Observed and Self-Perceived Information Literacy among teachers and future teachers and their relationship with sociodemographic variables[1]

Competencia Informacional Observada y Auto-percibida en docentes y futuros docentes y su relación con variables socio-demográficas

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Abstract

The relationship between the levels of Self-Perceived Informational Literacy (CIA) and Observed Informational Literacy (CIO) of a sample of 442 teachers and future teachers of Compulsory Education in Castile and León is studied in order to relate these levels with different socio-demographic variables. These variables include age, gender, occupation (future teacher versus in-service teachers) and educational level (Primary Education versus Secondary Education). Descriptive analyses and inferential analyses carried out show that the Self-Perceived Information Literacy is overrated in all the groups evaluated, which has allowed to introduce a variable named "valuation discrepancy" which measures the difference between self-assessment and performance (CIA-CIO) in Informational Literacy. The valuation discrepancy shows especially large values for future teacher as well as for males, and if the values for the dimensions considered are

analyzed, the valuation discrepancy is greater for the Information Search and the Evaluation of Information. The variance models which have been developed have found influence of gender, educational level and occupation on the levels of Self-Perceived Informational Literacy, Observed Informational Literacy and valuation discrepancy, and influence of age only on CIA, and there is also an interaction between educational level and gender at CIA and CIO levels. These results are relevant to design training activities for in-service teachers and future teachers, as they allow to draw a profile of teachers or future teachers who may have more need for training in Information Competence. They also could explain the results found in other studies according to which the highest level of digital and technological skills is found among male and younger people; these results could be consequence of using self-assessments and do not correspond to the actual performance.

Resumen

Se estudia la relación existente entre los niveles de Competencia Informacional Auto-percibida y Competencia Informacional Observada de una muestra de 442 docentes y futuros docentes de Educación Obligatoria en Castilla y León, con el objeto de relacionar dichos niveles con diferentes variables socio-demográficas. Entre estas variables se encuentran la edad, el género, la ocupación (futuros profesores/profesores en activo) y la etapa educativa (Educación Primaria/ Educación Secundaria). Los análisis descriptivos e inferenciales realizados muestran que la Competencia Informacional Auto-Percibida (CIA) está sobrevalorada frente a la Competencia Informacional Observada (CIO) en todos los colectivos evaluados, lo que ha permitido introducir una variable denominada "discrepancia valorativa" que mide las diferencias CIA-CIO entre la autovaloración y el nivel de desempeño en Competencia Informacional. Esta discrepancia valorativa muestra valores especialmente grandes para los futuros profesores, así como para los varones; y si se analizan los valores para las dimensiones consideradas, la discrepancia valorativa es mayor para las dimensiones de Búsqueda y Evaluación de la Información. Los modelos ANOVA desarrollados han encontrado influencia del género, la etapa educativa y la ocupación en los niveles de CIA, CIO y discrepancia valorativa y de la edad solamente en CIA, y se observa también una interacción entre la etapa educativa y el género en los niveles de CIA y CIO. Estos resultados son relevantes para diseñar actividades de formación del profesorado en activo y de los futuros profesores, pues permiten dibujar un perfil de los docentes o futuros docentes que pueden tener más necesidad de formación en Competencia Informacional.

También permitirían explicar los resultados de otros estudios según los cuales el mayor nivel de habilidades digitales y tecnológicas se encuentra entre los hombres y los sujetos más jóvenes; estos resultados serían consecuencia de la utilización de auto-valoraciones y no se corresponderían con el verdadero desempeño de los sujetos.

Palabras clave: competencias informacionales, enseñanza primaria, enseñanza secundaria, formación de profesores, formación continua, evaluación de la información, búsqueda de información, investigación educativa*.*

Introduction and objectives

Incorporating Information and Communication Technologies (ICT) into compulsory education today is a necessity, as an essential resource for teachers but also as a comprehensive part of educating new generations in a world influenced by technology development. We can thus differentiate two levels of ICT incorporation: the use of tools (interactive digital whiteboard, online resources, educational apps) specific to education, which form part of 'professional' teaching knowledge; and more general skills and tools present at all levels of education in today's society, such as searching for information, selection and assessment, processing and handling, and subsequent communication to others. In a study reviewing future teacher training in the digital era, Starkey (2020) highlights the differences between 'general' digital competence and specific digital competence, referring to the use of pedagogical and professional applications.

Compulsory education (6-16 years in Spain) is the most suitable period for training future generations in digital competence, and evidently, teachers during these stages must also have these skills in order to convey them (Redecker, 2017). Therefore, it is important to correctly diagnose the levels of Digital and Information Literacy of both teachers and future teachers in order to determine competence level and the most suitable teaching profiles.

This diagnosis must also be based on performance indicators and not self-reports or self-assessments. Some recent studies (Starkey, 2020;

Svoboda et al., 2019) emphasise the abundance of self-assessment based research, highlighting how self-perceived digital and information literacy are overvalued in primary and secondary teachers (Hatlevik, 2017; Maderick et al., 2016) and future teachers (Dinçer, 2018).

