



Development and validation of a life skills evaluation tool for online learning based on the framework of the capability approach

Pilar Gómez-Rey¹ · Elena Barbera² · Francisco Fernández-Navarro³ · Jingjing Zhang⁴ · António Moreira Teixeira⁵

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Abstract

The promotion of life skills in learners is especially challenging in distance and online environments where the learners' physical absence from the classroom hinders the evaluation of these types of skills. Due to the great challenges brought about by this physical absence, there is a lack of empirical studies attempting to examine life skills in web-based scenarios. This study therefore aimed to fill the existing gap in operationalizing the role of life skills for online learning through the capability approach (CA). This exploration was conducted under the umbrella of Nussbaum's version of the CA. Specifically, our study contributes by devising an integrative and comprehensive teaching and learning framework for open educational practices based on the CA, and by introducing a new instrument that has been adapted to this context. Methodologically, the design and validation of the instrument involved a four-stage process. First, Nussbaum's list of central human capabilities was operationalized for online learning. Then, in the second stage, a qualitative content validity check was performed to verify whether the instrument was appropriate and comprehensive in terms of what it was intended to measure. The aim of the third and fourth stages was to quantitatively assess the reliability and validity of the questionnaire. For the third stage, the instrument was pre-tested through a modified version of the Q-sort method. In the fourth stage, non-parametric tests were used to validate the internal consistency and content validity of the questionnaire. Thirty experts from the areas of online education, philosophy, and statistics took part in these stages.

Keywords Capabilities approach · Higher education · Life skills · Online education

✉ Pilar Gómez-Rey
pgomez@uloyola.es

✉ Jingjing Zhang
jingjing.zhang@bnu.edu.cn

¹ Department of Communication and Education, Universidad Loyola Andalucía, Seville, Spain

² Studies of Psychology and Education, Universitat Oberta de Catalunya, Barcelona, Spain

³ Department of Quantitative Methods, Universidad Loyola Andalucía, Seville, Spain

⁴ Faculty of Education, Beijing Normal University, Beijing, China

⁵ Department of Education and Distance Learning, Universidade Aberta, Lisbon, Portugal

Introduction

Education 2030 has served as an influential policy framework for national and international educational development and offers a broad vision of the role of education in societal development (Agbedahin, 2019). While reaffirming the right to basic education and focussing on the areas addressed by the education for all (EFA) movement, Education 2030 introduces new features that reflect an ambitious approach to education and learning in the twenty-first century. One of these features is dealt with in the sustainable development goal 4 (SDG 4), which aims to ensure inclusive and equitable quality education and lifelong learning opportunities for all.¹ It is a global commitment to ensure equitable opportunities for education from a holistic and lifelong learning perspective, based on a humanistic approach in which education is seen as a fundamental right and a public good.

Thus, it is vital to give a central place to strengthening the contribution of education to the fulfilment of human rights, peace and responsible citizenship from local to global levels, including gender equality, sustainable development and health. Under this idea, the authors of this study believe that life skills-based education can be used as a vehicle to prepare people for the demands of today's society. We follow the World Health Organization's definition when referring to the term 'life skills-based education'. Hence, life skills are defined as abilities for adaptive and positive behaviour that enable individuals to deal effectively with the demands and challenges of today. In the last decade, different researchers, theorists, and practitioners have studied this topic in relation to the holistic development of learners at different educational stages (FitzPatrick et al., 2014; Hanley et al., 2007; Khlaisang & Songkram, 2019; Visser, 2005). This study also aimed to shed some light on the challenges and windows of opportunities of skills-based life education. To do so, it was proposed to foster the development of life skills in online learning environments under the umbrella of the well-known capability approach (CA) framework. The CA is a philosophical framework that assumes, first, that the freedom to yield well-being is of primary moral importance and, second, that the freedom to achieve well-being should be promoted through the development of people's capabilities (Nussbaum & Sen, 1993). The CA has been adapted to different fields in the social sciences, leading to a new branch of social indicators and a new policy paradigm (mainly studied in development studies). Specifically, the CA has been implemented already in face-to-face educational settings, with success (Chiappero-Martinetti & Sabadash, 2014; Hoffman, 2006; Walker, 2008). Unfortunately, its adaptation to online environments remains a challenge for the online learning community. For instance, Robinson and Hullinger (2008) claimed that the online learners who developed life skills the most were the so-called "socially interactive students" (those who interacted about social and personal issues); however, this represents only half of the online learner population. In this context, different researchers have proposed several approaches to improve students' engagement, with the goal that these would ultimately create more favorable environments for promoting life skills in the classroom (Dixson, 2010; Kahn et al., 2017). Thus, Dixson (2010) suggested including approaches that improve learners' interactions in existing active learning educational models (to enhance the students' engagement). More recently, Kahn et al., (2017) highlighted the link between

¹ SDG4—Education 2030: http://uis.unesco.org/sites/default/files/documents/education-2030-incheon-framework-for-action-implementation-of-sdg4-2016-en_2.pdf.

“reflexivity” and student engagement in online environments as a crucial factor of social relations during learning.

To describe the study, this paper is organized as follows. "[Literature review: the CA and life skills education](#)" section provides an overview of the CA and gives some insights about how practitioners and researchers have applied it to the educational field. Then, the theoretical conceptualization and the operationalization of the CA for online learning are presented ("[Operationalizing the list of central human capabilities of Martha Nussbaum for online learning](#)" section). After that, the design of the instrument and methodology are described ("[Materials and methods](#)" section). The results are presented in "[Results](#)" section. Finally, "[Discussion](#)" section closes with a discussion and the main conclusions of this study.

Literature review: the CA and life skills education

The authors of this study are convinced that the CA can be used as a framework to meet the complex demands of today's society. It is a broad framework for evaluating an individual's well-being and social composure in society. The initial ideas and foundations of the CA can be traced back to Aristoteles, Adam Smith, and Karl Marx, but the notion of the CA itself was first conceived by Amartya Sen in the 1980s (Drèze & Sen, 2002) and later promoted mainly by Martha Nussbaum (Nussbaum & Sen, 1993). While Sen argued that it is inappropriate to create/develop a list of capabilities (Sen, 2011), Nussbaum did advocate the need for a list (Nussbaum, 2011). The differences can be explained by their personal fields of study. While Sen's vision was closer to economic reasoning, Nussbaum's was attuned with philosophy and with the need to measure the extent of individual well-being. Since Sen's contributions, the CA has been recognized widely by numerous researchers and has received some criticism. On one hand, opponents see the CA as a complex and multidimensional model lacking in specificity (Fukuda-Parr, 2003; Johannesson et al., 1996). On the other hand, supporters see it as a comprehensive framework, which includes a complete description of an individual's well-being (Dubois & Trabelsi, 2007; Hoffman, 2006).

There are some important studies worth mentioning which relate to the CA and education. For example, Hoffman (2006) presented an overview for promoting capabilities through skills-based teaching and learning. The author linked the Four Pillars of Learning (learning to know, learning to be, learning to live together and learning to do) to life skills education and used these pillars as a framework for the list of central human capabilities proposed by Nussbaum. From a different perspective, Walker (2008) analyzed how research-enhanced pedagogies can help in the acquisition of capabilities, using the CA to explain the research/teaching nexus. Walker's statistical results showed evidence of: (1) capability formation; (2) acquisition of knowledge and learning through research-enhanced pedagogies; and (3) pedagogical and institutional conditions of quality in relation to the research/teaching nexus. Moreover, Boni et al. (2010) examined the potential of the university context as a driving force behind a transforming cosmopolitan citizenship. Their study tested the differences, similarities and synergies amongst the promotion of abilities related to global citizenship in formal and informal contexts of learning. The selected abilities were chosen from Martha Nussbaum's CA and other related frameworks. These frameworks are all based on the premise that both formal and informal scenarios open new horizons to enhance learners' cosmopolitan capabilities. Despite this, it has come to light that each scenario promotes different cosmopolitan abilities. Chiappero-Martinetti and

Sabadash (2014) studied the possibility of combining human capital theory and the CA in order to better understand and measure both the instrumental and intrinsic values of education for individuals, and to trace the relative spill-over effect on societies. To do this, the authors presented three integrated sections in their chapter, discussing the role and value of education for human well-being. The first section reviewed the most significant attempts to define and measure education from a human capital perspective. The second section focused on education and human capabilities and considered the aspects that are not fully encompassed within or justified by the human capital perspective. The third section discussed how the human capital and the capabilities paradigms can complement each other in measuring the value of education. Furthermore, independent researchers and even some journals have promoted and supported CA theory within the educational community (Boni & Walker, 2013; Unterhalter et al., 2014).

