The paradox of learning to learn development: adapting a scale in secondary school students

La paradoja del desarrollo de aprender a aprender: adaptación de una escala en estudiantes de secundaria

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Abstract

The conceptualization of the competence of learning to learn has evolved over the years, and its name has been changed to personal, social, and learning to learn competence. However, the analysis of this competence's cognitive and metacognitive development is still central when talking about the self-regulation of learning, especially at the secondary school stage where the work of guidance departments is fundamental in developing specific skills for learning. This article presents a twofold objective: adapting a scale to measure the self-perception of the level of development of this competence, focusing on the cognitive and metacognitive dimension in secondary school students, and, secondly, the analysis of its evolution by year. The sample comprises 1033 secondary school students from the Community of Madrid. The first objective involves a double exploratory and confirmatory factor analysis process, selecting two different samples. The criterion validity is based on the relationship of competence with learning approaches and academic self-efficacy. An ANOVA and a Student's t-test were performed for the second objective. The results show adequate internal

consistency, obtaining a factorial structure of three factors (Self-assessment of the process, Self-knowledge as a learner, and Management of the learning process) and goodness of fit indices adequate to the postulated theoretical model, in addition to the relationships to support criterion validity are coherent and significant (p< .05). The results indicate that the level of development of learning to learn competence decreases as the academic year's progress. There are emotional aspects, such as motivation, which could explain this decline throughout secondary education, and it is essential to be able to act on them in the guidance processes.

Keywords: learning processes, competence, self-regulation, metacognition, self-efficacy, learning motivation, secondary education.

Resumen

La conceptualización de la competencia de aprender a aprender ha ido evolucionando a lo largo de los años, llegando a modificarse su denominación por competencia personal, social y de aprender a aprender. Sin embargo, el análisis del desarrollo cognitivo y metacognitivo de esta competencia sigue siendo central al hablar de la autorregulación del aprendizaje, especialmente en la etapa de secundaria donde la labor de los departamentos de orientación es fundamental en el desarrollo de ciertas habilidades para aprender mejor. Este artículo presenta un doble objetivo, el proceso de adaptación de una escala para medir la autopercepción del nivel de desarrollo de esta competencia, centrándose en la dimensión cognitiva y metacognitiva, en alumnos de secundaria y, en segundo lugar, el análisis de su evolución por curso. La muestra está formada por 1033 estudiantes de educación secundaria de la Comunidad de Madrid. El primer objetivo supone un doble proceso de análisis factorial exploratorio y confirmatorio seleccionando dos muestras diferentes. La validez criterial se apoya en la relación de la competencia con los enfoques de aprendizaje y la autoeficacia académica. Para el segundo objetivo se realiza un ANOVA y una t de Student. Los resultados muestran una adecuada consistencia interna, obteniendo una estructura factorial de tres factores (Autoevaluación del proceso, Autoconocimiento como aprendiz y Gestión del proceso de aprendizaje) y unos índices de bondad de ajuste adecuados al modelo teórico postulado, además las relaciones para apoyar la validez criterial son coherentes y estadísticamente significativas (p< .05). Los resultados indican que el nivel de desarrollo de la competencia de aprender a aprender disminuye a medida que avanzan los cursos académicos. Hay aspectos emocionales, como la motivación, que podrían explicar este descenso a lo largo de la educación secundaria y es importante poder actuar sobre ellos en los procesos de orientación.

Palabras clave: procesos de aprendizaje, competencia, autorregulación, metacognición, autoeficacia, motivación para el aprendizaje, educación secundaria.

Introduction

The theoretical approach used to define the learning to learn competence (also known as the LTL competence) is that developed by the European conceptualisation, research and development framework (Caena & Punie, 2019; European Commission, 2006; European Council, 2018; Fredriksson & Hoskins, 2006a; García et al., 2022; Hoskins & Fredriksson, 2008; Hutmacher, 1997; Sala et al., 2020; Salas & Gallardo, 2022; Stringher, 2014; Stringher et al., 2021; Valle, 2020), which has been guiding the state legislation governing this competence (LOE, 2006; LOMCE, 2013; LOMLOE, 2020; Martín-Alonso, & Muñoz-San Roque, 2022) with a perspective centred on the concept of self-regulatory competence (Hadwin et al., 2018; Salas & Gallardo, 2022; Salmerón et al., 2010; Schunk & Zimmerman, 1997; Torre, 2007; Usher & Schunk, 2018; Zimmerman 1995). Thus, the learning to learn competence is understood as the set of cognitive, metacognitive, emotional and relational skills that allow students to be aware of and to manage their own learning.