This paper globally analyses the relationship between performance levels and self-assessment of information literacy considering the factors of Search, Assessment, Processing and Communication proposed by Area and Guarro (2012) with some sociodemographic variables of current and future primary and secondary teachers, such as age, gender, occupation (active teachers versus future teachers) and education stage (primary versus secondary). Comparing self-perceived and performance levels related to the characteristics of teachers and future teachers allows us to diagnose training needs for these groups in specific aspects of information literacy, and also to effectively design ongoing training strategies and initial training for future teachers.

The following research questions have been set, based on Self-Perceived Information Literacy and Observed Information Literacy (globally and by factor) among current and future primary and secondary teachers in Castile and León: What is the relationship between these levels and sociodemographic variables? Does the discrepancy between self-perception and performance depend on the characteristics of the groups analysed? What training recommendations can be taken from these results?

Information Literacy and Digital Literacy

Digital Literacy in teachers has been addressed from different perspectives. In Spain, the institutional diagnosis tool is part of the Common Digital Competence Framework for Teachers (INTEF, 2017), which adapts to the European Digital Competence Framework v2.1, DIGCOMP (Carretero et al., 2017) and the European Digital Competence Framework for Educators, DIGCOMPEDU (Redecker, 2017).

This paper specifically focuses on Information Literacy as an essential part of Digital Competence; a decision based on the importance of training citizens in the correct search, selection and assessment of information in today's society in order to address the misinformation, 'fake news' and biased, malicious or opportunist information available

online. Also, within the specific scope of teaching, various studies agree on the majority use of internet in the classroom as a tool to search for information: Cabanillas et al (2020) show how teachers stress the importance of the Search for information over the Selection and creation of content or Communication. De Aldama and Pozo (2016), Losada et al. (2017), and Camacho and Esteve-Mon (2018), point to the search for information as one of the most frequent activities in primary classrooms; these results are confirmed in the review study by Colás et al. (2018).

Information Literacy in teachers is therefore decisive in many of the tasks proposed in the classroom; it also influences the search and organisation of teaching material and resources for the classroom. This paper will therefore focus on studying this aspect, and not only globally, but broken down in its components: Search, Assessment, Processing and Communication (Area & Guarro, 2012). This breakdown will enable a more detailed analysis in the areas in which teachers and future teachers have a higher or lower level, and will afford us greater accuracy when relating them to the sociodemographic variables of the subjects.

Prior studies with active teachers

Various studies in Spain and other neighbouring countries have addressed the relationship between sociodemographic characteristics of compulsory education teachers and some aspects of using ICTs in the classroom, including digital competence levels (generally self-perception). The most frequently studied characteristics are age, teaching experience and gender during primary and secondary education, although some studies include non-compulsory stages such as preschool education, non-compulsory secondary education and vocational training.

The influence of these sociodemographic characteristics offer different results. Some studies, such as Lucas et al. (2021) in Portugal, show the greater importance of personal factors (gender, age, teaching experience) compared to contextual factors (school equipment, access to resources, etc.) in digital competence self-assessments; however, this aspect is not so important in other studies, for example, Falcó (2017) finds that personal variables (age, experience, gender) have no influence on the digital competence of compulsory secondary education teachers in Aragón.

Influence of age and/or teaching experience

Several studies in Spain find that self-perceived digital competence is greater among younger teachers. For example, Almerich et al. (2016), with teachers in the Region of Valencia, or Fernández-Cruz and Fernández-Díaz (2016) in the Region of Madrid. Recent studies such as Cabanillas et al. (2020) in Extremadura, and Guillén-Gámez et al. (2020) in the Region of Madrid, find age has a negative influence on self-perceived teacher digital competence. Lucas et al. (2021) also find that younger teachers perceive themselves are more digitally competent.

Nevertheless, Area et al. (2016) with primary and compulsory secondary education teachers throughout Spain, point out that teachers with more professional experience use ICTs in the classroom more frequently, and in more educational situations. In the study by Fernández de la Iglesia et al. (2016) in Galicia, younger teachers consider that they have greater competence in technical—not didactic—dimensions. López-Belmonte et al. (2020) with Spanish pre-university teachers from eight autonomous regions show that younger teachers perceive themselves to be more competent in information and information literacy, communication and collaboration, and digital content creation. However, no relationship is found between age and problem-solving, and in digital security the highest self-assessments can be found in intermediate age groups.

This divergence among previous studies is an example of the differences between self-perception and real performance. In studies in which younger teachers have a higher level of Information Literacy, these levels were generally obtained from self-reporting questionnaires, while data on ICT use are quantitative, more objective, and refer to real use of technologies. Older teachers show better performance data despite perceiving themselves as less digitally competent.

These findings in Spain are confirmed by an international literature review study on the use of digital technology by primary teachers; Spiteri and Rundgren (2018) find that, although younger teachers perceive themselves to be better prepared to work with ICTs, teachers with more experience use them more frequently. Likewise, international studies by Eickelmann and Vennemann (2017) and Drossel et al. (2017), find that even though teachers more favourable to ICT use in the classroom are younger, older teachers with more experience use technology more often.

