Present and future of Teachers' Information Literacy in compulsory education*

Presente y futuro de la Competencia Informacional Docente en educación obligatoria

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Abstract:

The levels of Self-Perceived and Observed Information Literacy for a sample of in-service teachers and future teachers of Primary and Secondary Education are analysed as a whole and by its components of Searching for, Evaluating, Processing and Communicating Information. To do so, two validated tools are used which enable us to obtain Self-Perceived Information Literacy levels (through a self-assessment questionnaire) and Observed Information Literacy levels (through performance measures) from 442 in-service teachers and future teachers of 7 educational institutions in 4 provinces of Castile and Leon (Spain). The results of the descriptive and inferential analyses show that the Self-Perceived Information Literacy is overestimated compared to the Observed Information Literacy for all groups, especially among future Primary Education teachers, with the in-service Secondary Education teachers showing the least difference between self-perception and performance. The Observed Information Literacy is at its best level among the Secondary Education teachers and lowest level among the future Primary Education teachers. At each educational level the performance of in-service teachers is always higher than the performance of future teachers, indicating the preponderance of experience versus the generational effect. The components of the Observed Information Literacy with the lowest

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values for all groups are Searching for and Evaluating Information and, therefore, specific training activities are recommended.

Keywords: information literacy, primary education, secondary education, teacher training, in-service teacher training, information evaluation.

Resumen:

Se analizan los niveles de Competencia Informacional Auto-percibida y Competencia Informacional Observada de una muestra de docentes en activo y futuros docentes de Educación Primaria y Educación Secundaria Obligatoria, tanto globalmente como en las componentes de Búsqueda, Evaluación, Procesamiento y Comunicación de la Información. Para ello, se emplean dos instrumentos validados que han permitido obtener los niveles de Competencia Informacional Auto-percibida (mediante un cuestionario de auto-valoración) y Competencia Informacional Observada (mediante medidas del desempeño) de 442 profesores en activo y futuros profesores en 7 centros educativos de 4 provincias de Castilla y León (España). Los resultados de los análisis descriptivos e inferenciales muestran que la Competencia Informacional Auto-percibida está sobrevalorada frente a la Competencia Informacional Observada en todos los grupos analizados, especialmente entre los futuros profesores de Educación Primaria, con los profesores en activo de Educación Secundaria Obligatoria, mostrando la menor diferencia entre la auto-percepción y el desempeño. La Competencia Informacional Observada presenta el mejor nivel en el profesorado de Educación Secundaria Obligatoria en activo y el más bajo en los futuros profesores de Educación Primaria. En cada nivel educativo el desempeño del profesorado en activo es siempre superior al del futuro profesorado, indicando la preponderancia de la experiencia frente al efecto generacional. Las componentes de Competencia Informacional Observada con valores inferiores en todos los grupos son la Búsqueda y la Evaluación de la Información, por lo que son recomendables acciones de formación específicas.

Descriptores: competencia informacional, educación primaria, educación secundaria, formación de profesores, formación continua, evaluación de la información.

1. Introduction

The use of information and communication technologies (ICT) in the compulsory stage of education has many facets that must be thoroughly analysed in order to improve the digital and information literacy of teaching staff, both in-service teachers and those training to join in the future. One of these facets is the level of competence that teachers and future teachers have in extracting, evaluating, selecting, managing and communicating information, usually from the internet, that they will then use in the classroom. These activities can be grouped into one teaching competence named Information Literacy (Area and Guarro, 2012), which, al-

though very similar to Digital Teaching Competence (INTEF, 2017), focuses more specifically on the components of Searching for Information, Evaluating Information, Processing Information and Communicating Information (Area and Guarro, 2012), and which is the approach that will be used in this article.

It is also important that this diagnosis is as realistic as possible, that is, that it accounts for actual levels of competence (based on measuring performance) rather than self-perceived levels, obtained through self-assessments or personal evaluations. Thus, we will distinguish between Observed Information Literacy and Self-Perceived Information Literacy, using validated diagnostic tools for each of them, in order to check if there are significant differences between the two levels of competence and if these differences depend on the group analysed. This distinction is important because, as we shall see, the majority of studies carried out on teaching staff in Spain are based on self-assessments and they may not reflect the reality in schools or the true performance level of these teachers. This discrepancy will be particularly important in the case of future teachers, who, for generational reasons, are assumed to have a digital literacy that does not always correspond to reality.