The above review from the literature shows the importance of the CA for educational purposes; however, these studies do not propose an operationalization of the framework for the field of education. In these studies, the researchers have focused on the topic within the context of traditional (face-to-face) education, ignoring virtual environments. This fact can be justified due to the challenges associated with the implementation of the core competencies in online learning (Dixon, 2010; Kahn et al., 2017; Robinson & Hullinger, 2008). For this reason, the opportunity was taken in this study to propose a concrete example of how to operationalize the CA for virtual environments. In summary, this study sought to offer an educational tool for teachers and instructors teaching in online education and looking to evaluate whether their learners had successfully achieved the learning goals required nowadays.

Operationalizing the list of central human capabilities of Martha Nussbaum for online learning

The first step in developing the instrument was the operationalization of the constructs involved. The core capabilities proposed by Nussbaum were used as a framework for the conceptual model (Nussbaum, 2011). It should be noted that one particular set of capabilities in Nussbaum's framework is multidimensional (i.e., she included two or more constructs in her original definition). Our study included both multidimensional and unidimensional capabilities (which are denoted as constructs in this paper). A multidimensional construct is a single theoretical concept that is measured by several related dimensions, whereas unidimensional constructs are expected to have a single underlying dimension. Hence, we clearly specified the set of constructs (or the construct) comprising the capability being studied. The central human capabilities, adapted to online learning, are described below.

Life (L): Nussbaum defined this capability as “being able to live to the end of a human life of normal length; not dying prematurely, or before one's life is so reduced as to be not worth living” (Nussbaum, 2011, p. 33). This is a multidimensional capability (construct) with two related dimensions: (1) the part that refers to the length of someone's life (this dimension will be denoted as L_1) and (2) the part that refers to the quality of that life (this dimension will be denoted as L_2).

The L_1 dimension is related to the individual's personal development (learning). Education needs to be understood as a life project, that is, as a process with a beginning and an end throughout the whole of life. This means that learners should decide when they want

to start and finish their learning projects. This dimension could therefore be conceptualized as life-learning expectancy—the period of time during which a human being is likely to be motivated for learning under normal conditions. In the context of education, virtual institutions are excellent scenarios for people who want to balance their life commitments with the practice of lifelong learning.

The L_2 dimension is related to a set of basic skills that enable individuals and groups to effectively handle issues and problems commonly encountered in everyday life (which will enable the individual to have a better quality of life). In the context of education, these skills are the so-called soft skills (Dixon et al., 2010). Soft skills contribute to a person's ability to manage him or herself and relate to other people. In the context of online education, courses should be designed to help learners develop crucial soft skills such as self-study, time management, computer literacy, digital communication, and web searches.

Body health (BH): Nussbaum defined this capability as “being able to have good health, including reproductive health; to be adequately nourished; to have adequate shelter” (Nussbaum, 2011, p. 33). This unidimensional construct (with only one dimension) relates to health status and physical well-being. In this study, we will connect this dimension with the concept of being sedentary (especially relevant in online environments) (Balboa-Castillo et al., 2011).

Body integrity (BI): Nussbaum defined this capability as “being able to move freely from place to place; to be secure against violent assault, including sexual assault and domestic violence; having opportunities for sexual satisfaction and for choice in matters of reproduction” (Nussbaum, 2011, p. 33). This unidimensional construct (with only one dimension) relates to cyber security, harassment and, ultimately, the integrity of human beings. In this study, we will focus especially on the concept of cyber security. Upholding the security of e-learning programmes represents a challenge, as numerous systems are accessed and managed via the Internet by thousands of users over hundreds of networks (Pusey & Sadera, 2011).

Sense, imagination and thought (SIT): Nussbaum's study defined this capability as:

Being able to use the senses, to imagine, think, and reason—and to do these things in a truly human way, a way informed and cultivated by an adequate education, including, but by no means limited to, literacy and basic mathematical and scientific training. Being able to use imagination and thought in connection with experiencing and producing works and events of one's own choice, religious, literary, musical, and so forth. Being able to use one's mind in ways protected by guarantees of freedom of expression with respect to both political and artistic speech, and freedom of religious exercise. Being able to have pleasurable experiences and to avoid non-beneficial pain. (Nussbaum, 2011, p. 33)

In this study, this construct was associated with the concept of creativity. The relationship between sense, imagination and thought, and creativity is that all of them are functions of the brain that process information to determine a solution to a problem or an answer to a question. Modern creativity research is commonly said to have begun with Joy Paul Guilford in 1950, when he pointed out its very important nature as a research topic, and in 1967, when he distinguished between divergent and convergent types of creative problem solving (Guilford, 1967). Divergent thinking refers to a way of solving problems wherein a variety of possible solutions is proposed in an effort to find one that works. This is in contrast to convergent thinking, which relies on focussing on a finite number of solutions rather than proposing multiple resolutions. Thus, based on Guilford's (1967) research, this is a multidimensional capability (construct) with two related dimensions: (1) the part

that refers to divergent thinking (this dimension will be denoted as SIT_1) and the part that refers to convergent thinking (this dimension will be denoted as SIT_2). Hence, the challenge is to promote both divergent and convergent thinking to stimulate learners' creativity. Fortunately, computer-mediated communication presents opportunities for teachers and instructors to foster their learners' creativity at the individual level, small group level, and large, distributed group level (Dennis et al., 2019). When appropriately designed online collaborative learning can lead to deeper, transformative learning by promoting networking and by facilitating the process of discovery, the collection of ideas, and the integration of knowledge (Bates, 2019; Yang et al., 2018). Because it can be both synchronous and asynchronous, communication in online environments can be richer than in physical settings, thus supporting the development of a range of high level intellectual skills (Bates, 2019). Creative work is most effective in virtual learning spaces which have the capacity to support team work flow and sharing of information continuously (Bates, 2019). Additionally, the absence of physical space in online learning educational environments helps learners to share their thoughts with their peers with more freedom (Taylor, 1998), thus generating intimacy and trust as a result from the higher levels of self-disclosure (Jiang et al., 2013). On the other hand, the unique affordances of online learning might present challenges such as digital competence and time management (Kebritchi et al., 2017), cognitive load (Sweller, 2020) or being mediated by technology (often text-based) (Hrastinski & Keller, 2007).

Emotions (E): Nussbaum defined this capability as:

Being able to have attachments to things and people outside ourselves; to love those who love and care for us, to grieve at their absence; in general, to love, to grieve, to experience longing, gratitude, and justified anger. Not having one's emotional development blighted by fear and anxiety. (Supporting this capability means supporting forms of human association that can be shown to be crucial in their development). (Nussbaum, 2011, pp. 33–34)

This unidimensional construct refers to the degree to which learners feel free to express their emotions while learning. Based on a study by White (2013), these emotions can be categorized into three groups: (1) both positive active (excited) and deactive (hopeful) emotions; (2) deactive negative emotions; and (3) active negative emotions. For the purpose of this study, we selected two feelings per group according to their higher factor loadings. Hence, when referring to the E dimension, we refer to the following feelings of learners: enjoyment, happiness, worry, nervousness, annoyance, and anger. In the context of online education, the challenge is to design virtual environments with adequate tools (communication channels) to enable learners to express these emotions.