Gender and digital and information competence

Results on how gender affects digital and information competence among teachers in Spain are contradictory. While in Almerich et al. (2016), men claim to have a lesser domain of technological resources, Fernández de la Iglesia et al. (2016) and Guillén-Gámez et al. (2020) observe a significant inverse relationship. In Cabanillas et al. (2020) or Pozo et al. (2020), the effects of gender differ depending on the digital competence area considered, and Area et al. (2016) find no significant differences based on gender.

Studies with disparate conclusions can also be found in other countries. For example, in Lucas et al. (2021) male teachers in Portugal consider themselves to be more competent in most areas of digital competence; however, Scherer and Siddiq (2015) with compulsory secondary education teachers in Norway, find no difference between genders in terms of self-efficiency in the use of computers for education, but males show greater self-efficiency in general computer use (not specific to education). Gebhardt et al. (2019), with compulsory secondary education teachers from ICILS (International Computer and Information Literacy Study) participant countries, find that gender-based differences are minor and inconsistent, varying depending on the country.

Prior studies among future teachers

Studies with future teachers generally use data from Bachelor's Degree in Primary Education (PE) or Master's Degree in Secondary Education (MS) students. In PE, Esteve et al. (2016) find that students under 24 feel they are better trained for using ICTs in the classroom; however, Gabarda et al. (2017) find no significant correlation between age and self-perceived digital competence. Almerich et al. (2018) find that gender does not affect technological competence and a minor effect of age; the study by Grande-de-Prado et al. (2020) shows that the effect of gender depends on the digital competence area considered.

Some studies include older postgraduate or MS students: Jiménez-Hernández et al. (2020) show that those born before 1990 (Generation Z) perceive themselves to have a higher level of digital competence; the same applies to men versus women. Moreno et al. (2020) conclude

that age is an influential but not decisive factor in the self-assessment of Information Literacy among future compulsory secondary education teachers, although some variations are found depending on the specific areas and the strength of association is low. García-Martín and García-Sánchez (2017) find that level of knowledge and use of 2.0 tools among MS students depends on gender with women showing a higher level.

In other countries, such as Norway, Gundmundsdottir and Hatlevik (2018) find that future male teachers have a higher level of efficiency in ICT use for teaching. However, Tondeur et al. (2018) state that personal variables such as gender and age do not affect ICT competence perceived by trainee teachers in Belgium. Aslan and Zhu find contradictory results in the effect of gender on integrating ICTs among future compulsory secondary education teachers in Turkey, with studies in which gender has no effect (2017) and others where the effect is significant (2016). In the study by Cabezas et al. (2017) in Portugal, men perceive themselves to have greater knowledge in ICT concepts and devices, in handling technology and in attitude towards ICTs. In terms of age, the only significant differences are in the attitude block, which if favourable to older students.

Method

Based on the literature review and research questions, the following hypotheses are proposed:

- ■ H1: Self-Perceived Information Literacy will be overvalued compared to Observed Information Literacy in all groups, and this overvaluation will be greater for younger groups (future teachers).

- ■ H2: For each of the groups analysed, Self-Perceived Information Literacy will be higher among men, but there will be no significant gender-based differences in Observed Information Literacy.

- ■ H3: The factors of occupation (teacher/student), education stage (primary/secondary) and gender (man/woman) will have significant effects in explaining the variables of OIL (Observed Information Literacy), SIL (Self-perceived Information Literacy),

and the SIL-OIL variable (valuation mismatch, i.e., the difference between observed and self-perceived).

- ■ H4: Age will affect Self-Perceived Information Literacy but not Observed Information Literacy.

This study was based on a quantitative perspective that consisted in applying a diagnostic assessment to primary and compulsory secondary education teachers, and to Bachelor's Degree in Primary Education and Master's Degree in Secondary Education students in Castile and León. Thus, the process is a cross-cutting, non-experimental research design that assessed and analysed variables of interest in their natural context, without manipulation.

Sample

This study focuses on primary and compulsory secondary education teachers and future teachers in Castile and León (Spain), with an incidental sample of 442 participants: 199 future primary teachers, 161 future secondary teachers, 37 primary teachers and 45 secondary teachers. Information was collected with informed consent from the Regional Ministry of Education of Castile and León in the case of teachers, and from degree coordinators (Bachelor's in Primary Education and Master's in Secondary Education) for future teachers. The sample of teachers came from eight different schools in León, Salamanca, Valladolid and Burgos: 4 secondary schools, 3 primary, 1 rural school and 1 state-subsidised private school. The sample of future teachers included representatives from the four public universities in the Region.

