

# Exploring Social Sciences Students' Perceptions on Information Literacy and the Use of Mobile Technologies in Higher Education

Maria Pinto, Dora Sales, Rosaura Fernández-Pascual, and David Caballero-Mariscal

This study aims to examine information literacy (IL) and the use of mobile technologies in the educational sphere by a sample of social sciences undergraduate students (N = 1,390). The study used the MOBILE-APPS questionnaire, which is a scale for measuring students' perceptions regarding information literacy (both the institutional and as a personal dimension), the threshold concepts of the *ACRL Framework* and the use of ICT and mobile technologies in learning contexts. The survey was distributed to a sample of four universities and eight Social Sciences degrees in Spain. A descriptive, inferential, and multivariate study is performed, regarding age, course, gender, and degree. The results show that student perception is higher concerning the personal dimension of IL; most of the students are unaware of the threshold concepts of the *ACRL Framework*, and responses are very heterogeneous in relation to the use of ICT and mobile technologies. An MDS-clustering strategy regarding the diverse degrees that participate in the study is also provided, to grasp a disciplinary view. From the diagnosis developed in this research, some recommendations for teaching activity in IL as well as implications for academic libraries are provided.

## Introduction

Two decades ago, when reflection on competency-based training began to boom in higher education research, the Organisation for Economic Co-operation and Development (OECD)<sup>1</sup> asserted that key competencies are those necessary for personal development and fulfillment, active participation of citizenship, social inclusion, and employment. We live in an information society, surrounded by information and communication technologies, and the growing challenge is to learn to think critically about the resources and information we use and share. Information Literacy (IL) is increasingly important in all contexts of life, especially in the field of education. Thus, IL is undoubtedly one of the key competencies pointed out by

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the OECD and occupies an increasingly necessary place in our globalized and hyperconnected world. Johnston and Webber already proposed models for the information-literate university and the information-literate student, arguing that IL should be integrated into higher education curriculum.<sup>2</sup> IL is increasingly necessary for all disciplines, all learning environments, and all educational levels. It always benefits those who get engaged with it, because IL promotes an empowerment and strengthening of the formative processes, and life in general. However, information society and its contexts are constantly changing, and IL is, therefore, an area in constant evolution. In the current educational context with a high usage of mobile technology, in any case it is essential to develop the informational and digital literacy of students.<sup>3</sup>

The ubiquity and immediacy of mobile devices has led to a change in undergraduate perceptions regarding the use of these devices in their learning processes in higher education. Hence, to adapt IL training to the reality in the classroom, there is a need to diagnose empirically the perceptions that students have. Thus, this study provides the view of students in various Social Sciences disciplines. The MOBILE-APPS questionnaire, *Students' perception regarding the importance of using mobile technologies in the teaching-learning of information competencies (Mobile – Information – Literacy – Education – Attitudes – Perceptions – Prospectings – Students)*, which is a scale for measuring the students' perceptions regarding information literacy and the use of ICT and mobile technologies in learning contexts, has been used for this purpose.

Specifically, the following research objectives are addressed:

RO1. To discover the students' perception of what an information-literate university is and what fundamental skills an information-literate person should have.

RO2. To know the students' assessment of the IL threshold concepts defined in the *Framework for Information Literacy for Higher Education* proposed by ACRL.<sup>4</sup>

RO3. To comprehend the students' perceptions of the use of ICT, and especially of mobile technologies, in the educational context.

RO4. To identify patterns related to the perception of the students according to their degree of Social Sciences.

## Literature Review

In the current educational context, IL is extensively understood from a metaliteracy view.<sup>5</sup> In this sense, the revised definition of CILIP Information Literacy Group is worth noting:

Information literacy is the ability to think critically and make balanced judgments about any information we find and use. It empowers us as citizens to reach and express informed views and to engage fully with society.... Information literacy is associated and overlaps with other literacies, including specifically digital literacy, academic literacy and media literacy. It is not a stand-alone concept, and is aligned with other areas of knowledge and understanding.<sup>6</sup>

Metaliteracy expands the coverage of traditional information skills (determine, access, locate, understand, produce, and use information) to hold the collaborative production and management of information in participative digital milieus. This approach requires a ceaseless adaptation to emerging technologies and a comprehension of the critical thinking required to engage in these contexts as producers, collaborators, and distributors. In recent years, in the field of higher education, together with the irruption of mobile technologies, the relevance of training in digital literacy has begun to be enhanced. Gallardo, Minelli de Oliveira, Marqués-Molias, and Esteve-Mon review the range of concepts and approaches associated with digital literacy and its related terms, such as Information Literacy, Media Literacy, and Media and Information Literacy.<sup>7</sup> Terminological diversity reveals that there is still no clear and uniform consensus, precisely because of the very dynamism of the digital environments. In this sense, the integrative perspectives are very interesting.<sup>8</sup> In particular, Secker reflects on the possibility of considering “digital literacy” as a “bridging term” that allows the establishment of a holistic perspective to support the informational training of students, without forgetting that “digital is in many ways a distraction for teachers, who really need to focus on developing students’ and their own critical abilities to handle information in all its guises effectively.”<sup>9</sup>