Practical reason (PR): Nussbaum defined this capability as “being able to form a conception of the good and to engage in critical reflection about the planning of one's life (this entails protection for the liberty of conscience and religious observance)” (Nussbaum, 2011, p. 34). This unidimensional construct refers to the fact that individuals have freedom of thought, conscience, and religion. Practical reasoning is the exercise of submitting choices and actions, as well as objectives, values, and priorities to a reasoned examination.

Affiliation (A): Nussbaum defined this capability as:

Being able to live with and toward others, to recognize and show concern for other humans, to engage in various forms of social interaction, to be able to imagine the situation of another; and being able to be treated as a dignified being whose worth is equal to that of others (having the social bases of self-respect and non-humiliation).

This entails provisions of non-discrimination on the basis of race, sex, sexual orientation, ethnicity, caste, religion, national origin, and species. (Nussbaum, 2011, p. 34)

This unidimensional construct alludes to social interactions (in general) between members of a community. Developing social skills while learning promotes learners' academic success, health, and overall well-being (Durlak et al., 2011). In this study, we focused on social interaction by considering not only activities that occur inside the virtual classroom, but also those which take place outside it.

Other species (OS): Nussbaum defined this capability as "being able to live with concern for and in relation to animals, plants, and the world of nature" (Nussbaum, 2011, p. 34). This unidimensional construct relates to environmental awareness, that is, understanding the fragility of our environment and the importance of protecting it. This dimension can be fostered through strategies such as: (1) giving learners the chance to be involved in institutional actions that promote and support decisions to protect the environment; (2) providing learners with information about the action plans in which the university participates in relation to environmental awareness; and, (3) offering informational seminars.

Play (P): Nussbaum defined this capability as "being able to laugh, to play, to enjoy recreational activities" (Nussbaum, 2011, p. 34). This unidimensional construct refers to the learners' right to have fun, to laugh, and to engage in recreational activities while carrying out their studies. It is well known that some of the benefits associated with involvement in recreational activities are stress reduction (Kanters, 2000), increased self-esteem (Collins et al., 2001), and learner development (Geller, 1980). This capability can be promoted through strategies that include: (1) giving learners the chance to be involved in recreational activities organized by the institution itself; (2) providing learners with information about recreational activities in which the university takes part; and, (3) offering informational seminars.

Control over one's environments (COOE): Nussbaum defined this capability as:

Being able to participate effectively in political choices that govern one's life; having the right of political participation, protections of free speech and association; and being able to hold property (both land and movable goods), and having property rights on an equal basis with others; having the right to seek employment on an equal basis with others; having the freedom from unwarranted search and seizure. In work, being able to work as a human, exercising practical reason and entering into meaningful relationships of mutual recognition with other workers. (Nussbaum, 2011, p. 34)

This is a multidimensional construct with two related dimensions: (1) the part that refers to political issues (denoted as COOE₁) and (2) the part that refers to material concerns (COOE₂). The COOE₁ dimension relates to the capability to participate effectively in the political life that governs one's being (having the right and freedom to participate). In this study, this construct was associated with participation in the Learner Council. This entity is the highest governing body within a university's learners' association. The Learner Council is the channel for expressing learners' aspirations, requests, and proposals, and its function is to promote, coordinate, and defend their concerns, rights, and interests. The COOE₂ dimension relates to usability and accessibility. Accessibility is the practice of making your websites usable by as many people as possible (Kumar & Owston, 2016). For the purpose of this study, accessibility was limited to learner disabilities including visual impairment, motor and auditory functions, seizure disorders and cognitive/intellectual abilities (Seale

Table 1 Dimensions and theoretical concepts associated to them

Dimensions	Key concepts associated to each dimension
L ₁	Personal development (learning) of an individual
L ₂	Soft skills
BH	Sedentarism
BI	Cyber security
SIT ₁	Divergent thinking
SIT ₂	Convergent thinking
E	Channels of communication to express emotions
PR	Human rights in relation to education. Right to freedom of thought, conscience and religion
A	Social interactions between peers
OS	Level of awareness regarding environmental consciousness
P	Human rights in relation to education. Right to have fun, to laugh, and to engage in recreational activities
COOE ₁	Participation in the learner council
COOE ₂	Web accessibility/usability

& Cooper, 2010). Usability is, in essence, the user's ability to navigate through the site. In this study, we focused on learners' satisfaction with the web accessibility/usability of the university's own learning resources.

Finally, Table 1 summarizes the dimensions and theoretical concepts associated with them. This information will help to have a general overview of how to operationalize Nussbaum's list of central human capabilities in higher education online learning environments. Nevertheless, we encourage future researchers to expand this framework in other non-university formal/informal lifelong learning contexts (considering specific particularities of the selected learning scenario).

Materials and methods

This study was carried out using a mixed method-based research approach (qualitative–quantitative). Ethical considerations such as approval from the ethics committee of the Universitat Oberta de Catalunya (UOC) were adhered to. This study used panel members' rather than learners' viewpoints, as the latter are not subject-matter experts and, therefore, are not in a position to make judgements about the validity of the constructs and dimensions selected or the items involved in the study. The methodological design of the instrument was done in two stages, which Dillman (2000) pointed out as mandatory for instrument development.

Stage 1: instrument design

This stage involved moving from identifying concepts to conceptualizing them and then to operationalizing them. Four experts participated in this stage: a Portuguese professor with a Philosophy background, two Spanish researchers with extensive experience in online learning, and a Spanish professor in Statistics. They were chosen carefully based on their

areas of expertise. The first step of the procedure was to divide the core capabilities (constructs) proposed by Nussbaum into dimensions. After that (second step), the dimensions were operationalized for the online educational field. The last (third) step involved the generation of an item pool organized in a suitable format and sequence. To carry out this stage, the researchers used qualitative research methods for data collection, involving a literature review combined with unstructured interviews (Sapsford & Jupp, 1996). The output from this stage was a first draft of the questionnaire.

Stage 2: judgement

In stage 2, a number of experts were asked to confirm the validity of the content contained in the questionnaire (first draft of the questionnaire). For this purpose, different expert panels of different nationalities were appointed. Content validity was established through both qualitative and quantitative approaches, aiming to gain the experts' viewpoints about the relevance, clarity, and comprehensiveness of the first draft of the questionnaire.

In the qualitative content validity check, qualified experts verified whether the proposed method of devising the instrument was appropriate and comprehensive in terms of what it was intended to measure, as well as its population and use. Four experts participated in this stage: a Canadian senior researcher who was an expert in the field of philosophy, two senior researchers (from Spain and China) with different functional expertise in the field of online education, and a Spanish senior researcher with more than 15 years of experience in quantitative methods and statistics. Their selection was based on their professional roles. Specifically, these experts were each sent an email with information regarding the study to be carried out and were invited to participate voluntarily as judges to validate the work done in stage 1. They were then invited to participate individually in a virtual discussion with the researchers. The aim of the meeting was to establish the level of the expert's disagreement with the operationalization of the CA proposed in stage 1. Prior to this discussion, the experts received (1) a text file with definitions of the dimensions being studied (Nussbaum's list of central human capabilities operationalized for online educational environments) and (2) an Excel file with consistent operational definitions of the dimensions through developing indicators or items for measuring these dimensions (i.e., each dimension was defined with a specific number of items). In this way, the researchers used semi-structured interviews as a qualitative research approach (Adams, 2015). The output from this stage was a second draft of the questionnaire.