The sample included 31.3% of men and 68.6% of women, with a similar gender distribution in the four groups. The average age of teachers was 45.37 years and around 35% had 15 years or less teaching experience, 40% between 16 and 25, and the remaining 25% over 25 years. Difference in the average age of both groups of teachers was only 2 years (primary teachers had a higher average age), and both groups claimed to have been using computers for the same amount of time (approximate average of 22 years) and internet (average of around 17 years). The average age of future teachers was over 28 among future secondary teachers and under 22 in the case of primary education; they claimed to have been

using computers for an average of around 15 years and the internet for 13.

Distribution of ICT use for different purposes was similar in all groups when finding information online: a little more than 40% of subjects in both samples declared to spend between 1 and 5 hours per week, and approximately 30% in both cases between 6 and 15 hours. However, future teachers claimed to dedicate more hours to social networks, gaming or viewing audiovisual content: most teachers declared to spend less than one hour while students mostly claimed to dedicate over 5 hours per week to these activities.

Variables and Instruments

The main overall variables of the Observed Information Literacy (IL) and Self-perceived IL study are broken down into Search, Assessment, Processing and Communication of information, as well as a new variable called 'valuation discrepancy', obtained from the SIL-OIL difference. Explanatory variables used in this study were occupation (identifying the subject as a teacher or future teacher), education stage (associating the subject to primary or secondary education), gender and age.

Information collection tools come from prior studies and have previously been validated; they are considered to be suitable from a technical and psychometric perspective:

■ **Observed IL**: the instrument used is validated at content level (expert judgement) and statistical level: with a one-parameter Rasch model, reliability is over .75 (ordinal Cronbach's alpha), with acceptable Infit scores for 97% of items, and acceptable Outfit scores for 85% (Bielba et al., 2015, 2017). It comprises 18 exercises designed to assess the dimensions of Search (6 items), Assessment (3 items), Processing (5 items) and Communication of information (4 items).

■ **Self-perceived IL**: an adapted version (Rodríguez-Conde et al., 2012) of the IL-HUMASS instrument (Pinto, 2010) was created, updated according to European DIGCOMP indicators (Carretero et al., 2017; Redecker, 2017). It contains 18 Likert-type scale exercises with five levels assessing the dimensions of Search (4 items),

Assessment (5 items), Processing (4 items) and Communication of information (5 items). The statistical validation of this adaptation showed a reliability over .89 on the complete scale (and over .7 in each sub-scale), with a factorial structure with four empirical dimensions corresponding to the theoretical distribution of the dimensions considered and absorbing over 50% of variance.

Both instruments were developed using the *Google Forms* platform, in a single questionnaire filled out by study subjects during a single session. The questionnaire is available at https://bit.ly/2JHsRIV

Procedure

Descriptive and inferential analyses were applied, starting with a significance level of 5%. At descriptive level, the mean was obtained as the central tendency statistic and standard deviation as the dispersion statistic. Confidence intervals were calculated around the mean in order to view and compare results in criterion variables by interest group. Correlation statistics (Pearson or Spearman) were also calculated to study the association between criterion variables and age.

Parametric inferential techniques were also applied, specifically t-tests for related and independent groups and Analysis of Variance. In this latter case, a 3-factor model was applied, including all significant interactions in the final model.

Effect size was included in inferential analyses as a complementary measure (Gravetter et al., 2018) to prevent biases based on the different size of samples compared: small (values around $d=0.2$ and $h^2=.01$), medium (values around $d=0.5$ and $h^2=.06$) and large (values around $d=0.8$ and $h^2=.15$) effects were therefore considered.

Results

Initial exploration of SIL-OIL difference by sociodemographic profile

Table 1 shows overall scores in excess of 8 points and similar in the 4 groups in Self-perceived IL (SIL). Average scores in Observed IL (OIL)

range between 5 and 7 points, with differences of almost 2 points between the most distant groups. Thus, both intra-group and inter-group dispersion is greater in the OIL variable. Differences between SIL and OIL are significant in the 4 groups, with a larger size effect in future primary teachers and lower in secondary teachers.

TABLE 1. Descriptive exploration and inferential comparison of SIL-OIL performance

	OIL		SIL			SIL-OIL (related groups)					
	Mean	SD	Mean	SD	Mean	SD	t	df	p	d
Future primary teacher	5.24	1.73	8.21	0.80	2.96	1.77	23.45	196	<.001	1.67
Future secondary teacher	6.67	1.38	8.70	0.96	2.03	1.58	16.29	35	<.001	1.28
Primary teacher	6.13	1.24	8.15	1.19	1.98	1.54	7.72	44	<.001	1.29
Secondary teacher	7.04	1.22	8.22	0.94	1.18	1.26	6.28	160	<.001	0.94

Analysing the SIL-OIL comparison by dimension (figure 1) shows averages and confidence intervals above 0. There is thus a perceptual mismatch favourable to SIL in all dimensions and groups based on level and occupation. Future teachers generally show a greater SIL-OIL valuation discrepancy than active teachers. These valuation mismatches are greater in the Search dimension, and most adjusted in Communication.

