore be fully up-to-date until 2021.

This link to the WoS makes it possible to recover the entire operating sample and work automatically on it, meaning it can be used to generate results:

https://www.webofscience.com/wos/woscc/summary/8e41f76e-e531-4aa9-b64f-d8a0f0faeac7-1c0a99f7/relevance/1

Documents have been selected, although only those in the format of an article or review, from the three educational subject categories of the WoS: education & educational research; special education and educational psychology for the time frame between the first day of 2010 and the last day of 2020. The operating sample appears as follows according to the type of document and category of the WoS:

TABLE 1. Operating sample according to the type of document and educational categories of the SSCI database of Spanish educational research in the period 2010-2020.

Type of document	Categories of the Web of Science			
	Education and Educational Research	Special Education	Educational Psychology	Total*
Article	5912	386	1021	6831
Review	154	22	19	185
Total-fully-fledged	6066	408	1040	7016

*: documents (articles or reviews).
Source: Own elaboration.

Considering only fully-fledged literature by solely selecting articles and reviews forces a quality standard to be maintained for scientific documents; something typical of scientometric studies, which is commonly accepted by the scientific community (van der Panne, 2007; Makkonen & van der Have, 2013) and by assessment agencies (ANECA, 2021; Ministry of Universities, 2022). Summaries of congressional communications, book reviews, editorials, notes, letters, corrections and others are disregarded.

Some documents may belong to two or more subject categories of the WoS as continent journals are assigned to several of these subject categories. Therefore, and these are advance findings, in its three WoS categories, Spanish educational research shows the following commonalities (according to the number of documents and percentage[3] of the total) with other subject categories; namely: Linguistics (673 documents; 9.59% of the total), Language & Linguistics (507 docs.; 7.22%), Rehabilitation (397 docs.; 5.65%); Psychology, Developmental (329 docs.; 4.68%); Communication (308 docs.; 4.39%); Computer Science, Interdisciplinary Applications (254 docs.; 3.62%); Education, Scientific Disciplines (157 docs.; 2.23%); Social Sciences, Interdisciplinary (139 docs., 1.98%), Music (78 docs.; 1.11%) and 39 more categories with values below 1%. Such a high degree of commonality gives the impression of the field of education being extremely fertile and how various disciplines end up in this field; an observation which was already made in two previous studies (Fernández-Cano, 1999, 2011).

The operating sample may be distinguished as follows. It operates with 7016 documents; of these, only 2154 (30.7%) are available for open access, a type of publishing which is being introduced gradually. The languages used are: English in 4,808 documents (68.5%); Spanish in 2,132 documents (30.3%) and Portuguese in 58 documents (0.82%). Other languages represent marginal percentages of around 0.1%. It is clear that English continues to be the main language for communication of Spanish educational research even though many Spanish journals and journals written in Spanish are included.

A series of indicators/variables relating to productivity and citation have been recovered from this sample, in their various fields and meanings, developed by Fernández-Cano and Bueno (1999) for Spanish educational research and the most relevant data are set out below as results.

3. Results

Typical patterns of science shall be deduced from the data resulting from productivity and citation (Price, 1986; Gingras, 2016).

3.1. Diachronic production and fitted models

Table 2 below shows the yearly production of fully-fledged documents for the 2010-2020 time frame.

TABLE 2. Diachronic production of Spanish educational research indexed in the SSCI database for the 2010-2020 period.

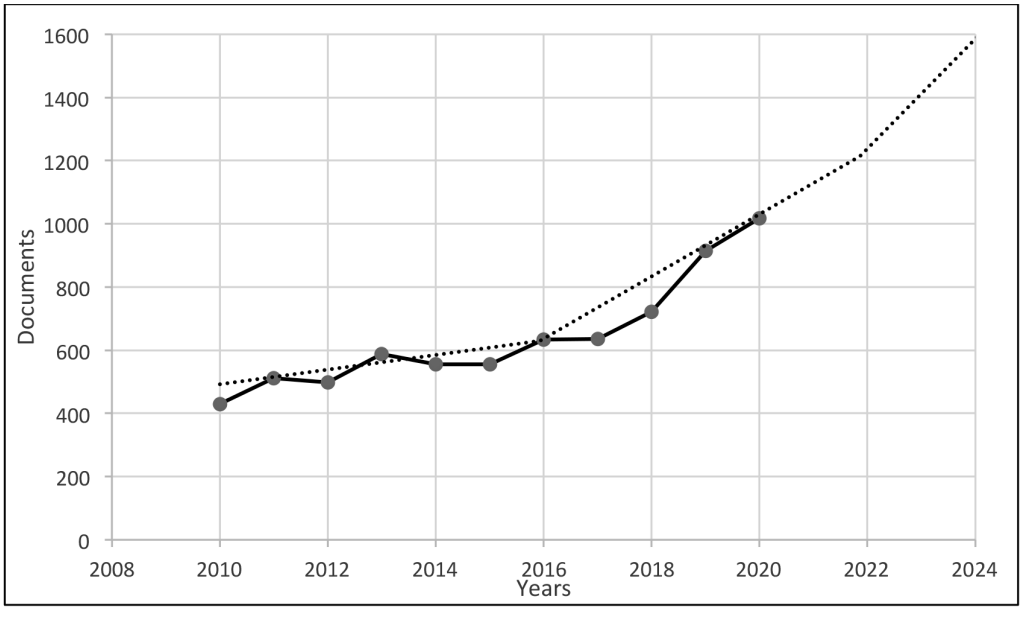
Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total
Fully-fledged SSCI	430	512	498	587	556	555	634	636	721	915	1007	7016
(Δ) % yearly		19	-2.8	17.8	-5.5	0	14.2	0.03	13.3	26.9	10	9.2

Source: Own elaboration.

Given the yearly fluctuations, an average increase of 9.2% is calculated; this is higher than the average increases observed in previous studies: 4.7%, in the 1998-2009 period and 3% for 1988-1997. This percentage is a clear and unmistakable sign of improvement in the production of fully-fledged documents regarding Spanish educational research.

The graphical solution (Graph 1) provides us with more conclusive evidence as it includes the trend line of best fit and the four-year forecast.

GRAPH 1. Fitted graph pattern with forecasts of Spanish production in educational research indexed in the SSCI database between 2010-2020.

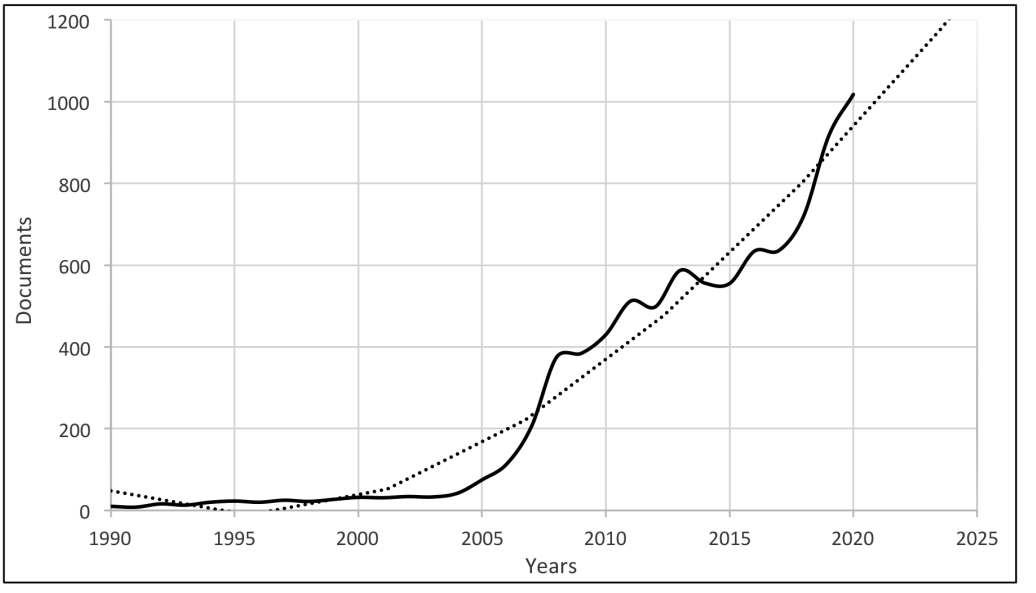


Source: Own elaboration.

The best fit is a 2nd order polynomial function ($Y = 6.3X^2 - 25549X + 1007$) given by a coefficient of determination between Production (documents) and Time (years), $R^2 = 0.93$, $p < 0.001$, which may be interpreted as a correlation coefficient. Predictive extrapolation until 2024 shows a growing productive trend; this signifies an optimistic outlook for Spanish educational research. It may be emphasized that in 2020 in the middle of the COVID19 pandemic, production increased by 10% compared to the previous year.

It could be of interest to include this study period (2010-2020) in a production time series determined by a more extensive time frame: 1990-2020, in order to obtain a more comprehensive view of the diachronic development of Spanish educational research in the last 30 years. We should therefore consider Graph 2:

GRAPH 2. Linear (____) and fitted (……) graph pattern with forecasts of Spanish production in educational research indexed in the SSCI database between 1990-2020.



Source: Own elaboration.

The 1990-2020 time series is fitted to various trend lines, the most justified is a 3rd order polynomial function, $Y = -0.017X^3 + 106.78X^2 - 217034X + 1.8$, with a fitted value $R^2 = 0.96$, $p < 0.001$. The linear diagram of this series also fits an exponential trend, but not as well, $R^2 = 0.88$ $p < 0.001$. This shows that the Spanish educational production indexed in the SSCI database fits a pattern typical of the scientific information proposed by Price (1986) and which was reviewed for various scientific disciplines by Fernández-Cano et al. (2004). The alarm raised in the previous study for the 1998-2009 period, on the possible forecast of production tending towards a logistic model with a stabilized production, as predicted by Price[4] (1986), is still not justified with the data available. Production has continued to grow and at a faster rate; this gives the impression of a young and fertile field of Spanish educational research as it has not yet entered into the logistic stabilization speculated by Price.

3.2. Institutional production

The sample includes 2491 entries from various institutions in and with which authors based in Spain have published during this time frame between 2010-2020. The analysis based on the affiliation descriptor used by the WoS offers the main pattern of the university as a production body. A list of the most productive universities, at least 100 articles, to be used as proof by the academic authorities, is given in Table 3 below, which includes indicators relating to: number of documents, percentage of the total sample and one indicator which is not considered in the previous studies, which is the Hirsch index[5].

TABLE 3. List of most productive universities in Spanish educational research indexed in the SSCI database.

R.	University	# docs.	%	Hirsch h
1ª	UB. Barcelona	507	7.22	38
2ª	UAB. Autónoma Barcelona	472	6.72	31
3ª	UV. Valencia	437	6.22	33
4ª	UGR. Granada	434	6.18	38
5ª	UPV/EHU. País Vasco	376	5.35	29
6ª	US. Sevilla	364	5.18	33
7ª	UAM. Autónoma Madrid	332	4.73	31
8ª	UNED. Universidad Nacional a Distancia	314	4.47	32
9ª	UCM. Complutense Madrid	297	4.23	22
10ª	UNIOVI. Oviedo	251	3.57	29
11ª	USAL. Salamanca	245	3.49	26
12ª	UM. Murcia	225	3.20	25
13ª	UMA. Málaga	206	2.93	25
14ª	UVA. Valladolid	174	2.48	24
15ª	UOC. Oberta de Cataluña	163	2.32	27
16ª	UNIZAR. Zaragoza	158	2.25	20
17ª	UA. Alicante	155	2.20	21
18ª	UCLM. Castilla-La Mancha	150	2.13	22
18ª	USC. Santiago de Compostela	150	2.13	19
20ª	URL. Ramón Llull	143	2.03	18
21ª	ULL. La Laguna	128	1.82	18
22ª	UCO. Córdoba	125	1.78	22
23ª	UdG. Gerona	121	1.72	17
23ª	UJI. Jaime I	121	1.72	21
25ª	UVIGO. Vigo	116	1.65	17
26ª	UPF. Pompeu i Fabra	115	1.63	23
26ª	UEX. Extremadura	115	1.63	20
28ª	UHU. Huelva	114	1.62	23
29ª	UDC. Coruña	113	1.61	21
30ª	UJA. Jaén	112	1.59	19
31ª	UAL. Almería	103	1.46	18
32ª	UAH. Alcalá de Henares	101	1.44	18
32ª	UDL. Lérida	101	1.44	18

Source: Own elaboration.

The table above allows some significant considerations to be made. Production is primarily from universities. A considerable statistical correlation is determined between production (number of documents) and Hirsch index; with Pearson's r, r = 0.91 ($p<0.0001$); rather, quality results from quantity, as some documents will be quoted a great deal if there are many available to quote.