The quantitative content validity was established using two alternative approaches. The first validation approach aimed to capture the extent to which the judges dis/agreed with the second draft of the questionnaire. To carry out this validation, two experts were selected specifically—two senior professors/researchers (from Spain and South Africa) in the field of study (Philosophy and online education)—to ensure that the perceptions of the target population were included in the analysis. Specifically, the pool of items contained in the second draft of the questionnaire was subjected to two sorting rounds by one independent judge per round (i.e., during the two sorting rounds, two different judges were used). Prior to sorting the items, the judges were briefed with a standard set of instructions that had been tested previously by a separate judge to ensure comprehensiveness and comprehensibility. They were requested to match the questionnaire items to the corresponding dimension categories, which were provided in a random order. They were provided with a document with a definition of the dimension categories to be measured (operationalization of the CA for online learning). The judges carried out the task by completing an online

questionnaire. They were also requested to reply to an open-ended question: "From your point of view, how well operationalized are Martha Nussbaum's core capabilities for online learning purposes? Justify your response." A modified version of the Q-sort method was used to analyse the results (Nahm et al., 2002). The quality of the sorting by each judge was measured through the overall % Hit ratio, % Hit per dimension and Cohen's kappa (κ) per construct. After analysing the classification matrices (and the qualitative inputs of the open-ended question), the authors of this work decided to reword/re-phrase or delete several items, aiming to enhance the relationship between the item and its corresponding dimension and its understandability by the potential respondents. Thus, the output from this stage was a third draft of the questionnaire.

In the second validation approach, the participants were asked to rate the questions in the third draft of the questionnaire, item by item, on a five-point Likert scale to indicate the extent to which they believed the presented items were associated with the dimensions being studied (a matrix with the same number of rows as questionnaire items and the same number of columns as dimensions). The items were presented in a randomized list to control for response bias that may occur from order effects. Response choices ranged from 1 (I totally disagree that the item belongs to the dimension) to 5 (I totally agree that the item belongs to the dimension). These participants received two files via email. The first file included a text document with a definition of the dimension categories to be measured (operationalization of the CA). The second file presented the actual task, including the task instructions. Twenty junior researchers, enrolled in a Spanish doctoral degree program and experienced in online learning environments, participated in this phase. In designing the methodology, the authors of this study took inspiration from the paper by Hinkin and Tracey (1999), who used an analysis of variance approach in order to determine item integrity and scale content validity. In this study, non-parametric tests were used instead of parametric tests (such as ANOVA) because a Shapiro–Wilk (S–W) test confirmed that the data were not normally distributed. Specifically, the Friedman test, as a non-parametric pre-hoc test, and the Holm method, as a post-hoc test, were conducted. Thus, the output from this stage was a fourth draft of the questionnaire.

Results

Based on the method presented in the previous section, the results are described below. The results for stage 1 were presented in "[Literature review: the CA and life skills education](#)". Regarding stage 2, the results are divided by the type of research conducted (qualitative and quantitative) and then analysed individually. It should be noted that the final instrument and draft questionnaires are publicly available at the website: <http://pgomezrey.com> (research > > supplementary material).

First alternative method validated: Q-sort method

Table 2 shows the statistical results (overall % Hits, % Hit per dimension and Cohen's kappa (κ) per dimension) obtained during the first sorting round (judge A). As shown in the table, 65.45% of the items were classified correctly according to their corresponding dimensions. The table shows that judge A correctly sorted the items of six dimensions out of a total of thirteen (% Hit of those dimensions was 100%). Hence, the items of these

Table 2 First sorting round

Judge A																
	L ₁	L ₂	BH	BI	SIT ₁	SIT ₂	E	PR	A	OS	P	COOE ₁	COOE ₂	Total	% Hits	κ
L ₁	3	0	0	0	0	0	0	1	0	0	0	0	0	4	75%	0.50
L ₂	1	0	0	0	2	0	0	0	0	0	0	0	0	3	0%	0
BH	1	2	0	0	2	0	0	0	1	0	0	0	0	6	0%	0
BI	0	0	0	4	0	0	0	0	0	0	0	0	1	5	80%	0.88
SIT ₁	1	0	0	0	2	0	0	1	0	0	0	0	0	4	50%	0.30
SIT ₂	0	0	0	0	0	4	0	0	0	0	0	0	0	4	100%	1
E	1	0	0	0	1	0	1	0	3	0	0	0	0	6	16.67%	0.26
PR	0	0	0	0	0	0	0	3	0	0	0	1	0	4	75%	0.64
A	0	0	0	0	0	0	0	0	3	0	0	0	0	3	100%	0.57
OS	0	0	0	0	0	0	0	0	0	4	0	0	0	4	100%	1
P	0	0	0	0	0	0	0	0	0	0	3	0	0	5	100%	1
COOE ₁	0	0	0	0	0	0	0	0	0	0	0	5	0	6	100%	0.90
COOE ₂	0	0	0	0	0	0	0	0	0	0	0	0	4	7	100%	0.88

Overall % Hit ratio 65.45%

dimensions (SIT₂, A, OS, P, COOE₁, and COOE₂) were not modified for the second sorting round. Conversely, some of the items related to the rest of the dimensions were either deleted or reworded. Below, we describe the technical modifications made to the dimensions involved (L₁, L₂, BH, BI, SIT₁, E and PR):

- For the L₁ dimension, three out of four items were sorted correctly by Judge A. However, the judge provided some nuances in relation to a few issues in the open-ended question, which allowed us to partially reorientate some items related to the construct. Following the recommendations of the judge, we decided to expand the set of items associated with the L₁ dimension (from four to five) and the remaining items were reworded to reinforce the relationship between the items and the dimension.
- For the L₂ and BH dimensions, none of the items were sorted correctly by Judge A. A similar situation also occurred in the E dimension. This observation, together with the comments that the judge left in the open-ended question, helped us to identify an underlying problem associated with these three dimensions. For this reason, the operationalization of both dimensions was redefined. Thus, we defined new items for each of the dimensions.
- For the BI dimension, four out of five items were sorted correctly by judge A. We concluded that the wrongly classified item should be deleted (the relationship with the dimension was not clear enough).
- For the SIT₁ dimension, three out of four items were sorted correctly by Judge A. For the PR dimension, three out of four items were sorted correctly by Judge A. For these dimensions, we decided to reformulate the items that were not classified correctly.

Table 3 shows the statistical results (overall % Hits, % Hit per dimension and κ per dimension) obtained during the second sorting round (Judge B). The value for overall % Hit ratio (92.86%) was significantly higher than that obtained in the first round, indicating

Table 3 Second sorting round

Judge B																
	L ₁	L ₂	BH	BI	SIT ₁	SIT ₂	E	PR	A	OS	P	COOE ₁	COOE ₂	Total	%Hits	κ
L ₁	5	0	0	0	0	0	0	0	0	0	0	0	0	5	100%	1
L ₂	0	6	0	0	0	0	0	0	0	0	0	0	0	6	100%	1
BH	0	0	4	0	0	0	0	0	0	0	0	0	0	4	100%	1
BI	0	0	0	4	0	0	0	0	0	0	0	0	0	4	100%	1
SIT ₁	0	0	0	0	3	0	0	1	0	0	0	0	0	4	75%	0.73
SIT ₂	0	0	0	0	0	4	0	0	0	0	0	0	0	4	100%	1
E	0	0	0	0	0	0	6	0	0	0	0	0	0	6	100%	1
PR	0	0	0	0	1	0	0	1	0	0	0	2	0	4	25%	0.30
A	0	0	0	0	0	0	0	0	3	0	0	0	0	3	100%	1
OS	0	0	0	0	0	0	0	0	0	4	0	0	0	4	100%	1
P	0	0	0	0	0	0	0	0	0	0	3	0	0	3	100%	1
COOE ₁	0	0	0	0	0	0	0	0	0	0	0	5	0	5	100%	0.81
COOE ₂	0	0	0	0	0	0	0	0	0	0	0	0	4	4	100%	1

Overall % Hit ratio 92.86%

a high level of reliability and construct validation. The table illustrates that Judge B correctly sorted items for eleven out of the thirteen dimensions (L₁, L₂, BH, BI, SIT₂, E, A, OS, P, COOE₁, and COOE₂). In this second round, there were minor changes related to the reformulation of some items of the SIT₁ and PR dimensions. Despite this, the results were considered to display an excellent level of inter-judge agreement, indicating a high level of reliability and construct validation. We therefore stopped the Q-sort method at round two.