The two major institutional developments of the learning to learn competence in the EU took place at the two main moments in which the EU selected and defined the key competences (European Commission, 2006; European Council, 2018) within its strategies for the years 2010 and 2020. As part of this process of conceptualisation, research and development, there has been an evolution leading to a change in the terminology used, from the old term – learning to learn competence (European Commission, 2006) – to the new term – personal, social and learning to learn competence (European Council, 2018).

Since its beginnings in the European context, two perspectives of this competence were noted: the cognitive psychology paradigm and the sociocultural paradigm, exemplified by the figures of Piaget and Vygotsky (Hoskins & Fredriksson, 2008; Fredriksson & Hoskins, 2006a). Hence, in the general framework of the Education and Training 2010 project (European Council, 2000), a series of meetings of experts on the subject were organised and they convened the Learning to Learn Network meetings (Fredriksson & Hoskins, 2006a; 2006b; 2007), focusing their work on the conceptualisation and measurement of the learning to learn competence. The aim was to create an instrument that was subsequently applied in eight European Union countries (Kupiainen et al., 2008).

The inconclusive results obtained through the instrument and the withdrawal of funds by the European Union resulted in a dearth of publications on the subject in the Centre for Research on Lifelong Learning (CRELL) until the issue was taken up again in the new 2018 reference framework of competences (Martín-Alonso, 2021). The new definition of the learning to learn competence (European Council, 2018) has prompted a new conceptualisation, research and development framework continuing on from the previous framework (Caena & Punie, 2019; Caena & Stringher, 2020; García et al., 2022; Sala et al., 2020; Suarez et al., 2005; Valle, 2020). The concept continues to evolve in a broader context around metacognition and self-regulation of the traditional definition and introducing socioemotional aspects, well-being and health (Caena & Punie, 2019). Thus, the current definition contemplates aspects such as collaboration with others, the contribution to physical and emotional well-being, healthy living and conflict management, without rejecting existing aspects, such as time management and learning (European Council, 2018).

In this context of the evolving thinking on the concept of learning to learn, not only is this understood from the perspective of self-regulatory competence (Hadwin et al., 2018; Salmerón et al., 2010; Schunk & Zimmerman, 1997; Torre, 2007; Usher & Schunk, 2018; Zimmerman, 1995) and as a broad concept that encompasses metacognition (Efklides, 2011; Moreno & Martín, 2007; Panadero & Tapia, 2014; Pintrich, 2000; Torre, 2007; Whitebread et al., 2007; Winne 2018; Zimmerman, 1995), but it also integrates cognitive and sociocultural perspectives of learning (García et al., 2022; Hadwin et al., 2018; Panadero, 2017; Panadero & Tapia, 2014; Salas & Gallardo, 2022; Schunk & Greene, 2018; Usher & Schunk, 2018; Winne, 2018; Zimmerman, 2013).

Thus, based on the analysis of the aforementioned theoretical models, we have selected the most significant dimensions that determine the concept of the learning to learn competence (Martín-Alonso, 2021; Muñoz-San Roque et al., 2016): self-assessment of the process; self-awareness as a learner; and management of the learning process. These dimensions differ from the current theoretical framework for defining the personal, social and learning to learn competence, as they omit the more social part of learning, which has been included in the latest legislation. Further research will add this aspect when designing and assessing this competence, an aspect that is considered fundamental in the new European conceptualisation framework (European Council, 2018) and which

has inspired a change in the legislation in Spain (LOMLOE, 2020). The instrument adapted in this study has focused on the cognitive aspects of the competence, following the legislative framework of the moment. However, a major contribution is that it addresses personal aspects of the student, including self-awareness as a learner.

The first of the three dimensions considered relevant when defining the learning to learn competence from cognitive and metacognitive perspectives refers to the dimension of self-assessment of the process, that is, the verification of the procedure followed by the student while learning. It is a basic metacognitive strategy within the learning to learn competence (Hautamäki et al., 2002; Zimmerman, 2013) that, in addition to knowledge of the process, assumes executive control during learning that incorporates control of the effort involved in the task (Martínez-Fernández, 2007).