3.3. Publishing journals

311 different journals are registered which have published this Spanish educational production in the 2010-2020 time frame. Table 4 below lists journals which have 50 or more documents published.

TABLE 4. List of publishing journals on Spanish educational research indexed in the SSCI database in the 2010-2020 time frame with at least 50 documents.

R.	Journal	# docs.	%	FI2020	Quartile
1ª	*Revista de Educación*	534	7.61	1.057	Q3
2ª	*Educación XX1*	334	4.76	3.265	Q2
3ª	Comunicar	308	4.39	6.013	Q1
4ª	*Enseñanza de las Ciencias*	304	4.33	1.217	Q4
5ª	Cultura y Educación	275	3.92	n.d.	n.d.
6ª	*Revista Española de Pedagogía*	231	3.29	1.612	Q3
7ª	*Porta Linguarum*	231	3.29	1.200	Q4
8ª	*Revista de Psicodidáctica*	198	2.82	3.225	Q2
9ª	*Infancia y Aprendizaje*	196	2.79	0.854	Q4
10ª	*Computers & Education*	194	2.76	8.538	Q1
11ª	Movimento	131	1.86	0.523	Q4
12ª	Research in Developmental Disabilities	120	1.71	3.230	Q1
13ª	International Journal of Bilingual Education and Bilingualism	82	1.16	4.159	Q1
14ª	British Journal of Educational Technology	74	1.05	4.929	Q1

15ª	Interactive Learning Environment	67	0.95	3.928	Q1
16ª	IEEE Transactions on Learning Technologies	60	0.85	3.720	Q2
17ª	Studies in Higher Education	60	0.85	4.379	Q1
18ª	Learning and Individual Differences	59	0.84	3.139	Q2
19ª	System	58	0.82	3.167	Q2
20ª	Psicología Educativa	56	0.79	1.250	Q4
21ª	Revista Latinoamericana de Investigación en Matemática Educativa-RELIME	55	0.78	0.792	Q4
22ª	*Higher Education*	55	0.77	4.634	Q1
23ª	*Journal of Intellectual Disability Research*	50	0.71	2.424	Q2

Code: R.: ranking according to production; Journal: Title; # docs.: Number of documents published; %: percentage of documents in relation to the total; IF2020: Impact factor of the journal in 2020; Q: Quartile in which the journal is found according to its impact factor; n.a.: not available; in *italics*, journals which have been repeated in the last two series considered. Source: Own elaboration.

It may be observed that the nine highest-producing journals are Spanish journals and journals written in Spanish; this shows a significant change in the information on Spanish educational research, which is very different from the situation in the 1980s when there were no Spanish educational journals indexed in the SSCI database until the entry of the **revista española de pedagogía**.

The journals which appear in italics are repeated in relation to the previous publication (II). However, none of the ten journals from the first publication (I) are reiterated, but they are repeated in relation to the 1998-2009 period; this gives the impression that the publishing pattern has changed over time.

The subjects inferred based on the titles and lines of the highest-producing journals are: computing education, special education, higher education, language and linguistics in education, learning problems, didactics of science and mathematics and physical education. Another noticeable pattern is that Spanish educational journals continue to be general; more specialization would perhaps be desirable.

3.4. International collaboration

Spanish researchers have collaborated on 2617 documents with other researchers from 104 countries. This represents 37% of the total production, a graph which has significantly increased in relation to the two previous publications of this study;

in particular, this collaboration between countries had rather marginal values in the first period investigated (1988-1997). A comparison is made here between 1998-2009 and 2010-2020 (the current period), where an increase is observed in international collaboration as regards frequency and percentage; the figures for the top ten collaborator countries may be seen in Table 5 below.

TABLE 5. International collaboration (only the top 10 countries) between two periods (1998-2009 and 2010-2020) in the Spanish research production indexed in the SSCI database.

	1998-2009 period			2010-2020 period		
Ranking	Country	No. docs.	%	Country	No. docs.	%
1º	USA	54	5.06	USA	352	5.01
2º	Inglaterra	30	2.61	Inglaterra	274	3.90
3º	Portugal	18	1.68	Chile	163	2.32
4º	Holanda	14	1.31	Portugal	142	2.02
5º	Francia	13	1.21	Holanda	110	1.56
6º	Canadá	12	1.12	Australia	105	1.49
7º	Chile	11	1.03	Alemania	95	1.35
8º	Alemania	11	1.03	Italia	86	1.22
9º	México	9	0.84	México	86	1.22
10º	Argentina	8	0.75	Brasil	82	1.16
	Σ	180	15.89	Σ	1495	21.25

Source: Own elaboration.

The main collaboration pattern with Anglo-Saxon colleagues (with the USA and England) is still observed. With over a third of research carried out as part of international collaboration, the assertion of an isolated Spanish educational research, which was influenced by previous studies, does not seem justified. The increase in collaboration with Chile is noteworthy, which may well be due to the guidelines of the Chilean National Agency for Research and Development (ANID), formerly the Chilean National Commission for Scientific and Technological Research (CONICYT), which promote the awarding of postgraduate education grants abroad (2020).

3.5. General citation of Spanish educational research

This is probably the most novel part of this study in relation to the two previous ones. Citation has been established as an evaluative indicator par excellence for research in hard and social sciences, and of course in education sciences too (Fernández-Cano and Expósito, 2001; Moed, 2005). However citation also allows us to infer hot topics and emerging fronts

in relation to research (Úbeda et al., 2020), which gives the impression of a research agenda in advance and which we missed for many years without defining one that was extensive or accepted.

The general citation data generated by 7016 Spanish educational research documents indexed in the SSCI database in the 2010-2020 period are as follows:

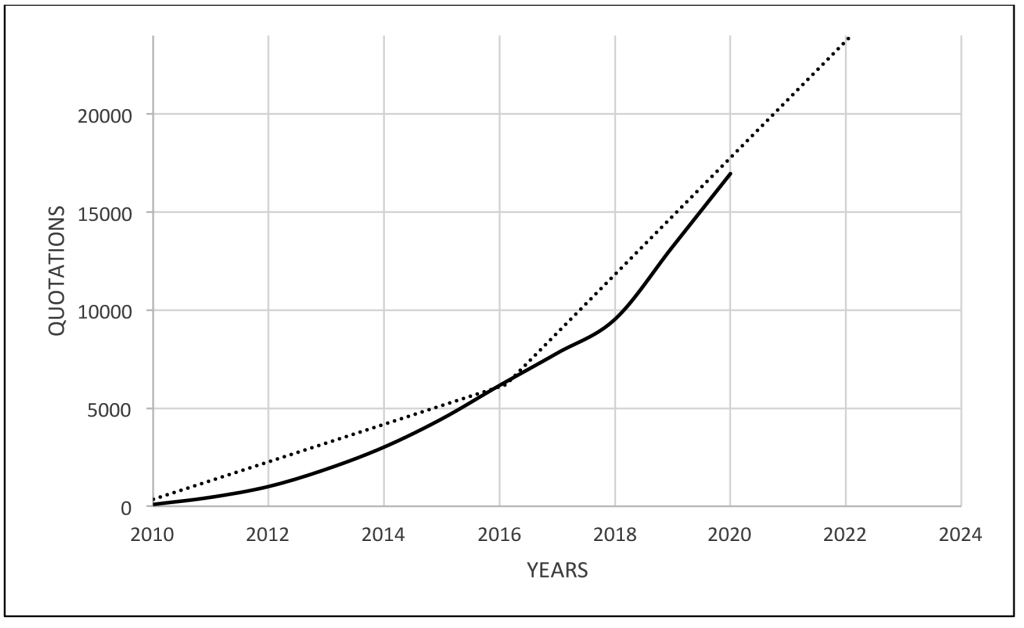
- Total quotations received: 81915.
- Deducted self-citation quotations: 74800.
- Average quotations per document: 11.68.
- Hirsch h index: 89.

The citation pattern obtained offers data which are very high in both total and average quotations, and particularly the h index of 89; this indicates that at least 89 documents have received 89 quotations or more; and, although there is no regulatory Archimedean point for this indicator, it is desirable that the higher this is, the more positive the assessment of the human group is, as in the case of this study, institution, journal or author (Rodríguez-Navarro and Imperial, 2007).

3.6. Diachronic citation pattern

Graph 3 shows the diachronic pattern, also referred to as the retrospective longitudinal pattern, of citation for this period. It is impressive that after 95 quotations were received in 2010, 16920 were received in 2020. This gives us a sound idea of the way in which and how much the acceptance and impact have progressed, in short, of Spanish educational research.

GRAPH 3. Fitted graph pattern with forecasts of the citation of Spanish educational research indexed in the SSCI database between 2010-2020.



Source: Own elaboration.

The graph pattern of the trend line is fitted to a 2nd order polynomial function ($Y = 165.63X^2 - 665886X + 7E+08$) with an almost perfect fit given by $R^2 = 0.99$, $p < 0.001$. An exponential fit is also acceptable with $R^2 = 0.94$, with equal statistical meaning. The four-year predictions are highly optimistic, with this growth pattern still rapid, almost exponential.

3.7. Citation classics

Eugene Garfield (1977, 1989), one of the founders of scientometrics as a scientific discipline and creator of the Institute for Scientific Information (ISI) of Philadelphia, conceptualized the idea of the citation classic as a scientific document which obtained at least 100 quotations. Since then, citation has become as mass, if not abusive practice (Gingras, 2016), the use of which is growing exponentially. Nonetheless, getting an article to reach 100 quotations is undoubtedly an achievement which bears witness to the quality of the aforementioned; even more so for 200 quotations, which is the Archimedean point used in this study to describe a scientific document as a citation classic; please see Table 6.

TABLE 6. List of citation classic articles (more than 200 quotations received) on Spanish educational research in the 2010-2020 period.

Title of article/ review	No, authors	Year	Journal	University/ Country**	Total quotations	Quotations#
Gamifying learning experiences: Practical implications and outcome	6/6	2013	Computers & Education	Alcalá de Henares	662	66.2
Augmented reality trends in education: a systematic review of research and applications	5/3	2014	Educational Technology & Society	Gerona Athabasca, CAN	408	45.3
Impact of an augmented reality system on students' motivation for a visual art course	3/2	2013	Computers & Education	Simón Bolívar, USB, VEN Carlos III	404	40.4
The impact of entrepreneurship education in higher education: a systematic review and research agenda	5/2	2017	Academy of Management Learning & Education	Manchester, MMU, GBR, Sevilla Anglia Ruskin, ARU, GBR Lyon, EML, FRA	330	55
Blended learning in higher education: Students' perceptions and their relation to outcomes	3/3	2011	Computers & Education	Granada	312	26

Predicting students' final performance from participation in on-line discussion forums	4/4	2013	Computers & Education	Córdoba	269	26.9
Using game theory and competition-based learning to stimulate student motivation and performance	1/1	2010	Computers & Education	Vigo	268	20.6
An empirical study comparing gamification and social networking on e-learning	4/4	2014	Computers & Education	Alcalá de Henares	263	29.2
The use of scoring rubrics for formative assessment purposes revisited: A review	2/1	2013	Educational Research Review	Autónoma Barcelona Kristianstad, HKR, SWE	260	26
Context-aware recommender systems for learning: a survey and future challenges	7/1	2012	IEEE Transactions on Learning Technologies	Católica Lovaina, KU, BEL Alcalá de Henares Atenas, AUA, GRC Guayaquil, ESPOL, ECU Fraunhofer, FIT, DEU	259	23.5
Parental involvement on student academic achievement: A meta-analysis	6/6	2015	Educational Research Review	Complutense/ UNED/País Vasco/La Rioja	252	31.5
Emotion-regulation ability, burnout, and job satisfaction among British secondary-school teachers	5/1	2010	Psychology in the Schools	Yale, USA Cantabria Jaguelónica, UJ, POL	235	18
Using clickers in class, The role of interactivity, active collaborative learning and engagement in learning performance	4/4	2012	Computers & Education	Zaragoza	229	25.4
Evaluating virtual reality and augmented reality training for industrial maintenance and assembly tasks	7/2	2015	Interactive Learning Environments	ORT Braude, ISR Tecnalia, Madrid Fraunhofer, IGD, DEU Navarra, UNAV Parma Sidel SpA, ITA	227	28.3
La competencia mediática: propuesta articulada de dimensiones e indicadores	2/1	2012	Comunicar	Pompeu i Fabra Buenos Aires, UBA, ARG	221	20

Experimenting with electromagnetism using augmented reality: Impact on flow student experience and educational effectiveness	4/2	2014	Computers & Education	Carlos III de Madrid Simón Bolívar, USB, VEN	209	23.2
New technology trends in education: Seven years of forecasts and convergence	5/5	2011	Computers & Education	UNED	207	17.2
Developing responsible global leaders through international service-learning programs: the Ulysses experience	3/2	2011	Academy of Management Learning & Education	Ramón Llull Viena, UNIVIE, AUT	206	17.1
CLIL research in Europe: past, present, and future	1/1	2012	International Journal of Bilingual Education and Bilingualism	Jaén	204	18.5
Virtual and remote labs in education: A bibliometric analysis	6/6	2016	Computers & Education	UNED/Granada	203	29

Code: No. authors: a/b; a total authors/b authors from Spanish centres; *: Abbreviations of the country according to the ISO 3166-1 standard; #: Average yearly quotations.
Source: Own elaboration.