Taking into account the ever-changing informational environment, the ACRL proposed the thought-provoking *Framework for Information Literacy for Higher Education*. The *Framework* called for a renewed vision of IL as “an overarching set of abilities in which students are consumers and creators of information who can participate successfully in collaborative spaces. Metaliteracy, indeed, demands behavioral, affective, cognitive, and metacognitive engagement with the information ecosystem.”<sup>10</sup> Among other aspects, the *Framework* emphasizes the idea that learning is a dialogue with society and the relevant issues that shape our life contexts and that learners should be prepared to become informed citizens in a critical and continuous manner. Thus, in the specific field of higher education, the importance of the acquisition of information skills is key to the preparation of such critical citizenship. The *Framework* is articulated around six frames that are identified as essential threshold concepts for training and that are presented together with their respective associated knowledge practices and dispositions: Authority Is Constructed and Contextual; Information Creation as a Process; Information Has Value; Research as Inquiry; Scholarship as Conversation; and Searching as Strategic Exploration.

To date, the practical development of the *Framework* in the university context is still incipient, and it is essentially being developed in the United States. In view of the works that deal with the application of the *Framework* in higher education, it is relevant to highlight the contribution of Kuglitsch, who analyzes the tension between IL as a generalizable competency and as a competency applied to specific disciplines, with the aim of reflecting on teaching for transfer, using the *Framework*.<sup>11</sup> In her opinion, the threshold concepts or frames of the *Framework* are widely applicable, but for this they have to be contextualized in disciplinary communities of practice. Also, Folk’s qualitative study on the benefits of using students’ own knowledge and previous experience in carrying out research assignments is based on the frames of the *Framework*, thus showing an example of its didactic application.<sup>12</sup> The works by Scott and by Foster, Doyle, and Yukhymenko are of special interest.<sup>13</sup> Scott offers an inspiring research that reflects on undergraduate students’ perceptions on ACRL *Framework* IL threshold concepts, particularly on the transformative, integrative, and troublesome nature of the concepts.<sup>14</sup> Her results show that students have interesting views on the concepts but tend to mix up application and theory. Foster, Doyle, and Yukhymenko developed the *Student Perceptions of Information*

*Literacy Skills* (PILS) questionnaire to measure student self-perceptions of information skills using exclusively the six frames of the *ACRL Framework* to ask students about three variables related to each of the six frames, namely perceptions of skills, understanding, and feelings about each information frame, using the following scale: Novice, Advanced Novice, Emerging, Advanced Emerging, Developing, Advanced Developing, and Expert.<sup>15</sup> A further study by Hofer, Lin Hanick, and Townsend offers a comprehensive exploration of how threshold concepts can be applied in IL training, identifying important elements and connections between each concept and relating theory to practical methods that can transform the way IL is taught.<sup>16</sup> The authors explore in depth the didactic potential of threshold concepts for IL.

With regard to the massive influx of mobile devices and their use in the teaching and learning process and the acquisition of basic informational skills, it should be noted that they have developed especially during the current decade, when the use of mobile technologies has become commonplace in teaching-learning contexts, particularly in higher education. Walsh undertook an attitudinal study on information skills and the use of mobile devices.<sup>17</sup> This pioneering analysis emphasizes the unstoppable presence of mobile technologies and the need for teachers and information professionals to adapt to this new reality for the benefit of the students. In a similar vein, Woodcock, Middleton, and Nortcliffe provided one of the first instruments that measure the inclusion of mobiles in the teaching-learning processes of higher education students and the perceptions about their use.<sup>18</sup> Their conclusions recognized the growing relevance of mobiles' use and their incorporation for academic purposes as the main means of collaborative work. Havelka brings together the study of IL and mobile devices conceived as the only tool for accessing, processing, and analyzing information.<sup>19</sup> Her study reviews the conceptualization of IL and mobile information literacy. This perspective directly and indirectly addresses the relationship between the acquisition of IL, the use of mobile devices for this purpose, and the growing development of applications for the teaching-learning process. In this direction, we can point out the role of mobile devices in the teaching-learning processes within the classroom and their relevance as instruments in the access, analysis, and selection of information in relation to libraries. In this sense, Yoon analyzes the level of incorporation of the mobile as an essential library tool. The agents involved—students, teachers, and librarians—show an increasing level of incorporation of devices and apps for this purpose. However, there are still discrepancies among the different groups. Hence the need for coordination and joint training is emphasized.<sup>20</sup>

In a similar vein, but from a qualitative perspective, Bosman and Strydom analyzed the growing advance of mobile technologies in university teaching contexts.<sup>21</sup> Their research on mobile literacy focuses on the need to implement and develop mobile learning but delving into critical attitudes toward information.

Mullins addresses the role of apps in managing the library and accessing available sources and catalogues. From an empirical perspective and with a quantitative instrument, she studies the optimization of IL through mobile technologies. The research concludes that, despite their necessity and the advantages that apps bring, their use is limited and less adequate than expected. Despite the demand and the positive attitude, intergenerational and sector differences are noted (teachers, students, librarians).<sup>22</sup>

For Al-Emran, Elsherif, and Shaalan, generational differences in the use of mobile phones to access information, and as a fundamental tool for higher education, can be a conditioning factor for their management and inclusion in the classroom.<sup>23</sup> If institutions do not proceed to make changes in the curriculum and implement methodologies that make their use viable

in the university, a generation gap may open up between faculty and students. Along these lines, Hanbidge, Tin, and Sanderson developed an innovative experience of coordinated training action between the teaching staff and the library. Their joint and collaborative proposal improved results in terms of IL acquisition and development. The training and use of mobile apps also contributes to reducing the generation gap.<sup>24</sup>

Also, Hwang, Lai, Liang, Chu, and Tsai carried out a qualitative descriptive study of the use of mobiles in pre-university classrooms, especially for access to and processing of information.<sup>25</sup> They also analyzed the acquisition and development of critical thinking and communication skills necessary for students in their undergraduate stage. As these authors conclude, mobiles and applications are the indispensable means of relationship among peers. But they should change their perspective to understand that the scope of these new tools affects not only informal settings but also formal education.