In order to make as comprehensive a diagnosis as possible, a total of 442 subjects were analysed from four different groups within Compulsory Education in Castile and Leon: in-service Primary Education teachers, in-service Compulsory Secondary Education teachers, future Primary Education teachers (students of the Bachelor's degree in Education) and future Compulsory Secondary Education teachers (students of the Master's Degree in Secondary Education), using data obtained in different areas and universities in the region.

Thus, the research questions that this paper addresses are: What is the Self-Perceived Information Literacy and Observed Information Literacy of in-service and future Primary Education and Compulsory Secondary Education teachers in Castile and Leon? Is the Self-Perceived Information Literacy overestimated compared to the Observed Information Literacy? Are there differences in the levels of different components of Information Literacy? How does this diagnosis affect teacher training activities?

1.1. Digital and information literacy of in-service teachers

In-service Primary Education (PE) and Compulsory Secondary Education (CSE) teachers play a very important role in the development of their students' competences, including the specific case of digital and information literacy. Evidently, teachers must acquire the competences they want to teach their students first; you cannot teach a competence correctly if you do not possess it yourself. However, the case of digital and information literacy corresponds to a societal need that, in many cases, emerged after the training period

of the in-service teachers, meaning it must be acquired through ongoing training activities and specific refresher programmes.

Several research studies in Spain have addressed the topic of assessing the digital and/or information literacy of in-service teachers at different educational levels. One group of studies focus specifically on PE level teachers with most of them showing that although this group considers itself to have a sufficient level of digital competence, it lacks certain training and is unaware of many tools and resources that could be useful. This is the case of recent studies carried out by Camacho and Esteve (2018) in 15 autonomous regions in Spain; Llamas and Macías (2018) in the region of Madrid; Lores et al. (2019) in the region of Valencia; and Rossi and Barajas (2018) in Catalonia.

Another body of work focuses specifically on CSE teachers, such as the study by Álvarez and Gisbert (2015) with teachers from all over Spain, who perceive themselves as having a good level of information literacy when in reality they show significant gaps in key aspects of evaluating, managing and transforming information. Falcó (2017), with secondary school teachers in Aragón, also shows that they consider themselves to have an average level of performance in personal ICT use but show a low level of didactic use.

A third set of studies compares the level of digital and information literacy of in-service teachers at different educational levels. For example, Area et al. (2016), with PE and CSE teachers from 15 autonomous regions in Spain, find differences in the ICT integration profile depending on the educational level, as did Suárez-Rodríguez et al. (2018) with PE, CSE and University teachers in the region of Valencia. However, Guillén-Gámez et al. (2020) find no differences in the Digital Teaching Competence of a sample of pre-school (PS), PE and CSE teachers in the region of Madrid depending on the educational level being taught.

This same situation is found outside of Spain: it is clear that a large proportion of in-service teachers still lack adequate digital and information literacy, as highlighted in recent review articles such as those by Fernández-Batanero et al. (2020) or Svoboda et al. (2019), which analyse papers focused on all educational levels in an international context and recommend starting training activities with in-service teachers, especially in the more applied and pedagogical aspects.

1.2. Digital and Information literacy of future teachers

At the same time, the digital and information literacy and ICT use of future PE teachers in Spain has also been examined, studying different cohorts of students in different universities. The general result of these studies is that future teachers perceive themselves to be competent in general aspects, especially those related to using browsers

and searching for information, but less competent in more didactic aspects, such as the creation of teaching content or processing of information.

These findings are maintained at university level in more recent research, such as that by Casillas et al. (2019) with future PS teachers in Castile and Leon; Caldeiro et al. (2019) with PS and PE students in Galicia; Girón Escudero et al. (2019) with PS and PE students in Castilla-La Mancha; or Pascual et al. (2019) and Rodríguez-García et al. (2019) with PE teachers in Asturias and Andalusia.

At an international level, the review article by Starkey (2020) also emphasises the differences between the 'general' digital literacy of future teachers, which is not specific to their profession but corresponds to the skills of the general population, and specific digital literacy which includes teaching and professional applications.

