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# Design and Validation of Transversal Competences Assessment Instrument (TCAI) in Compulsory Secondary Education

## *Diseño y Validación del Instrumento para Evaluar Competencias Transversales (IECT) en Educación Secundaria Obligatoria*

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**Resumen:** Las competencias básicas (tales como Búsqueda y gestión de la información; Comprensión y expresión de información y emociones; Competencia para hacer y emprender; Competencia para vivir juntos y Competencia para ser) son necesarias para un adecuado desarrollo personal, social y profesional. Este estudio diseña y valida, con Análisis Factorial Confirmatorio, un instrumento para evaluarlas. Se recopilaron datos de 751 estudiantes de Secundaria,

con edades comprendidas entre 11 y 18 años. Los resultados confirman la estructura del instrumento, compuesto por cinco escalas independientes. El instrumento es válido para su aplicación de manera conjunta o separada.

**Palabras clave:** Competencias básicas, Educación Secundaria, Evaluación, Escalas.

**Abstract:** The basic competences (such as Information Acquisition and Management; Understanding and Expression of Information and Emotions; Competence to Do and Undertake; Competence to Live Together; and Competence to Be) are necessary to achieve adequate personal, social and professional development. This study develops and validates, through Confirmatory Factor Analysis, an instrument

for assessing them. Data were collected from 751 secondary students, with ages ranging from 11 to 18. The results confirm the structure of the instrument, comprising five independent scales. The instrument is valid for its application, either as a whole or separately.

**Keywords:** Basic competences, Secondary education, Assessment, Scales.

## INTRODUCTION

A competence involves the proven ability to use knowledge, skills and personal or social abilities and attitudes to respond effectively and ethically to a complex demand in a particular context (European Commission, 2018a; OECD, 2005).

The basic, key or transversal competences, are those considered indispensable for interacting in a wide range of social situation such as professional (also known as soft skills) and scholar contexts (Almerich, Díaz-García, Cebrián-Cifuentes and Suárez-Rodríguez, 2018) and for self-development (OECD, 2005) and, therefore, constitute the main aim of compulsory education (European Commission, 2016b).

In education, transversal competences can be considered as “relevant skills that students have to develop through the several stages of the educational degrees” (Gómez-Gasque, Verdecho, Rodríguez-Rodríguez and Alfaro-Sáiz, 2018, p. 334). Consequently, transversal competences are a current topic in the present worldwide educational arena (Sá and Serpa, 2108). As stated by Tsankov (2017) “One of the most important tasks of education is to form and develop competences, especially transversal ones, which are basic and guarantee that individuals can handle their future roles” (p. 129).

The UNESCO report by Delors (1996) identifies four pillars of education considered to be transversal to disciplines and daily life situations: learning to be, learning to live together, learning to do, and learning to know.

Based on the Delors Report (1996), the European Commission (2018b) in the Council Recommendation of 22 May 2018 proposes a framework consisting of eight basic competences: Literacy Competence, Multilingual Competence, Mathematical Competence and Competence in Science, Technology and Engineering, Digital Competence, Personal, Social and Learning to Learn Competence, Citizenship Competence, Entrepreneurship competence and Cultural awareness and Expression competence.

The European framework has been a reference for the Spanish educational proposal of the eight basic competences included in the Organic Law on Education (LOE) 2/2006, of May 3 and in the Royal Decree 1513/2006. This framework was restated in the Organic Law for Educational Improvement (LOMCE) 8/2013 and in the Royal Decree 126/2014, where seven basic competences were included.

The frameworks listed in Table 1 show similarities in the conceptualisation and structuring, which leads to the inference of competences cross-cutting is extended to geographical and political domains.