## Methodology

### *The Sample*

Participants are social sciences undergraduates of four Spanish universities (University of Granada, University Jaume I of Castellón, University of Murcia, and Complutense University of Madrid) from eight degrees: Audiovisual Communication, Information Science, Business Management and Administration, Economy, Education, Journalism, Pedagogy, and Tourism. These social science degrees were chosen due to their representativeness in terms of the relevance of IL for the education of their students and their future working life. At the same time, it was considered that these degrees are a diverse cluster that could offer an enriched perspective of the results.

Nearly all (98.5%) of the participants study on-site. The demographic characteristics of the sample are shown in table 1.

Participants	Degree	Frequency	%
	Audiovisual Communication	100	7.2
	Business Management and Administration	189	13.6
	Economy	128	9.2
	Education	451	32.4
	Information Science	97	7
	Journalism	117	8.4
	Pedagogy	144	10.4
	Tourism	164	11.8
	<b>Total</b>	<b>1,390</b>	<b>100%</b>
Level/Course		Frequency	%
	First	152	11
	Second	72	5
	Third	624	45
	Fourth	542	39
Age	Range 18–40 years	Mean 21.7	
Gender	Female 68.9%	Gender index 2.21	

Besides the degree in Information Science, it is important to put forward that IL is addressed explicitly only in a single course in the Audiovisual Communication and Journalism degrees and, regrettably, in none in the Business Management and Administration, Tourism, Economy, Education, and Pedagogy degrees. In these last degrees, however, students are made to see that it is important to learn how to search, contrast, and manage information in order to carry out academic tasks since it is part of diverse assignments required in the subjects they are studying. All students are familiar with what it means to study and live in today's information society, and this research aims to get closer to their perceptions.

### ***MOBILE-APPS Questionnaire***

The questionnaire (see appendix) has been previously validated,<sup>26</sup> and this study offers the first results of its use. MOBILE-APPS questionnaire is an attitudinal scale composed of 22 IL items clustered in the following four dimensions:

D1. Information-literate university: It is made up of five items and focuses on analyzing students' perceptions of what an information-literate university is, reflecting on its role in higher education and its relevance in promoting information access, analysis, and critical treatment.

D2. Information-literate person: It includes six basic information skills that are developed at a personal level, focusing on access, knowledge, critical analysis of information sources, production, and dissemination.

D3. Perception on IL threshold concepts: It gathers the six threshold concepts included in the *ACRL Framework*: authority is constructed/contextual, information creation as a process, information has value, research as inquiry, scholarship as conversation, and searching as strategic exploration. The wording of the concepts was revised with the aim of facilitating the students' understanding. Most of the students in the sample do not explicitly know the *Framework*, but we consider that it is fruitful to analyze their perception of the threshold concepts, with which they can interact using critical reflection, to contribute to this initial diagnosis.

D4. ICT, Mobile technologies (MobT), and students: It is made up of five items related to the impact (positive or negative) of ICTs, especially mobile devices, on student learning processes.

### ***Data Collection***

A stratified sample design has been carried out that guarantees the representation of the information obtained and allows inferences to be made with sufficient consistency. A proportionate stratified probability sample was considered (with proportional allocation), with three strata: university, degree, and academic year, according to the total number of students enrolled in each stratum.

The sample is made up of students enrolled for the academic year 2018–2019. The data collection was carried out between the months of October and February. The survey was preferably completed online, either by computer or by mobile phone (using the QR code), and the support of the teaching staff of the degrees involved was available. In a few cases (9% of the sample), when the teaching staff advised this method, the questionnaire was administered in the classroom and on paper by a researcher of the work team trained for this purpose. Subsequently, the information was entered into the general database. A total of 1,390 valid surveys were obtained. See table 2 for technical details of the sample collection.

<b>TABLE 2</b> <b>Sample: Technical Data</b>	
Design	Stratified probabilistic sampling by degree and university
Academic Year	2018–2019
Collection Period	October 2018–February 2019
Methodology	Online: via computer or mobile phones (QR code)
Link to MOBILE-APPS Questionnaire	Original Spanish:
	<a href="http://infocompetencias.com/cuestionarios/estudiantes/">http://infocompetencias.com/cuestionarios/estudiantes/</a>
	English translation:
	<a href="http://infocompetencias.com/cuestionarios/estudiantesEN/">http://infocompetencias.com/cuestionarios/estudiantesEN/</a>
No. of Valid Surveys	1,390

The scale's reliability of the questionnaire was tested, calculating the Cronbach's alpha coefficient, overall and for each dimension of MOBILE-APPS. All the values exceed the recommended minimum of 0.7, which indicates a credible level of reliability and internal consistency,<sup>27</sup> except for the dimension D4 (ICT, MobT, and students) (see table 3).