The inferable pattern in this list of citation classic articles is that the majority have been published in foreign journals and in English, and are rich in collaborations, both at a national and international level. The only citation classic published in Spanish is that published by the journal *Comunicar*, assigned to two subject categories of the WoS: Education & educational research and Communication.

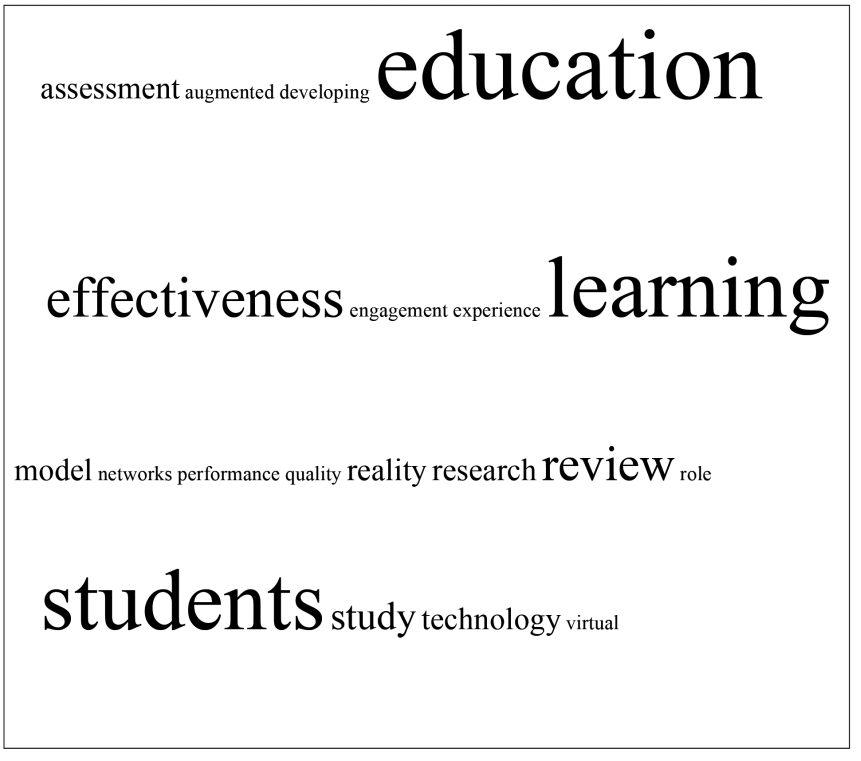
Computers & Education is noteworthy, with ten articles published, for being the journal in which the most quoted Spanish educational research is published; and for the peculiar fact the authors do not tend to work at faculties of education. *Computers & Education* therefore has an extensive and clear influence on educational research as a journal which receives a large number of quotations to studies with some authors based in Spain. This journal is, of course, found in the first quartile (Q1) in two subject categories: Education & Educational Research and Computer Science, Interdisciplinary Applications, and this position is a sign of the consolidation of an emerging research front: Education and Computing (Úbeda and Fernández-Cano, 2019).

The university of Alcalá de Henares (UAH) is also noteworthy as, despite its low productivity in the general ranking (32nd position), it stands out with three highly quoted articles. The first article on gamification has over 600 quotations with a yearly average of 66.2 quotations/year.

3.8. Inferring research fronts based on citation data

A cloud has been created with the twenty most used words in the titles of the most quoted articles (with at least 100 quotations); this cloud has been generated by the program *TagCrowd* which shows an interesting pattern that can be seen in Graph 4.

GRAPH 4. Word cloud of the most quoted (>100 quotations) terms included in the titles of the Spanish articles on educational research indexed in the SSCI database.



Source: Own elaboration.

There is a ranking in the terms used in the titles. On the one hand, we find very generic terms which have already been indicated in previous studies and with more of an influence, more dimension according to Graph 4: Education, learning, students, study, research, review. These terms determine a general research front. On the other hand, another more specific level shows hot research topics, such as augmented, networks, virtual reality, technology. These last terms are typical of the emerging front of Educational Computing. Another specific second front is that of Educational Evaluation, which is not emerging but constant, and is made up of topics such as effectiveness, performance, assessment, quality, experience, engagement. These are therefore the two main specific research fronts of Spanish educational research with the highest international visibility and impact in the 2010-2020 period opposite the general front.

4. Discussion

The results obtained allow for a general pattern to be inferred which is the fitting of Spanish educational research to patterns typical of the most advanced sciences. An optimistic view of this field is not therefore unfounded. Consequently, it may be stated that Spanish educational research is abundant, with a high citation impact6, fitted in terms of scientometrics and internationalist.

4.1. Conclusions and recommendations

After this third version has been written and taking into account the two previous versions, well-supported conclusions may be reached which make it possible to recommend some guidelines.

The highest-producing journals are primarily Spanish. However, as a *lingua franca* for scientific communication, English continues to be the language which has gradually prevailed in the scientific communication of Spanish educational research. Although Spanish journals continue to be published in Spanish, it is now common for articles to be presented in a bilingual publication; in Spanish and English, of course.

In the most recent time frame, international collaboration has extended to 37.3% of the articles indexed in the SSCI and this is mainly carried out with Anglo-Saxon universities and with countries which are close in terms of geography (Portugal) and language (Chile and Mexico).

Retrospective longitudinal analyses of the 2010-2020 period for both the production and citation variables indicate a growing trend which may be fitted to polynomial and exponential functions; a clear sign of the force of Spanish educational research.

It is confirmed, as was already expressed in a study prior to this one (Fernández-Cano, 2011) when it was stated that "the field of Spanish education continues to be extremely fertile and welcoming for other members and disciplines"; this example is from the world of Computing which has eagerly and productively considered problems in education, publishing in the journal *Computers & Education*, with highly quoted articles which determine an emerging research front, Educational Computing. These incursions would be unthinkable and intolerable in other scientific communities which are rather zealous about their scopes of activity. However, from the perspective of the field of education, as education is a field of study in which various disciplines advance quickly, these are considered fruitful visits which contribute to the positive transformation of this field. Educational Evaluation continues to be a specific research front, which is not emerging but constant, as well as general education.

4.2. Openings

In view of the huge production of Spanish bibliometric studies on education, it is recommendable to begin a summary with the bibliometric works available according to the recommendations and indicators offered by Fernández-Cano and Bueno (1999); rather, a third study in line with the work carried out by Fernández-Guerrero et al. (2020) with Spanish doctoral theses on scientific and medical information.

It would be recommendable to perform a retrospective longitudinal study to ob-

serve the citation of Spanish journals from the inclusion of the aforementioned in the SSCI database and its subsequent leap to JCRs. Likewise, enquiries should be made into how journals have stopped being indexed in the SSCI and no longer appear in the latest JCRs (e.g. Cultura y Educación).

This is where quoting Spanish works starts to be encouraged, which should perhaps be an almost patriotic duty. In other countries, such as the USA, Moed (2005) observed that academicians primarily quote their fellow citizens and not so many people from other nations, although it is a well-known fact that the number of American journals and journals written in English which are included in JCRs is higher than those published in other countries and languages.

It would be feasible to carry out additional studies parallel to this one in order to investigate publishers and funding bodies as regards Spanish educational research; a matter which is rather neglected as Spanish educational research has had very scarce, dispersed and limited funding. Without elaborating on more data in this respect, for this study it has been stated that 4980 records/documents, in other words 71% of the operating population have not received any funding whatsoever from the 1920 funding bodies included. Two funding entities stand out: the Government of Spain funded 588 documents (8.38%) and the European Commission made it possible for 290 documents (4.13%) to be funded. In terms of publishers, this is not a trivial matter as for some time now the purchasing and management of Spanish journals by multinational scientific publishing companies has been verified.

The performance of our illustrious scientists who publish in journals of the *Education, Scientific Disciplines* category of the *Science Citation Index Expanded* database should be investigated once and for all.

It would be advisable to perform more specific studies, which are highly necessary, that compare Spanish educational research to that which is carried out in other countries and disciplines; as is observed in a study on Spanish emergency doctors (Fernández-Guerrero et al., 2017).

Furthermore, given the significant progress in scientometrics and altimetry and the availability of powerful bibliometric computer packages (e.g. Bibliometrix and VOSviewer) it would be advisable to carry out studies on underlying structures, such as the various analyses of networks relating to authors, journals, institutions and terms, semantic maps, subject evolution, verbal analysis and co-citation. These advanced activities would be suitable for specialist scientometrics, however they would exceed the scope of this study and possibly the interests of the potential readers of this journal.

One last recommendation: readers should dispel their insidious belief, where this is the case, of a low quality of Spanish educational research, as this is unsupported.

Notes

[1] It would be relevant to make a distinction between scientometrics and bibliometrics. Bibliometrics concerns the measurement (*metrics*) of published products (*biblios*) in any format. Scientometrics is the measurement of any science achievement and its agents and institutions, including, of course, bibliometrics.

[2] The tension between specialists and non-specialists.

[3] Amounts with decimals have been rounded.

[4] Price (1986) predicted that all scientific production indicators (number of articles, journals, centres, researchers, etc.) tended towards a logistic model (similar to an S slanting to the right) with three consecutive phases: linear, exponential and logistic; constant and indefinite growth is therefore unacceptable.

[5] The Hirsch index is an eponym given to a scientometric indicator which combines productivity and citation data. A value *h* of this index indicates that a production unit (author, group, institution or country) has published at least *h* articles with at least *h* citations; in other words, this is the number matched by documents and citations. Although the success of the indicator has been questioned, it has resulted in the seminal article in which the indicator was set out (Hirch, 2005) obtaining 5444 citations (!) in the WoS until the start of January 2022.

[6] There has been a great deal of discussion about the validity of the citation indicator as a sign of quality as regards research. There is plenty of literature in this respect and the general conclusion that may be drawn from it is that citation has been accepted by the scientific community (Fernández-Cano, 2021); it has been validated through use.

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Authors' biographies

Antonio Fernández-Cano is a Professor at the Universidad de Granada in the department of Research Methods and Diagnosis in Education. His areas of research interest are research methodologies and evaluation, educational scientometrics and doctoral theses. Production indexed in the WoS: 44 documents with h index=10.

https://orcid.org/0000-0003-3991-4443

Alfonso Fernández-Guerrero is a self-employed architect and holds a master's degree in secondary education from the Universidad de Granada. His areas of research interest are educational architecture, hospital architecture and computer applications in education.

Differences in teachers' training in digital competence and its application in the classroom: A comparative study by educational levels between Spain and France

Diferencias en la formación del profesorado en competencia digital y su aplicación en el aula. Estudio comparado por niveles educativos entre España y Francia

Diego GONZÁLEZ-RODRÍGUEZ, PhD. Assistant Professor. Universidad de León *(diego.gonzalez@unileon.es).*
Agustín RODRÍGUEZ-ESTEBAN, PhD. Assistant Professor. Universidad de León *(arode@unileon.es).*
Héctor GONZÁLEZ-MAYORGA, PhD. Associate Professor. Universidad de León *(hgonm@unileon.es).*

Abstract:

In today's information society, digital competence is an essential tool in teaching and learning processes. The aim of this comparative study was to identify differences in initial and in-service ICT (Information and Communication Technology) training and in the use of these tools in the classroom between teachers in Spain and in France. Data from the OECD's Teaching and Learning International Survey - TALIS 2018, which collects information on different aspects of teacher training, were used for the analysis. After merging the databases, a final sample of 19,088 primary (ISCED 1) and lower secondary (ISCED 2) teachers was used. The results of this study showed parity in the level of initial training among primary school teachers and a lower level of initial training among Spanish secondary school teachers compared to their French counterparts. In-service

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training and application of digital resources and tools in classroom were significantly higher in the case of Spanish teachers. No significant variations were found according to years of teaching experience. It is concluded that there is a need to strengthen ICT training at the initial stage and modify in-service training in Spain so that it can lead to increased application of these tools in teaching and learning processes.

Keywords: ICT, digital competence, teacher training, teaching practice, information society, digital culture.