**Table 1. Correspondence among transversal competences in different educational frameworks**

UNESCO (DELORS, 1996)	EUROPEAN UNION (2018)	RD 126/2014 (LOMCE, 2013)	DECREE 236/2015	
			BASIC TRANSVERSAL COMPETENCES	DISCIPLINARY COMPETENCES
Learning to know	Personal, social and learning to learn	Learning to learn	To learn and to think	
Learning to do	Entrepreneurship	Sense of Initiative and entrepreneurship	Initiative	
Learning to live together	Citizenship	Social and civic	Coexistence	Social and civic competence
Learning to be			To be	
	Literacy	Linguistic	Verbal, non-verbal and digital communication	Linguistic and literary communication competence
	Multilingual			
	Digital	Digital		
	Mathematical competence and competence in science, technology and engineering	Mathematical competence and competence in science and technology		Mathematical competence
				Scientific competence
				Technological competence
	Cultural awareness and expression	Cultural awareness and expression		Artistic competence
				Motor competence

Note: Adapted from Gobierno Vasco (2014). Plan Heziberri 2020, marco del modelo educativo pedagógico.

Based on the LOMCE (2013), the Royal Decree 236/2015 is established which will give rise to the basic competences in the Basque Country, classified in two groups: basic disciplinary and basic transversal ones (Gobierno Vasco, 2014) (see Table 1). In the first group are placed seven basic disciplinary or specific competences: Social and Civic Competence; Linguistic and Literary Communication; Mathematical Competence; Scientific Competence; Technological Competence; Motor Competence and Artistic Competence. The second category includes five transversal basic competences, considered as those which are common to all disciplines and related to the four pillars identified by UNESCO (1996): Learning and Thinking, Doing and Undertaking, Living Together, Being Yourself and Communicating.

Finally, Garagorri, Gartzia, Mujika and Olaziregi (2017) specify abilities and attitudes for each transversal competence to facilitate their teaching, their development and assessment. These authors identify the following competences based on previous educational frameworks: Competence to Learn and to Think (including two components: Information Acquisition and Management, and Understanding and Expression of Information and Emotions), Competence to Live Together, Competence to Do and to Undertake and Competence to Be.

Competence-based learning, as a way of applying knowledge and skills to solve specific situations, involves several changes in the educational paradigm, both in the teaching strategies, focused on students' activity, and in the evaluation criteria, focused on their performance (Harks, Klieme, Hartig and Leiss, 2014; Villardón, 2012). Competence development seeks "authentic evaluation" consisting of assessing students' performance in some tasks linked to real or simulate situations whose resolution implies know (knowledge), know-how (procedures, skills, abilities), and how to behave (values, attitudes, emotions) (Callejas and Jaimes, 2009; Ferreyra and Backhoff-Escudero, 2016). Villardón (2006, 2012) proposes the following steps in order to carry out a competency assessment based on the performance of students: (a) establish competences or learning outcomes to be developed by the students according to the educational level (Yániz and Villardón, 2006); (b) determine the criteria or reference, as well as the evidence on which judgments about the achievement of the criteria are based; (c) break down the criteria into observable indicators or items through rubrics to realize the degree of accomplishment of the criteria; (d) plan the procedure for collecting information and feedback to students; and (f) to reflect on the evaluation system.

Consistently, criteria are the reference to assess the level acquired on objectives or learning outcomes and, therefore, to observe the level of competencies achieved (European Commission, 2018a). Even though assessment techniques of

disciplinary competences have been settled for collecting and integrating information about knowledge, skills and attitudes (Álvarez, Pérez and Suárez, 2008), the assessment of basic transversal competences remains as a challenge for teachers, among other reasons for its transversality (Cano, 2012; Mompoin-Gaillard, Rajic, Machado and Lázár, 2016), and because these theoretical constructs are difficult to measure in the same way as learned knowledge of any specific discipline is valued (Brown, Furtak, Timms, Nagashima and Wilson, 2010; Cook *et al.*, 2012; Miñano and Castejón, 2011). Concerning basic transversal competences evaluation, the short path existing has been mainly focused on the university environment (Liu, Yin and Wu, 2020; Luppi, Bolzani and Terzieva, 2019; Rodríguez, Ibarra and Curbéro-Ibáñez, 2018).

Therefore, new tools and techniques need to be designed for basic transversal competences assessment in the field of secondary school (Mompoin-Gaillard *et al.*, 2015). This study aims to design and validate a new assessment tool on basic transversal competences founded on performance criteria.