FIGURE 1. Sample distribution in SIL-OIL difference based on level and occupation
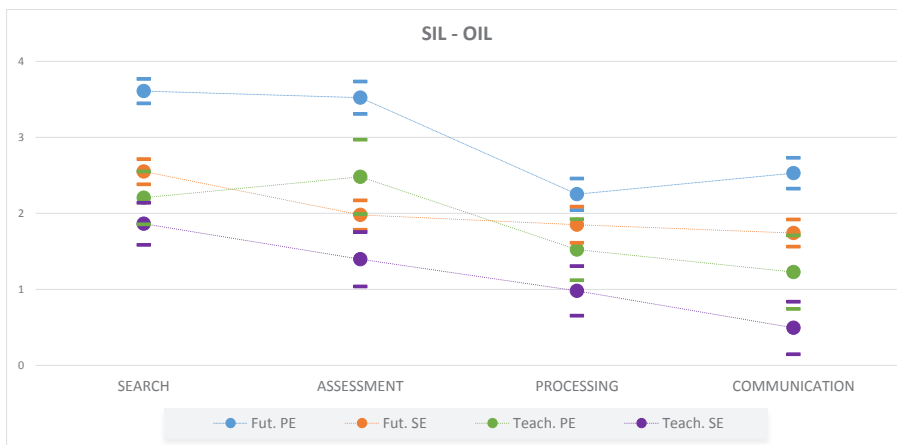

Table 2 compares SIL and OIL scores in each dimension, confirming this tendency. Significant differences can be observed between self-assessment and performance in all groups, with generally high effect sizes in future teachers and medium in active teachers. According to effect sizes, the Search dimension shows the highest level of perceptual mismatch.

TABLE 2. Inferential comparison of SIL-OIL dimension performance by occupation and stage (t-test for related groups)*

	Search			Assessment			Processing			Communication		
	t	p	d	t	p	d	t	p	d	t	p	d
Fut. Primary	-22.51	<.001	-1.60	-16.41	<.001	-1.67	-10.84	<.001	-0.77	-12.42	<.001	-0.83
Fut. Secondary	-15.34	<.001	-1.21	-10.23	<.001	-0,806	-7.78	<.001	-0.61	-9.76	<.001	-0.77
Teach. Primary	-6.34	<.001	-1.04	-5.01	<.001	-0.83	-3.74	<.001	0.62	-2.51	.016	-0.41
Teach. Secondary	-6.73	<.001	-1.00	-3.90	<.001	-0.58	-3.00	.004	-0.45	-1.43	.160	-0.21

* Degrees of freedom are the same as in table 1.

Table 3 compares Information Literacy levels in men and women, who reach similar levels in OIL, but men feel more competent in SIL (with a low effect size). However, SIL-OIL perceptual mismatch is similar in men and women.

TABLE 3. Distribution of SIL-OIL variables based on gender

|	Man		Woman		Independent groups			
	Mean	**SD**	**Mean**	**SD**	**t**	**df**	**p**	**d**
OIL	6.02	1.92	6.02	1.57	0.03	437	.982	0.00
SIL	8.58	0.98	8.31	0.91	2.83	436	.011	0.29
SIL-OIL	2.55	1.87	2.27	1.68	1.60	435	.110	0.17

Figures 2, 3 and 4 show average scores (and confidence intervals) in OIL, SIL and SIL-OIL variables by dimension based on gender. The OIL variable obtains scores with an unclear tendency: there are only significant differences favourable to women in assessment, although men in the sample obtain significantly higher average scores in processing and search.

FIGURE 2. Sample distribution in OIL variable based on gender
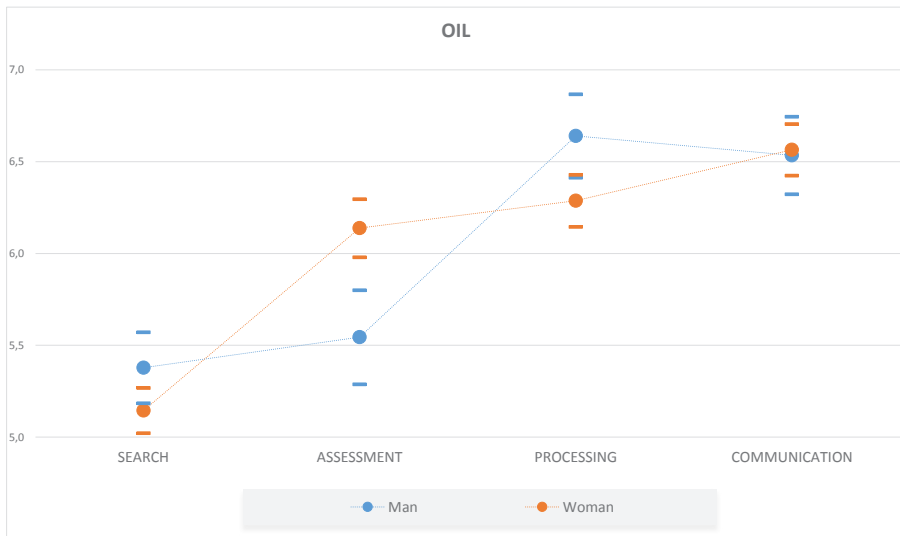
In the SIL variable, men have a higher average self-perception in all dimensions, with a significantly higher distance in Search. Significant differences are found in Search and Processing.

