Informational Literacy And Information And Communication Technologies Use By Secondary Education Students In Spain: A Descriptive Study

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ABSTRACT

Informational literacy and the use of technologies by Secondary Education students in Spain: A descriptive study. The development of Information and Communication Technologies (ICTs), together with their application to research carried out on educational areas, are factors which contribute to the promotion of a new educative model constructed on literacy-based competences and skills, and which sets technologies as essential tools for a life-long learning process (Unesco, 2005). This is the framework where we can insert the research that we are currently carrying out, funded by the research Program I+D+I of the Spanish Ministry of Education, and in the frame of which we are developing a diagnostic assessment of informational literacy competence in students between 14 and 16 years (Secondary Education), based on the fact that one of the main aspects in knowledge generation and acquisition is the capacity to use information extracted from documents and electronic resources, available in informational networks in a correct way. In this paper we present the results obtained from evidences on the contrast existing between the level of use of technologies (videogames, social networks...) and the level of informational literacy shown by students. The data were gathered from a sample of more than 1000 Secondary Education students who are around 15 years old.

Keywords: Information literacy; Competences; Lifelong learning; ICTs

1. RESEARCH CONTEXT AND BASIS

Scientific advances on Information and Communication Technologies that have taken place from the middle of the 20th Century, when Alan Turing (1912-1954) started to develop his studies on computation, to the beginning of the new 21st Century, have drastically transformed daily lives of human beings as well as their relation with the surrounding environment. New technological artifacts based on the efficient management of information have irrupted, and have turned into, one of the basic pillars of economical, social and cultural development (Castells, 1999).

In the context of this society, new educative challenges, that have to be solved, are born, especially in relation to access, assessment, understanding and use of the enormous quantity of information available. An important percentage of the information that reaches us has never been filtered, has dubious quality, is anonymous and appears in the most diverse of the formats (CAUL, 2002). We should be aware that a vast quantity of information and technologies without the human capacity of understanding and efficient use of it, will not succeed by itself in creating well informed citizens (CAUL, 2002). O'Farrill (2008, page 157) summarized it when saying that: «Accessing information, while a pre-condition, is not equal to learning or to being able to mobilize knowledge appropriately».

This group of new competences related to the management of information that have been born in the Knowledge Society bear a strong relation to the concept of *lifelong learning* to the extent that most authors in the field treat them as inseparable (Andretta, 2007; Bundy, 2004; Gómez Hernández, 2007; Markauskaite, 2006; National Forum of Information Literacy, 2005). As a consequence of living in s 'liquid' society, that is to say, an uncertain and dynamic society where living conditions change even before human behaviors turn into habits, (Bauman, 2006, 2007) and where the knowledge acquired in the childhood and adolescence is not forever useful (Area Moreira, 2001; Mária Pinto, Sales, & Osorio, 2008; European Union, 2000), people are asked to possess a continuous capacity of updating and acquisition of new competences required in each moment (Majó i Cruzate & Marqués, 2002; Markauskaite, 2006). To succeed in the creation of these 'liquid', docile minds, it is necessary to build citizens both ready to *learn to learn* and to promise and be responsible for their permanent learning process (International Labour Organization, 2003).

It is precisely from these reflections that, what numerous authors have called 'new literacies', flourish (Lankshear, 2008; Pasadas Ureña, 2008), 'new literacies' that reach far beyond reading/writing abilities, conceived as the nucleolus of literacy so far. Included in these new literacies, Informational Literacy (Alfin) has been born as an essential artifact (Catts, 2005) for the 21st Century citizen (Pinto Molina, 2008).

Most of the authors taken into account in this study (Andretta, 2007; Koltay, 2009; Pinto Molina, 2008; Wen, 2008) make reference to the classical definition of the American Library Association (ALA) (1989): «Recognize when information is needed and have the ability to locate, evaluate and use effectively the needed information».

To sum up, we can differentiate the competences that ALFIN contains in four different dimensions or basic steps:

- *Information Search*: The person has to be able to use all types of information sources, as well as to be familiarized with specific strategies for information search.
- *Information Selection*: The person must possess specific knowledge on the main landmarks (authors, institutions, typologies…) of the field of which the information is being searched. In this way, s/he will be able to select the most appropriate information, according to his/her interests.
- *Information Processing*: The control of understanding, analysis and synthesis of information competences is essential in this step, together with the control of certain tools that can be useful for information management.
- *Communication and Popularization of Information:* The person who is said to have Informational Literacy competences should control skills related to information popularization through various channels, in different registers and adapted to the audience to whom it is addressed.