Second validation approach: non-parametric tests

Table 4 shows the statistical results of the Friedman and Holm tests for alpha (α) 0.05 and 0.10. Also, the table shows the mean ranking (\bar{R}) and *p-value* obtained in each of the items associated with the L₁, L₂, BH, and BI dimensions. The \bar{R} was obtained as follows. First, the junior researchers evaluated the degree of belonging of each of the items to the dimensions being researched. After that, the test used assigned the maximum degree of belonging to the minimum ranking and the minimum degree of belonging to the maximum ranking (in this case, thirteen, because of the total number of dimensions). Then, the \bar{R} was calculated taking into account the junior researchers’ responses and the thirteen dimensions. These \bar{R} are reported in Table 4 (likewise, the \bar{R} of the rest of the dimensions studied are detailed in Tables 5 and 6). A low mean ranking indicates that the participants (junior researchers) agreed that an item belonged to a concrete dimension. An ideal situation is when an item with a low ranking in a concrete dimension coincides with the dimension to which, theoretically, the item belongs. The *p-value* is associated with the Holm test and is reported in cases: (1) when the Friedman test has detected significant differences at group level and (2) when the dimension to which the item theoretically belongs is the one with the lowest ranking. In this test, the control method for each of the items is the dimension to which the item theoretically belongs, according to the researchers of this study. Hence, the objective was to examine whether or not the researchers’ perceptions differed from

Table 4 Statistical results of the Friedman and Holm's test for the dimensions L₁, L₂, BH and BI

D ₁ /R̄	L ₁	L ₂	BH	BI	SIT ₁	SIT ₂	E	PR	A	OE	P	COOE ₁	COOE ₂	Decision
	R̄/p-value	R̄/p-value	R̄/p-value	R̄/p-value	R̄/p-value	R̄/p-value	R̄/p-value	R̄/p-value	R̄/p-value	R̄/p-value	R̄/p-value	R̄/p-value	R̄/p-value	
L ₁ /1.3,28	-	4.88/0.19	7.28/0.00*	8.03/0.00*	6.90/0.00*	7.18/0.00*	7.45/0.00*	6.73/0.01*	7.38/0.00*	8.18/0.00*	7.95/0.00*	7.85/0.00*	7.95/0.00*	✓
L ₁ /1.2,1.00	-	7.50/0.00*	7.50/0.00*	7.50/0.00*	7.50/0.00*	7.50/0.00*	7.50/0.00*	7.50/0.00*	7.50/0.00*	7.50/0.00*	7.50/0.00*	7.50/0.00*	7.50/0.00*	✓
L ₁ /1.3,3.25	-	5.50/0.07*	7.85/0.00*	8.85/0.00*	6.50/0.00*	7.53/0.00*	7.85/0.00*	6.95/0.00*	7.60/0.00*	7.55/0.00*	7.55/0.00*	7.85/0.00*	7.18/0.00*	✓
L ₁ /1.2,93	-	4.40/0.23	7.80/0.00	7.80/0.00*	7.13/0.00*	7.50/0.00*	7.80/0.00*	7.20/0.00*	7.53/0.00*	7.80/0.00*	7.80/0.00*	7.80/0.00*	7.53/0.00*	✓
L ₁ /1.2,3.25	-	3.60/0.78	7.68/0.00*	7.68/0.00*	7.68/0.00*	7.68/0.00*	7.38/0.00*	7.40/0.00*	7.38/0.00*	7.68/0.00*	7.68/0.00*	7.98/0.00*	7.98/0.00*	◇
L ₂ /1.3,20	5.88/0.03*	-	8.05/0.00*	7.95/0.00*	6.68/0.00*	6.68/0.00*	7.20/0.00*	6.65/0.01*	7.18/0.00*	8.13/0.00*	8.13/0.00*	8.03/0.00*	7.28/0.00*	✓
L ₂ /1.2,33	6.63/0.00*	-	7.60/0.00*	7.60/0.00*	7.60/0.00*	7.28/0.00*	7.33/0.00*	7.60/0.00*	6.95/0.00*	7.60/0.00*	7.60/0.00*	7.60/0.00*	7.30/0.00*	✓
L ₂ /1.3,65	6.78/0.01*	-	7.73/0.00*	7.18/0.00*	7.30/0.00*	7.18/0.00*	7.50/0.00*	7.30/0.00*	7.50/0.00*	7.73/0.00*	7.20/0.00*	7.73/0.00*	6.25/0.03*	✓
L ₂ /1.4,3.68	7.15/0.00*	-	7.83/0.00*	7.55/0.00*	7.50/0.00*	7.18/0.00*	7.15/0.00*	7.58/0.00*	5.50/0.14	7.83/0.00*	7.33/0.00*	7.83/0.00*	6.93/0.01*	✓
L ₂ /1.3,3.23	7.25/0.00*	-	7.55/0.00*	6.93/0.00*	7.55/0.00*	7.55/0.00*	7.25/0.00*	7.55/0.00*	7.55/0.00*	7.55/0.00*	7.55/0.00*	7.55/0.00*	5.95/0.03*	✓
L ₂ /1.4,4.63	7.65/0.00*	-	7.93/0.00*	7.93/0.00*	7.25/0.00*	7.63/0.00*	7.55/0.00*	7.70/0.00*	3.08/0.00*	7.08/0.00*	7.23/0.00*	7.68/0.00*	7.70/0.00*	×
BH/1.1,63	6.90/0.00*	6.28/0.00*	-	7.15/0.00*	8.20/0.00*	8.20/0.00*	7.60/0.00*	8.03/0.00*	7.18/0.00*	7.85/0.00*	6.63/0.00*	7.93/0.00*	7.45/0.00*	✓
BH/1.1,43	6.33/0.00*	6.33/0.00*	-	7.70/0.00*	7.90/0.00*	8.10/0.00*	7.38/0.00*	8.10/0.00*	7.55/0.00*	7.88/0.00*	6.80/0.00*	7.75/0.00*	7.88/0.00*	✓
BH/1.1,75	6.75/0.00*	5.70/0.00*	-	8.10/0.00*	8.08/0.00*	8.08/0.00*	7.80/0.00*	8.15/0.00*	7.55/0.00*	7.93/0.00*	4.90/0.00*	7.98/0.00*	8.22/0.00*	✓
BH/1.1,78	6.55/0.00*	5.73/0.00*	-	7.80/0.00*	8.03/0.00*	8.03/0.00*	8.03/0.00*	7.80/0.00*	7.80/0.00*	7.80/0.00*	6.15/0.00*	7.65/0.00*	7.80/0.00*	✓
BI/1.1,78	7.63/0.00*	7.28/0.00*	7.63/0.00*	-	7.63/0.00*	7.63/0.00*	7.63/0.00*	7.05/0.00*	7.63/0.00*	7.63/0.00*	7.28/0.00*	7.28/0.00*	6.98/0.00*	✓
BI/1.1,75	7.63/0.00*	7.38/0.00*	7.35/0.00*	-	7.65/0.00*	7.65/0.00*	7.65/0.00*	7.00/0.00*	7.65/0.00*	7.65/0.00*	7.65/0.00*	7.28/0.00*	6.70/0.00*	✓
BI/1.3,38	7.55/0.00*	7.55/0.00*	7.55/0.00*	-	7.55/0.00*	7.55/0.00*	7.55/0.00*	7.25/0.00*	7.55/0.00*	7.55/0.00*	7.55/0.00*	7.55/0.00*	6.88/0.00*	✓
BI/1.4,1.33	7.68/0.00*	7.35/0.00*	7.68/0.00*	-	7.68/0.00*	7.68/0.00*	6.98/0.00*	7.68/0.00*	7.68/0.00*	7.68/0.00*	7.68/0.00*	7.43/0.00*	6.53/0.00*	✓