## MATERIALS AND METHOD

### *Participants*

A total of 751 compulsory secondary students (49% females, 51% males), with ages ranging from 11 to 18 fulfilled the instrument. The research sample comprised students enrolled in the first and the fourth grades of Compulsory Secondary Education (CSE) from two different schools (henceforth, School 1 and School 2), and data were collected in two separates, but consecutive, school years (2019 and 2020). A total of 39 student-groups participated in the validation process, as follows: 1 group from School 1 (N=51) participated in the pilot phase (at the beginning of 2019 school year), 24 groups (4 groups from School 1 and 20 groups from School 2) in the final of 2019 school year application and 15 groups (4 groups from School 1 and 11 groups from School 2) in the 2020 application.

As regards the educational level, due to the impossibility to collect data from all the CSE courses because of time constraints, first and fourth grades were selected, in order to guarantee as much data variability as possible. Consequently, 57.71% of the participants were enrolled in first grade of CSE, and the remaining 42.29% in fourth grade of CSE (Table 2).

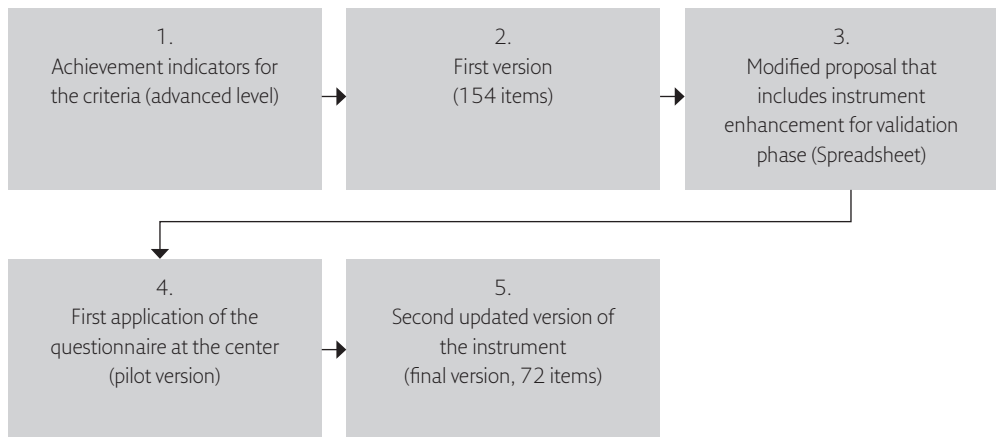
**Table 2. Distribution of the research sample**

SCHOOL CENTER	EDUCATIONAL LEVEL	SCHOOL YEAR		N
		2019 (n)	2020 (n)	
1	1st grade	71	80	151
	4th grade	51 <sup>(*)</sup>	-	51
2	1st grade	193	60	253
	4th grade	130	166	296

Note: <sup>(\*)</sup>This student-group participated only in the prior pilot phase in 2019, as part of the validation process.

### *Instrument*

The process followed to develop the self-assessment tool is included in Figure 1.

**Figure 1. Instrument development process**

The development process began by specifying the dimensions for the instrument corresponding to each transversal competence, which are considered independent or unrelated to each other. Specifically, in the present research, they were defined based on the classification proposed by Garagorri *et al.* (2017). Firstly, a pool consisting of achievement indicators of the four competences (Competence to Learn and to Think, Competence to Live Together, Competence to Do and to Undertake and Competence to Be) was elaborated. Then the pool was pruned by screening out redundant items and rewording or redistributing some others

to provide consistency across them. Therefore, drawn on theoretical considerations, the Competence to Learn and to Think was split down in two, as proposed by Garagorri *et al.* (2017): (i) information acquisition and management, and (ii) understanding and expression of information and emotions. That change allowed us to consider also, in a separate way, aspects regarding communication (verbal, non-verbal and digital), in line with the educational framework Heziberri 2020 (See Table 3) and European Union (See Table 1).

**Table 3. Correspondence between the components in the present study, Heziberri 2020 and the proposal by Garagorri *et al.* (2017)**

BASIC TRANSVERSAL COMPETENCES BASED ON HEZIBERRI 2020	COMPETENCES PROPOSED BY GARAGORRI <i>ET AL.</i> (2017)	COMPONENTS PROPOSED IN THE PRESENT STUDY
Competence for communication (verbal, non-verbal and digital)	—	Understanding and expression of information and emotions
To learn and to think	To learn and to think (information acquisition and management; Understanding and expression of information and emotions)	Information acquisition and management
To live together	To live together	To live together
Initiative competence	To do and undertake	To do and undertake
To be	To be	To be

Therefore, five competences emerged to comprise the theoretical structures for the constructs in the present study:

*Understanding and Expression of Information and Emotions* (UAIE) refers to the ability to understand and communicate different types of knowledge and emotions in a personal and clear way, knowing how to extrapolate it to other situations or contexts.