Research on the group of future CSE teachers in Spain has been carried out by surveying students of the Master's Degree in Secondary Education (MSE) at different universities. In general, this research shows that the level of digital literacy of these future teachers is that of a normal user, but their level of knowledge of specific pedagogical tools is usually very low, as indicated in recent studies by Cózar et al. (2019) with MSE students in Castilla-La Mancha; or Moreno et al. (2020) with MSE students in Ceuta; and Napal et al. (2018) with MSE teachers in Navarra. The study by Gómez-Trigueros et al. (2019) with future teachers at all levels (PS, PE and CSE) in the region of Valencia also shows very superficial knowledge of specific pedagogical tools and a low level of digital literacy.

1.3. Digital Literacy versus Information Literacy

Many of the aforementioned studies focus on digital skills and ICT use in general in schools at different levels of education, and not on Information Literacy specifically. There is also an institutional tool in Spain for diagnosing Digital Literacy, part of the Common Digital Competence Framework for Teachers (INTEF, 2017), which adapts the European Digital Competence Framework for Citizens v2.1, DIGCOM (Carretero et al., 2017; Ferrari, 2013) and the European Framework for the Digital Competence of Educators, DIGCOMPEDU (Redecker, 2017).

However, the main activity that teachers do in the classroom is to use the Internet as a tool to search for information. As shown in the study by Losada et al. (2017), more than 93% of the activities involving the use of ICT proposed by year 5 and 6 PE teachers in the Basque Country relate to searching for and/or acquiring information and these results are confirmed in the review article by Colás et al. (2018). De Aldama and Pozo (2016) also report that the majority (more than 92%) of the tasks proposed by PS and PE teachers for using ICT require searching for in-

formation, and they highlight the difference between what teachers think about their ICT use and what they actually do in the classroom. Camacho and Esteve-Mon (2018) also identify searching for information as one of the most common activities in the PE classroom.

It is within this activity of searching for, evaluating, selecting and using information that teachers' Information Literacy plays a decisive role, as an element that has a major influence on teachers' Digital Competence. As Spiteri and Rundgren (2020) point out, teachers need to know how to handle and manage information and pass these skills on to their students: this includes searching for information, evaluating the data obtained, summarising it and communicating it to others.

Therefore, we see the interest in analysing not only Information Literacy overall but also its components of Searching for, Evaluating, Processing and Communicating Information (Area and Guarro, 2012). Analysing these four components separately will provide a more accurate picture of both teachers' self-perception and performance in this competence.

1.4. Self-perception versus performance in Information Literacy

A common feature of the abovementioned studies on teachers' or future teachers' digital or information literacy is that they tend to collect data through questionnaires, surveys and tools that gather self-perceived competence from the users themselves. They are therefore self-assessments of the ability to solve different tasks related to the use of computers and the Internet. This widespread use of self-perception questionnaires in studies on teachers' digital and information literacy has been highlighted in recent review articles by Starkey (2020) or Svoboda et al. (2020).

Assessing teachers' self-perceived competence is important as many studies link self-perception and self-efficacy as decisive elements for including new technologies. Thus, Drossel et al. (2017), with CSE teachers from 5 countries, show that self-efficacy in the use of ICT is a predictor of its use in the classroom, and that this self-perceived efficacy is much more important than a positive view of the advantages of using ICT. This same importance of self-efficacy is illustrated by Svoboda et al. (2019) by analysing works from different countries.

However, the self-perceived competence study masks the diagnosis and does not provide a complete picture of the situation, as it tends to be overestimated by in-service teachers, as reported by Hatlevik (2017) and Maderick et al. (2016) with PE and CSE teachers or Dinçer (2018) with future teachers. This same gap between the subjects' self-perceived level and the actual Information Literacy acquired is shown in several recent studies in the field of education (Dolenc and Šorgo, 2020; García-Llorente et al., 2020).

Although a detailed analysis of the meaning and methods of assessing competence is beyond the scope of this article, we agree with Area and Guarro (2012) in taking an approach to competence that includes situation analysis, the use of knowledge and metacognition. It is using knowledge (or "action" according to these authors) in particular that reinforces the need to look for competence indicators in actual performance and task execution, rather than in self-assessment of such. De Pablos (2010), when talking about the development of digital and information literacy, also points out that "The development of competences, as stated above, requires their verification in practice through the fulfilment of clearly established performance criteria" (p. 10).