The best result is in bold face and the second one in italics

Holm's test found significant differences at $\alpha=0.05$ (*) or $\alpha=0.10$ (°)

Friedman's test did not found any significant difference in mean ranking among the dimensions (Δ)

Table 5 Statistical results of the Friedman and Holm's test for the dimensions SIT₁, SIT₂, E and PR

D//R̄	L ₁ R̄/p-value	L ₂ R̄/p-value	BH R̄/p-value	BI R̄/p-value	SIT ₁ R̄/p-value	SIT ₂ R̄/p-value	E R̄/p-value	PR R̄/p-value	A R̄/p-value	OE R̄/p-value	P R̄/p-value	COOE ₁ R̄/p-value	COOE ₂ R̄/p-value	Decision
SIT ₁ /I ₁ /3.67	7.06/0.01*	6.28/0.04*	7.72/0.00*	7.72/0.00*	-	6.94/0.01*	7.39/0.00*	5.94/0.00*	7.39/0.00*	7.72/0.00*	7.72/0.00*	7.72/0.00*	7.72/0.00*	✓
SIT ₁ /I ₂ /4.47	7.11/Δ	6.72/Δ	7.78/Δ	7.78/Δ	-	6.25/Δ	7.78/Δ	6.94/Δ	6.36/Δ	7.03/Δ	7.78/Δ	7.78/Δ	7.47/Δ	✓
SIT ₁ /I ₃ /6.14	7.31/0.37*	7.31/0.37*	7.64/0.25*	7.64/0.25*	-	2.86 /0.01*	7.63/0.25*	7.31/0.37*	7.28/0.38*	7.64/0.25*	7.31/0.37*	7.64/0.25*	7.31/0.37*	×
SIT ₁ /I ₄ /3.72	7.42/0.00*	6.56/0.03*	8.03/0.00*	8.03/0.00*	-	5.19/0.26	7.64/0.00*	6.50/0.00*	6.78/0.02*	8.03/0.00*	7.47/0.00*	7.61/0.00*	8.03/0.00*	✓
SIT ₂ /I ₁ /5.41	7.28/Δ	6.86/Δ	7.61/Δ	7.61/Δ	5.08 /Δ	5.42/Δ	7.33/Δ	6.81/Δ	7.22/Δ	7.61/Δ	7.61/Δ	7.33/Δ	7.22/Δ	×
SIT ₂ /I ₂ /3.25	7.25/0.00*	7.58/0.00*	7.58/0.00*	7.58/0.00*	5.00/0.18	-	7.58/0.00*	7.25/0.00*	7.58/0.00*	7.58/0.00*	7.58/0.00*	7.58/0.00*	7.58/0.00*	✓
SIT ₂ /I ₃ /2.86	7.31/0.00*	7.31/0.00*	7.64/0.00*	7.64/0.00*	6.14/0.01	-	7.64/0.00*	7.31/0.00*	7.28/0.00*	7.64/0.00*	7.31/0.00*	7.64/0.00*	7.31/0.00*	✓
SIT ₂ /I ₄ /2.58	7.17/0.00*	5.80/0.01*	7.50/0.00*	7.89/0.00*	6.81/0.00*	-	7.61/0.00*	6.83/0.00*	7.61/0.00*	7.53/0.00*	7.89/0.00*	7.89/0.00*	7.89/0.00*	✓
E/I ₁ /2.10	7.75/0.00*	7.48/0.00*	7.43/0.00*	7.15/0.00*	7.75/0.00*	7.75/0.00*	-	7.03/0.00*	7.05/0.00*	7.75/0.00*	7.48/0.00*	7.45/0.00*	6.85/0.00*	✓
E/I ₂ /2.08	7.68/0.00*	7.05/0.00*	7.38/0.00*	7.40/0.00*	7.68/0.00*	7.68/0.00*	-	7.28/0.00*	6.98/0.00*	7.68/0.00*	7.40/0.00*	7.38/0.00*	7.38/0.00*	✓
E/I ₃ /2.03	7.73/0.00*	7.15/0.00*	7.35/0.00*	7.48/0.00*	7.73/0.00*	7.73/0.00*	-	6.85/0.00*	7.08/0.00*	7.73/0.00*	7.73/0.00*	7.43/0.00*	7.03/0.00*	✓
E/I ₄ /1.75	7.70/0.00*	7.70/0.00*	7.33/0.00*	7.15/0.00*	7.70/0.00*	7.70/0.00*	-	7.30/0.00*	6.73/0.00*	7.70/0.00*	7.43/0.00*	7.40/0.00*	7.43/0.00*	✓
E/I ₅ /1.45	7.70/0.00*	7.70/0.00*	7.40/0.00*	7.43/0.00*	7.70/0.00*	7.70/0.00*	-	7.00/0.00*	7.00/0.00*	7.70/0.00*	7.43/0.00*	7.70/0.00*	7.70/0.00*	✓
E/I ₆ /1.63	7.98/0.00*	7.35/0.00*	6.38/0.00*	7.78/0.00*	7.65/0.00*	7.98/0.00*	-	7.25/0.00*	7.25/0.00*	7.98/0.00*	7.65/0.00*	6.70/0.00*	7.45/0.00*	✓
PR/I ₁ /5.13	7.60/-	7.90/-	7.90/-	6.40/-	7.90/-	7.90/-	7.10/-	-	6.58/-	7.00/-	7.90/-	4.13/-	7.58/-	×
PR/I ₂ /2.68	7.53/0.00*	6.58/0.00*	7.78/0.00*	6.45/0.00*	7.48/0.00*	7.78/0.00*	7.18/0.00*	-	7.78/0.00*	7.78/0.00*	7.45/0.00*	7.10/0.00*	7.48/0.00*	✓
PR/I ₃ /3.38	7.55/0.00*	6.98/0.00*	7.85/0.00*	7.63/0.00*	7.53/0.00*	7.85/0.00*	6.13/0.03*	-	6.50/0.01*	7.85/0.00*	7.53/0.00*	7.05/0.00*	7.30/0.00*	✓
PR/I ₄ /2.35	7.73/0.00*	6.78/0.00*	7.73/0.00*	7.43/0.00*	7.73/0.00*	7.73/0.00*	7.10/0.00*	-	7.73/0.00*	7.73/0.00*	7.40/0.00*	7.18/0.00*	7.73/0.00*	✓

The best result is in bold face and the second one in italics

Holm's test found significant differences at $\alpha=0.05$ (*) or $\alpha=0.10$ (◊)

Friedman's test did not found any significant difference in mean ranking among the dimensions (Δ)

Table 6 Statistical results of the Friedman and Holm's test for the dimensions A, OE, P, COOE₁, COOE₂