FIGURE 3. Sample distribution in SIL variable based on gender
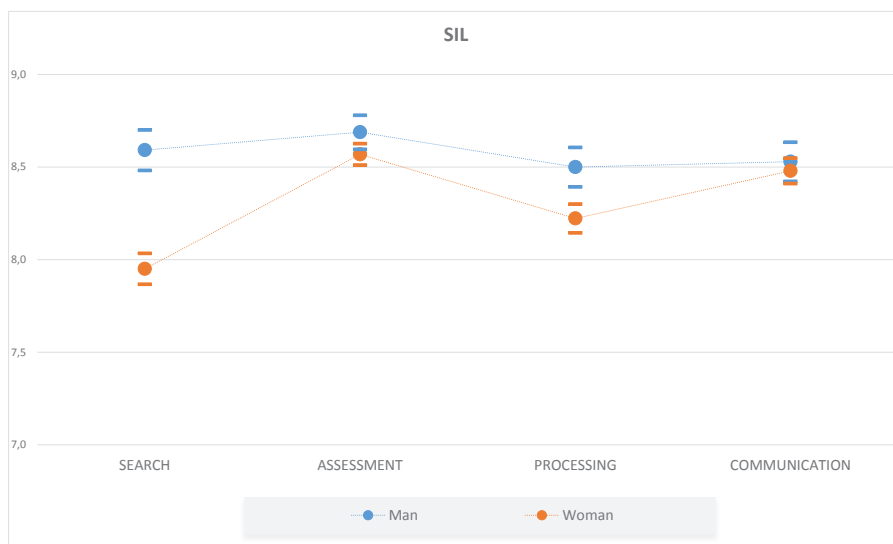
Finally, significant SIL-OIL perceptual differences are observed in the Search and Assessment dimensions; the mismatch is higher among men in both cases.

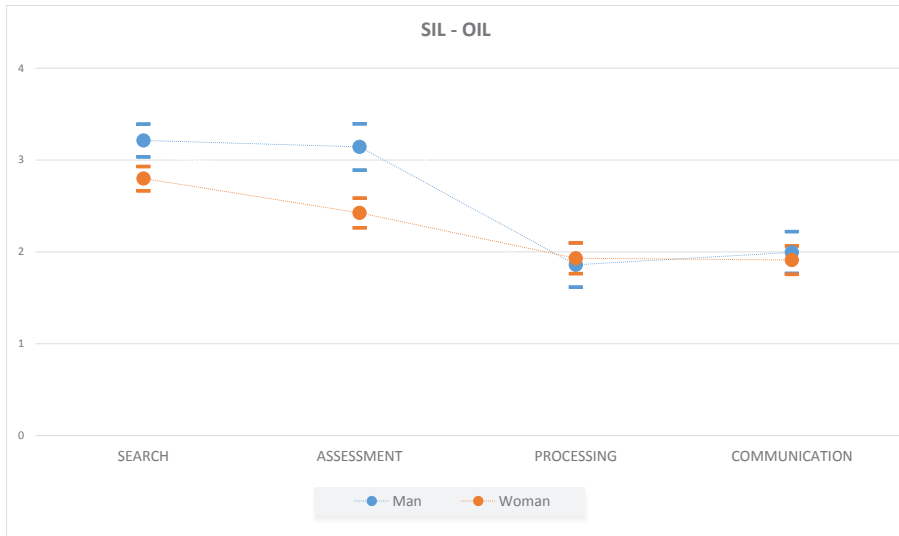**FIGURE 4.** Sample distribution in SIL-OIL difference based on gender

Table 4 confirms the above observations: men achieve higher SIL levels in Search and higher SIL-OIL perceptual mismatches in Assessment. Women, meanwhile, achieve higher OIL levels in Assessment. Effect size in low or medium-low in all cases.

TABLE 4. Differences in SIL-OIL dimensions based on gender (t-test for independent groups)*

	OIL			SIL			SIL-OIL		
	t	p	d	t	p	d	t	p	d
Search	1.04	.299	0.11	4.47	<.001	0.46	1.80	.072	0.19
Assessment	-2.04	.042	-0.21	1.12	.262	0.12	2.45	.015	0.25
Processing	1.36	.175	0.14	2.04	.042	0.21	-0.24	.810	-0.03
Communi-cation	-0.12	.903	-0.01	0.39	.695	0.04	0.30	.763	0.03

* Degrees of freedom are the same as in table 3.

Table 5 shows the relationship between the age variable and OIL, SIL and SIL-OIL levels. While performance levels (OIL) are similar based on age (with insignificant correlations), younger people feel more competent in the dimensions Search, Assessment and Communication (negative correlations indicate that a higher age equates to lower SIL level, and vice versa). In terms of SIL-OIL perceptual mismatch, negative correlations indicate that older people have a lower mismatch in Search and Communication, although tendencies are of moderate or even low intensity. These tendencies are confirmed by observing age-OIL_total and age-SIL-OIL_total correlations.