The second dimension focuses on self-awareness as a learner, which is what Deakin-Crik (2014) call strategic knowledge, that is, being aware of one's own learning process and of the context by applying metacognitive strategies such as being aware of oneself (cognitively and affectively), of the learning process and of the relationship between oneself and that process (Villardón-Gallego et al., 2013). It has an emotional aspect, as it integrates the awareness of strengths and weaknesses and, in general, emotional self-awareness (Martín & Moreno, 2007).

Thirdly, management of the learning process includes the planning and the cognitive management of the process, whereby the student sets realistic goals and implements metacognitive strategies in order to acquire a personal commitment to achieving these goals (Martínez-Fernández, 2007; Villardón-Gallego et al., 2013; Zimmerman, 2013). It incorporates aspects such as planning (times, schedules, etc.), cognitive management and testing and, ultimately, knowledge and control of strategies adapted to the task (Caena & Punie, 2019).

When analysing how the learning to learn competence evolves as students progress through academic years, there are several studies that show that its development decreases, as do motivational aspects (Gaeta, 2013; González Fernández, 2005; Palomo del Blanco, 2014; Rodríguez Fuentes, 2009; Rosario et al., 2012). In this regard, Dignath and Büttner (2008) conducted a meta-analysis of self-regulation in primary and secondary school and concluded that students in higher years learn more strategically, but their motivation decreases as they progress from year to year. Stringher (2021) considers that, in the development of learning

competences, there are key elements such as motivation, creativity and curiosity to learn and that these decrease over the school years, to increase again in early adulthood. This decline in the development of learning skills due to motivational factors also appears in the classic study by Zimmerman and Martinez-Pons (1990) and is also noted by Pintrich (2003) with reference to the decline in student motivation.

This paper presents the most relevant results of this research, the main objectives of which are twofold.

The first objective is the adaptation of a valid, reliable instrument that measures the development of the learning to learn competence in secondary school students, taking into account the legislative framework that defined the cognitive and metacognitive aspects of the competence.

The second objective is to analyse whether the paradox of a decrease in their perception of their development of the competence is present as students progress to higher years. This is an issue of interest in the field of educational research and for the work carried out by professionals in psycho-pedagogical guidance, since the development of learning skills has always been a fundamental field of work in schools and the object of tutorial action.

Method

The research design was cross-sectional and used quantitative methodology. The approach applied in the process of adapting the scale was hypothetical-deductive, based firstly on theoretical sources and then, through empirical validation, based on a structure with different factors from a scale validated in university students.

Sample

The sample was a non-probabilistic incidental sample and met three fundamental requirements: the subjects were secondary school students from state, subsidised or private schools in the Region of Madrid, they were studying the different academic options available in the fourth year of Obligatory Secondary Education (ESO) and they were enrolled in different years. During the 2017-2018 and 2018-2019 academic years, the questionnaire was

given to 1155 subjects. Missing or randomly answered values were eliminated. Data were selected from a sample of 1033 secondary education and baccalaureate students, of whom 544 were female and 489 were male. 163 (15.8%) were from the first year of ESO (1ESO), 184 (17.8%) from the second year of ESO (2ESO), 200 (19.4%) from the third year of ESO (3ESO), 336 (32.5%) from the fourth year of ESO (4ESO), 130 (12.6%) from the first year of baccalaureate and, finally, 18 (1.7%) from the second year of baccalaureate. As regards the schools, 759 students studied in subsidised schools (72.7%), 136 in private schools (13.2%) and 146 in state schools (14.1%).

For the dual process of confirmatory and exploratory analysis, the sample was divided into two according to the dates on which the questionnaire was answered. The sample for the exploratory analysis consisted of 355 participants, of whom 219 (61.7%) studied in subsidised schools and 136 (38.3%) in private schools. The sample selected for the confirmatory factor analysis (CFA) consisted of 678 participants, of whom 530 (78.4%) studied at subsidised schools and 146 (21.6%) at state schools. With respect to the number of subjects required to carry out a CFA, Ferrando and Anguiano-Carrasco (2010) suggest a sample of 200 observations as a minimum to be taken into account. Rojas-Torres (2020) also advocates samples of 200 for a CFA, indicating that from this N onwards the increase does not greatly affect the robustness of the classical adjustment indices.