As a consequence, Informational Literacy is formed by a series of specific competences. In the last few years, the most important research groups in this field have developed competence lists, called 'Alfin norms', that all informationally literate people should control. Among these proposals, we can highlight those of ALA (2000), the Council of Australian University Librarians (CAUL) (2001) and the SCONUL (2001).

It is from this competence-based, and step-divided perspective that the development of an assessment on Alfin competences in Secondary Education in Spain (E.S.O.) will be based on.

This paper shows preliminary results of the surveying process carried out in state and public/independent schools to students of 3rd and 4th grades of Secondary Education. This Study has been developed in the framework of a research project funded by the Spanish Ministry of Science and Innovation, section I+D+I projects in the education field (SEJ2006-10700), and which has continuity in the ongoing project "*Key Competences Assessment and Teacher Training in Secondary Education: TIC, ALFIN and School Coexistence (EF-TALCO)*[1].

[1] National Project I+D+i, 2009: *Key Competences Assessment and Teacher Training in Secondary Education: TIC, ALFIN and school coexistence (EF-TALCO).* Ref.: EDU2009-08753

2. RESEARCH METHODOLOGY

The *objective* of this empirical study is to describe, from a diagnostic assessment process viewpoint, the level of Informational competence perceived by students from 14 to 16 years, in their final stage of compulsory education in Spain. The final aim is to provide schools with emprical information that could favor decision-taking processes. As a consequence, we try to supply reasonable explanations of the different studied phenomena (Informational and digital competences), with the aim of contributing to the creation of a knowledge basis or to provide with reliable information to base decision-taking processes in the new educative context of 21st Century.

2.1. Research design

The research methodology used to attain the aforementioned objective can be included in the ex-post-facto group. It is a co-relational descriptive design implemented through a survey (Kerlinger & Lee, 2002). Therefore, experimental hypotheses are senseless in this study, where we do not try to demonstrate that there are intended changes, but where we try to determine or explain a situation that is unknown for us.

2.2. Variables and tools

Variables in this study have been classified in two types: Predictive variables (independent), where we can stress the presence of variables related to the students' profile (level, age, gender, socio-cultural situation, type of school, academic performance, etc.); and criterion variables (dependent) that will be defined after the analysis of the different dimensions of informational and technological competences.

Data have been gathered in a quantitative way, based on survey methodology, together with the use of *Likert* scales. This instrument has three different groups: The first one, related to demographical and socio-personal data of the students, the second one, where we incorporate a validated scale of self-perceived informational competence (Maria Pinto, 2009) and the third one on frequency of use of ICTs by students, both at school and at home. The second group, related to self-perceived informational competence, contains 25 items that can be grouped under the dimensions of: : *search, selection, processing, communication and popularization of information.*

2.3. Sample

The group of subjects studied corresponds to the students enrolled in 3rd and 4th grades of Secondary Education (14 to 16 years) in the Spanish region of *Castilla y León*, belonging to 381 different state schools. The method to select the sample has been random based on locations. In this sense, the sample has been selected from the list of schools in the region. If we take into account studies and descriptions on this issue for finite samples and α=0.05, with a mistake variation of ± 3%, we need an invited sample of 1,087 subjects, what would be equivalent to the selection of 10-13 schools out of the 381 ones in *Castilla y León* where the level on which the study is based in taught.

Finally, and once the questionnaire has been filled in, the sample is formed by **1,175** students of Secondary Education (ESO), of whom a 45,5% (n=535) belong to 4th grade of ESO, and a53.4% (n=627) to 3rd grade. These minor variations do not surprise us because, according to the Statistics of Non-university Studies (MEC, 2009), in the academic year 2006/2007, 23,566 (53,2 %) out of 44,307 students were enrolled on 3rd grade while the rest 20,741 students were enrolled in 4th grade (46,8 %). Besides this, when we analyze national data obtained in this same study, we corroborate that out of 841,256 students of the second stage (3rd and 4th grades) of Secondary Education in 2006/2007, 452,031 (53,7 %) were in 3rd grade, while 389,225 (46,3 %) were in 4th grade.

These data are very similar to the ones that have been obtained in the sample studied, and, therefore, we can state that the tendency shown indicates that results are adjusted to frequency distribution of population, and not to the particular interest on the conduction of the activity.

Considering the type of school, and taking into account the data obtained, we test that the sample is balanced in terms of students belonging to a state school (54,5 %, n=640) and a public or independent school (45,5 %, n=535).