<b>TABLE 3</b> <b>Reliability Estimates for the Student's Perception Questionnaire</b>		
<b>Dimension</b>	<b>Cronbach's alpha</b>	<b>Cronbach's alpha if item deleted</b>
D1: Infolit University	0.725	0.653–0.778*
D2: Infolit Person	0.805	0.760–0.795
D3: ACRL Framework Threshold Concepts	0.73	0.655–0.744**
D4: ICT, MobT, and Students	0.691	0.627–0.668
Global	0.792	0.776–0.803***
*The scale improves if item 5 is removed.		
**The scale improves if item 12 is removed.		
***The scale improves if items 18 and 19 are removed.		

Data processing was performed using IBM SPSS Statistics 22 software. Descriptive and multivariate techniques are considered. As data are not normally distributed, nonparametric methods are taken into account. Finally, a cluster analysis has been carried out and a multi-dimensional scaling technique (MDS) has been applied to provide a map that displays the position of the degrees, the similarities between them, and the detected clusters in relation to the four dimensions addressed by the MOBILE-APPS questionnaire: the institutional (D1) and personal (D2) view on IL, the threshold concepts of the *ACRL Framework* (D3), and the use of technologies, especially mobile ones (D4).

## Results

A general overview of the results obtained when applying MOBILE-APPS questionnaire is offered, taking into account its four dimensions (see table 4). It is observed that the measures of central tendency (mean and median) present similar average values just under 4 points on a 1 to 5 scale, and variable dispersion is perceived in the responses.

**TABLE 4**  
**Global Results by Dimension**

	<b>D1-Infolit University</b>	<b>D2-Infolit Person</b>	<b>D3-ACRL Framework Threshold Concepts</b>	<b>D4- ICT, MobT, and Students Positive Impact</b>	<b>D4- ICT, MobT, and Students Negative Impact</b>
Mean	3.83	4	3.98	3.91	3.41
Median	3.8	4	3.83	4	3.8
Std. Dev.	0.9	0.86	0.85	1.02	1.25

### *Perceptions on Information-Literate University and Information-Literate Person*

In relation to the scores declared in the dimensions D1: *Infolit University* and D2: *Infolit Person*, the results granted to three items of D2 stand out: 7— *Understands and uses relevant and quality information sources*, 8— *Uses varied information resources efficiently and effectively*, and 9— *Evaluates information sources in an analytical and critical manner*, with average levels exceeding 4 points (see table 5). Regarding the dispersion of the scores, greater homogeneity is observed in the perception of D1 item 4— *Makes the teaching-learning process easier*, and D2 items 6— *Knows how to identify their information needs*, 7— *Understands and uses relevant and quality information sources*, and 8— *Uses varied information resources efficiently and effectively*.

**TABLE 5**  
**Descriptive Results MOBILE-APPS by Item, D1 and D2**

	<b>Mean</b>	<b>Std. Dev.</b>
<b>D1: The informationally literate university...</b>		
1. Is the future of higher education	3.89	0.866
2. Promotes critical and reflective thinking in the education community	3.72	0.898
3. Fosters lifelong learning	3.93	0.884
4. Makes the teaching-learning process easier	4	0.856
5. Assumes that teaching will be of an increasingly ubiquitous nature (online education and blended learning)	3.62	1.045
<b>D2: An informationally literate person is one who...</b>		
6. Knows how to identify his/her information needs	3.9	0.82
7. Understands and uses relevant and quality information sources	4.13	0.831
8. Uses varied information resources (websites, databases, eBooks, books, academic articles, and other resources) efficiently and effectively	4.22	0.805
9. Evaluates information sources in an analytical and critical manner	4.07	0.888
10. Properly cites the information sources used	3.78	0.949
11. Knows how to disseminate information in a rigorous and appropriate manner	3.93	0.875

In what follows, we study the influence of course, university, age, and gender. There are no significant differences according to the course or the university (Kruskal-Wallis,  $p > 0.05$ ). Nonetheless, there are statistically significant differences in relation to age in item 3— *Fosters lifelong learning*, in which participants over 30 years of age show an average score of around 3.5 points, a much lower score than the values declared in this item by young people under 30.



With regard to gender, there are clear statistically significant differences in all items of D2: Infolit Person dimension, in which female students state that they agree more than male students (U-Mann Whitney,  $p < 0.05$ ). Conversely, there are no significant gender differences in the perception of what an information-literate university should be (D1: Infolit University).

### *Perceptions on ACRL Framework Threshold Concepts*

In relation to the scores declared in the third dimension of the questionnaire, the students' perception of IL threshold concepts (see table 6), the ratings given to items 13—*Creating information is a process* and 14—*Information has value*, with average levels exceeding 4 points and low dispersion, stand out. The low valuation of item 12—*Authority is constructed and contextual* is also evident, with a mean of 3.40 associated to the greater dispersion of the dimension (std. dev. 0.93).

	<b>Mean</b>	<b>Std. Dev.</b>
<b>D3: ACRL Framework Threshold Concepts</b>		
12. Authority is constructed and contextual	3.4	0.933
13. Creating information is a process	4.11	0.791
14. Information has value	4.53	0.687
15. Research is a process of questioning	3.84	0.902
16. Learning is a dialogue	3.97	0.914
17. The search for information is a strategic exploration	4.07	0.842

There are statistically significant differences according to age in item 14—*The information has value* (it is detected that the degree of agreement increases with age). There are no differences by course or university. There are also no gender differences in this dimension, so males and females perceive the IL threshold concepts in a similar way.