Instruments

The objective of adapting a scale to measure the learning to learn competence in secondary school students involved an initial analysis of existing instruments and the detailed selection and study of those that were considered essential. The starting point was an instrument that had already been developed and validated, aimed at university samples (Muñoz-San Roque et al., 2016). It was adapted to adequately take into account the differential characteristics of a sample of secondary school students. The analysis began with a construct of self-regulatory competence (Hadwin et al., 2018; Salmerón et al., 2010; Schunk & Zimmerman, 1997; Usher & Schunk, 2018; Zimmerman, 1995), with the integrating vision of Torre (2007). The basis, then, was a structure comprised of four components (context, cognition, behaviour and emotion) with two subdimensions in each component (knowledge and control/management). Similarly, the

process of elaboration of the European pre-pilot test to measure the learning to learn competence (Hoskins & Fredriksson, 2008) was taken into consideration, as were the existing instruments (Deakin-Crick et al., 2004; Elshout-Mohr et al., 2004; Hautamäki et al., 2002; Moreno, 2002), which led, in 2008, to the pre-pilot test applied in eight countries (Kupiainen et al., 2008; Moreno et al., 2008).

The first stage was the drafting of 26 items. For the selection of the definitive items, two fundamental criteria were applied: content validation by university professors through the Clarity, Appropriateness, Relevance and Accessibility (CARA) model (Hernández-Franco & Gonzalo-Misol, 2009) and psychometric analysis of the operation items, maintaining those whose highest factor saturation in the rotated matrix fell within the dimension postulated by the proposed theoretical model and which did not have a weighting greater than .30 in the rest of the factors.

After the analyses, 19 items were maintained on a scale of 1 to 6 (not very developed to highly developed) and which maintained the different conceptual nuances on which the theoretical basis rested.

The analyses also included:

■ Sociodemographic data (year, school, sex, age, number of curricular subjects failed and average grade in the last evaluation, academic self-perception, academic options taken in the fourth year of ESO being studied, academic option at the end of the fourth year of ESO, parents' level of studies)

Two instruments were also applied in order to analyse the criterion validity of the Scale:

■ The Revised Two-Factor Study Process Questionnaire (R-LPQ-2F) scale (Kember et al., 2004), translated by González Geraldo et al. (2010).

■ The Academic Self-Efficacy Scale (Torre, 2007).

Procedure and data analysis

The battery of tests was designed in paper format and those responsible for the schools, who collaborated voluntarily, were asked to administer

the questionnaires. The internal protocols applied in the schools guaranteed that the questionnaires were answered confidentially and voluntarily and that the required consent was given, thus guaranteeing the ethical criteria of the data gathering process.

The internal consistency coefficients were calculated using Cronbach's Alpha and McDonald's Omega coefficient, since the scale of the items was ordinal and there were fewer than seven response options (McDonald, 1999). The homogeneity indices were calculated using the IBM SPSS Statistics 20.0 and Jamovi statistical packages. Similarly, construct validity was analysed by means of an exploratory factor analysis (principal component analysis and Promax rotation), certifying the sample adequacy of the scale by means of the Kaiser-Meyer-Olkin test and Bartlett's sphericity test.

Criterial validity was checked by analysing the correlation of the scale and its factors with variables, namely the deep focus, shallow focus and self-efficacy variables. These are constructs that have been established in educational research and with which the scientific literature indicates a relationship.

To perform the confirmatory factor analysis, structural covariance techniques were used since, according to Martínez-Abad and Rodríguez-Conde (2017), the estimates of the product-moment or polychoric correlation coefficients are very similar when the number of response options is greater than 5 in ordinal variables. For this purpose, the EQS 6.1 (Structural Equation Modelling Software) program (Bentler, 1995) was used. For parameter estimates, the robust maximum likelihood (RML) method was used, with a series of indicators to assess the model fit, in accordance with various authors (Abad et al., 2011; Brown, 2006; Byrne, 2006; Cho et al., 2020; De Carvalho & Chima, 2014; Fan et al., 2016; Goh & Yusuf, 2017; González-Montesinos & Backhoff, 2010; Hair et al., 1998; Hu & Bentler, 1999; Jöreskog, 1970; Kline, 2005; Xia & Yang, 2019). Thus, absolute Ji^2 and relative Ji^2 fit indicators (divided by degrees of freedom), Akaike's Information Criterion (AIC), the root mean square error of approximation (RMSEA) index, GFI (goodness of fit index), CFI (confirmatory fix index), TLI (Tucker and Lewis index) and the standardised root mean square residual (SRMR) index were used. The final model will be presented with the parameters of the structural relationships indicating the standardised factor coefficients and the estimation errors.