Resumen:

La competencia digital es, en el contexto de la sociedad informacional actual, una herramienta esencial que los docentes han de incorporar a los procesos de enseñanza y aprendizaje. El presente estudio se ha planteado con un carácter comparativo entre España y Francia, teniendo como finalidad la identificación de diferencias en la formación inicial y permanente en TIC (tecnologías de la información y la comunicación) y la aplicabilidad de estas herramientas en el aula entre los docentes de ambos países. Se han utilizado los datos de la Encuesta Internacional de Enseñanza y Aprendizaje – TALIS 2018 de la OCDE, la cual recoge información sobre distintos aspectos de la formación docente. Se ha trabajado con una muestra final de 19 088 docentes de educación primaria (ISCED 1) y educación secundaria inferior (ISCED 2). Los resultados han mostrado una igualdad en el nivel de formación inicial en esta materia en los docentes de primaria y un menor nivel de los profesores españoles de secundaria respecto a los franceses. La formación permanente y la aplicación de herramientas digitales en el aula ha sido significativamente superior en el caso de los profesionales españoles. No se encontraron variaciones relevantes en función de la experiencia docente. Se concluye que es necesario potenciar la formación en TIC en la etapa inicial y ajustar la formación permanente en España para que esta pueda materializarse en una mayor aplicación de estas herramientas en los procesos educativos.

Descriptores: TIC, competencia digital, formación del profesorado, práctica docente, sociedad de la información, cultura digital.

1. Introduction

Technological advances are causing major changes in contemporary society and have made digital competence a priority for society as a whole, one that requires people to acquire skills linked to the use of digital information and technological development (Castells, 2006; Castells & Himanen, 2016; Rodríguez-Esteban et al., 2021). This competence is a basic tool in twenty-first century society (Osuna-Acedo et al., 2018), and it has also become a clear indicator of employability (Martín et al., 2013; Rodríguez-Esteban et al., 2019) as, among other aspects, it provides individuals with skills for collaborative work or managing computer programs (Council of the European Union, 2014; European Commission, 2020a).

As a result, educational systems have made significant efforts to provide students with a response aimed at achieving this competence (Sánchez-Antolín et al., 2016). Current students will enter a job market where it is still not known what 90% of the jobs will be and where knowledge of computer skills will be required (European Commission, 2017; European Commission/EACEA/Eurydice, 2019).

This situation has been increased by the Covid-19 health crisis, which has caused changes that have a major effect impact at a global level, both in how people engage with work, confirming the vital need to be competent in any process that involves some degree of technology, and in teaching–learning processes (Asenjo Gómez & Asenjo Gómez, 2021; Babatunde & Soykan, 2020; Cifuentes-Faura, 2020; García-Zabaleta et al., 2021; OECD, 2020).

Two decades ago, authors such as Scriven (1994) and Perrenoud (2004) established different systems of teaching competences, covering aspects such as command of the subject, instruction and evaluation, continuous training, and teamwork in depth. It has become necessary to add digital competence to these systems (López Belmonte et al., 2019) since, as mentioned in the most recent European Commission (2020a) report on the European Higher Education Area, it is essential to take advantage of digital technologies to make progress in the teaching–learning process. For the European Commission/EACEA/Eurydice (2019), the challenge that instruction for digital training has posed for education has resulted in a need to provide strategies for Europe's educational centres that enable them to offer training that keeps pace with the speed of advances in information technology, thus avoiding a technological imbalance. Furthermore, acquisition of this competence must be considered in the initial university training stage for teaching professionals (Gabarda et al., 2021; Ottestad et al., 2014; Romero-Tena et al., 2020). On the other hand, the support of educational policies for in-service teacher training linked to the development and promotion of teaching as a career is regarded as fundamental (Arnáiz-Sánchez et al., 2021). This particular continuous learning over time is one of the most obvious indicators of the quality of teaching practice (Ministerio de Educación y Formación Profesional, 2019). The position of the Council of the European Union also follows these lines when considering "the training, recruitment and updating of teachers and trainers for the development of lifelong learning" (Council of the European Union, 2002, p. 2).

This study centres its analysis on a comparison of the situations of Spain and France, given the similarities between the two educational systems in regards to the integration of digital competence in the school curriculum in primary and secondary education (European Commission/EACEA/Eurydice, 2019).

In Spain, there are two distinct frameworks with regards to teaching competences. On the one hand, there are the ministerial orders that set out the requirements for verifying the official university

qualifications that prepare people to work as an early years teacher or primary education teacher. These insist that students on these courses must have a knowledge of and apply ICT in the classroom, and be capable of discerning which tools contribute to improved learning (Orden ECI/3854/2007; Orden ECI/3857/2007). It is, however, worth noting that Order ECI/3858/2007, of 27 December, Establishing the Requirements for Verifying Official University Qualifications that Entitle Holders to Exercise the Professions of Teacher in Compulsory Secondary Education and Baccalaureate, Professional Training and Language Teaching includes neither acquisition of digital competence nor the use of ICT in the syllabuses of the Master's in Teacher Training, with the exception of the specific master's that gives access to the educational guidance specialism (European Commission, 2021). On the other hand, Spain's National Institute for Educational Technologies and Teacher Training (INTEF) has published the Common Framework for Digital Teaching Competence. This establishes five dimensions of digital competence: information and information literacy, communication and collaboration, creation of digital content, security, and problem solving (INTEF, 2017).

In the case of France, digital competences are included in a generic teaching competences framework (Arrêté du 1 juillet 2013). Similarly, the Master's in Teaching, Education, and Training (*Master de l'enseignement, de l'éducation et de la formation*), which is a requirement for entering the teaching profession at pre-primary (equivalent to the second cycle of early years education in Spain), primary, and secondary stages includes in its content the use of ICT tools and digital resources applied to teaching and learning processes (Arrêté du 15 juin 2012). With regards to the continuous development of digital teaching competences, the European Commission/EACEA/Eurydice (2019) identifies three aspects to consider: in-service professional development activities with the aim of fostering teachers' digital capacities; self-evaluation tools for identifying teachers' learning needs; and professional networks dedicated to facilitating exchanges on the subject of digital education. Regarding in-service professional development activities, Spain offers online ICT training and learning experiences through INTEF and through the different training centres at the autonomous region level, while France's digital training for teachers is provided through the M@gistère platform. It is also worth noting that both Spain and France have networks of teachers – ConectaTIC and Viaéduc respectively – that enable them to interact and share their resources openly and securely (European Commission/EACEA/Eurydice, 2019). Finally, regarding evaluation systems in this framework, the Spanish Ministry for Education and Professional Training, through INTEF, has developed the Digital Teaching Competence Portfolio, which provides a tool for self-evaluation of the five dimensions of digital competence. Teachers in France can demonstrate their digital competence through an evaluation system put in place by the Ministry for National Education, Youth, and Sport by obtaining the C2i level two certificate (*Certificat Informatique et Internet*).

2. Objective

In view of what is set out above, we proposed this study, with the following objectives: firstly, to describe the differences between Spain and France in initial training in ICT applied to teaching according to educational levels; secondly, to analyse differences in in-service training; and thirdly, to identify differences between teachers from the two countries in the degree of use of these tools in the classroom. The three objectives were described independently for teachers from primary education and those from lower secondary. For the three objectives, we also analysed the potential influence on these variables of years of experience as a teacher.

3. Material and Methods

3.1. Data and participants

For this study, we used data from the Teaching and Learning International Survey (TALIS 2018). This is a large-scale international survey run by the Organisation for Economic Co-operation and Development (OECD). It describes the work of teachers and principals from educational establishments, collecting information on four fundamental areas of the teaching profession – basic knowledge and skills, the status and prestige of the profession, the collaborative dimension, and responsibility and autonomy – with the aim of contributing to the development of educational policies.

The study takes place every five years. Spain has participated in every edition of it. In the 2018 edition, which provided the data used in this study, 34 countries participated. In all of them, the questionnaire is completed by teachers and principals from compulsory secondary education centres. Some countries, including Spain and France, also took part in the survey for primary education. This multi-level perspective (data from ISCED-1 and ISCED-2) justifies the use of this database instead of others such as the Programme for International Student Assessment (PISA), the International Civic and Citizenship Education Study (ICCS), the Progress in International Reading Literacy Study (PIRLS), or the Trends in International Mathematics and Science Study (TIMSS), which only provide data on teachers at some educational levels.

Data collection was done over three months towards the end of the 2017–2018 academic year (Ministerio de Educación Formación Profesional, 2019). Once both databases had been merged (ISCED 1 with 51,782 subjects and ISCED 2 with 153,682 subjects) and the teachers from Spain and France had been selected, our final sample comprised a total of 19,088 subjects. Women made up 69% of the Spanish sample, which had a total of 14,653 teachers, while women represent 72% of the French sample, which comprises 4,435 professionals.

With regards to educational level, the Spanish sample in primary education included 7,246 subjects, with a mean of 16.9 years' teaching experience (SD = 10.3). In the case of France, there was a total of 1,429 professionals at this level, 87% of them women, with a mean of 15.4 years' experience (SD = 9.5).

In lower secondary education, the total number of teachers who answered the questionnaire in Spain was 7,407, with women representing 62% of the total. The mean years' of teaching experience in this case was 17.2 (*SD* = 10.1). In France, the total number of secondary teachers was 3,006, 65% of whom were women. The mean years' teaching experience was 16.5 (*SD* = 9.9).

3.2. Instrument and variables

The original English version of the questionnaire completed by teachers (Teacher Questionnaire) features 58 questions. The following segmentation variables were used for the comparative analyses: country, level (ISCED-1, primary and ISCED-2, lower secondary), and years' experience, which has been recoded into 4 bands.

We selected the following study variables. To describe initial training in ICT applied to teaching, we used variable TT3G06H1, which is covered by question 6 on the questionnaire (always using the Teacher Questionnaire in English as a reference): Was training in ICT applied to teaching included in the initial training stage? Continuous training in ICT applied to teaching is described on the basis of question 23 from the questionnaire: Were ICT skills for teaching included in your professional development activities in the last 12 months? This question corresponds to variable TT3G23E and, as in the previous case, has two unique values: Yes/No.

Finally, the extent to which teachers allow students to use ICT in class is described. Information on this is collected from variable TT3G24P, which appears in question 42 from the questionnaire: How often do you let students use ICT for projects or work in class? The variable includes four categories: never or almost never, occasionally, frequently, and always. For the comparative analysis by bands of years' experience, this variable was recoded into two large categories: a first one including the initial categories of occasionally and never or almost never, and a second one with the categories frequently and always.

3.3. Data analysis

Given the qualitative nature of the study variables, we used contingency tables to measure the association between the country and each of the stated variables. Each comparison was done independently for the two levels of teaching: ISCED-1, primary education and ISCED-2, lower secondary education.

We used χ^2 as a test statistic to describe the statistical significance, considering a significance level of $\alpha < 0.05$. To measure the effect size, the value of the phi coefficient was used in the 2×2 tables, and Cramér's V in the 2×4 table. To improve precision when reading the results, we added the values of the adjusted standardised residuals. This enabled us to check the statistical significance (values greater than ± 1.96) between the expected frequency and observed frequency in each cell in the contingency table (López-Roldán & Fachelli, 2018). All of the analysis was done using the SPSS v26 statistical analysis package.

4. Analysis and results

4.1. Initial training in ICT applied to teaching

Table 1 shows the results of the contingency analysis that enabled us to establish what training in ICT applied to teaching teachers receive in their initial training, comparing Spain and France. With reference to primary teachers, only 1 in 2 teachers in Spain received initial training in ICT for teaching. This figure is similar to the one observed in the case of France. In the case of secondary education, we found a statistically significant association between the country and the initial training received ($\chi^2 = 121.17$, $p < 0.000$) with a small effect size (phi coefficient=0.112). Only 39.6% of the secondary teachers in Spain received this type of training in their initial stage, compared with 51.9% of the French teachers, with a statistically significant standardised residual value of 11.3, which shows that there is a high difference.

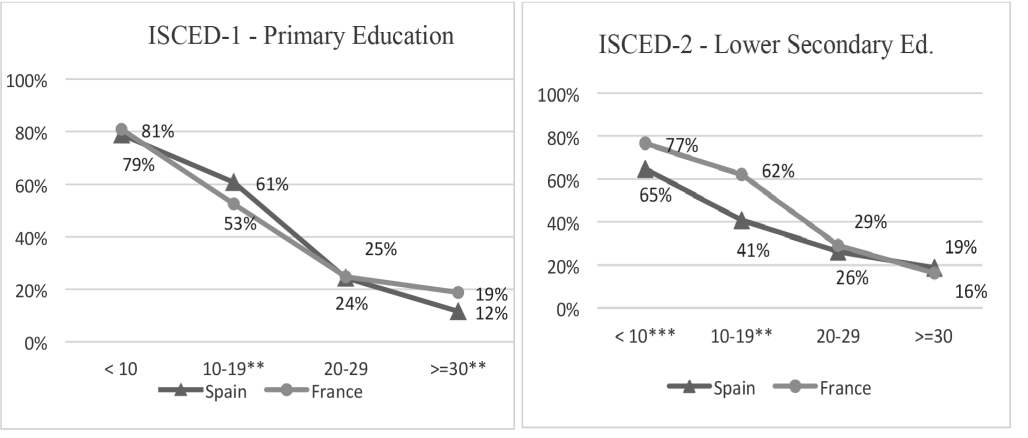
TABLE 1. Initial training in ICT for teaching by country and educational level.