### *Perceptions on ICT, MobT, and Students*

Finally, in relation to the scores declared in the ICT and mobile technologies dimension (D4, see table 7), the rating of item 18—*I usually take notes or search for information on mobile devices* stands out, with an average score of 4.31 points.

D4 is the dimension with the greatest heterogeneity. This result is possibly due to the different level of incorporation of ICT in the teaching of the degrees analyzed, as evidenced in the following section.

Statistically significant differences are also detected according to age, in items 21—*The use of ICTs lowers the importance I give to properly citing sources* and 22—*Mobile devices have contributed toward my being more distracted in class*. In these items, there is a lower degree of agreement with increasing age; that is to say, older students seem to use ICTs more effectively and perceive that they do not generate too much negative impact on their learning.

There are no differences by course or university. As for gender, there are clear differences in this dimension (D4: ICT, MobT, and students), in which male students score lower in items 18, 19 and 20 (positive impact) and higher in items 21 and 22 (negative impact): in other words, it seems that they use ICT worse.

**TABLE 7**  
**Descriptive Results MOBILE-APPS by Item, D4**

	Mean	Std. Dev.
<b>D4: The use of ICTs and mobile settings in the learning process</b>		
18. I usually take notes or search for information on mobile devices (laptops, tablets, or smartphones)	4.35	0.92
19. I believe that I am able to access all the information I need using ICTs and mobile devices	3.97	0.963
20. I believe that instant access to information improves my critical thinking skills when selecting verified information and documents	3.42	1.171
21. The use of ICTs lowers the importance I give to properly citing sources	3.14	1.230
22. Mobile devices have contributed toward my being more distracted in class	3.68	1.263

### *Discipline-Based Perceptions*

The fourth objective of this study is addressed in two parts. First, the differences between degrees with nonparametric techniques are examined. Then, the positioning (by means of cluster and MDS), showing their pairwise similarities and the identified groups, is studied.

Thus, first, the overall perception declared by students on the four dimensions of the MOBILE-APPS questionnaire is compared and classified according to their degree. Average values per dimension range from 3.52 to 4.20 on a scale of 1–5 (see table 8).

**TABLE 8**  
**Mean Values by Dimension and Degree**

Degree	D1-Infolit University	D2-Infolit Person	D3-ACRL Framework Threshold Concepts	D4- ICT, MobT and Students positive impact	D4- ICT, MobT and Students negative impact
Audiovisual Communication	3.71	3.95	3.96	3.7	3.22
Business Management and Administration	3.74	3.9	3.66	3.86	3.48
Economy	3.91	3.98	3.9	3.94	3.35
Education	3.83	4.03	3.89	3.97	3.42
Information Science	3.72	4.2	3.85	3.87	3.15
Journalism	3.63	4.02	3.85	3.81	3.29
Pedagogy	3.77	3.97	3.92	3.81	3.18
Tourism	3.7	3.75	3.72	3.87	3.54

The degree in Information Science is the one that values the personal dimension of IL (D2) the most. Economy heightens the institutional dimension of IL (D1). Audiovisual Communication values the *ACRL Framework* threshold concepts (D3) to the greatest extent. Economics and Education seem to be the degrees that use ICT and mobile devices in the teaching process in a better way (D4), since they score high on items 18, 19, and 20. On the other hand, Business Management and Administration and Tourism score high at 21 and 22: that is, they perceive more the negative impact of ICT. In this last sense, the degree that declares the lowest score is Information Science.

Significant differences are found between the degrees analyzed in the global values declared in each dimension (Kruskal-Wallis,  $p < 0.05$ ).<sup>28</sup> To examine these differences in depth, the degrees are compared in pairs (see table 9).

**TABLE 9**  
**Significant Differences between Degrees,  $p < 0.05$**

	Audiovisual Communication	Business and Administration	Economy	Education	Information Science	Journalism	Pedagogy	Tourism
Audiovisual Communication								
Business and Administration	D4							
Economy								
Education	D4	D3						
Information Science		D1 D2	D2	D1 D4				
Journalism		D3	D1					
Pedagogy				D4	D2			
Tourism	D3		D1	D2D3	D1 D3	D2	D3	

D1: Infolit University (red).

D2: Infolit Person (blue).

D3: ACRL Framework Threshold Concepts (green).

D4: ICT, MobT and Students (black).