To test the second research objective, the Students' t statistics and analysis of variance (factorial ANOVA) were used to assess the differences between groups. Information on the Students' t or the F in ANOVA, the probability that the difference is due to chance (p), the degrees of freedom (df) and the effect size (d or η2) will be shown. An analysis was performed of the assumptions of homogeneity of variances, using Levene, and of assumptions of normality, using Shapiro-Wilk. Nonparametric tests (Mann-Whitney U and Kruskal-Wallis) were analysed when they were not met in order to confirm that the results held. Significant values were considered to be those where p<.05.

Results

In response to the first research objective, to assess the internal consistency of the scale, values of .888 in Cronbach's Alpha and .891 in McDonald's Omega coefficient were obtained for the 19-item scale, which allows us to conclude that the scale adequately discriminates between students in their perception of their development of the learning to learn competence. An analysis of the homogeneity indices of the items (correlation of each item with the total scale without the item) shows that all have values above .32. Table I shows the means and standard deviations of the items and dimensions, the homogeneity indices of the items, and the Cronbach's Alpha and McDonald's Omega coefficient of the scale and its dimensions.

TABLE I. Descriptive statistics and internal consistency analysis

Total and factors	Mean	Deviation	Alpha	Omega
Perceived level of development of the Learning to Learn competence (Total)	4.20	0.77	.888	.891
Self-awareness as a learner	4.52	0.78	.723	.726
Self-assessment of the process	4.20	0.90	.770	.780
Learning management	3.86	1.02	.767	.772

(Continued)

TABLE I. Descriptive statistics and internal consistency analysis *(Continued)*

ITEMS IN THE SCALE	Mean	Devia-tion	r	Omega without item
Self-awareness as a learner				
8. I use different ways of studying depending on the task I am asked to do.	4.19	1.450	.445	.692
10. I am aware of my strengths and weaknesses when I am studying or learning (I know what I am good or bad at).	5.08	1.161	.375	.704
11. I ask for help from the right person when I need it.	4.58	1.417	.450	.690
12. I like learning.	4.29	1.383	.435	.691
13. I feel capable of successfully completing the learning tasks in order to achieve the objectives proposed in the subjects.	4.43	1.201	.508	.673
14. When I am learning I think of content related to other subjects or things I already know.	4.18	1.290	.441	.692
2. I am aware of the value of learning for the people around me (parents, teachers, etc.).	4.85	1.161	.346	.714
Self-assessment of the process				
5. I check whether I am doing well in studying for an exam or doing a learning task or if I need to change the way I do it.	4.06	1.158	.567	.735
6. I know the steps I am taking when I am studying and I can describe them orally.	4.23	1.336	.533	.743
9. I make the effort necessary to learn.	4.34	1.273	.541	.740
17. I am sufficiently proficient in study techniques such as underlining, outlining, summarising, etc.	4.15	1.534	.428	.771
18. I have good, effective study habits.	3.89	1.393	.590	.726
1. When I am studying and there is something around me that may hinder or prevent me from studying, I am able to change this situation (e.g. if there is noise I go to another place, I ask for help from a classmate if I need it, etc.).	4.55	1.367	.424	.769
Learning management				
4. Before starting to study I plan the time needed to achieve the objectives I have set myself.	3.68	1.690	.604	.713
19. When I finish studying or doing an assignment, I check that nothing is missing from what I had planned before I started.	4.25	1.429	.480	.747
7. I establish fixed times for study in my evening or weekend schedule.	3.40	1.663	.553	.728
15. In the exam period, I plan my work in such a way that I have time to study all the exam content.	4.06	1.467	.550	.729
16. In exams, before I start writing I think about how I am going to do it so that I have time to finish it.	3.67	1.536	.331	.777
3. I set goals, I detect what is not working when I am studying and I modify it to improve it.	4.10	1.361	.526	.735

Source: Compiled by author

The KMO test (=.869) and Bartlett's sphericity test (Ji^2= 2380.484; p<.001) indicate that the selected sample is adequate to perform the factorisation of the items. An exploratory factor analysis was carried out, extracting three factors through Kaiser's criterion and parallel analysis. The three factors explain 39.90% of the total variance (Table II).