TABLE 5. Relationship between age and OIL, SIL and SIL-OIL variables

	OIL		SIL		SIL-OIL	
	r	p	r	p	r	p
Search	-.084	.196	-.399	<.001	-.196	<.001
Assessment	-.075	.247	-.150	.021	.020	.757
Processing	-.009	.889	-.120	.066	-.046	.482
Communica-tion	.065	.322	-.294	<.001	-.205	<.001
Total	-.060	.360	-.299	<.001	-.142	.029

Explanatory power of sociodemographic variables

After observing that occupation, stage and gender are the variables with the clearest influence on Information Literacy, a 3-factor (occupation, stage and gender) variance analysis model was applied to each of the three criterion variables: OIL, SIL and SIL-OIL (table 6). Significant main effects are obtained in the occupation and stage variables in all 3 models, and significant gender effects in the SIL-OIL model. In the case of SIL, significant gender effects can be found in interaction with level. Higher effect sizes are observed in the stage variable; they are high in the OIL model.

TABLE 6. 3-factor ANOVA models for OIL, SIL and SIL-OIL*

|	OIL			SIL			SIL-OIL		
	F	**p**	η^2	**F**	**p**	η^2	**F**	**p**	η^2
Occupation	11.19	.001	.025	4.55	.034	.010	18.71	<.001	.041
Stage	89.58	<.001	.171	22.96	<.001	.050	36.69	<.001	.078
Gender	2.02	.156	.005	3.54	.060	.008	5.66	.018	.013
Stage*Gender	5.78	.017	.013	5.04	.025	.010	-	-	-
R²	19.30%			6.60%			12.20%		

* Total degrees of freedom=438

Table 7 complements these results, showing the average score of these criterion variables based on occupation and education stage.

TABLE 7. Mean (SD) IL based on occupation and stage

	Occupation		Education stage	
	Student	**Teacher**	**Primary**	**Secondary**
OIL	5.88 (1.73)	6.63 (1.30)	5.37 (1.69)	6.75 (1.35)
SIL	8.43 (0.91)	8.19 (1.05)	8.20 (0.87)	8.60 (0.98)
SIL-OIL	2.54 (1.75)	1.54 (1.44)	2.81 (1.77)	1.85 (1.56)

Significant interaction is observed between education stage and gender in the OIL and SIL models, but not in SIL-OIL (figure 5). Specifically, while in OIL, women in primary education have the highest levels with no clear differences in secondary education, in SIL both groups are similar in primary but men in secondary perceive that they have higher levels.

FIGURE 5. Interaction between gender and education stage in OIL and SIL
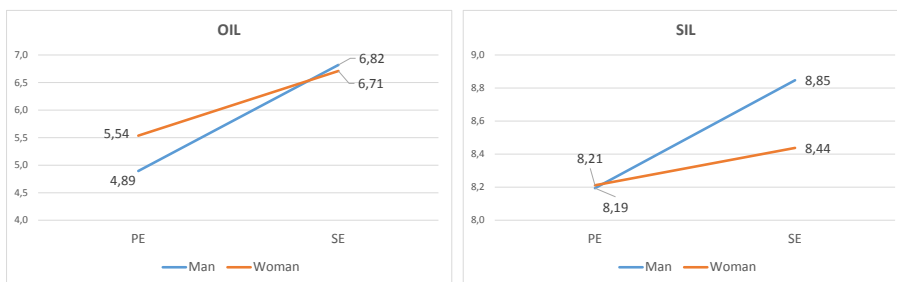
Discussion and conclusions

This paper has analysed Information Literacy (IL) from a sample of active and future primary education and secondary education teachers, adopting a dual approach. Firstly, scores were obtained overall and by component from self-assessments and from real performance for subjects in each group analysed. The relationship between these scores and different sociodemographic variables: gender, age, occupation (future teachers/teachers) and education stage (primary education/secondary education) was then analysed.

As a first conclusion, systematic overvaluation from self-assessments (Self-perceived IL-SIL) compared with performance measurements (Observed IL-OIL) was confirmed, as highlighted in other studies in the field of teaching (Dinçer, 2018 Hatlevik, 2017; Maderick et al. 2016). In this sense, authors such as Maderick et al. (2016) and Dinçer (2018) defend that levels based on self-assessments are not adequate measurements of Digital Literacy; they recommend explicitly labelling these scales as 'digital competence assessment scales' and not 'digital competence scales'. The first part of hypothesis H1 is therefore confirmed, leading to a new variable called 'valuation discrepancy'. This is the difference between SIL values and OIL values and it accounts for the mismatch between a subject's self-assessment and their performance.