	Primary		**Secondary**	
	Yes	No	Yes	No
Spain	50.1 % (-0.5)	49.9 % (0.5)	39.6 % (-11.3)	60.4 % (11.3)
France	50.8 % (0.5)	49.2 % (-0.5)	51.9 % (11.3)	48.1 % (-11.3)
	χ^2=0.266, p=0.635		χ^2=121.117, p<0.000; coef. Phi=0.112	

Note: For each cell, the percentage and, in parentheses, the adjusted standardised residuals, are given.
Source: Own elaboration.

Graph 1 shows independently the distribution of teachers who received ICT training in their initial training according to the bands of years of teaching experience. A decrease in the percentage of teachers who have received this training can clearly be seen as years' experience increases. Although this result is completely predictable, the comparative analysis by levels and countries makes it possible to identify several relevant facts. We observe a similar pattern of decrease in Spain and France in the case of primary education. Only slight differences were noted, albeit statistically significant ($p < 0.05$), in the 10 to 19 years' experience band with 61% of teachers responding affirmatively in Spain compared with 53% in France and the more than 30 years' experience band where the response pattern is inverted, with a more positive responses by the French teachers (19% compared with 12%). In the case of secondary education, more pronounced differences are observed in the two bands that correspond to a fewer years' experience. Of French teachers with under 10 years' experience, 77% have received this training compared to 65% of Spanish teachers. In the case of the 10–19 years band, the differences increase to 21 percentage points (62% compared with 41%).

GRAPH 1. Initial training in ICT by years' experience.



Note: Along with the labels for the intervals, the statistical significance of the differences is presented, where applicable, according to the following levels: **p < 0.05; and ***p < 0.000.
Source: Own elaboration.

4.2. In-service training in ICT applied to teaching

Table 2 shows the values that enable us to identify possible differences in ICT in-service training applied to teaching between the two countries analysed for each of the levels of teaching. This variable included the number of subjects who had (or had not) done professional development activities during the last 12 months on this topic. Important differences can be seen between the two countries, especially in primary education. More than 2 out of every 3 teachers from Spain (66.6%) reported having received this training in the last year. This figure is 32.7% in the case of the teachers in France. The differences are statistically significant ($\chi 2 = 537.959$, $p < 0.000$), although the effect size is not high: phi coefficient = 0.256. In the case of secondary education, the differences are also significant ($\chi 2 = 227.497$, $p < 0.000$) with a smaller effect size (phi coefficient = 0.157). Specifically, 68.8% of the Spanish secondary teachers did these activities, compared with 51.7% of the French ones. Analysis of the adjusted standardised residuals indicates that at this level the differences between countries, even though they are important and significant, are smaller than those found in primary education (15.1 compared with 23.2).

Graph 2 shows the percentages of teachers who did professional development activities in ICT in the two countries analysed by bands of years' experience. Considering both graphs simultaneously leads us to note that there is a similar answer pattern at both levels, with higher percentages of in-service ICT training in Spain than in France. The differences, which are significant in all cases, are more accentuated in the case of primary education. At this level, we found differences of more than 30 percentage points in all of the bands. These differences stand out in the group of teachers with between 10 and

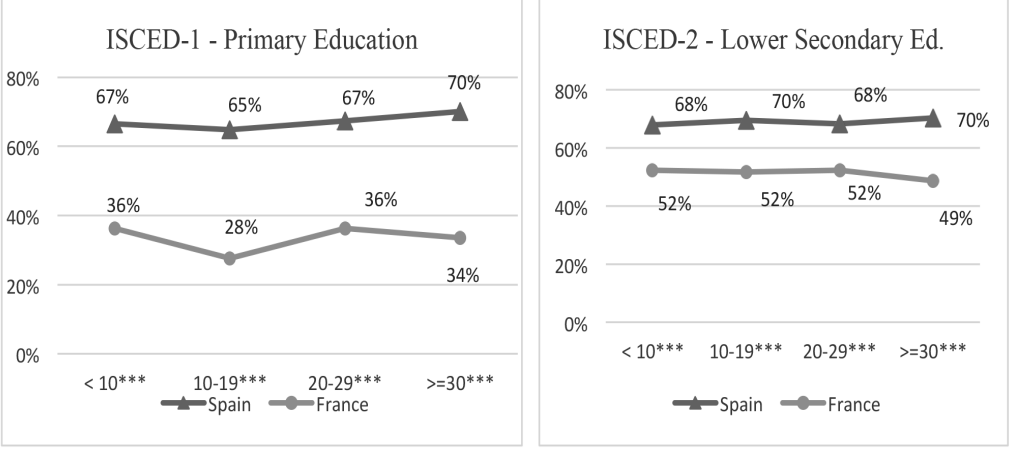
TABLE 2. In-service ICT for teaching training by country and educational level.

	Primary		Secondary	
	Yes	No	Yes	No
Spain	66.6 % (23.2)	33.4 % (-23.2)	68.8 % (15.1)	31.2 % (-15.1)
France	32.7 % (-23.3)	67.3 % (23.2)	51.7 % (-15.1)	48.3 % (15.1)
	χ^2=537.959, p<0.000; coef. Phi=0.256		χ^a=227.497, p<0.000; coef. Phi=0.157	

Note: For each cell, the percentage and, in parentheses, the adjusted standardised residuals, are given.
Source: Own elaboration.

19 years' experience, where the Spanish percentage is 65% compared with 28% for the French. The percentage is also more than double in the highest band, 30 years or more (70% compared with 34%). In the case of secondary education, the percentages in Spain vary between 68% and 70%, with small differences by years of experience, and are similar to those found in primary education. Nonetheless, a difference can be observed in the comparison with France, as there is a clear increase in the level of training of French secondary teachers compared with the primary ones, resulting in a fall in the differences with Spain. These differences, however, continue to be statistically significant. There are also no major variations depending on years' experience. The figures vary between 52% and 49%.

GRAPH 2. In-service ICT training by years' experience.



Note: Along with the labels for the intervals, the statistical significance of the differences is presented, where applicable, according to the following levels: **p < 0.05; and ***p < 0.000.
Source: Own elaboration.

4.3. Application of ICT in the classroom

The last block of this study is aimed at identifying any differences in the degree of application of ICT in the classroom. This variable is measured on an ordinal scale according to how frequently teachers allow their students to use ICT in their classes or work. As in the previous sections, independent analyses were carried out for primary and secondary teachers. At the first level, primary education, the largest concentration of subjects in Spain was found in the intermediate categories: occasional and frequently (41.6% and 32.4%, respectively). Significant differences appeared between the two countries ($\chi^2 = 756.457$, $p < 0.000$), with a moderate effect size (Cramér's V = 0.323). Looking at the standardised residuals makes it possible to state the direction of these differences and their meaning for each pair of categories. In the lower category, the differences are significant and high: only 14.8% of the primary teachers in Spain report doing this type of activity never or almost never. As Table 3 shows, in the case of French teachers, the percentage increases to 46.7% (value of the adjusted standardised residuals = 25.5). The direction of the differences is inverted in the case of the opposing categories, especially in the category frequently, where we find an elevated value of the residuals (15.1). The percentage of Spanish teachers in this category is almost three times that of French teachers (32.4% compared with 11.2%). In compulsory secondary education, the responses followed a similar pattern with teaching professionals in Spain making more use of these tools ($\chi^2 = 174.785$, $p < 0.000$) and with a low effect size (Cramér's V = 0.138), although the differences with the group of teachers from France were smaller, as the values of the standardised residuals show. We note the high and significant difference (value of the residuals = 8.6) in the higher category always. Some 16.6% of the Spanish secondary teachers were in this category, compared with 9.6% of the French teachers.

TABLE 3. Application of ICT in the classroom by country and educational level.

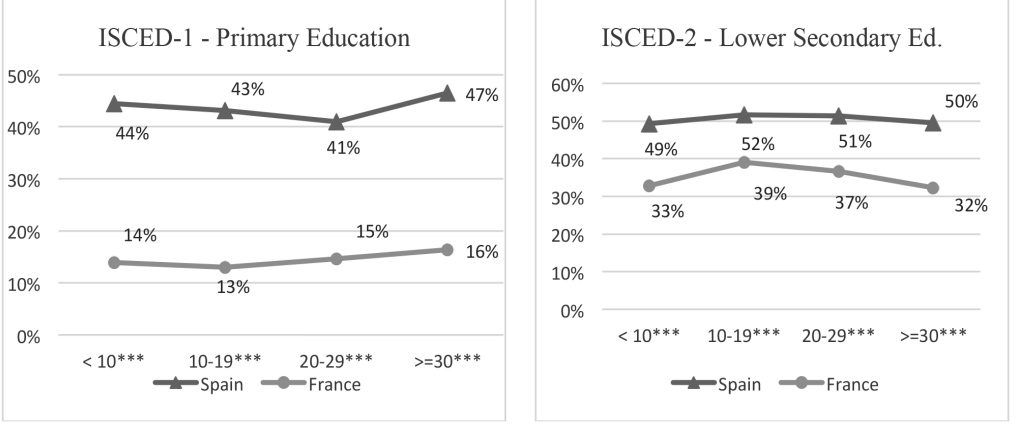
	Primary				Secondary			
	Never-almost.n.	Ocas.	Freq.	Always	Never-almost.n.	Ocas.	Freq.	Always
Spain	14.8 % (-25.5)	41.6 % (1.5)	32.4 % (15.1)	11.1 % (9.2)	12.3 % (-5.1)	37.0 % (-9.5)	34.1 % (7.2)	16.6 % (8.6)
France	46.7 % (25.5)	39.3 % (-1.5)	11.2 % (-15.1)	2.7 % (-9.2)	16.3 % (5.1)	47.8 % (9.5)	26.3 % (-7.2)	9.6 % (-8.6)
	χ^2=756.457, p<0.000; Cramér's V=0.323				χ^2=174.785, p<0.000; Cramér's V=0.138			

Note: For each cell, the values of the percentage and, in parentheses, the adjusted standardised residuals are given.
Source: Own elaboration.

Finally, Graph 3 shows the response pattern for this variable according to years' experience as a teacher. The values from combining the frequently and always categories are presented to give a better understanding of the graphs. In general, the overall differences between the two countries are maintained in each of the bands that define years of experience. In all of the bands described, and for both levels, the differences found were statistically significant ($p < 0.000$), with teachers from Spain displaying greater use of these resources. In the case of primary education, the differences were between 26 percentage points for teachers with between 20 and 29 years' experience, and 31 points in the group with 30 or more years' experience. Furthermore, it is notable that, in both countries, teachers with more years' experience use ICT more in the classroom: 47% in the case of Spain and 16% in the case of France.

The situation is similar in the case of secondary education: greater use of ICT by teachers in Spain is apparent in all age bands. The differences vary between 13 percentage points, in the group with 10 to 19 years' experience, and 18 points in the case of teachers with 30 years' experience or more.

GRAPH 3. Use of ICT in class by years of experience.



Note: Along with the labels for the intervals, the statistical significance of the differences is presented, where applicable, according to the following levels: **p < 0.05; and ***p < 0.000.

Source: Own elaboration.

5. Discussion and conclusions

This study centred on describing differences in ICT training between teachers in France and Spain in primary education (ISCED-1 level) and lower secondary education (ISCED-2 level). It also analysed the use in the classroom of these technological tools by these professionals. We used the data from the Teaching and Learning International Survey – TALIS 2018. This is a large-scale survey, coordinated by the OECD, which describes the work of teachers and principals from educational centres around the world. We worked with a total

of 19,088 primary and lower secondary teachers from Spain and France.