TABLE II. Total variance explained

	Initial eigenvalues		
ITEM	**Total**	**% of variance**	**Accumulated %**
1	5.541	26.386	26.386
2	1.491	7.098	33.485
3	1.347	6.416	39.901

Source: Compiled by author

The saturation of the items in each factor and the reliability obtained is described in Table III.

TABLE III. Matrix of rotated components

ITEM	**1**	**2**	**3**
It 6	.669	.028	.082
It 21	.624	-.052	.090
It 18	.573	.266	.325
It 5	.501	.262	.296
It 9	.487	.289	.211
It 20	.445	.111	-.036
It 17	.427	.158	.220
It 1	.352	.241	.261

(*Continued*)

TABLE III. Matrix of rotated components *(Continued)*

ITEM	1	2	3
It 12	.120	.669	.066
It 14	.039	.653	.092
It 2	.170	.582	.045
It 13	.252	.553	.312
It 8	-.074	.527	.363
It 10	.346	.441	-.154
It 11	.174	.416	.129
It 7	-.055	-.038	.774
It 4	.286	-.019	.682
It 15	.287	.191	.598
It 19	.252	.283	.582
It 3	.396	.308	.429
It 16	.053	.313	.415

Source: Compiled by author

When analysing the criterial validity, correlations of r=. 558 (p<.001) between the learning to learn competence and the use of a deep focus, r= -.230 (p<.001) with the use of a shallow focus and r= .582 (p<.001) and the perception of Self-Efficacy were obtained. The relationship between academic performance and perception of the level of development of the learning to learn competence was r= .402 (p<.001). These results are in line with those obtained by other authors, as will be seen in the discussion.

Regarding the confirmatory factor analysis, the goodness-of-fit indices of models A, B and C are presented in Table IV and the diagram of model B is presented in Graph I.

TABLE IV. CFA Model Fit Indices

	Ji²	df	P	Ji²/df	AIC	GFI	CFI	TLI	SRMR	RMSEA
A	445.29	186	<.001	2.39	73.29	.92	.91	.90	.05	.05
B	310.48	149	<.001	2.08	12.88	.94	.94	.93	.04	.04
C	281.14	116	<.001	2.42	49.14	.94	.94	.93	.04	.05

Source: Compiled by author

GRAPH I. Diagram of model B of three related factors
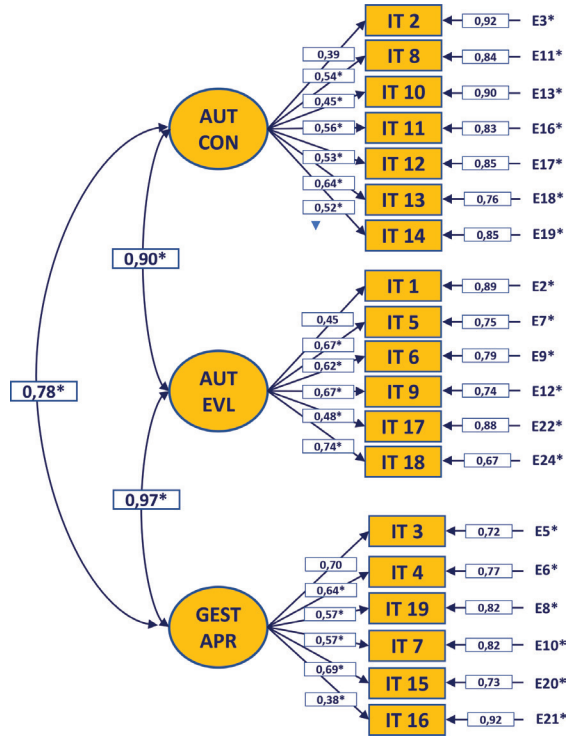
The RMSEA value (= .04) was less than .05 indicating that the model had a good level of fit (Goh & Yusuf, 2017; Hu & Bentler, 1999). The GFI (= .94) and CFI (= .94) indices were around .95, and can be considered good indicators as they are close to .95 (Fan et al., 2016). The TLI index also stood at .93. Although it would not meet the > .95 criterion (Hu & Bentler, 1999; Xia & Yang, 2019), it would meet that of Goh and Yusuf (2017), as it is > .90. The SRMR index would be below the < .08 criterion (Cho et al., 2020; Hu & Bentler, 1999), which would make it a good indicator of model fit.