*Information Acquisition and Management* (IAM) encompasses a broad range of actions, such as, to identify the need of the information according to the goals, specify the search keywords, select the appropriate source and focus on the main information, knowing how to save it.

*Competence to Do and Undertake* (CDU) deals with the ability to propose new, original and useful action-oriented ideas.

*Competence to Live Together* (CLT) encompasses a broad range of student responses, such as, to express freely and respectfully what they feel, think and want to do; be emphatic and be respectful of diversity of origin and culture, to solve

conflicts; to play the role assigned in team work, fulfilling the commitments acquired; and to comply with the established norms to learn and to live together.

*Competence to Be* (CB) refers to several actions related to the ability to transfer cognitive, affective, communicative and social skills to other situations or contexts; to self-regulate behaviour; to use responsibly ICTs; to give importance to the environment for learning and having adequate physical conditions; to know their own strengths and weaknesses for learning and to know how to overcome them; to have a healthy lifestyle; and to value themselves positively, showing self-confidence.

This first version of the instrument with 154 items was submitted to experts, both professionals and academics. The academic experts (N=4) had to evaluate for each item its relevance for assessing the competence, as well as the clarity of the wording, on a scale of 1 (not suitable) to 4 (totally suitable). The practical experts were 2 teachers from each of 2 participant schools. They had to assess the suitability of the items for the students on a scale of 1 (not suitable) to 4 (totally suitable). They could also make suggestions for the writing.

Based on experts' opinions, some items were rewritten and those with the worst ratings were eliminated (N=52). This second version had a total of 102 items.

A prior pilot application of the instrument was carried out in both Basque and Spanish languages in the 4th year of School 1 to 51 students (Table 2). The application was made in presence and collectively, using Google Form. Descriptive analyses were carried out to detect those items with a low level of response or those with a low rate of discrimination. In addition, the content and wording of the items was reviewed. The last version of the instrument consisted of 72 items to which the frequency of occurrence was answered using a 5-point Likert scale (1="Never"; 2="Few times"; 3="Quite often"; 4="Many times"; 5="Always"), in addition to the options "I don't know/ I don't want to answer", "I don't understand the question").

The instrument was applied in Spanish and in Basque. For the purposes of this paper, it was back-translated into English (Tyupa, 2011).

### *Procedure*

The school principals were contacted and informed of the research. They, in turn, presented it for approval at a staff meeting. After written permission was granted by the schools, consent forms were forwarded to students' parents or guardians to inform them of the purpose of the study and explain that collected data were going to be dealt with confidentiality and used solely for research purposes. In addition, students were also informed of the general purpose of the study and of their rights as participants, stressing that their participation was anonymous and



voluntary. No incentives were offered in exchange for participation. The instrument took approximately 40 minutes to complete. Students who participated in 2019 responded online in a collective face-to-face session. In 2020, due to the lockdown situation by COVID-19 students responded online in a virtual group session.

### *Data analysis*

For the development and validation of the instrument, a series of statistical analyses were undertaken using the software packages IBM SPSS Statistics 26 (Arbuckle, 2019b) and Amos 26 Graphics (Arbuckle, 2019a).

On the one hand, the univariate normality was tested through skewness and kurtosis, assuming that absolute values above 2.3 indicate a large divergence from the normal distribution (Lei and Lomax, 2005). The univariate normality obtained, the absence of missing data (as all the items were compulsory to answer) and the large sample size used in the study validated the implementation of Maximum Likelihood (ML) estimation (Chou and Bentler, 1995; Finney and DiStefano, 2006) with listwise deletion (Brown, 2006).