With regards to the first objective, describing the differences between Spain and France in initial training in ICT applied to teaching by educational levels, we have found that in general there is limited ICT training for teaching professionals, especially in teachers from lower secondary education. The Covid-19 health crisis has highlighted this shortcoming as it has obliged teachers to call on their digital knowledge, either through blended and online classes, or an endless list of tasks that had not required this digital competence to the same extent (Asenjo Gómez & Asenjo Gómez, 2021; García-Zabaleta et al., 2021). Furthermore, and as a predictable outcome, it was found that professionals with more years' teaching experience have less training. Regarding the difference between countries, we observed that while there are no significant differences between primary education teachers, differences were found in those from the lower secondary stage. Teachers from France received more training. This could be explained by the larger amount of pedagogical training that aspiring secondary education teachers in France have traditionally received compared to their Spanish counterparts (Manso & Valle, 2013; Rebolledo, 2015). Furthermore, at present the French Master's in Teaching, Education, and Training has a duration of two years (120 ECTS), while the Spanish Master's in Teacher Training lasts one year (60 ECTS), in any of the specialities (European Commission, 2020b, 2021). These results show that while the efforts Spain has made to adapt to the EHEA in regards to the inclusion of ICT in syllabuses have borne fruit in bachelor's degree qualifications (Herrada & Herrada, 2011), the qualifications that give access to teaching in secondary education are still likely to include a greater proportion of content dedicated to teachers' acquisition of digital competence.

The second objective considered differences with regards to in-service training in ICT. Approximately two out of every three teachers in Spain had carried out professional development activities in ICT applied to teaching during the year prior to the application of the survey, which demonstrates the high level of enthusiasm for in-service training among teachers in Spain (Rodríguez-Esteban et al., 2021). While the absolute figures are not very high, we found important and significant differences with the French professionals, especially in the case of primary education. In this sense, it is worth noting the backing that has been given in Spain to both INTEF (2017), as the official body responsible for teacher training and integration of ICT in non-university education, and to the specific teacher training centres in each autonomous region. To this, we should add that some autonomous regions have specific centres of resources and training of teachers in ICT. Similarly, years of experience do not seem to affect the decision to do training activities in this area, as very few differences were found, especially in Spain, according to the bands that defined this variable. These results, which point at the fact that professional practice is not an indicator that shapes

this training decision, are not in line with what was found by González-Vallinas et al. (2007). They analysed in-service training in a sample of 2722 secondary teachers and found that younger and less experienced teachers received more in-service training than those who were older and had more professional experience, as the latter group felt they had more baggage resulting from their everyday practice. Training in digital competence, along with other areas such as bilingualism, turns out to be one of the central foundations on which educational policies are based given its inclusion in syllabuses and its fostering in the context of lifelong learning (Escudero et al., 2018). Shortcomings in initial training of both primary school teachers and secondary school teachers (Tadeu, 2020), along with the constant evolution of technologies, mean that training in this field must always be present in teaching practice. We must understand that one of the principal motives that lead teachers to train continuously over the years derives from shortcomings in training in these areas of content and tools in their initial training (Gabarda, 2015), and we must also consider the economic incentive (financial rewards for hitting training targets over a six-year period) that teachers receive for doing a minimum number of hours of this type of training (Alfaro et al., 2014; González-Mayorga et al., 2017). This could explain the limited influence of years of experience on the realisation of these professional development activities.

Finally, in relation to the third objective, use of ICT in class, our results indicate that while its application is still not very high, with larger percentages observed in the occasional use category, teachers in Spain make significantly greater use of it than that reported by the teachers in France, in both primary and lower secondary education. Accordingly, we can consider different variables that affect this application of ICT in the classroom. On the one hand, teachers need to know how students use ICT and what they use it for, as this will help them identify the aspects that might have a greater influence on the learning process (García-Martín & Cantón-Mayo, 2019; Gutiérrez-Martín, et al., 2022). On the other hand, they must also take into account personal factors, especially teachers' beliefs and attitudes regarding these tools. The teachers who describe more positive attitudes towards new technologies are the ones who make the most and best quality use of them (Gargallo et al., 2006). However, there is a process of feedback here as it is precisely those teachers with more knowledge in this area that describe more positive attitudes towards it (Ramírez et al., 2012). In this sense, Hidalgo-Cajo and Gisbert-Cervera (2022) have studied a series of variables, including attitude and self-efficacy, that explain teachers' different motivations regarding the use of ICT. These variables give various profiles for teaching staff that can be grouped into two categories: on the one hand, those with less motivation for ICT training, that is to say, those who are reluctant to change their traditional methodology or find the change confusing; and, on the other hand, teachers with a more motivated attitude, as in the case of those who are convinced and innovative, who feel attracted towards in-ser-

vice learning and training in ICT. These profiles are also closely related to the role played by the technological development of the educational centre itself. It is clear that the provision of adequate equipment will enable teachers to incorporate these tools into their teaching schedules and classroom practices (Sánchez & Galindo, 2018; Sánchez-Antolín et al., 2016). This aspect is also related to another of the results found in our study, the slight tendency to use these tools to a greater extent in the group with more years of experience, a result also found by Area-Moreira et al. (2016). González-Vallinas et al. (2007) state, in this sense, that teaching staff with more years' experience tend to be found in educational centres with more material resources, which could explain the slight relationship observed between the two variables.

In conclusion, this study, which was proposed as a comparison, has shown that Spain must continue to enhance teachers' digital competence in the initial training stage, where the situation is more unfavourable, especially in lower secondary education. Although in-service training stands out as a strong point, it should be noted that to ensure the efficacy of this type of training and promote better development of digital competence by students (Wu et al., 2022), educational policies must make an effort to link this training to the educational situation (Escudero et al., 2018) so that it does not merely become a collection of courses for the purpose of accreditation. Various studies have noted teachers' dissatisfaction with the training they receive in this area as they believe that it is not well matched to the challenges of the twenty-first century (Alfageme-González & Miguel, 2017; Escudero et al., 2018; Guarro et al., 2017). Accordingly, various programmes and projects of recognised standing within the EHEA, such as Erasmus+, have done important work in studying digital competence centred on successful educational methodologies to favour the teaching and learning process in educational centres, with the aim of enhancing this training and reducing teachers' dissatisfaction with it (Alonso de Castro & García-Peñalvo, 2022).

Despite the representativeness of the large sample in this study, we believe that one major limitation of this study is the difference in sample sizes between the two countries, with the number of participants in Spain being notably larger. Another important limitation is effect size, as on the whole, small effect sizes were found. However, when used with large samples, low effect sizes can be found in statistically significant associations (Fidler et al., 2005). As future lines of research, we firstly propose the use of validated instruments that make it possible to describe with more precision the situation regarding knowledge and use of digital tools (Tourón et al., 2018). We also propose an analysis of teachers' participation in the new in-service training options, among which MOOCs (Massive Online Open Courses) are particularly notable as they offer advantages such as generalisation at a global level or the possibilities for interactivity (Atiaja & García, 2020) and are not as closely linked to processes of formal recognition or accreditation.

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Authors' biography

Diego González-Rodríguez holds a PhD in Educational Psychology and Educational Sciences from the Universidad de León. He is an Assistant Professor in the Area of Research Methods and Diagnosis in Education. His research focuses on school dropout and academic performance during the transition from primary to secondary education, as well as on teaching competences. He is a member of the ÉVORI research group (https://www.evori.net).

https://orcid.org/0000-0001-7584-9103

Agustín Rodríguez-Esteban holds a PhD in Psychology and Educational Sciences. He is an Assistant Professor in the MIDE area at the Universidad de León. His main lines of research focus on the acquisition of competences, studies on higher education and employability. He has participated in several projects funded by the European Commission. He is a member of the ÉVORI research group (https://www.evori.net).

https://orcid.org/0000-0002-7409-5976

Héctor González-Mayorga holds a PhD in Educational Psychology and Educational Sciences from the Universidad de León. He is an Associate Professor in the Area of Research Methods and Diagnosis in Education, and Primary Education Teacher. His research focuses on the impact of large-scale assessments of the education system (PISA and TALIS) and on initial and in-service teacher training. He is a member of the ÉVORI research group (https://www.evori.net).

https://orcid.org/0000-0003-1161-1694

Book reviews

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Book reviews

Gargallo, B., & Pérez, C. (Coord.) (2021). *Aprender a aprender, competencia clave en la sociedad del conocimiento. Su aprendizaje y enseñanza en la Universidad [Learn to learn, key competency in knowledge society. The way in which it is learned and taught at university].*
Tirant Humanidades. 454 pp.

The book that I present, in good taste undoubtedly reflects the work and recent research coordinated by Bernardo Gargallo and Cruz Pérez, colleagues of the Educational Theory Department of the UV, and I am also bound by a friendly relationship and admiration for their career and the way in which they understand their (our) profession.

I will not begin by summarizing parts or chapters of the book: this has already been magnificently set out for you in the brief introduction. I will deal with other aspects, starting with the context of the book, which will give way to a reading or interpretation of some of the main ideas. The "learning to learn" (LtL) competency in higher education is the central theme of the book, the result of a research project which is also jointly supervised by the coordinators. In this respect, the book is a joint proposal in which numerous researchers of the project from three Valencian universities are involved as co-authors: the Universitat de València, the Universidad Politécnica de Valencia and Universidad Católica de Valencia.

I would like to begin, if I may, precisely with the conceptual issue which is the basis of the book, the definition of a new competency to encourage among university students: this must be competent (skilful, knowledgeable, predisposed, committed, etc.) in these processes and actions understood as "learning to learn", such an interesting competency which is necessary in societies such as the one we live in. However, is this a roundabout expression, a free periphrasis? Would it not be enough to learn, therefore, in every sense of the word? Not exactly. The book goes more deeply into special and even innovative learning in the university sphere. It shows,

therefore, clear support for autonomous and active learning led by the students themselves, as they are ultimately responsible for the professional activity for which university prepares them at an administrative level. Thus, LtL is a type of culmination of the enlightened sapere aude project, to dare to know and think, to know by thinking and also by acting: knowledge for action and from action. In other words, contemplative yet practical knowledge, in any case critical: "thinking without a banister", as Hannah Arendt would later say, without anyone from outside always having to tell you what you must do, say or feel, therefore without obliging directions (manipulation) or external protection. After all, as proclaimed by Kant in the last third of the 18th century, this was precisely the motto of Enlightenment: the impetus for the autonomy of individuals and people, typical of societies which are not enlightened as such, but in a dynamic and unfinished process of enlightenment. Prepared, we could say, to learn how to improve learning in life, economy, research, public organisation, etc. Societies which have allegedly learned everything already, which say they have achieved the most sublime interpretation of almost everything, are not enlightened societies, but obliging if not doctrinaire societies and therefore anti-enlightened. Given our postmodern condition, as stated by Lyotard, do we currently find ourselves in this obliging state, in a society of empty knowledge? Does the new wave of impassioned proclamations at a differential, identifying, national and other levels respond, a new anti-enlightened creed, reluctant to open learning which is able to rethink itself, audacious enough to do so? Is audacity dying due to critical, self-critical knowledge in narcissistic consumer societies or any societies which again see salvation in ethnic or national purity? Is any group which is willingly subjected to the fiery speeches of new redeemers (those of economic growth at any cost, those of America First, those of new technoscientific and transhumanist utopias, etc.) capable of learning to learn?

Returning to our scope, following the inrush of LtL, doubts have been raised about purely mechanical, we could say educational, learning. As the aforementioned is important, it does not affect the core of what real university education should be as preparation for good professional activity. This essence is therefore found in a new type of teaching and learning based on significant, critical and self-critical learning, and on the flexible, autonomous and renewed implementation of this learning. In the "capability of people to educate themselves, to adapt to new situations and problems, to continue learning throughout their lives" (p. 33). The key of this competency, without explaining what it applies to and how, is adaptation and transfer. Its vagueness is precisely the root of its ambiguity and also its strength.

However, expressing, as is done at the start of the book, a competency-based education model (in this case that of learning to learn) calls for some questions to be asked on this model, brought

about by the same appearance of the LtL which is understood, in this way, as "competency". Chapter one of the book deals with the polysemic and rather controversial nature of the term "competency", and it is therefore necessary to clarify the concept. Thus, the competency model was described directly in the university reform at the end of last century, with the creation of the European Higher Teaching (or Education?) Area. It seems that this way of understanding the LtL competency was the leitmotiv of the aforementioned reform, as included in the Tuning Project, carried out by 100 European universities in order to redefine and develop the curricula, respecting the autonomy of each university but above all coordinating common elements in line with the spirit of the Bologna Process. The project shows the importance, in a knowledge society, of lifelong learning and of the development of "competencies to access information and knowledge, to use it according to the established purposes, in order to update it, to learn continuously, to understand what is being learned and to be able to use this in various contexts and situations of a changing reality" (the words in italics are our own) (p. 20).

However, what is the aim of this? Be competent in order to achieve the "established purposes"? The growing internationalization and technologization of economies and societies calls for constant changes and adaptations, flexibility among employees and new focuses in the organisation of companies. Ultimately, "the knowledge, capabilities and attitudes of the workforce represent a key factor for innovation, productivity and competitiveness, and contribute to the motivation and to the professional satisfaction of workers and to the quality of work" (p. 20).