Therefore, the importance of assessing Information Literacy by means of tools (suitably validated) that not only analyse self-perceived literacy but also include measuring observed literacy based on the subjects' performance is clear.

2. Material and Methods

2.1. Hypothesis and research process

Based on the literature review and research questions, the following hypotheses were developed:

- H1: For all the groups analysed, the levels of Self-perceived Information Literacy will be higher than the levels of Observed Information Literacy, both overall and in each of their components.
- H2: The levels of Observed Information Literacy will be different between teachers and future teachers at each educational level (PE or CSE), with in-service teachers scoring higher.

This study is based on a quantitative approach, using a non-experimental cross-sectional research design. Consequently, a diagnostic assessment was carried out on in-service PE and CSE teachers and future teachers (students of the Bachelor's degree in PE and Master's Degree in SE). In this way, the research process consisted of evaluating and analysing the variables of interest in their natural context, without manipulating them, and identifying, thanks to this diagnosis, areas for improvement that could be a priority when training in-service and future teachers in the key competences of Information Processing and Digital Literacy.

2.2. Sample

This study is based on in-service and future PE and CSE teachers in Castile and Leon (Spain), with a convenience sample of 442 participants: 199 future PE teachers, 161 future CSE teachers, 37 PE teachers and 45 CSE teachers. Out of the total sample, 31.3% were men and 68.6% were women, with a similar distribution by sex in the 4 groups.

It is important to note, with regard to the sample assessed in this study

named *future CSE teachers*, that it is made up of students of the Master's Degree that qualifies them to teach both Compulsory Secondary Education and the Spanish Baccalaureate, Vocational Training and Official Language Teaching. Despite the high heterogeneity of this group, this conceptual simplification has been made throughout the article, taking into account that most of the future teachers will join this educational level, in order to facilitate the reading of this article.

The average age of the in-service teaching staff is 45.37 years old, with 35% of the teachers having 15 or less years of teaching experience, 40% between 16 and 25 years and the remaining 25% with more than 25 years' experience. Although the PE teachers are on average 2 years older, both groups of in-service teachers say that they have been using computers and the Internet for almost the same length of time (the former for around 22 years on average in both cases and the latter for around 17 years on average). Meanwhile, while the average age of the future CSE teachers is more than 28 years old, the average age of the PE students is less than 22. In general, the future teachers report an average of around 15 years' experience using computers and 13 using the Internet.

As for how often they use ICT for different purposes, while both the teachers and students have a similar distribution of hours per week devoted to getting information from the Internet, it is the students who report spending significantly more time scrolling through social media, playing games or watching audiovisual content (series, films, etc.).

While the Department for Education of the Regional Government of Castile and Leon gave their informed consent for data to be collected from the teaching staff, it was the coordinators of the degree programmes involved who gave their consent for data to be collected from the students.

2.3. Variables and tools

Both Observed Information Literacy (OIL) and Self-perceived Information Literacy (SIL) were included as study variables, overall and broken down into the 4 components usually evaluated when they are studied: Searching for, Evaluating, Processing and Communicating Information.

In relation to tools, those used have been previously validated and are suitable from a technical and psychometric point of view:

- Observed IL: The tool used contains 18 exercises made up of slider scale items which assess the components of Searching for (6 exercises), Evaluating (3 exercises), Processing (5 exercises) and Communicating Information (4 exercises). This tool has been validated in previous studies (Bielba et al., 2015; Bielba et al., 2017), both at a content level, using expert judges, and at a statistical level, using Item Response

Theory techniques (one-parameter Rasch models). To be specific, the 4 components have a reliability of over .75 (using the ordinal Cronbach's alpha statistic), item-total correlations over .2 for 65% of the items, acceptable Infit scores for 97% of the items and acceptable Outfit scores for 85%.

- Self-perceived IL: An adaptation of the IL-HUMASS tool (Pinto, 2010; Rodríguez-Conde et al., 2012) was used, updated based on the indicators of the European DigComp framework (Carretero et al., 2017; Redecker, 2017), which is composed of 18 Likert-scale items with 5 levels: 4 items for Information Searching, 5 for Evaluating, 4 for Processing and 5 for Communicating. This tool is statistically valid (Rodríguez-Conde et al., 2012), obtaining a reliability score of over .7 for the 4 components and .89 for the entire scale, as well as an empirical 4-component factor analysis that absorbs more than 50% of the variance and matches the theoretical distribution of the items almost perfectly.