On the other hand, the standardized Mardia's multivariate kurtosis coefficient was analysed, setting a benchmark for the critical ratio (c.r.) of 7.13. Due to the multivariate non-normality of data in the current study (c.r.=124.16) (Bentler, 2005), the parameters of the Confirmatory Factor Analysis (CFA) were estimated using the Satorra-Bentler robust corrections for standard errors, statistical errors and goodness-of-fit indices. Items were forced to load on their hypothesized factors. The variances for the first observed indicator of each latent variable were fixed to 1, and the variances for all error weights and the remaining parameters were freely estimated.

Then, based on theoretical considerations, only unidimensional models, in which all items were indicators of a single factor, were subjected to CFA. In all cases, the data analysis consisted of two phases. The first was to conduct the CFA for the theoretical structures. The second phase was to propose alternative models with the aim of improving the final version of the scales and to select those with the best overall goodness-of-fit data. To determine which model best fits the data, several fit indices were used to judge the adequacy of the analyses. Because the Satorra-Bentler chi-square ( $S-B\chi^2$ ) may be affected by the sample size and the complexity of the model (Hair, Black, Babin and Anderson, 2009), additional indices were considered: a) the ratio  $S-B\chi^2 / df$  (degrees of freedom); b) the Comparative Fit Index (CFI); and c) the Root Mean Square Error of Approximation (RMSEA), with a relative 90% confidence interval. To interpret these indices, the

following criteria were used: a)  $S-B\chi^2 / df < 2$  (excellent),  $S-B\chi^2 / df < 3$  (good),  $S-B\chi^2 / df < 5$  (acceptable) (Bentler, 2005); b)  $CFI \geq .90$  (good),  $CFI \geq .95$  (excellent) (Hoyle and Panter, 1995); and c)  $RMSEA \leq .08$  (good),  $RMSEA \leq .05$  (excellent) (Hu and Bentler, 1999). In addition, the Akaike's Information Criterion (AIC) was used to compare the models with different estimated parameters in such a way that lower values indicated higher parsimony for the model.

Finally, reliability was also assessed with the Composite Reliability (CR) and Cronbach's coefficient ( $\alpha$ ). To interpret the scores, values above .50 for the former were considered adequate (Fornell and Larcker, 1981) and values above .70 for the latter indicate acceptable reliability (Nunnally, 1978).

## RESULTS

The skewness and kurtosis analysis showed that most items met the aforementioned criteria. Specifically, skewness scores ranged from -2.12 (UAIE17) to 0.15 (UAIE01); whereas kurtosis scores ranged from -1.16 (UAIE16) to 1.77 (UAIE15). The only exception was item UAIE17 with a kurtosis value of 4.43. However, visual inspection of the corresponding graphic distribution showed that, although initially identified as an outlier, it was suitable for retention and inclusion in subsequent analyses. With these considerations, the theoretical models, consisting of five unrelated first-order factors, were tested (Table 4).

**Table 4. Goodness-of-fit indices for the theoretical models**

SCALE	$S-B\chi^2 / df$	CFI	RMSEA (90% CI)	AIC
IAM	3.78	.94	.061 (.052, .070)	275.92
UAIE	5.96	.81	.081 (.076, .087)	913.05
CDU	4.06	.96	.064 (.052, .076)	163.50
CLT	4.16	.86	.065 (.059, .071)	597.57
CB	5.97	.85	.081 (.075, .088)	716.88

Note: IAM=Information Acquisition and Management; UAIE=Understanding and Expression of Information and Emotions; CDU=Competence to Do and Undertake; CLT=Competence to Live Together; CB=Competence to Be.

As can be seen, both IAM and CDU showed good fit to data, according to the aforementioned cut-off criteria. Regarding CLT, its structure showed overall adequate fit to data, although the CFI was behind the desirable score. Meanwhile, in UAIE and CB, all assessed indices were out of range. As a consequence, the structures

were further inspected through the standardized factor loadings and modification covariance indices. These scores suggested that the structures could be significantly improved by eliminating some items (Table 5).