D/II	\bar{R}	L ₁	L ₂	BH	BI	SIT ₁	SIT ₂	E	PR	A	OE	P	COOE ₁	COOE ₂	Decision
		\bar{R}/p -value	\bar{R}/p -value	\bar{R}/p -value	\bar{R}/p -value	\bar{R}/p -value	\bar{R}/p -value	\bar{R}/p -value	\bar{R}/p -value	\bar{R}/p -value	\bar{R}/p -value	\bar{R}/p -value	\bar{R}/p -value	\bar{R}/p -value	
A/I ₁ /1.45	7.78/0.00*	6.45/0.00*	7.65/0.00*	8.05/0.00*	7.43/0.00*	7.78/0.00*	7.78/0.00*	7.78/0.00*	7.50/0.00*	-	7.73/0.00*	6.28/0.00*	7.40/0.00*	7.75/0.00*	✓
A/I ₂ /2.45	7.13/0.00*	7.10/0.00*	7.78/0.00*	7.78/0.00*	7.78/0.00*	7.78/0.00*	7.78/0.00*	7.23/0.00*	7.78/0.00*	-	5.78/0.00*	7.53/0.00*	7.78/0.00*	7.15/0.00*	✓
A/I ₃ /3.75	7.50/0.00*	7.20/0.00*	7.80/0.00*	7.80/0.00*	7.80/0.00*	7.80/0.00*	7.80/0.00*	7.80/0.00*	6.93/0.00*	-	5.58/0.14	6.75/0.01*	6.83/0.00*	7.48/0.00*	✓
OE/I ₁ /1.30	7.28/0.00*	7.23/0.00*	7.33/0.00*	7.58/0.00*	7.58/0.00*	7.58/0.00*	7.58/0.00*	7.58/0.00*	7.58/0.00*	7.58/0.00*	-	7.28/0.00*	7.58/0.00*	7.58/0.00*	✓
OE/I ₂ /2.45	7.25/0.00*	5.30/0.02*	6.63/0.00*	7.90/0.00*	7.90/0.00*	7.90/0.00*	7.90/0.00*	7.90/0.00*	7.90/0.00*	7.63/0.00*	-	6.95/0.00*	7.58/0.00*	6.73/0.00*	✓
OE/I ₃ /2.25	7.20/0.00*	7.20/0.00*	7.50/0.00*	7.50/0.00*	7.50/0.00*	7.50/0.00*	7.50/0.00*	7.18/0.00*	7.50/0.00*	7.18/0.00*	-	7.50/0.00*	7.50/0.00*	7.50/0.00*	✓
OE/I ₄ /1.30	7.60/0.00*	6.93/0.00*	7.33/0.00*	7.60/0.00*	7.60/0.00*	7.60/0.00*	7.60/0.00*	7.60/0.00*	7.60/0.00*	7.33/0.00*	-	7.60/0.00*	7.60/0.00*	7.33/0.00*	✓
PI/I ₁ /2.33	7.68/0.00*	6.90/0.00*	7.08/0.00*	7.93/0.00*	7.93/0.00*	7.93/0.00*	7.93/0.00*	7.93/0.00*	7.93/0.00*	6.15/0.00*	6.60/0.00*	-	7.68/0.00*	7.03/0.00*	✓
PI/I ₂ /2.33	7.70/0.00*	6.95/0.00*	6.13/0.00*	7.95/0.00*	7.63/0.00*	7.63/0.00*	7.95/0.00*	7.40/0.00*	7.95/0.00*	5.93/0.00*	7.53/0.00*	-	7.63/0.00*	7.95/0.00*	✓
PI/I ₃ /2.48	7.63/0.00*	7.03/0.00*	6.68/0.00*	7.88/0.00*	7.55/0.00*	7.55/0.00*	7.88/0.00*	7.33/0.00*	7.88/0.00*	5.75/0.00*	7.53/0.00*	-	7.88/0.00*	7.55/0.00*	✓
COOE ₁ /I ₁ /2.03	7.40/0.00*	7.63/0.00*	7.95/0.00*	7.58/0.00*	7.95/0.00*	7.95/0.00*	7.95/0.00*	7.13/0.00*	7.10/0.00*	6.53/0.00*	7.63/0.00*	6.73/0.00*	-	7.43/0.00*	✓
COOE ₁ /I ₂ /1.85	7.93/0.00*	7.93/0.00*	7.60/0.00*	7.55/0.00*	7.38/0.00*	7.38/0.00*	7.38/0.00*	7.13/0.00*	6.73/0.00*	6.93/0.00*	7.58/0.00*	7.63/0.00*	-	7.43/0.00*	✓
COOE ₁ /I ₃ /1.38	7.65/0.00*	7.65/0.00*	7.65/0.00*	7.65/0.00*	7.65/0.00*	7.65/0.00*	7.65/0.00*	7.35/0.00*	7.03/0.00*	7.05/0.00*	7.65/0.00*	7.00/0.00*	-	7.05/0.00*	✓
COOE ₁ /I ₄ /2.45	7.48/0.00*	7.75/0.00*	7.75/0.00*	7.75/0.00*	7.75/0.00*	7.75/0.00*	7.75/0.00*	7.43/0.00*	7.10/0.00*	6.13/0.00*	7.43/0.00*	7.40/0.00*	-	6.85/0.00*	✓
COOE ₂ /I ₁ /1.03	7.15/0.00*	7.43/0.00*	7.73/0.00*	7.43/0.00*	7.45/0.00*	7.73/0.00*	7.73/0.00*	7.73/0.00*	7.73/0.00*	6.75/0.00*	7.73/0.00*	7.43/0.00*	7.73/0.00*	-	✓
COOE ₂ /I ₂ /1.38	7.30/0.00*	6.60/0.00*	7.88/0.00*	7.25/0.00*	7.60/0.00*	7.88/0.00*	7.88/0.00*	7.60/0.00*	7.60/0.00*	6.60/0.00*	7.88/0.00*	7.58/0.00*	7.88/0.00*	-	✓
COOE ₂ /I ₃ /1.30	7.55/0.00*	7.55/0.00*	7.55/0.00*	7.25/0.00*	7.55/0.00*	7.55/0.00*	7.55/0.00*	7.55/0.00*	7.55/0.00*	7.25/0.00*	7.55/0.00*	7.25/0.00*	7.55/0.00*	-	✓
COOE ₂ /I ₄ /1.33	7.55/0.00*	7.25/0.00*	7.55/0.00*	7.25/0.00*	7.55/0.00*	7.55/0.00*	7.55/0.00*	7.55/0.00*	7.55/0.00*	7.55/0.00*	7.55/0.00*	7.55/0.00*	7.55/0.00*	-	✓

The best result is in bold face and the second one in italics

Holm's test found significant differences at $\alpha=0.05$ (*) or $\alpha=0.10$ (°)

Friedman's test did not find any significant difference in mean ranking among the dimensions (Δ)

those of the junior researchers, who were responsible for validating the third draft of the questionnaire.

The first column of Table 4 (and, subsequently, Tables 4 and 5) provides information about: (1) the dimensions of this study (D), (2) the items which define each of these dimensions, according to the researchers of this study (I), and (3) the \bar{R} associated with each of these items within its dimensions. The following columns provide data regarding the \bar{R} and *p-value* associated with each of the dimensions. And, finally, the last column displays information regarding the decision that the researchers took after interpreting the statistical results item by item and for each dimension. Thus, key decisions made at this stage included: (1) to maintain the item (\checkmark), (2) to reword the item (\diamond) or (3) to remove the item from the final questionnaire (\times). Specifically, from Table 4, the fifth item (I_5) from the L_1 dimension was reworded and the sixth item (I_6) from the L_2 dimension was removed. It is worth mentioning that the L_1 and L_2 dimensions belong to a multidimensional construct (L). For this reason, some difficulties were found when analysing the items for these dimensions (as can be seen in Table 4). For each of the remaining dimensions, it can be observed that the operationalization was made appropriately.