The two tools were developed using the *Google Forms* platform, through a single questionnaire available at https://bit.ly/2JHsRIV.

2.4. Data analysis

The data analysis includes descriptive and inferential analyses and was carried out using Microsoft Excel and SPSS V.25 software, with a significance level of 5%. In order to avoid bias related to sample size, the hypothesis tests include the effect size calculation (Cohen, 1969; Tomczak and Tomczak, 2014). Since the assumptions of normality are not met, non-parametric tests are applied, calculating the effect size statistic eta squared (η^2) in the case of the Kruskal-Wallis H test, and r in the case of the post-hoc pairwise comparisons (based on the statistic obtained in the Mann-Whitney U test) (Tomczak and Tomczak, 2014). The values are interpreted according to the criteria established by Cohen (1969).

3. Results

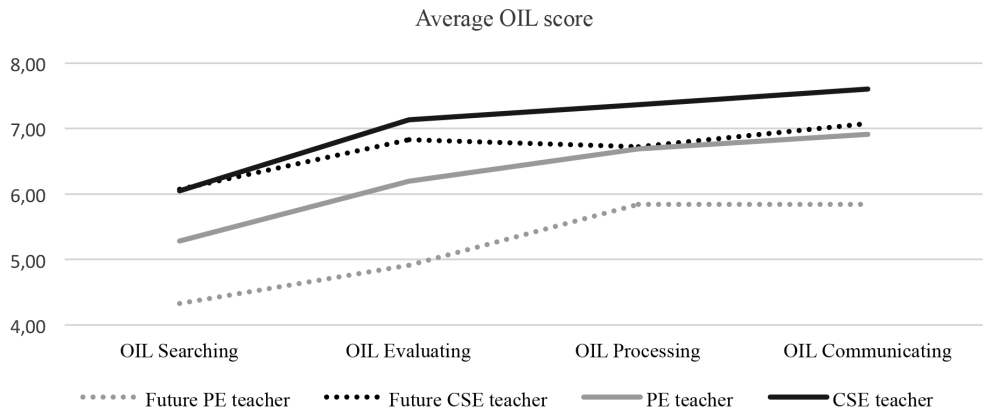
3.1. Diagnostic assessment

Let us first look at the levels of Observed IL and Self-perceived IL in the 442 subjects who participated in the diagnostic assessment.

In the case of Observed IL, Graph 1 shows that the highest score in all of the components is that of the in-service CSE teachers, while the lowest score in all of the components corresponds to the future PE teachers. The PE teachers obtained intermediate scores, slightly lower in some components than those of the future CSE teachers. One noteworthy result is that the mean is always higher for the in-service teachers than the corresponding future teachers at the same educational level.

In terms of the IL components evaluated, Graph 1 shows a low level in Searching for Information in all groups, while the highest performance scores correspond to the Processing and Communicating components.

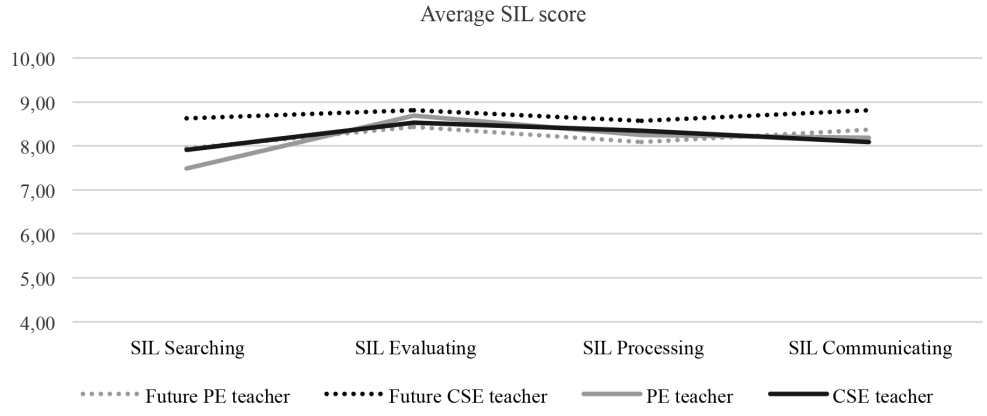
GRAPH 1. Observed IL (OIL) components for all groups.