**Table 5. Goodness-of-fit indices for the revised structures**

SCALE	ITEM(S) DELETED	S-B $\chi^2$ /df	CFI	RMSEA (90% CI)	AIC
IAM	IAM08	3.37	.95	.056 (.046, .066)	214.12
UAIE	UAIE09, UAIE16, UAIE17	5.81	.85	.080 (.073, .087)	613.19
CDU	CDU06	2.89	.98	.050 (.035, .066)	105.87
CLT	CLT04, CLT05, CLT09, CLT14	4.49	.89	.068 (.060, .076)	369.51
CB	CB07, CB10, CB11, CB12	5.52	.90	.078 (.069, .086)	370.58

Note: IAM=Information Acquisition and Management; UAIE=Understanding and Expression of Information and Emotions; CDU=Competence to Do and Undertake; CLT=Competence to Live Together; CB=Competence to Be.

These modified scales were significantly better fit to data when compared to the theoretical ones. Nevertheless, as seen in Table 5, both UAIE and CB remained showing scores out of the desirable cut-off criteria (S-B $\chi^2$  /df ratio in both and CFI in CB); whereas CLT showed overall acceptable to good fit-to-data with the exception of CFI, which was borderline. Regarding the AIC, these revised structures were more parsimonious and interpretable.

Finally, additional properties of the final versions were assessed with the Composite Reliability (CR) and Cronbach's coefficient ( $\alpha$ ) of each structure. The reliability analyses showed good internal consistency of the IAM (CR=.86,  $\alpha$ =.88), UAIE (CR=.87,  $\alpha$ =.87), CDU (CR=.84,  $\alpha$ =.84), CLT (CR=.84,  $\alpha$ =.83) and CB (CR=.87,  $\alpha$ =.87). These scores were found to be good based (Fornell and Larcker, 1981; Nunnally, 1978). Therefore, the results suggested that the items were internally consistent in representing the corresponding factors. All standardized factor loadings ( $\lambda$ ) were reestimated, assessing that all of them were statistically significant ( $p < .05$ ).

These results confirmed the structure for the instrument, consisted of five independent scales. The final version is composed of 59 items (See table 6).

**Table 6. Standardized factor loadings for the final scales**

SCALE	ITEM	$\lambda$
IAM	IAM01. Before starting a search, I identify the key words	.650
	IAM02. I look for information in different media (book, journals, newspapers or websites, among others)	.558
	IAM03. I look for high-quality sources of information	.603
	IAM04. I record what I observe by using annotations, photographs or videos, among others	.600
	IAM05. I prepare the appropriate questions in an interview or questionnaire to get the information I need	.671
	IAM06. I interpret the information without being influenced by my feelings or opinions	.528
	IAM07. Before looking/searching for information, I plan how to do it	.610
	IAM08. When I write information in a classwork, I mention where I got it from	*
	IAM09. When I search on the Internet, I save the information	.566
	IAM10. I share online with my classmates the resources found on the Internet	.514
	IAM11. I work collaboratively online with my classmates	.592
	IAM12. I use different computer programs (text or databases, among others)	.666
UAIE	UAIE01. When I study, I write a word list with the terms that I do not understand and their definition	.517
	UAIE02. When I read a text, I underline the main ideas	.467
	UAIE03. I summarize and connect the information by using several techniques (diagrams and concept maps, among others)	.639
	UAIE04. When I carry out an oral presentation, I express myself clearly	.648
	UAIE05. When I carry out an oral presentation, I realize what I have to improve	.556
	UAIE06. When I carry out an oral presentation, I present the main ideas of the classwork	.687
	UAIE07. When I do a written work, I organize the information into sections	.621
	UAIE08. When I do a written work, I write clearly	.495
	UAIE09. I express easily my emotions	*
	UAIE10. I use several applications and/or platforms to create digital content	.560
	UAIE11. I use gestures and expressions to remark what I say	.435
	UAIE12. I use technology to learn	.502
	UAIE13. I realize the tricks I use to learn	.618
	UAIE14. I use techniques (summaries, underlines, studying out aloud, among others) that help me to learn	.586
	UAIE15. I use technology to present works (Word, PowerPoint or Prezi, among others)	.511
	UAIE16. I use social networks for academic purposes	*