Based on these statements, we may suspect that the new competency developed in the book is strictly due to these established purposes which are alluded to, or in other words, due to the purposes and the values of a technocapitalist economy, in which, speaking of a knowledge society may be seen as a joke in very poor taste. Rather, a surveillance society, in the words of Shoshana Zuboff, or societies of owners which, according to Thomas Piketty, justify and explore inequalities, may be discussed. This has certainly been one of the major accusations made against the EHEA and particularly against the Tuning Project, especially from the philosophical point of view of the basic human capabilities of Martha Nussbaum, or the economic perspective for Human Development according to Amartya Sen (a perspective which supports the United Nations Development indicators, beyond the GDP dogma within the framework of a more ethical economy).

Nonetheless, this suspicion dissolves throughout the chapters, where the new interpretation of learning to learn injects a new meaning into the competency model in university teaching. For example, in chapter two the idea of being competent is reinterpreted in such a way which includes critical thinking aimed at new purposes, which today prevail as a result of

the excesses of an unbridled economism. These new purposes speak of the unavoidable need to move towards social, economic and ecological sustainability, the International Sustainable Campus Network, the SDGs, the competency for justice and ethical responsibility, etc. within the framework of the United Nations 2030 Agenda. And in chapter three, revising the theoretical grounds for LtL, the heart of its new semantics is dealt with, even on the part of the European Commission in 2018; on this basis, it is preferred to talk about "personal, social and learning to learn competency" in a clear attempt to include cooperative, social and ethical aspects in this vital learning.

The rest of the book very successfully follows this path. New construction-implementation-evaluation models for LtL in Higher Education are set out and detailed: from the resource to discussion groups to redefine the aforementioned, or the preparation of a questionnaire to evaluate it, to the proposal of methodologies for its implementation: Cooperative learning, project-based or problem-based learning, service-learning, online forums and social network analysis, practical simulation method, etc.

In short, the invitation to the sapere aude from the university must be reinterpreted in no other way than in the heart of (supposed) knowledge societies, which are globalised, technological, free or not so free, convulsed and, oh, still unacceptably unequal like our own.

Vicent Gozálvez ■

Domínguez Garrido, M. C., López-Gómez, E., & Cacheiro-González, M. L. (Coords.) (2021).

Investigación e internacionalización en la formación basada en competencias [Research and internationalization in competency-based education].
Dykinson. 283 pp.

Nowadays competencies are an essential mainstay in all education systems around the world, insofar as they involve a use of knowledge which goes beyond memory content and is also applied in problem-solving. According to the current pedagogical trends, these competencies must play a key role in the school setting and they must therefore be researched in detail on an international level in order to raise awareness of their scope and efficiency in a world which is constantly changing. The book Research and internationalization of competency-based education, coordinated by María Concepción Domínguez, Ernesto López-Gómez and María Luz Cacheiro-González, does a thorough analysis from different perspectives and covering various areas of learning in relation to the importance of competencies. Furthermore, researchers from 7 different countries have been involved in preparing this study, meaning that international data and views have also been provided.

The book is organised into three sections, which make up 13 chapters in total; all are written in Spanish except for two, which are in English. The first section is composed of three chapters which aim to guide, contextualise and provide the reader with a definition of the competen-

cy concept and its meaning and use in a world which is constantly changing. The second section has 5 chapters and looks into competency research itself. It focuses on aspects such as planning, statistics in the digital-teaching field or social education and its relationship with play-based learning; it also ends with a practical and holistic example of STEM Education. Lastly, the third section is made up of five chapters which centre on competency-based education at different stages of school (early childhood, secondary, placement, university, university lecturing and educational research).

Therefore, chapter one goes into more depth about the competency concept and the way in which it is implemented and functions in curriculums in the school environment. Furthermore, a brief but enriching analysis is carried out on the contexts and possible cultural frameworks in order to help readers understand competency-based education. Two main approaches are focused on: human capital and human development.

Subsequently, chapter two makes a necessary and appropriate reflection on the relationship between three key aspects: needs and requirements of a constantly-evolving society, school curriculum and characteristics of academic learning. In accordance with what is set out, although it is true that these elements may, and, in fact must, be combined, this is not always possible on a practical level regarding education. This may be due to several reasons, such as a curriculum which does not consider significant social changes, the difficulty of fitting everything into a relatively short space of time, lack of communication among educational institutions, etc. Therefore, considering and analysing competency-based learning is of vital importance, and teachers play a key role in obtaining new generations of motivated and independent individuals who are adapted to the future.

Very much in line with this last point, chapter three expands even more on the information about the very changeable and informational world that we live in. Thus, it defends a competency approach and multidisciplinary and systemic learning in which aspects such as commitment, education or teaching are linked by literacy. Furthermore, this is illustrated by a student model on which research is carried out at a centre of the University of Oviedo. The aim of this is to achieve active and committed participation, from natural and social environments to political and technological settings, through the use of the continuous and dual education of ecosystems.

The following section introduces this in chapter four, focusing on the importance of competency planning in education. It pays particular attention to two years: the last year of secondary/Bachillerato and the first year of university, given that these are fundamental in guiding young people and preparing them to develop academically as they finish one year and start another, in which high levels of maturity and coherence are now significantly reached. All of the aforementioned is illustrated by an in-depth study, and the importance of

competency-based education is once again stressed for both students and teachers.

Chapter five sets out a series of conclusions and bibliometric statistics after analysing almost 300 international studies on teacher digital competency, which is essential for today's world. Productivity, collaboration, content and impact are the four indicators on which this competency is based. Although some countries have advanced a great deal and experienced significant exponential growth, it is still clear that there is not enough training on this digital competency for teachers, and the aforementioned are encouraged to keep making progress in the coming years.

Chapter six goes into even more detail about digital competency however, in this case, in relation to the training of social educators. Following a study carried out with around 800 participants, relevant data were observed in order to understand the current outlook of their training. On the one hand, the participants stood out as observers of content, where virtual tutorials obtained a high score and, on the other hand, they got rather low results when asked about their contributions or creation of suitable digital materials for the professional field. Conclusions are therefore reached which are similar to those in chapter 5, and the tools and resources are encouraged to be given in order that new generations of social educators may be trained with full digital competency, in accordance with modern times.

Chapter seven makes a clear distinction between Gamification and Play-based Learning and defends the use of both in order to improve competency-based education, given that its implementation in the field of education is showing promising results. These signify another way to improve competency education, like technological education, by means of the countless resources that may help to encourage creativity and digital development in classrooms.

Furthermore, chapter eight very clearly sets out the need to promote STEM education, which boosts and empowers sciences and new technologies. This chapter therefore includes an example called StartlearnING, which aims to develop these competencies in full. This proves to be a very promising method, the holistic implementation of which brings about significant changes and improvements in motivation, commitment, problem-solving processes and technological-scientific knowledge among both students and teachers.

Chapter nine deals with the need to pedagogically analyse, from early childhood, the cultural and diverse framework in which we find ourselves. It defends the correct definition of competencies and an up-to-date learning method from the beginning, which makes it possible to take in all of this diversity and offer the same opportunities to boys, girls and families.

Chapter ten is focused on the role of the Teacher Training Master's Placement as regards learning and properly understanding the way in which a competency-based education works. Various research on this

area is analysed throughout the chapter, and constant, free-flowing and appropriate communication is particularly emphasized, in addition to the participation of various representatives of the Placement in order to achieve proper competency-based training for new Secondary Education teachers.

Towards the end of the book, competency training of future teachers is explored, not only in relation to typical competencies of teacher development, but also those which must be applied with students. Future teachers must be taught a series of competencies which allow them to give their full potential when teaching, while being aware of their importance, which include methodological, communicative and digital competencies, without forgetting the capability to assess, plan and deal with cultural diversity, etc. In short, this chapter offers an enriching analysis and an in-depth reflection on these aspects and competencies themselves which must be looked at more closely in the training of future teachers.

Chapter twelve puts special emphasis on a narrative review carried out at an international level in order to analyse the role and training in teaching competencies among University lecturers, focused on an international level. The outcome of this is particular attention being drawn to the difference between formal and personal competencies. Formal competencies reflect knowledge and the way in which it is passed on through a certain methodology, while the latter refer to the more ethical side, as well as a closer relationship between teachers and students.

Lastly, the final chapter makes an analysis of the competencies to be promoted in the area of research and outreach. These competencies are of vital importance, not only to guarantee reliable and quality science, but also to introduce them and encourage their daily use in various educational institutions so that, starting with research, the best competency-based training may be achieved at all levels of education.

In conclusion, this is a book that must be read by researchers in the field of education and, in general, by anyone whose main everyday activities involve educational work. Together with the content set out, the text provides an international and current perspective, with a well thought-out and coherent structure, which is accessible and permits swift reading. Undoubtedly a sound contribution to the field of contemporary didactics.

Paula Álvarez Urda ■

Martínez-Otero Pérez, V. (2021).
La educación personalizada del estudiante [Personalized education of students].
Octaedro. 191 pp.

All education has two functions: human development and meeting social needs. This complex task involves a form of education which constantly seeks human dignity, in which an in-depth knowledge of students and an acceptance of individual differences are considered, beyond the concern for academic achievement. In keeping with this laudable ob-

jective, the book Personalized education of students, by Valentín Martínez-Otero Pérez, does a thorough analysis of matters relating to the personalized education of students, focusing his attention on adolescence, as a crucial period for human development with specific educational needs. From a perspective of integration, in this publication the author takes significant scientific and humanistic approaches based on various conceptions regarding education, document review, educational experience and research at an international level.

This is a work which is ultimately aimed at the individuals who play a key role in improving education: people in charge of education, teachers, families and specially the students themselves. As such, the work is set out in a modern format which, following years of study and research carried out by the author on this subject matter, also considers the impact of the coronavirus (SARS-CoV-2) pandemic on the field of education, as well as the challenges that this unusual and unexpected health crisis has instilled on education around the world. In these circumstances, there are people who strive to study and others who are trying to teach. However, the digital, social and economic divide has also become clearer. In addition to the psychological impact that lockdown itself has brought about and which combines with the impact already seen. It is therefore extremely useful to read this book in order that the academic community which is interested in improving education is able to minimize the consequences of this impact as much as possible by means of the data, reflections and recommendations presented by professor Martínez-Otero.

This commitment to improving education involves a significant and radical change, as in addition to meeting current social needs, the teaching and learning process is aimed to be adapted to the interests and needs of learners for the harmonic development of their personality. Thus, with a holistic view of the education process, the work is organised into three topics to help readers understand matters relating to the personalized education of adolescents. In this regard, by means of an introductory chapter, the philosophical foundations for individuals and the way in which these affect education are established. Afterwards, the author focuses on adolescent psychology and, furthermore, on the pedagogy of affectivity and on the implications on education resulting from the connection between intelligence and affectivity. Lastly, teacher training is set out as a significant element for the personalized education of adolescent students. Although this last point seems an ambitious and exhaustive task, from a humanist perspective, professor Valentín Martínez-Otero manages to split the various key topics into the seven chapters that make up the book. Each one deals with the current educational challenges that call for a change in education culture, demanding that education be personalized.

As the main approach of the work, the first chapter of the book deals with the attention to individuals from a humanist point of view, integrating their essence and their existence. Based on humanist

pedagogic grounds, authors such as Víctor García Hoz, the author of this work, emphasizes the humanizing/personalizing nature of education, in addition to considering the commitment of pedagogy to personal improvement, to happiness, to love, to freedom and to community. These aspects, as a whole, are of an introductory and fundamental nature in order to cover the other chapters.

In chapter two, professor Martínez-Otero focuses on adolescence, considered a special stage characterized by significant changes and therefore with specific educational needs, therefore emphasis is placed on its biological, psychological and social aspects, in order to offer some guidance to teachers, to education professionals and to the students themselves so that adolescents have the best school and life experience possible.

Furthermore, chapter three provides a series of conceptual reflections on affectivity, which is essential for the development of young people, and the main affective experiences are covered in this field: emotions, feelings, passions and motivations. The systematization of the aforementioned has a significant effect on optimum learning, healthy relationships and the personal well-being of students.

Chapter four is in keeping with the previous chapter, as it focuses more closely on matters related to self-esteem and self-concept, based on the recognition give to the relevance of dealing with these concepts from an educational perspective, by means of emotional education. With this in mind, the role of the teacher is underlined as a significant element in the appropriate development of students, the display of which has a positive bearing on the social relationships and the academic performance of the aforementioned.