Source: Own elaboration.

In contrast, when we look at Self-perceived IL, we can see in Graph 2 that the average scores are higher, with no major differences between the components analysed, and very similar for all the groups assessed. The group of future CSE teachers achieved slightly higher average scores than the other groups.

GRAPH 2. Self-perceived IL (SIL) components for all groups.



Source: Own elaboration.

Table 1 shows, for all of the groups, the mean scores and dispersions measured by the coefficient of variation (CV) for both Observed IL (OIL) and Self-perceived IL (SIL), overall and by component, as well as the differences between them (SIL-OIL score).

TABLE 1. Mean and dispersion of Observed IL and Self-perceived IL and SIL-OIL difference.

		Searching	Evaluating	Processing	Communicating	Overall
Future PE teacher	OIL Mean (CV)	4.33 (1.33)	4.91 (0.89)	5.84 (1.61)	5.84 (1.61)	5.24 (0.33)
	SIL Mean (CV)	7.95 (0.18)	8.43 (0.14)	8.09 (0.17)	8.37 (0.14)	8.21 (0.10)
	SIL-OIL	3.62	3.52	2.25	2.53	2.97
Future CSE teacher	OIL Mean (CV)	6.07 (0.30)	6.83 (0.35)	6.72 (0.39)	7.07 (0.30)	6.67 (0.21)
	SIL Mean (CV)	8.62 (0.16)	8.81 (0.15)	8.57 (0.10)	8.81 (0.13)	8.70 (0.11)
	SIL-OIL	2.55	1.98	1.85	1.74	2.03
PE teacher	OIL Mean (CV)	5.28 (0.39)	6.20 (0.44)	6.69 (0.34)	6.91 (0.35)	6.13 (0.20)
	SIL Mean (CV)	7.48 (0.20)	8.69 (0.11)	8.24 (0.17)	8.19 (0.18)	8.15 (0.15)
	SIL-OIL	2.20	2.49	1.55	1.28	2.02
CSE teacher	OIL Mean (CV)	6.05 (0.30)	7.14 (0.33)	7.36 (0.27)	7.60 (0.27)	7.04 (0.17)
	SIL Mean (CV)	7.91 (0.16)	8.53 (0.12)	8.34 (0.14)	8.09 (0.15)	8.22 (0.11)
	SIL-OIL	1.86	1.39	0.98	0.49	1.18

Source: Own elaboration.

The Self-perceived IL (SIL) measurements show, in addition to high and similar scores in all of the components, small and comparable dispersions in all of the groups. Therefore, at the self-perception level, only minor differences are found between the in-service PE and CSE teachers and the future teachers, all of whom consider themselves to have a good level of IL in all of the components.

However, there are noticeable differences in the performance of these groups. In the case of Observed IL (OIL), Table 1 shows that there are big differences between the groups evaluated, both in the mean value (overall and by component) and in the size of the dispersion. The best scores and lowest dispersion are obtained by the in-service CSE teachers, closely followed by the future CSE teachers, and the worst scores by the future PE teachers. The high variability of the scores obtained by the group of future PE teachers is striking and an indication of very different levels of individual performance within this group.

In terms of SIL-OIL differences, the group with the biggest differences in all of the IL components is the future PE teachers, with the biggest difference be-

tween their self-assessment and actual level of performance. The PE teachers and future CSE teachers have intermediate scores which vary according to the component evaluated, while the in-service CSE teachers' self-assessments are the most in line with their actual level of performance.

It is worth highlighting the large difference between the SIL and OIL for the in-service and future PE teachers in the Evaluating component (more than 3.5 points) and the large difference between the SIL and OIL in the Searching component for the future PE and CSE teachers (more than 2.5 points).

3.2. Inferential analysis

In order to analyse the significance of these differences overall and by component, hypothesis tests were carried out between the groups considered, taking into account the differences between subjects with the same professional status (in-service teachers or future teachers), as well as between subjects at the same educational level (PE or CSE).