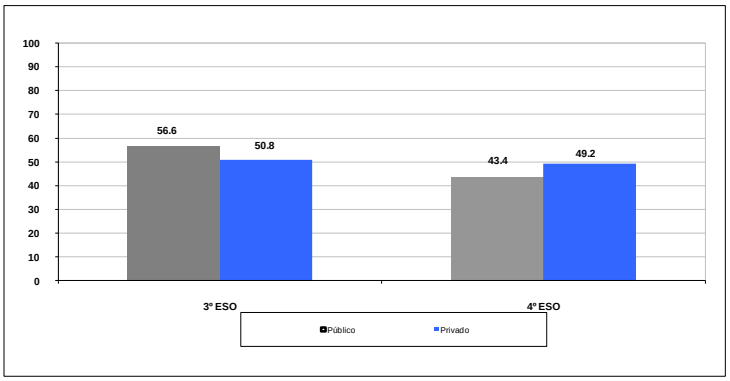

Figure 1. Representation of the sample studied in terms of academic year and school type

2.4. Results

Derived from the analysis of the data obtained, we show the results, making a difference, firstly, between those referred to knowledge on informational literacy, and secondly, those related to the use of computing tools.

2.4.1. Informational literacy knowledge

In this section we try to analyze what are the competences, related to informational literacy, that Secondary Education students in Spain mostly control, as well as to know to what degree do they consider its control relevant. For these purposes we have created 25 items related to informational literacy to which students have answered following a scale between 1 and 9 (being 1 the lowest and 9 the highest), both to indicate the level of importance that the competences have in their education process and the level of knowledge that they have on them.

Table 1. Descriptive statistics on the importance that students give to informational competences.

Informational Competences (Importance given)	$\overline{X}$	S_x	N
5. Search and retrieve information from internet	7,84	1,468	1161
13. Extract the information that you actually need	7,50	1,665	1152
16. Download software through internet	7,31	1,805	1153
21. Write a document (class assignment…)	7,21	1,766	1163
18. Install software	7,06	1,940	1159
4. Know theoretical concepts of the subjects	6,84	1,938	1159
23. Ellaborate academic presentations (powerpoint)	6,81	1,984	1159
7. Know strategies of information search	6,74	1,819	1159
20. Communicate yourself in different languages (English…)	6,73	2,370	1161
19. Public communication	6,53	2,036	1147
24. Popularize information through internet (webs, blogs, …)	6,43	2,142	1150
14. Recognize the different parts in which the text id divided	6,38	1,985	1157
11. Determine if fan information source is updated	6,19	2,157	1145
8. Assess the validity of information sources	6,17	1,925	1138
1. Read articles or books in printed format	6,14	2,097	1171
6. Use sources as blogs, distribution lists, forums	6,06	2,136	1159
9. Recognize the idea of author in a text	5,97	2,154	1159
17. Use calculation sheets to carry out activities	5,95	2,189	1150
3. Consult and use data bases	5,89	2,073	1155
22. Know the laws on information usage and intellectual property	5,89	2,198	1138
12. Know the most relevant authors and institutions in your thematic area	5,78	2,088	1144
10. Know the different typologies of scientific information sources	5,63	2,104	1131
15. Use data-bases management tools	5,56	2,120	1119
2. Access and use catalogues through internet	5,40	2,139	1164

* Mean and standard deviation obtained from a scale between 1 and 9 (1=Very low; 3=Low; 5=Mean; 7=High; 9=Very high)

As it can be observed in the table above, subjects give a medium-high importance to all informational competences presented, considering more relevant ($\overline{X}$ > 7) those related to the use of computing tools that students use more frequently *(Search and retrieve information from internet, Download and install software through internet, Write a document).*

It is logical that the competence *Search and retrieve information from internet* has to be the more highly valued, taking into account that, according to a study of Washington University (Head & Eisenberg, 2009), when students face problems in their daily life that make them look for information, more than a 90 % of the subjects turn to Google and Wikipedia, and; on the other hand, when they face academic problems, percentages keep maintaining between 85 and 95 %. Less importance ($\overline{X}$ < 6) is given to more specific competences related to specialized computing knowledge (Use of calculation sheets, data-bases and management tools for data-bases, Access to catalogues, knowledge about the most relevant sources in a thematic strand, and take into account the typology of the information source). Likewise, we can observe a tendency to underestimate the importance of competences related to the category 'information selection'.