Lastly, the Akaike index score (AIC) was noteworthy. Following the criteria of Burnham and Anderson (1998), the best model is that with the lowest AIC. Thus, in model A, with 21 items, the AIC index was 73.29, in model B with 19 items the AIC was 12.88 and in model C, with 17 items, there was an AIC of 49.14. This was the reason for selecting model B.

The indices calculated in model B of three related factors and 19 items offer a good fit between the theoretical model postulated and it can be considered an acceptable model, there being a satisfactory degree of congruence between the hypothesised theoretical model and what was shown by the empirical data of the sample of secondary school students, which were similar to those obtained in the university sample (Muñoz-San Roque et al., 2016).

Once the model had been defined and in order to respond to the second research objective, the interest of the paper focused on verifying the evolution of the level of development of the competence according to the grade in which the student was enrolled in order to analyse its relationship with age. The results according to the grade indicated that the level of self-perception of the development of the learning to learn competence obtained a higher mean in 1ESO (mean= 4.48), followed by 2ESO (mean= 4.26), 3ESO (mean= 4.12), 4ESO (mean= 4.13) and, finally, baccalaureate (mean= 4.11). The difference was statistically significant (p< .05) between 1ESO and the rest of the years except for 2ESO, although the magnitude of the difference was low ($\eta2$= .02) (Cohen, 1992). This datum indicates that the perception of the development of this competence decreases as the school years progress, as can be seen in Table V.

TABLE V. Main variables of the research as a function of the year

Variables	Year	Mean	σ	F	η²	Peer-to-peer comparison
CAaA	1ESO	4.48	0.74	6.57***	.02	1ESO > 3ESO 1ESO > 4ESO 1ESO > BACC
	2ESO	4.26	0.74			
	3ESO	4.12	0.74			
	4ESO	4.13	0.80			
	BACC	4.11	0.79			
	Total	4.20	0.78			
AUTEVL	1ESO	4.51	0.82	7.51***	.03	1ESO > 3ESO 1ESO > 4ESO 1ESO > BACC
	2ESO	4.26	0.88			
	3ESO	4.15	0.87			
	4ESO	4.12	0.92			
	BACC	4.02	0.91			
	Total	4.20	0.90			

(*Continued*)

TABLE V. Main variables of the research as a function of the year *(Continued)*

Variables	Year	Mean	σ	F	η²	Peer-to-peer comparison
AUTCON	1ESO	4.76	0.74	4.53**	.02	1ESO > 2ESO 1ESO > 3ESO 1ESO < 4ESO
	2ESO	4.48	0.80			
	3ESO	4.44	0.73			
	4ESO	4.48	0.81			
	BACC	4.54	0.76			
	Total	4.52	0.78			
GESTAPR	1ESO	4.20	0.97	6.29***	.02	1ESO > 3ESO 1ESO > 4ESO 1ESO > BACC
	2ESO	3.94	0.91			
	3ESO	3.75	1.02			
	4ESO	3.78	1.04			
	BACC	3.75	1.10			
	Total	3.86	1.02			

*p<.05; ** p<.01; ***p<.001
Source: Compiled by author

A second contrast analysis of the means between the first year of ESO (1ESO) and the first year of baccalaureate (Table VI) serves to evaluate the magnitude of the effect of the difference between the first and last

TABLE VI. Learning to learn and its components depending on whether the student is enrolled in 1ESO or in baccalaureate.

Variables	Year	Mean	σ	t	d
CAaA	1ESO	4.49	0.77	3.82***	0.48
	BACC	4.11	0.79		
AUTEVL	1ESO	4.53	0.86	4.67***	0.57
	BACC	4.02	0.91		
AUTCON	1ESO	4.77	0.75	2.42*	0.30
	BACC	4.54	0.76		
GESTAPR	1ESO	4.18	0.98	3.30***	0.41
	BACC	3.75	1.10		

*p<.05; ** p<.01; ***p<.001
Source: Compiled by author

year of the sample. The differences are statistically significant (p<.05) and of moderate magnitude in the learning to learn competence (CAaA) (t= 3.82; df= 244; p< .001; d= 0.48); in self-assessment of the process (AUTEVL) (t= 4.67; df= 260; p< .001; d= 0.57); in self-awareness as a learner (AUTCON) (t= 2.42; df= 255; p< .05; d= 0.30) and in learning management (GEST APR) (t= 3.30; df= 261; p< .001; d= 0.41).