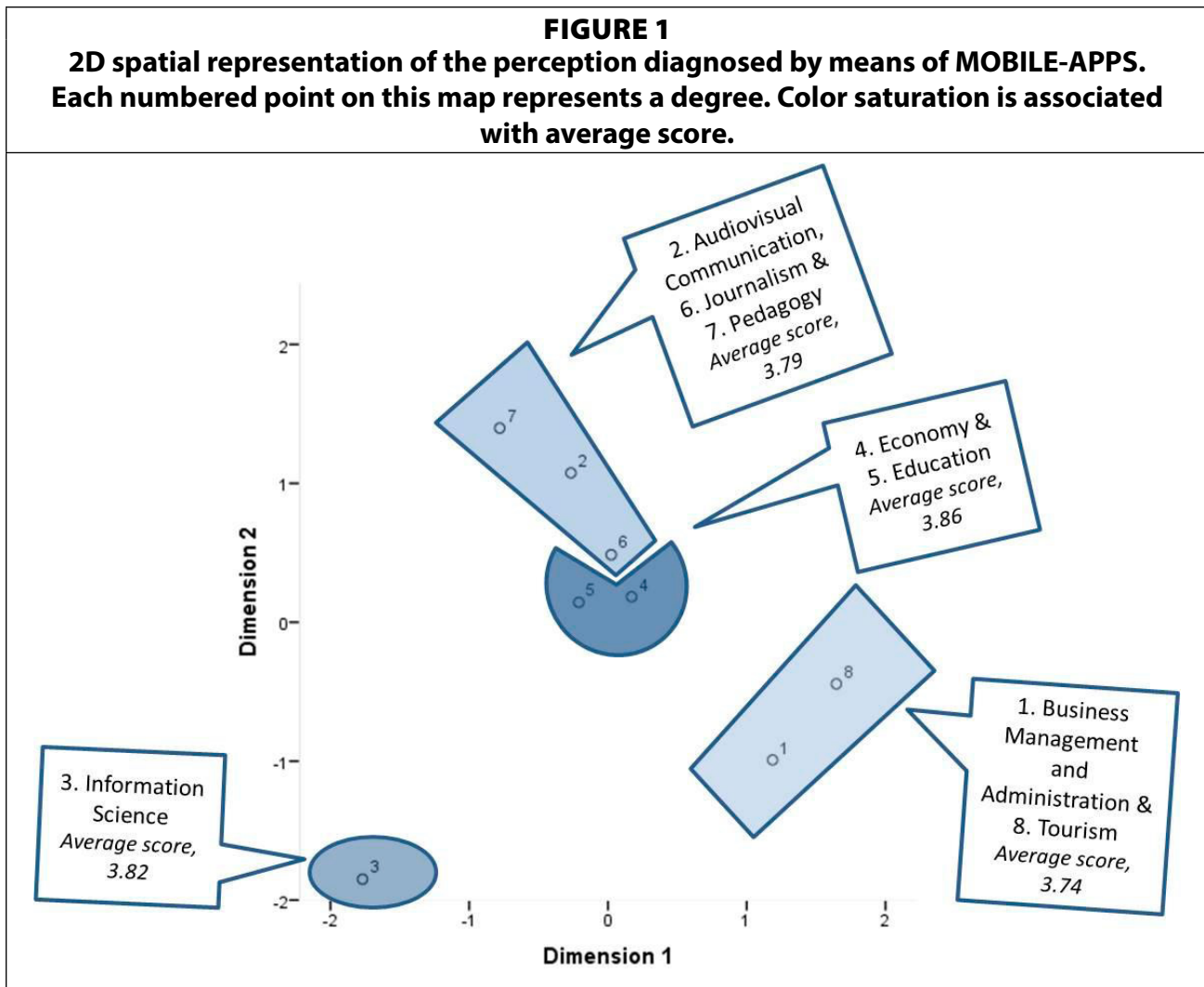
Finally, to provide the grouping that reveals the relationships between the degrees, it is interesting to apply a cluster analysis.<sup>29</sup> Cluster analysis is a statistical method for classification, used in this study as a way of determining homogeneous groups of degrees based on the similarity of responses regarding declared perceptions.<sup>30</sup>

To externally validate the resulting classification,<sup>31</sup> the multidimensional scaling technique (MDS) has been applied.<sup>32</sup> This technique makes it possible to visualize the relationships found after the cluster analysis and manually provide a map of relations that represents the similarities found, allowing some patterns of behavior to be distinguished. MDS allows the 22 analyzed variables (MOBILE-APPS questionnaire) to be represented in a space of low dimension, normally 2D, transforming the perception of each degree in its corresponding spatial location, where the distance between them represents the similarity (see figure 1).

The results make it possible to identify four essential groupings of degrees: the first is made up of Business Management and Administration and Tourism; the second group is made up of Economy and Education degrees. The third group includes Audiovisual Communication, Pedagogy, and Journalism. Finally, Information Science is isolated from the other degrees.

## Discussion

It is observed that there is a gap between the results of the institutional and the personal perceptions obtained according to dimensions D1 (university) and D2 (person) of the MOBILE-APPS questionnaire. That is, students perceive the importance of IL more for their own learning needs than as part of what the university institution itself has to promote. It also indicates that



female students are the ones who have the greatest perception about the personal dimension of IL. That is, female students are more aware of the importance of IL on an individual level, as something each person needs and strives for personally.

On the threshold concepts of the *ACRL Framework* (D3), it must be taken into account that most university students are not familiar with the new dimensions of IL, as well as key concepts that define 21st-century IL, including those of the *Framework*. In the Spanish university system, most undergraduate degrees have no information literacy course in the curriculum despite the fact that their academic training and subsequent professional projection increasingly requires it. This lack of knowledge explains the low scores recorded in this dimension in general, without significant differences in any variable (including age, course, gender).

In relation to D4 (ICT, MobT, and students), a high heterogeneity is detected in this dimension, which highlights the different level of incorporation of ICT in education. Older age and female gender seem to be factors related to lower negative impact of ICTs on learning.