**Table 6. Standardized factor loadings for the final scales**

SCALE	ITEM	$\lambda$
UAIE	UAIE17. I know how to insert pictures into a document	*
	UAIE18. I know how to insert links into a document	.486
CDU	CDU01. In team work, I bring original ideas	.733
	CDU02. In team work, I propose realistic ideas	.643
	CDU03. I find it easy to organize the ideas that come to my mind	.712
	LDU04. When I have several alternatives, I choose the most appropriate	.614
	CDU05. I express my ideas in team work even when my classmates do not agree with me	.552
	CDU06. It is easy for me to accept the ideas of my classmates	*
	CDU07. I can think of different ideas to solve a problem	.615
	CDU08. I am tenacious until finishing the task	.585
	CDU09. I assume the role of leader in team work	.546
CLT	CLT01. I express my ideas, respecting my classmates	.640
	CLT02. It is easy for me to put myself in the other person's shoes	.564
	CLT03. I communicate with persons of different origins and cultures	.433
	CLT04. I am interested in knowing other cultures	*
	CLT05. I dare to say "no" when others ask me for something I do not really want to do	*
	CLT06. I accept constructive criticism from my classmates	.564
	CLT07. I am grateful when someone does me a favour	.491
	CLT08. I congratulate others when they do something well	.604
	CLT09. In the future, I would like to participate in volunteerism	*
	CLT10. I fulfill my duties in team work	.640
	CLT11. In team work, I do my tasks in time	.505
	CLT12. I accept all the group members, with their faults and virtues	.543
	CLT13. I help to create a good working environment in group	.588
	CLT14. I like that my group is integrated of different people	*
	CLT15. I take part when someone disrespects another person	.462
	CLT16. I respect the environment	.457
	CLT17. When there is a conflict, I discuss calmly	.511

**Table 6. Standardized factor loadings for the final scales**

SCALE	ITEM	$\lambda$
	CB01. I have a willingness to learn new things	.538
	CB02. When I have something to do, I get on with it without anyone telling me	.632
CB	CB03. The feedbacks I receive from classmates help me to learn	.575
	CB04. I keep my study place in good conditions (silence, order and lighting, among others)	.599
	CB05. I organize the tasks well to meet the deadlines	.641
	CB06. I focus on the task without being distracted	.676
	CB07. I know which tasks I am good at and which ones are more difficult to me	*
	CB08. I try to improve at tasks that I am not good at	.668
	CB09. I lead a healthy lifestyle	.584
	CB10. I accept myself as I am	*
CB	CB11. When I feel bad, I think of strategies to feel myself better	*
	CB12. I am optimistic (positive thinking)	*
	CB13. I feel strong to overcome difficult situations	.514
	CB14. I know my own strengths and weaknesses	.518
	CB15. I am consistent with the decisions I take	.540
	CB16. I reflect on my own actions	.552

Note: \*Item deleted in the final version of the scale after validation process.

## DISCUSSION

The aim of this study was to design and validate an instrument to measure the level of basic transversal competences in CSE. Drawing on previous literature, a measurement tool, comprising five competences, is designed based on the performance indicators of the criteria of each competence according to Garagorri *et al.* (2017).

The results confirm the structure for five independent scales to assess the key aspects of the basic transversal competences: Information Acquisition and Management (IAM); Understanding and Expression of Information and Emotions (UAIE); Competence to Do and Undertake (CDU); Competence to Live Together (CLT) and Competence to Be (CB). The suppression of some items allowed improving the adjustment of the instrument.

The first IAM scale is composed of 11 items, as a result of removing the item IAM8. This item is related to referencing the original source of the information. This is certainly not a generalized requirement in CSE, nevertheless, it should be

taught and required to avoid misappropriation of intellectual property (Kresalja, Marticorena, Roca and Unger, 2007; Quiroz Papa de García, 2014).

The UAIE scale finally consists of 15 items, after the exclusion of three items. Despite these removals, the adjustment of this scale is weaker. Perhaps the wide heterogeneity of the items, some related to information and to the use of technology in the academic context, and others related to emotions, may explain this result. Additionally, managing emotions can be particularly challenging at this age (Gázquez, Sainz, Pérez-Fuentes, Molero and Soler, 2015), more complicated than academic communication. Item UAIE16, which refers to the use of social networks for academic purposes, is also eliminated from the scale. This result may be based on the fact that, at this age, social networks are used almost exclusively for leisure activities (Ifinedo, 2016; Macedo-Rouet *et al.*, 2020).