When the assumptions of homogeneity of variances and normality were not met, the statistics were verified through non-parametric tests (Kruskal-Wallis and Mann-Whitney U), confirming the results presented.

These results show that the students' perception of their level of development in this competence decreases as the academic years progress from 1ESO to the first year of baccalaureate, and that this decrease is considered statistically significant and of moderate magnitude. This leads us to examine this apparent paradox in greater depth, since theory indicates that students in higher school years are able to implement higher order metacognitive and self-regulatory skills (Zimmerman, 2013).

Conclusions

The first objective of this paper was the adaptation of a scale to measure the learning to learn competence in secondary school students which, due to the reliability indices, factorial structure and goodness-of-fit indices presented, can be considered valid and reliable. It is important to note that the factors extracted are in line with the European framework for the assessment of this competence (Hoskins & Fredriksson, 2008). Self-assessment of the process, as a basic metacognitive strategy of the learning to learn competence, appears in the work of Hautamäki et al. (2002) and self-awareness as a learner is identified with what Deakin-Crik et al. (2004) call strategic knowledge in the framework of the elaboration of the European pre-pilot test (Kupiainen et al., 2008). Similarly, the resulting components are in tune with the theoretical framework of the learning to learn competence through self-regulatory competence (Hadwin et al., 2018; Panadero, 2017; Panadero & Tapia, 2014; Salas & Gallardo, 2022; Salmerón & Gutiérrez, 2012; Schunk & Greene, 2018; Torre, 2007; Usher & Schunk, 2018; Winne, 2018; Zimmerman, 2013) and with the European legislative framework (European Commission 2006; European Council, 2018), although with a higher weighting of cognitive factors

with respect to socio-cognitive factors, in accordance with the prevailing legislation at the time of the adaptation of the scale. Further research will include a new dimension encompassing these factors to assess the personal, social and learning to learn competence more broadly.

The relationship observed between learning to learn, self-efficacy and the use of a deep focus has broad correlates with other research (Ardura & Galán, 2019; Biggs, 1987; Cerezo et al., 2019; Kulakow, 2020; Phan, 2011; Ramudo et al., 2017; Schunck & Zimmerman, 1994; Usher & Schunk, 2018), which confirms the validity of the criteria of the scale.

The second aim of the paper, and one of the most significant results of the research, was to demonstrate that, as students progress through their school years and in age, their learning to learn scores decrease significantly. This result was not seen in the European pre-pilot test of learning to learn in Spain (Moreno et al., 2008) or in samples of the university population (Muñoz-San Roque et al., 2016; Torre, 2007). Neither do these differences agree with the theoretical model on the development of self-regulated learning (Zimmerman, 2013), which postulates evolutionary progress from processes of imitation and modelling to others in which the learner can already regulate his or her own learning process. However, several research projects have shown that there is a decrease in learning skills and motivation between lower and higher school years (Dignath & Büttner, 2008; Gaeta, 2013; González Fernández, 2005; Palomo del Blanco, 2014; Pintrich, 2003; Rodríguez Fuentes, 2009; Rosario et al., 2012; Zimmerman & Martínez-Pons, 1990).

This decrease in motivation to learn must be corroborated through research focused on the environmental factors affecting the competence, such as the international study by Stringher (2021), which proposes as a plausible hypothesis that educational systems fail to interest students by using rather traditional methodologies. It is also essential to carry out studies that incorporate the vision of teachers on this aspect, which we consider essential.

It is fundamental that in the development of learning skills there be a parallel between cognitive and metacognitive skills and emotional and motivational skills.

One line of research that would help to explain this decrease in the self-perception of competence as students gradually move up to higher years of secondary education would be to look more closely, through a longitudinal study, at how and when the components of the learning to

learn concept develop evolutionarily, and information should be gathered through performance tests that will give a more objective view of the level of development of the competence.

One limitation of this study is that the instrument designed focused on cognitive and metacognitive aspects. Further research will include the social dimension in the design of instruments for the assessment of this competence, an aspect that is considered fundamental in the new European conceptualisation framework (European Council, 2018) and that has inspired the change in legislation in Spain (LOMLOE, 2020). Another limitation is related to the sample – access to secondary school students is a complicated process, and therefore it was not possible to have a larger and more heterogeneous sample as regards type of school. This fact has meant that the sample used for the adaptation of the instrument and to analyse whether there was a decline in the competence in each school year was the same. However, even with this being the case, it was possible to access information from 1033 students.

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