Subsequently, chapter five does a thorough analysis of the connection between intelligence and affectivity. In accordance with the main objective of the book, as stated by professor Martínez-Otero, the most important thing is to bear in mind the complex link between cognitive and emotional processes, as well as the need to keep clarifying these links. The author therefore considers the concept of "affective intelligence", based on the line of research that he himself has been developing for decades, in order to offer some guidelines from these approaches which are aimed at teachers and drive healthy professional development, the appropriate course of which intends to contribute to the personalized education of students.

In addition to these points, chapter six covers the current problems caused by adolescents' inappropriate and excessive use of the internet (cyberaddiction and cyberbullying) which call on the educational communities, including parents, to take preventive measures. In this respect, guidelines are given for appropriate use of the internet from a perspective of dialogue and commitment to integral education.

Lastly, chapter seven defends teacher training beyond the technical aspects,

while considering the cognitive and axiological dimensions of the aforementioned. To this end, the author makes some notes on five models which may be used in the organisation of teacher training. Personalized education indeed requires teachers to be trained in order to offer means to students so that, both in and out of school, they can face the challenges and demands of an interconnected and globalised society like that in which they happen to live.

All in all, this book is a significant formative and informative resource which states the relevance of personalization as a pedagogic conception, particularly in adolescence so that, beyond teaching techniques, the individual needs of students are considered, from a perspective of diversity and meeting the demands of today's society. This is an inspiring work which successfully puts across its strong and hopeful message of improving education by means of personalizing education. If it could be summarized in just one quote, perhaps the words of professor Martínez-Otero in chapter one would be the most suitable:

> Real pedagogy demonstrates its commitment to improving human life, to its perfection. Its increasing efforts emerge from a healthy optimism, a necessary trust in the possibilities to develop. People are not perfect, but they are perfectible. The coordination between science and ethics offers a sound platform for all educational theory. Without the concurrence of rational and axiological elements, the pedagogic discourse will end up dying out and, of course, may not encourage personal development (p. 31).

Martha Leticia Gaeta González ■

Pérez, C., & Asensi, C. (2021). *Cómo crear un clima de aula positivo. Actividades y técnicas de intervención. [How to create a positive classroom environment. Intervention activities and techniques].* Desclée de Brower. 211 pp.

From nursery and primary school to the highest levels of the education system, it is essential that students feel safe and comfortable. How students feel in the classroom determines the way in which they develop social bonds with their classmates and teachers. Teachers must therefore know how to organise the classroom, helping to create and maintain an environment which favours the school community and daily learning. In fact, research shows that the classroom environment has an influence on learning environments, therefore affecting the perception of students and teachers, their interactions, their emotions, the sense of belonging to the educational community of a school and other factors which are important for academic success.

Despite the benefits of having a positive classroom environment, there has been a growing concern in recent years to obtain a good school community. It is true that complicated situations at school are nothing new, but lately we have managed to draw more attention to bullying, disrespect for classmates and teachers, certain irresponsible behaviour or damage to equipment and facilities. These types of problems related to community have a negative effect on pupils, who end up having difficulties in establishing and developing interpersonal relationships.

It is therefore necessary to know how to create and maintain a positive classroom environment. Not just that, but also how to make this environment reach the whole educational community of a school. The book Cómo crear un clima de aula positivo [How to create a positive classroom environment] reveals how this can be achieved based on a wide range of intervention activities and techniques.

Something that makes this book valuable is that it was written at home during the months of lockdown caused by the COVID-19 pandemic. This forced break, which suddenly appeared in the middle of the fast pace imposed on us by modern life, allowed a married couple who are teachers to stop and read, think, compile materials and take their time to write about the most relevant points of the experiences built up throughout their careers at all levels of compulsory education.

There are, of course, more books on the market about school community which deal with the classroom environment, but this one is special. It is not common to find material published by authors who share techniques that have continued to work for them for a long time, and even less so when this experience has often been reconsidered at home, beyond the professional environment. I believe that the best way to assess the book is to think about who wrote it and why they decided to do so.

Throughout his career of 40 years, Cruz Pérez Pérez has given classes at all levels of the education system, from nursery education right up to doctorates. The aforementioned has worked as a primary school teacher, secondary school teacher, in school psychopedagogy services and as a lecturer in the Educational Theory Department of the University of Valencia. Carolina Asensi Cros has worked for 37 years as a primary school teacher, always showing an interest in educational innovation and experimentation of new learning models in the classroom. The aforementioned has consequently received three prizes for educational innovation from the Generalitat Valenciana throughout her career.

The book begins by explaining the type of educational environments that help students to develop attitudes and behaviours which are positive for learning. Initially, it was considered that teachers were the only people responsible for generating and maintaining this classroom environment, but with the educational paradigm focused on learning, students also started playing their part. This involved teachers establishing ways for everyone to express themselves and get involved in building the community classroom environment. Chapter 3 is therefore devoted to the learning of democratic norms, which must be laid down by consensus and with guidance from the teacher.

From Chapter 4, the authors start to set out a range of techniques for various levels of education and even for different situations. The reader will find activities for nursery classrooms, where the youngest pupils set their own rules, and also for organising group communities in primary or secondary education. The material includes techniques to help

teachers coordinate with each other and better control the learning environment of students, particularly from the stages when children start to depend less and less on their teacher.

When the community classroom rules are laid down clearly and precisely, children and adolescents have a reference which helps them to know how they must behave and students rarely have to be punished for seriously breaking these rules. However, sometimes there are groups in which the sense of community is a lot worse and this ends up making students feel less comfortable, therefore having a negative effect on their learning process. Chapter 9 is exclusively devoted to offering ways to deal with these situations in which it is more difficult to create a positive community environment. Here the authors propose a model which calls for strict control of the learning and community environment, at least as a starting point, until the situation improves.

There are also activities for the home environment, as well as for primary schools or high schools. Mums and dads will find material in Chapter 10 useful to develop a democratic parenting style, and teachers will be able to get interesting ideas in order to guide families in this respect. Afterwards, there are two chapters which are mainly devoted to conflict resolution in schools. One of these chapters looks for positive ways to solve problems in the classroom and the other provides school mediation techniques for any conflicts which have an effect on the community, even outside class.

The book ends with a final chapter on the assessment of the community environment. The aim of this chapter is to keep track of the classroom environment in order to ensure it remains positive. The section starts by clarifying how and why a diagnosis of the current situation of the classroom must be made, and it then sets out several assessment tools. Ultimately, what makes it possible to maintain a situation which is suitable for getting on and learning in class is the perspective that we end up reaching with appropriate tracking, which makes it possible to predict conflicts and prevent them in time.

This publication is part of the Learning to be collection of the prestigious Desclée De Brouwer publishing house, which aims for values to be learned. The publishing house has been running for more than seventy years and specialises in pedagogy and psychology books, as well as other social disciplines, and therefore provides consumers with certain quality guarantees. This volume in particular is a work specifically aimed at nursery and primary school teachers, and secondary and higher education teachers. It is therefore considerably valuable for vocational training and university students who are learning about subjects related to the world of education, particularly if they intend to work as primary or high school teachers, pedagogues, psychopedagogues or social educators.

Furthermore, families of children and adolescents enrolled in any level of compulsory education may get useful ideas which help them to bring up their children.

School management teams will also find this book interesting, as one of their aims is to provide a positive and widespread environment in which everyone gets along in the educational community of their school. In short, it may be said that this book is very practical and useful for all education professionals, with verified ideas and material which have proven to be effective in various learning environments.

Fran J. García-García ■

Call for papers for a monographic issue about: "A renewed character education following the pandemic and the invasion of Ukraine"

We will observe the next December 10, 2023, the 75th anniversary of the Universal Declaration of Human Rights, which has been of great importance around the whole world, having a significant influence (although not always with the desired force) on the establishment of political systems which use this Universal Declaration as a reference point for their national policies.

There is no doubt that in our area of knowledge, article 26 is of particular importance. This has served as inspiration for numerous Constitutions, such as that of Spain. This article reads as follows:

1. Everyone has the right to education. Education shall be free, at least in the elementary and fundamental stages. Elementary education shall be compulsory. Technical and professional education shall be made generally available and higher education shall be equally accessible to all on the basis of merit.

2. Education shall be directed to the full development of the human personality and to the strengthening of respect for human rights and fundamental freedoms. It shall promote understanding, tolerance and friendship among all nations, racial or religious groups, and shall further the activities of the United Nations for the maintenance of peace.

It is evident that from the whole article, point 1 has had the most success: for example, it may be pointed out that in Spain, 17% of people were illiterate in 1950 and this figure dropped to 1.56% in 2020.

Nonetheless, it is debatable whether point 2 has had the same success. Indeed, this section is completely unconnected with any economistic flavour. Nowadays, however, when what is repeated most is employability, the statement that the basic education goals must be found in personality development and in the fostering of attitudes in relation to respect, understanding, tolerance and friendship is striking.

This call for reflection on the basic education objectives has in recent years had a clear impression on defending the character education of the young generation, as an essential goal in the activity of teachers, which must be considered by all. This is because good character directs

us towards a more humane world in which money is not at the centre, rather what is sought is a life worth living, where our humanity and the dignity of all human beings is encouraged.

This group of ideas has resulted in greater reflection on the importance of character education. However, this has not stopped the environment from starting to believe that the considerations regarding character education were a matter more in line with sweet dreams than true realities. It is evident that there is a pressing need to make another updated presentation of character education.

Hence the call for this monographic issue of the **revista española de pedagogía** which aims to offer a reflection on the consequences that some current events have had on education, which have changed the educational horizon. In particular, we consider to be essential the study, on the one hand, of the pandemic — and not from just a technological or political point of view — that we are dealing with, which has affected around 500 million people and which has killed over 6 million people, and, on the other hand, of the invasion of Ukraine, which has attacked the implicit western premise that we lived in a narcissistic democracy in which a freedom without any reference points was worshipped, where the only limitation was the rejection of violence.

These two facts call for a group of important ideas to be reconsidered. We recently spoke about transhumanism and that human beings were called to live for many years. However, millions of people of all ages, places and backgrounds suddenly disappeared in a period of two years. What's more, they disappeared in silence and alone. Governments tend to give lower numbers than what the figures really are. People are forced to die alone, as millions have had to live alone, and death does not have a public image. We also believed that democracy and peace between nations were well consolidated in western countries, and suddenly we witnessed the war started by a powerful nation against a much smaller nation, which is expected to be absorbed putting forward similar ideas to the territorial demands, to *Lebensraum*, declared by Hitler and which led to the Austrian *Anschluss* on March 12, 1938, which was followed by the invasion of Poland on September 1, 1939, giving rise to the Second World War.

A monographic issue is therefore called for with the title: "A renewed character education following the pandemic and the invasion of Ukraine". A *renewed* education is proposed because we must confront the problems at present without letting ourselves be led by ideologies which are responsible for the current crisis, while bearing in mind the well-known phrase that we are dwarfs standing on the shoulders of giants. We will therefore be able to widen our gaze if we follow the great tradition of thinking on the characteristics of human beings, as this will allow us to plan a better future. This is an opportunity for our youth to be renewed like the eagle's (Ps. 103, 5), knowing that, in the words of

Virgil, they can conquer who believe they can (*Aeneid*, l. V, 231).

a) The main lines of development of the proposed subject, which may be analysed from several points of view, are as follows:

b) The pandemic as a chance to remind ourselves of the limits of human beings and their capacity of generosity.

c) The rediscovery of respect for the dignity of all human beings.

d) The basic principles of a character open to others and to the truth, unconnected with the culture of sentimental narcissism.

e) The variety of methods to promote character education in secondary education and experiences about its applications.

f) The diverse strategies to evaluate progress in character education.

The originals, which shall follow the Author instructions, published on the journal website, shall be sent via e-mail to director.rep@unir.net before September 10, 2022.

The Editors will be the professors:

José Antonio Ibáñez-Martín. Emeritus Professor of Philosophy of Education of Universidad Complutense de Madrid and Universidad Internacional de La Rioja (UNIR). Editor of **revista española de pedagogía**. Director of the Master of Education of Character and Emotional Education (UNIR). National Prize of Literature for Essay Works. Great Cross of Alfonso X the Wise.

Josu Ahedo Ruiz. Degree in Philosophy, Political Science and Law. Graduated in Communication. Doctor of Philosophy. Accredited as Associate Professor by ANECA. After many years as a secondary school teacher, he was appointed in 2011 to the Universidad Internacional de La Rioja (UNIR), where he has been Vice-Rector for Student and Academic Quality, between 2012 and 2019. Currently, he is the Director of the Master of Teaching Methods in Personalized Education and Coordinator of the Master in Character Education and Emotional Education. Director of the University Expert in Personal Academic Advising: Tutoring and Preceptuation. Director of the research group "Educational activity as an action".

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