The CDU scale consists of 8 items related to generating ideas and alternatives. Although the fit-to-data is good, it would be necessary to deepen the characteristics of this competence to better define it. It is a competence related to initiative, which is very relevant in the training of proactive citizens who contribute to social transformation (Arruti and Paños-Castro, 2020). In this regard, methodologies based on challenges, projects, or problems, have proven to be effective for the development of this competence (Berry, 2011; European Commission, 2016).

The CLT scale comprises 13 items, after removing four items. One of them, CLT05, refers to assertiveness, which is an indispensable element for coexistence, although it is certainly a challenge in adolescence (Murillo and Hernández, 2011). It would be convenient to develop assertiveness in an explicit way in CSE. The rest of the items removed (CLT04, CLT09, CLT14) have to do with diversity. It appears that this result reflects difficulties in coexisting with classmates of different cultures and characteristics. In an increasingly global world, it is imperative to learn to coexist with diversity (Guasp-Coll, Navarro-Mateu, Lacomba-Trejo, Giménez-Espert and Prado-Gascó, 2021; Mora, de Lucas, González, Solanes and Vázquez, 2018; Sáenz-Hernández, Lapresta-Rey, Ianos and Petreñas, 2020; Spyropoulou, Surlantzi, Karakosta, Kotsampasoglou and Giovazolias, 2020).

Finally, the CB scale is defined by 12 items related to self-awareness and responsibility in school tasks. The discarded items have to do with self-acceptance (CB10), and with the ability to readjust their thoughts in order to feel better (CB11), by focusing on the positive (CB12). This result may reflect the nonconformity and pessimism with which adolescence is often described (Bisquerra, 2009, 2012; Martínez-Garrido and Murillo, 2015).

Several similarities can be appreciated in the content of some items of the different scales. Despite being based on the performance criteria of each competence

(Garagorri *et al.*, 2017), these coincidences reflect that some components of the different competences are to some extent similar, which confirms their cross-cutting nature (Gobierno Vasco, 2014).

One of the limitations of this proposal is that it is entirely based on self-assessment. It would be appropriate to integrate it with other performance-based assessment techniques, such as observation or hetero-applied techniques, responded by the schoolteachers.

On the other hand, the validation of the instrument was carried out on a relatively reduced and homogeneous sample, which means that the results are not entirely generalizable. Although the resulting sample group was large enough for the research purposes, it would be advisable to increase the size and diversity of the sample in terms of school type, rural or urban area, geographic location, among others, to further assess the invariance of the factor structures. In this line, replicate the study with larger samples are needed to provide insights and improvements regarding the factor structure.

Nevertheless, the psychometric properties of the Transversal Competences Assessment Instrument (TCAI) showed that it is an appropriate instrument for measuring the level of basic transversal competences of compulsory secondary students. As it has been proved that the structure comprises five independent scales, the instrument can be used either as a whole for measuring the key transversal competences or separately in case of being interested in assessing just one or some of them. However, further research is needed regarding the constructs of the UAIE and CB competences to improve the fit of the scales to assess them.

The contribution of this article is twofold; on the one hand, it offers a useful procedure for developing a self-applied transversal competence assessment instrument based on performance criteria that could be adopted for the evaluation of other competences, as it has a consistent approach with an authentic assessment. And authentic assessment is a tool that fosters students learning through the process of assessment itself (Brown, 2015).

On the other hand, it simultaneously offers the possibility of assessing the basic transversal competences in CSE and identifying some fundamental training objectives in educational systems all over the world. Indeed, the cross-national nature of the competences assessed in the present study, which emerged from the UNESCO framework (Delors, 1996), enables its application, prior adaptation and validation, to other geographical contexts. As the instrument has been designed to be self-applied, it can be used for training purposes to encourage students to reflect on the development of these competences (Lahn, 2011; Rekalde and Buján, 2014; Sabariego-Puig, 2015; Santos-Pastor, Castejón-Oliva and Martínez-Muñoz, 2012;



Villardón, 2006). In this way, self-knowledge is encouraged as the first step in planning one's own life project, which is fundamental for the development of identity in adolescence (Broc-Cavero, 2000). Finally, TCAI can be an effective resource for providing feedback to students on their strengths and areas for improvement in regards to transversal competences (Brown, 2015).

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