Table 2 shows the significant differences obtained in the OIL (Observed IL) scale. Highly significant differences can be seen in all of the components analysed, with high overall effect sizes in the OIL. The main differences are found between the future PE and CSE teachers in all of the components, with a high effect size in the overall OIL. Similarly, significant differences are seen between the PE and CSE teachers in the overall OIL, also with high effect sizes.

TABLE 2. Hypothesis test (Kruskal-Wallis H) between groups for the OIL.

	χ^2	p. (η^2)	Groups	χ^2	p. (r)
OIL_SEARCH	62.07	<.001 (.135)	Future PE teacher - Future CSE teacher	-101.42	<.001 (.391)
OIL_EVAL	47.57	<.001 (.102)	Future PE teacher - Future CSE teacher	-83.51	<.001 (.325)
OIL_PROCESS	16.59	<.001 (.031)	Future PE teacher - Future CSE teacher	-38.39	.026 (.144)
OIL_COMM	28.66	<.001 (.059)	Future PE teacher - Future CSE teacher	-58.07	<.001 (.229)
OIL_OVERALL	86.13	<.001 (.190)	Future PE teacher - Future CSE teacher	-108.98	<.001 (.421)
			Future PE teacher - PE teacher	-61.58	.046 (.203)
			PE teacher - CSE teacher	-79.59	.031 (.374)

Source: Own elaboration.

Table 3 shows the significant differences obtained in the SIL (Self-perceived IL) scale. Although overall significant differences are seen again in all of the components, the effect sizes in this case are moderate. In terms of the differences between groups, the differences observed between the future PE and CSE teachers are again noteworthy, although in this case the effect sizes are moderate.

TABLE 3. Hypothesis test (Kruskal-Wallis H) between groups for the SIL.

	χ^2	p. (η^2)	Groups	χ^2	p. (r)
SIL_ SEARCH	36.05	<.001 (.076)	Future PE teacher - Future CSE teacher	-67.72	<.001 (.264)
			Future CSE teacher - CSE teacher	-74.15	.003 (.252)
SIL_EVAL	9.76	.021 (.015)	Future PE teacher - Future CSE teacher	-41.19	.013 (.163)
			Future PE teacher - Future CSE teacher	-45.59	.004 (.179)
SIL_PRO-CESS	11.66	.009 (.020)	Future PE teacher - Future CSE teacher	-52.27	.001 (.208)
			Future CSE teacher - CSE teacher	-79.77	.001 (.260)
SIL_COMM	22.71	<.001 (.045)	Future PE teacher - Future CSE teacher	-80.184	<.001 (.318)
			Future CSE teacher - CSE teacher	-72.50	.004 (.236)

Source: Own elaboration.

4. Discussion

The results of the diagnostic assessment carried out have answered the research questions regarding the level of Self-perceived IL and Observed IL of in-service and future teachers in Castile and Leon, with the dimensional structure of the differences found also analysed.

Interestingly, the results differ according to whether we look at Self-perceived IL or Observed IL, an issue already reported by several studies in the field of education (Dinçer, 2018; Dolenc and Šorgo, 2020; García-Llorente et al., 2020; Hatlevik, 2017; Maderick et al., 2016). The results associated with Self-perceived IL show a high level in all of the groups, with no significant differences between them. These results are in line with those obtained in previous studies in Spain (Álvarez and Gisbert, 2015; Camacho and Esteve-Mon, 2018; Falcó, 2017; Rossi and Barajas, 2018) and internationally (Fernández-Batanero et al., 2020; Slovoboda et al., 2019), which show that teachers consider themselves competent in the use of ICT even though this is not their real level of

performance. This confirms Hypothesis H1 of the study, showing the overestimation of self-perceived IL by in-service teachers and especially future teachers. In this regard, Dinçer (2018) makes an interesting proposal when he suggests using the term *competence/literacy perception scale* instead of *competence/literacy scale* when the measurements are obtained from self-assessment questionnaires.