Table 2. Statistical data on the level of knowledge of informational competences

Informational Competences (level of knowledge)	$\overline{X}$	S_x	N
5. Search and retrieve information from internet	7,84	1,483	1152
16. Download software through internet	7,25	2,028	1146
21. Write a document (class assignment…)	7,20	1,711	1154
13. Extract the information that you actually need	7,13	1,683	1145
23. Ellaborate academic presentations (powerpoint)	6,94	2,019	1158
18. Install software	6,59	2,217	1154
6. Use sources as blogs, distribution lists, forums	6,57	3,251	1146
4. Know theoretical concepts of the subjects	6,56	2,948	1142
14. Recognize the different parts in which the text id divided	6,47	1,843	1148
1. Read articles or books in printed format	6,44	1,904	1158
24. Popularize information through internet (webs, blogs, …)	6,42	2,275	1149
7. Know strategies of information search	6,38	1,865	1150
19. Public communication	6,04	2,099	1137
17. Use calculation sheets to carry out activities	5,91	2,200	1147
8. Assess the validity of information sources	5,85	2,027	1122
11. Determine if an information source is updated	5,83	2,091	1139
20. Communicate yourself in different languages (English…)	5,82	2,236	1150
2. Access and use catalogues through internet	5,70	2,257	1153
9. Recognize the idea of author in a text	5,68	2,020	1149
3. Consult and use data bases	5,54	2,208	1141
12. Know the most relevant authors and institutions in your thematic area	5,37	1,980	1135
22. Know the laws on information usage and intellectual property	5,25	2,111	1127
10. Know the different typologies of scientific information sources	5,14	2,230	1123
15. Use data-bases management tools	5,04	2,190	1112

* Mean and standard deviation obtained from a scale between 1 and 9 (1=Very low; 3=Low; 5=Mean; 7=High; 9=Very high)

People polled admit to have a medium-high level of knowledge in the informational competences presented and, likewise, declare to have a high knowledge ($\overline{X}$ > 7) on almost the same competences which they declared were very relevant *(Search and retrieve information from internet, Download and install software through internet, Write a document),* coinciding as well the competences less valued by students with those which they affirm have less control of. These coincidences in the results keep feeding the hypothesis that competences that are better controlled by students are as well the most highly valued, due to the knowledge of the benefits that it can supply. We can see again how the competences that students declare to control in a lower degree are those related to information selection.

We can complete the data obtained with results obtained in a study (Sigalés, Mominó, Meneses, & Badia, 2009), where it is highlighted that the majority of students is able to create a text document (78,8 %) and to install

and uninstall a program (71 %),while only approximately a third of those polled (32,2 %) declared to be able to create a data-base. On the other hand, some other data that provide us with coherence on those obtained in this study are based on the use of internet by students; while students cited in the aforementioned study declare to have high abilities when searching for information (91,8 %) and file downloading (77,5 %), they also declare to have a lower ability on publishing contents on the internet (36,9 %).

We present below the results that make reference to the four categories considered, each of which is formed by a group of items out of the 25 proposed. We refer to the following categories: *Information search* (items 1 to 7), *information selection* (items 8 to 12), *information processing* (items 13 to 18) and *communication and popularization of* information (items 19 to 24).

In the light of the results obtained, we can observe that the category *information selection* is the one with a lower value both in importance and knowledge level. Nevertheless, if we compare the mean valued obtained in both cases: importance and knowledge level, we find that the category with a higher value varies in a way that, for the students, the most relevant categories are competences related to *information processing and communication and popularization of information*. Besides, if we conduct a first comparison between means, we can observe that, except for *information search*, in the rest of categories the mean is moderately higher in terms of importance than in terms of level of knowledge perceived. This datum indicates us that students are demanding a greater formation in competences related to *selection, processing, communication and popularization of information.*

Table 3. Statistical descriptive data: Importance and knowledge level categorized.

	Importance perceived		**Self-perceived competence**			
Informational Competence	$\overline{X}$	$\mathbf{S_x}$	**N**	$\overline{X}$	$\mathbf{S_x}$	***N***
Search of information	6,43	1,216	1116	6,46	1,333	1079
Selection of information	5,96	1,587	1080	5,59	1,482	1063
Information processing	6,63	1,318	1074	6,41	1,334	1072
Communication and popularization of information	6,61	1,429	1106	6,29	1,363	1091

Even though if we carry out a t-score test for correlated samples to test if there are statistically significant differences between **importance** given and **level of knowledge** perceived on informational competences, we do not find differences in relation to information search (t=-,163; p=0.871); but we do find differences in the three binomials: Information selection (t=10,264; p=0.000), information processing (t=7,303; p=0.000) and information communication and popularization (t=9,748; p=0.000). In this same sense, the aforementioned study indicates that students believe themselves to be experts in handling ICTs, but the reality is that they do not have interiorized the processes that have to be carried out for a correct processing of information (not only search of information, but also information assessment and communication).