Analysing SIL and OIL scores obtained by the different groups leads to interesting conclusions from two perspectives. Considering the dimensional structure of IL, overvaluation of self-perception compared to performance is true in all components considered and is especially

intense in the Search for Information. This component is highly significant as it is the first step in information management and a major part of the activity both inside and outside the classroom (De Aldama & Pozo, 2016; Cabanillas et al., 2020; Camacho & Esteve-Mon, 2018; Colás et al., 2018; Losada et al., 2017). Based on the groups studied, lower performance (OIL) by the two groups of future teachers is noteworthy—especially future primary teachers—, which confirms the second part of hypothesis H2. This difference is clear when analysing valuation discrepancy (SIL-OIL); these values are much higher in primary education students than the other groups, showing very poor performance by this group.

The second block of conclusions refers to how sociodemographic variables influence SIL, OIL and valuation discrepancy. The individual effect of each of these sociodemographic variables was studied in H2 (gender) and H4 (age), and a series of variance analysis models were also proposed to verify the explanatory power of these variables and how they interact (hypothesis H3).

In terms of how gender influences IL levels, hypothesis H2 is confirmed, showing that there are no significant differences in performance (OIL) based on gender. There are, however, differences in self-perceived levels (SIL) as men consider themselves to be more competent than women, in line with prior studies (Aslan & Zhu, 2016; Cabezas et al., 2017; García-Martín & García-Sánchez, 2017; Grande-de-Prado et al. 2020; Gundmundsdottir & Hatlevik, 2018; Jiménez-Hernández et al., 2020, Lucas et al., 2021), although other authors have not found differences based on gender (Aslan & Zhu, 2017; Falcón, 2017; Gebhardt et al., 2019; Scherer & Siddiq, 2015; Tondeur et al., 2018). In a more detailed analysis of SIL-OIL difference by component, significant values are found in Search for Information and especially in Assessment of Information, the dimension in which men have a greater valuation discrepancy due to their high self-perception (SIL) and lower performance (OIL) compared to women. Meanwhile, variance analysis models only highlight that gender has a significant impact on SIL-OIL valuation discrepancy, interacting with education stage in SIL and OIL and partially confirming hypothesis H3. In primary education, women show the same high self-perception values (SIL) as men but their performance (OIL) is much better, while in secondary education the performance of both men and women (OIL) is similar, but men consider themselves to be much more competent (SIL).

Regarding the effect of age, hypothesis H4 is confirmed: OIL levels show no significant difference based on age, but an influence is notable in SIL levels and this is significant in Search and Communication of Information. Younger subjects assess themselves as much more competent in these components, as shown in various prior studies (Almerich et al., 2016; Cabanillas et al., 2020; Esteve et al., 2016; Fernández-Cruz & Fernández-Díaz, 2016; Guillén-Gámez et al., 2020; Jiménez-Hernández et al. 2020; Lucas et al., 2021), although other authors find that age has no influence or claim that this influence depends on the dimension considered or teaching experience (Area et al. 2016; Drossel et al., 2017; Eickelmann & Vennemann, 2017; Falcó, 2017; Fernández de la Iglesia et al., 2016; Gabarda et al., 2017; López-Belmonte et al. 2020; Spiteri & Rundgren, 2018; Tondeur et al., 2018).

In terms of interactions between variables, in addition to the interaction indicated above between gender and education stage, age is found to have no influence and the significant factor that most affects SIL, OIL and SIL-OIL valuation discrepancy is education stage: secondary teachers and future teachers have higher levels than primary teachers and future teachers. Occupation also has a significant influence: active teachers of any stage have better Information Literacy values than the future teachers of those same stages.

The results of this study also point to interesting factors for teacher and future teacher training. Regarding active teachers, even though the Professional Teacher Competences of Castile and León do not specifically include Information Literacy, Digital Competence does include the skill of 'Analysing, search and processing information'. This paper first highlights the need to reinforce IL among active teachers, especially primary teachers, and particularly in the area of Search for Information. Secondly, this training must be independent of the level reported by teachers in self-assessments: if teachers consider themselves to have a good IL level, they are not likely to request specific training that would be of great interest to improve their performance. Evidence of performance must therefore be sought or, in any case, self-assessment scales must be adjusted to better adapt to reality.

Poorer performance of future teachers compared to active teachers highlights the essential role of experience and refutes the existence of a 'generational' effect according to which younger subjects have a better level of information competence. High valuation discrepancy in

future primary teachers and wide dispersion of OIL scores indicate the need to provide Bachelor's Degree in Education students with specific training, particularly in Search for Information. In the case of Master's Degree in Secondary Education students, although their performance is mildly better, there is also a notable need to improve their IL training, particularly education-specific training.

Limitations and future studies

Although this study analyses data from various schools in difference provinces, it is limited to a single Autonomous Region which could limit the scope of the conclusions. Increasing the number of participating subjects would also be highly desirable—especially active teachers from both education stages—in order to confirm some results.

Adding new sociodemographic variables to outline a much more detailed profile of Observed IL levels in compulsory education would also be interesting. For example, variables related to the school for active teachers (ICT equipment, access to computers, institutional policies, training plan attendance, etc.); and for future teachers, data on specific training received during their university studies or on computer use (training or education tasks, leisure, social media use, etc.).

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