The case of the future teachers is particularly noteworthy because, for generational reasons, they are usually assumed to have a high level of mastery of new technologies and of the digital world, corresponding to their own self-image (SIL). However, this high self-perception is not maintained when they are given performance tasks. These results add to the lack of knowledge of teaching-specific applications by future teachers, especially PE teachers, reported in several studies in Spain (Casillas et al., 2019; Caldeiro et al., 2019; Girón Escuderoet al., 2019; Lores et al., 2019; Pascual et al., 2019; Rodríguez-García et al., 2019) and in other countries (Dinçer, 2018; Gudmundsdottir and Hatlevik, 2018), painting a bleak picture for when the time comes for these future teachers to join schools. It would therefore be advisable to review the training plans of future teachers in order to promote these essential aspects in their professional work (Dinçer, 2018; Girón Escudero et al., 2019; González-Trigueros et al., 2019, Gudmundsdottir and Hatlevik, 2018; Lores et al., 2019; Maderick et al., 2016).

The future CSE teachers performed at a higher level than the future PE teachers and closer to the in-service PE teachers, but at a lower level than the in-service CSE teachers, showing an intermediate level consistent with that reported in previous studies (Cózar et al., 2019; Gómez-Trigueros et al., 2019; Moreno et al., 2020; Napal et al., 2018).

As for hypothesis H2, it is confirmed that in-service teachers have higher levels of Observed IL than future teachers, irrespective of the educational level. These results show that experience in using computers in the classroom and in solving tasks on a regular basis improves IL levels more than the training received in the PE or MSE Degrees, and that it is greater than the mere "generational" effect. This same positive influence of professional experience on the level of ICT integration in the classroom has already been reported in Spain (Area et al., 2016) and abroad (Drossel et al., 2017; Spiteri and Rundgren, 2020).

Therefore, a number of theoretical and practical implications can be derived from this study that may be of interest. The theoretical implications include the need to use measurements based on actual performance and not on self-assessment scales when beginning to study IL in different teaching groups. Self-perceived measurements mask the true situation of in-service teachers in primary and secondary schools and do not account for the true level of future teachers (Bachelor's or Master's degree

students), showing an overestimated image that may distort the diagnosis.

The practical implications are mainly related to the need for IL training in the in-service and future teacher groups, with a special focus on Primary Education and the Searching for and Evaluating Information components. In the case of the in-service teachers, the high score they give their IL level in the self-assessment may affect teacher training initiatives: if these teachers have the (wrong) perception of having a good level of IL, they will not request specific training activities that would be highly useful for them. In the case of the future teachers, the results point to the need to reinforce training in digital and information literacy, especially within Bachelor's degrees in Education. It is highly advisable to train future teachers, especially with regard to Searching for and Evaluating Information, who have very poor results (and very different to their high self-assessment) for this group.

5. Conclusions

The sample of in-service teachers show moderate levels of Observed Information Literacy, although they are significantly lower than the levels they give in their self-assessment of their IL level.

The Searching and Evaluating components were the ones with the lowest performance scores in the in-service teacher group and those that should be specifically encouraged among in-service teaching staff, especially given that a large number of ICT-related activities carried out in the classroom involve searching for relevant information on different subjects.

The case of the future PE and CSE teachers is particularly noteworthy, with their performance always lower than that of the in-service teachers at the same educational level, disproving the supposed "generational" effect according to which young people have a higher level of internet and digital literacy. The future PE teachers, in particular, show large dispersions (that is, high variability between subjects) and a significantly lower level than the other groups and their group also has the biggest difference between self-perception and reality. All of this should inspire an in-depth debate on the IL training they receive in undergraduate degrees, focusing specifically on the skills of searching for and evaluating information, which are the components where this group showed the worst performance.

This study has several important limitations that need to be addressed. Firstly, it should be pointed out that although the study covers several schools and areas, it is limited to just one autonomous region, and that the sampling procedure applied was non-probabilistic for convenience, which may be associated with a bias in the representativeness of the sample. Thus, it would be advisable to collect data from other regions and to increase the number of subjects (in-service teachers in particular) in order to reduce

these biases and improve the generalisability of the results.

Secondly, as already mentioned in the methodology, it is important to bear in mind that the sample of future CSE teachers comes from students of the Master's Degree in Secondary Education. Consequently, this group has very heterogeneous characteristics, so it would be of interest in future work to divide this population into more homogeneous subgroups, making it possible to identify whether there are different levels of Information Literacy among these subgroups.

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