Analogously to the descriptive results from Table 4, the results of the SIT_1 , SIT_2 , E, and PR dimensions are presented in Table 5 and discussed below. The modifications to be implemented in each of these dimensions were as follows. First, it is important to note that the third item (I_3) of the SIT_1 dimension and the first item (I_1) of the SIT_2 dimension were removed in the final version of the questionnaire, since the items did not obtain the minimum ranking. Second, when analysing the second item (I_2) of the SIT_1 dimension, it can be perceived that the Friedman test did not detect any significant differences between the groups. We hypothesize that the complexity of the study (a high number of dimensions being researched) may be the reason for this issue. Thus, the researchers in this study concluded that the item would remain for the last version of the questionnaire. Third, the first item (I_1) of the PR dimension did not have the lowest mean ranking and the Friedman test found no significant differences. For this reason, the researchers concluded that the item would be removed in the last version of the questionnaire.

Finally, the results associated with the A, OE, P, $COOE_1$, and $COOE_2$ dimensions were quite promising (Table 6). All the items from these dimensions had the lowest R , and significant differences were found in all but one of the cases (A/I_3). Despite this issue, it can be perceived that the junior researchers agreed the dimensions had been operationalized properly.

Discussion

This paper describes the development of an instrument to foster the development of life skills in online learning environments under the umbrella of the well-known CA framework. The design of the instrument involved a four-stage process. First, Nussbaum's list of central human capabilities was operationalized for online learning. Next, a mixed method-based research analysis (qualitative-quantitative) was carried out to assess the reliability and validity of the instrument by getting input from experts in different fields (virtual learning, philosophy, and statistics). Thus, semi-structured interviews were used for the process of item refinement. The output from this stage was a second draft of the questionnaire. A modified version of the Q-sort method was then used to analyse the extent to which different judges dis/agreed with the second draft of the questionnaire

(third stage). The output from this stage was a third draft of the questionnaire. Finally, non-parametric tests (Friedman and Holm tests) were used in order to validate the third draft (fourth stage). The results of this study showed that the instrument designed to evaluate life skills-based education in online learning contexts has statistical validity and reliability. Additionally, it is important to stress that the results obtained are also aligned with those reported in the specialized literature. For example, the Sense, imagination and thought construct was associated with the concept of creativity in this study, and for that reason it was divided theoretically into two related dimensions: divergent and convergent thinking. The empirical results obtained validated this decision statistically and are also in line with the results reported by Guilford (1967), in which creativity was similarly divided in the related elements. Furthermore, in this study, the Play construct was linked to the rights of a person to have fun, to laugh, and to engage in recreational activities while learning. When referring to recreation we mean activities in which people engage during their free time as an extracurricular pastimes, that they enjoy, and that they recognize as having socially redeeming values. The statistical analysis included all of these elements in the same construct (the Play construct), in this way being aligned with the research outcomes of different researchers that highlight the impact of recreational activities in the educational curriculum (Collins et al., 2001; Geller, 1980; Kanters, 2000). Life skills are cross-cutting applications of knowledge, skills, values and attitudes which are important in the process of individual human development and lifelong learning. As stated in the UNESCO Education vision of global citizenship education, this includes people's agency, social relationships and both hard and soft skills. Increasingly, researchers and practitioners have been discussing the importance of learners developing life skills (FitzPatrick et al., 2014; Hanley et al., 2007; Khlaisang & Songkram, 2019; Visser, 2005). This has been especially the case in distance and online environments. On one hand, online learning environments offer the flexibility needed for an education in these important skills. But, on the other hand, this may be particularly challenging given that learners do not interact physically with each other or the teacher (Kahn et al., 2017; Robinson & Hullinger, 2008). The tool that is presented in this article addresses this challenge using Martha Nussbaum's multidimensional framework of the CA, adapted to online education. This includes wide, long and deep competencies. The new instrument can be used to assess the level of life skills achieved by learners in online environments.

Also, it is worth noting the significance of this research for the online educational community. The instrument proposed could be employed in the different stages of the ADDIE model—Analyze, Design, Develop, Implement, and Evaluate (the model for instructional development most recognized by educators and learning design) (Nichols Hess & Greer, 2016). First, the instrument could be used in the analysis phase to align the instructional goals and objectives of a future online learning program with the Education 2030 paradigm. Second, the operationalization of the CA constructs could definitely help pedagogical and learning design in planning, developing and implementing open educational practices for the promotion of life skills. Third, the instrument could also be used for teachers and instructors to measure (evaluation phase) the extent to which the above mentioned life skills are being promoted in online learners.

There are some notable limitations to this study. First, similar to many instrument design processes described in social science studies, it did not include a random sample of professionals from the fields of philosophy and online education. They were chosen specifically, based on their areas of expertise. Thus, the participants recruited for this study had an adequate understanding of what the CA means. This fact would explain the positive

statistical results regarding the instrument's validity. Second, the judgemental approach to establishing content validity involves literature reviews and follow-up with an evaluation by expert judges or panels. Sometimes, the procedure for judging content validity requires researchers to be present with experts in order to facilitate validation. However, it is not always possible to have many experts on a particular research topic at one location and the location of experts in different geographical areas poses a limitation to conducting validity checks on a survey instrument (Choudrie & Dwivedi, 2005). Third, it would have been favourable to have a larger sample for the last phase of instrument validation. This would have allowed us to use parametric tests (such as ANOVA and t-test) rather than non-parametric ones as part of our methodology. However, this study examined the issue being investigated within a specific framework, thereby making it more difficult to identify and attract potential participants with expertise in the CA. Thus, the research team believes that the validity obtained through the non-parametric tests is promising.

This study opens a window for some very ambitious future research. The research team is interested in examining the extent to which online human capabilities are related to UNESCO's four pillars of education. Additionally, inspired by the European Lifelong Learning Indicators index, the research team aimed to create an index of lifelong learning for online learning. Thus, the final goal is to create a European Online Lifelong Learning index for making lifelong learning more tangible and comparable for teachers and instructors in online education all over the world, that is, creating an evaluation instrument to appraise the strengths and weaknesses of online universities in providing lifelong education.

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Declarations

Conflict of interest The authors declare that they have no conflict of interest.

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Pilar Gómez-Rey holds an MSc in Business Administration, an MSc and a PhD in Education and Information and Communications Technology. She is Associate Professor of Education at the Universidad Loyola Andalucía, Spain. Her research is focused on measuring quality learning in online and distance scenarios.

Elena Barbera is Doctor in Psychology and full Professor in Educational Psychology at Open University of Catalonia in Barcelona (Spain). Her research activity is specialised in the area of educational psychology, relating in particular to knowledge-construction processes and educational interaction in e-learning environments, evaluating educational quality and assessing learning, distance learning using ICT and teaching and learning strategies.

Francisco Fernández-Navarro received a PhD in Computer Science and Artificial Intelligence in 2011. He was a research fellow in Computational Management with the European Space Agency, The Netherlands, and is currently working as Associate Professor at the Universidad Loyola Andalucía, Spain.

Jingjing Zhang is Professor of Educational Technology at Beijing Normal University, where she directs the Big Data Centre for Technology-mediated Education. She is interested in how learning occurs between people engaging in online and offline communication. She holds a PhD and an MSc from the University of Oxford. Before joining Beijing Normal University, she trained at the OECD, Paris, and then interned at the United Nations headquarters in New York.

António Teixeira is Associate Professor at Universidade Aberta, where he has held the positions of Pro-rector and of Director of the Department of Education and Distance Learning. He is also a researcher at the University of Lisbon and collaborates with the University of Rome 3. He was President of EDEN – European Distance and E-learning Network. With a PhD and an MPhil in Philosophy from the University of Lisbon, his research interests include open education, eLearning pedagogy, educational innovation and ethics.