It is evident that there are significant differences between Social Science degrees. From figure 1 and table 8, the following aspects can be noticed:

With regard to the perception of what students “understand” of an information literate university (D1), it is important to highlight the above average values of students in Economics

**TABLE 10**  
**Degrees' Position Regarding the MOBILE-APPS Dimensions**

Dimension	Position		
	Outstanding	Medium	Low
<b>D1-Infolit University</b>	Economics and Education	Pedagogy	The rest of degrees
<b>D2-Infolit Person</b>	Information Science	Audiovisual Communication, Journalism, and Pedagogy	Business Management and Administration and Tourism
<b>D3-ACRL Framework Threshold Concepts</b>	Audiovisual Communication and Pedagogy	Information Science	Business Management and Administration and Tourism
<b>D4- ICT, MobT, and Students Positive Impact</b>	Economics and Education	Business Management and Administration and Tourism	Audiovisual Communication, Journalism, and Pedagogy
<b>D4- ICT, MobT, and Students Negative Impact</b>	Information Science, Audiovisual Communication, Journalism, and Pedagogy	Economics and Education	Business Management and Administration and Tourism

and in Education, while the rest of the degrees show heterogeneity of students' perception. Likewise, it is observed that there are discrepancies between the degrees in the perception of what the students "understand" of an information literate person (D2). In this respect, and although it is not surprising, the students in Information Science demonstrate a greater awareness of almost all the items. Regarding D3 (*ACRL Framework* threshold concepts), there are also differences in perception between the degrees. Audiovisual Communication and Pedagogy claim to be more in agreement with all the items related to the *ACRL Framework* threshold concepts.

In relation to the D4 dimension (ICT, MobT, and students), the different level of incorporation of ICT in the teaching of the Social Sciences degrees analyzed is confirmed. Economics and Education seem to be the degrees that use technologies and mobile devices in the learning process in a better way. In the case of Education, it should be noted that the curricula incorporate two compulsory subjects devoted to the use of technological resources and educational technologies. For their part, students in Economics are familiar with specific software, official databases, and online apps and platforms accessing sources relevant to their discipline, such as stock markets.

The use of mobile devices may lead to a greater willingness to use technology, but it also leads to a dependence on devices for access to information. In other words, because of the familiarity with which students use mobiles, they may be inclined to integrate them into their academic life; but, at the same time, this may give them a feeling that the mobile is enough to access the information they need, and they may trust these devices too much and lose sight of the need to reflect deeply and turn to other resources, such as the library. In fact, library professionals could help them integrate the mobile devices they already use, really taking

into account the training possibilities they offer, mainly through the knowledge and use of apps and other mobile training resources.

In addition, the ubiquity and immediacy of mobile phones in classrooms can lead to a greater distraction and tendency to relax attitudes toward the access, management, and processing of information.<sup>33</sup> This is also diagnosed in the present research, in the answers of the students from Information Science, Audiovisual Communication, and Pedagogy degrees, who are more aware of the possible negative impact of technologies on their learning processes.

Finally, when approaching affinities between degrees, it should be put forward that the degrees that present greater similarity are Business Management and Administration and Tourism, followed by the pair Economy and Education, which is next to the group formed by Audiovisual Communication, Pedagogy, and Journalism. The degree in Information Science shows a different position, as it appears apart from the rest. This is understood because of the curricular profile of the degree, focused precisely on everything related to the information ecosystem. This fact highlights the singularity of Information Science students regarding the rest of the degrees, where, as mentioned before in the sample presentation, IL is addressed explicitly in a single subject (Audiovisual Communication and Journalism degrees) or unfortunately in none (Business Management and Administration, Tourism, Economy, Education, and Pedagogy degrees). On the other hand, in these degrees there is not a joint training with the academic libraries that favors the global acquisition of these competencies, in spite of the fact that, as Julien, Gross, and Latham state, the librarians can play a relevant role in the training of the student body for the acquisition of the skills in IL, which should be emphasized and made visible.<sup>34</sup>

The cluster arrangement is consistent with the differences shown in table 9. The results indicate that analyzing similarity data between degrees with MDS and cluster analysis provides complementary information that serves as a basis for discovering patterns of behavior.<sup>35</sup>

## Conclusions and Recommendations

The reliability of the MOBILE-APPS questionnaire is consolidated after applying the instrument to a representative sample of social science students from eight disciplines (Audiovisual Communication, Information Science, Business Management and Administration, Economy, Education, Journalism, Pedagogy, and Tourism). Also, it was found that the factorial model resulting from the data analysis consolidates the stability of the instrument and guarantees its transferability.

It is well known that IL is undoubtedly one of the pillars of lifelong learning. But life has become largely digital, and IL takes on a central role in the conceptualization of digital-information literacy. Its importance is becoming increasingly evident, even urgent, and this will only increase in all areas of education, especially higher education. In this highly technological environment, it is important to remember, as proposed by James Elmborg in a pioneering study,<sup>36</sup> that the basis lies in helping students to develop a critical consciousness toward information. And, in the digital and mobile context that surrounds us, it is also a priority to provide learners with the appropriate competencies to handle technology in a way that empowers them as citizens and, at the same time, as future professionals.

As an example for educational reflection, McGraw Hill Education recently detected that only 4 out of every 10 undergraduate students in the United States feel highly prepared for their future working lives.<sup>37</sup> The figure puts a worrying gap on the table, as it is fewer than half. Awareness of the need to train students on a critical, transferable, and adaptable basis

in a changing environment is an increasingly pressing challenge. Information literacy (from a metaliteracy view) can and will be a driving force, providing them with a much-needed ability to think critically, both for their academic years and for their future workplace. Today, and increasingly, every person should strengthen the critical thinking to learn to manage and contrast responsibly the enormous amount of information that surrounds us, to distinguish opinions from facts, to learn to consume and produce information in collaborative digital environments, always in an ethical manner, and to understand that all this is part of a necessarily life-long learning process. Therefore, we can claim IL as a key for the development of citizenship, education, and professional practice.<sup>38</sup>

This study confirms that the incorporation of mobile devices is proving to be an unstoppable reality that is increasingly in force in the field of higher education. However, both in the perception of the use of ICT and mobile technologies in the classroom and in the perception and understanding of IL (in its institutional and personal dimensions, and also regarding the *ACRL Framework* threshold concepts) there are differences depending on the degree. There are also some differences according to the gender variable, which would be interesting to deepen in future studies. Furthermore, after applying a cluster analysis and a multidimensional scaling, the different profiles are verified according to the degrees analyzed. These results therefore may provide valuable insights for both educators and academic librarians to improve curriculum and instructional designs, as they underline the convenience of devising programs that address the specific needs of each cluster of disciplines.

The Horizon Report already highlights that university institutions should work to give a boost to information and digital literacies.<sup>39</sup> Our research provides empirical information based on the belief that only by knowing the view of our students will it be possible to tailor IL instruction, paying attention to the aspects that need reinforcement and in a manner appropriate to contexts. For that purpose, it is relevant to promote studies that delve into disciplinary differences,<sup>40</sup> as a way of being more precise in addressing particular training needs of specific learning communities on campus.

### ***Recommendations and Implications for Academic Libraries***

Therefore, after this diagnosis of the perception of a substantial sample of higher education students from various degrees in Social Sciences in terms of information literacy and the use of ICT and mobile technologies, two main lines of action may be proposed as recommendations to promote future work in this much-needed field, bearing in mind that what is key is to place students' needs at the center of any approach and educational endeavor:

- Encourage institutional measures: Work to promote the inclusion in curricula of specific IL subjects in degrees where these are not yet present, which, in the case of Spain, unfortunately are the vast majority.
- Support students through educational improvement actions: To develop complementary training programs in mobile information literacy, always from the critical perspective that is at the base of IL. To this end, it would be essential to take advantage of the alliances between the university faculty and the library staff and resources, in order to promote students' continuous training, also bearing in mind that: "Students are mobile and have expectations about the availability of university services while they are on the go. The Library and the University need to be cognizant of this and integrate mobile development into their strategic planning exercises."<sup>41</sup>

Indeed, the picture drawn by this research raises relevant implications and opportunities for academic librarians, encouraging their involvement in the ever-vibrant life cycle of IL in higher education.<sup>42</sup>

In this age of disinformation and fake news, and given the dynamic needs for academic training, fostering IL for the entire university community should be a priority. For this reason, many universities are promoting institutional plans to address the new education challenges posed by the current context, although most of them focus on the digital transformation of institutions. In any case, to meet societal demands in higher education, the academic library and the library staff have to be recognized as vital partners in the development of the strategy for the institution, a key asset for IL training, to make it sustainable and to support a real cultural change across the institution.

To be truly effective, IL training should be embedded in the curriculum. Unfortunately, in many university degrees in Spain, there is no training in IL within the curricula. For this reason, aiming to create more student-centered teaching and learning environments, the collaboration between faculty members and academic librarians may be even more crucial, precisely in situations such as the context of this study, in which most Social Sciences degrees do not have any information training subjects. Given the difficulty of carrying out reforms in the curricula, which in any case need time to be implemented, the library can become the epicenter for supporting training actions focused on the needs of each learning community, in its specific context. Thus, it is worth noting the enormous potential of academic librarians as support for teachers who want to promote IL in their students.

Regrettably, on many Spanish campuses today, undergraduate students, especially in the first years of their university studies, do not take full advantage of the library, its resources and educational possibilities and rarely turn to the assistance of librarians for their information needs or research work. Any IL initiative in higher education should raise awareness about the critical importance of the use of libraries, which are constantly recycling themselves to adapt to the demands of the information society and the needs it generates on their specific campuses.

In other words, greater collaboration and communication among faculty, librarians, and students needs to be fostered to improve students' IL skills, because "training developed jointly by faculty and librarians, in which each part shares from their experience and knowledge, as well as taking into account the views and opinions of students, could provide students a more well-rounded education. Collaboration could also ensure having information literacy programs that work for everyone, which would be a more positive and fruitful academic experience for all stakeholders."<sup>43</sup>

All in all, this study provides a snapshot of the perceptions of Social Sciences undergraduates and, for future studies, as a next step it will also be essential to examine the faculty's perceptions to compare possible divergences and analyze the generational gap. Also, follow-up studies could be conducted after the implementation of training initiatives, with support from the library, to examine how these perceptions might have evolved. This would make it possible to develop strategies and resources to improve the weaknesses that may be diagnosed, according to the diverse degrees' profiles, and contribute to the indispensable development of IL as a key focus in higher education.



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