To analyze the validity of content of the informational literacy scale, we carry out a factorial analysis (AFAC). Firstly, we test the suitability of data for its application (see table below).

Table 4. Degree of association among variables indicators.

Correlational matrix	**Correlated variables**
Barlett esfericity test	7554,216 (p=0,000)
Main diagonal of the anti-image correlational matrix	High values (>0,9) in all cases but item 6, where it is higher than 0,8

Results justify that necessary conditions for the application of AFAC are fulfilled, and therefore, we continue with the extraction of factors and dimensions on the self-perceived competence level. The analysis has been carried out using the method of principal components, with varimax rotation. The four factors that remain from the analysis (self-values higher than one) can explain the 50,598% of the variation percentage of the total of the correlational matrix. If we analyze the variation percentage that explains every component, we see how the first value explains the 32,101% of the variation, that is to say, with a single component, we can explain more than half

of the variability; the rest 18,497% can be explained with other three factors, being the second factor to explain the 8,083%; 6,180% the third and the fourth 4,234%.

To sum up, factor analysis shows that there is a multidimensional structure on the concept analyzed, as it can be foreseen. The four factors are defined below:

Table 5. Matrix of rotated components. Perceived level on informational competences

	Components			
	1	**2**	**3**	**4**
15. Use data-bases management tools	,763			
3. Consult and use data bases	,733			
11. Determine if an information source is updated	,599			
10. Know the different typologies of scientific information sources	,593			
8. Assess the validity of information sources	,588			
22. Know the laws on information usage and intellectual property	,562			
2. Access and use catalogues through internet	,514	,416		
12. Know the most relevant authors and institutions in your thematic area	,513		,505	
7. Know strategies of information search	,487			
17. Use calculation sheets to carry out activities	,446			
5. Search and retrieve information from internet		,784		
13. Extract the information that you actually need		,632		
16. Download software through internet		,620		,410
21. Write a document (class assignment…)		,599	,463	
18. Install software		,490		
1. Read articles or books in printed format		,460	,451	
23. Ellaborate academic presentations (powerpoint)		,459		
9. Recognize the idea of author in a text			,683	
14. Recognize the different parts in which the text id divided			,624	
20. Communicate yourself in different languages (English…)			,593	
19. Public communication			,539	,414
4. Know theoretical concepts of the subjects			,406	
24. Popularize information through internet (webs, blogs, …)				,696
6. Use sources as blogs, distribution lists, forums				,625
Total variation explained =50,598	16,816	12,989	12,208	8,585

Extraction method: Analysis of main components. Rotation method: Varimax normalization or Kaiser-based. Rotation has converged in 13 iterations.

Factor 1. *Specific technical knowledge on informational literacy:* Groups competences referred to specific abilities that are not easily acquired in a autodidactic way, and which are not normally taught at schools. Included, in respect to those obtained in the importance level, the ones referring to library science and documentation that can be considered.

Factor 2. *Daily activities related to information management*: Includes competencies that students habitually perform both at school and at home. It has been included, in respect to those obtained in the importance level the item *Elaborate academic presentations (PowerPoint)* that, due to the familiarity of many students with this software, could be considered part of this group.

Factor 3. *Basic academic competences not related to information and communication technologies:* Includes competences related to activities that are normally developed in the classroom.

Factor 4. *2.0. Web: Use of interactive online communication tools in the academic context:* Incorporates items referred to the use of online tools to the collective elaboration of knowledge, such as blogs, forum, wikis…
2.4.2. Level of commandment in the use of computing tools in the daily life of the teenager in Spain.

In this section, basic competence levels of those polled are described in relation to leisure and free-time activities that entail the use of specific and varied technologies, which, a priori, they carry out in their habitual life. It is ordered in a five-point scale, being 1 zero knowledge and 5 a high knowledge.

Table 6. Basic description of the knowledge level on computer applications (ordered list)

Level of basic abilities on technologies in teenagers (2009)	$\overline{X}$	S_x	1 (%) Nothing	2 (%)	3 (%) Something	4 (%)	5 (%) A lot	N
19. Insert music from my computer to an Mp3	4,71	,756	1,5	1,5	5,0	9,0	83,1	1159
9. Watch videos from YouTube	4,65	,816	1,8	2,1	4,8	11,3	79,9	1155
6. Surf the net, select and sabe information	4,61	,763	1,0	1,6	6,5	17,7	73,2	1155
20.Download information from a mobile phone or a camera	4,51	,989	3,5	2,9	6,6	13,6	73,5	1157
11. Use a social network (Tuenti, Facebook…)	4,47	1,091	5,3	3,1	6,0	10,1	75,5	1156
18. Burn a CD	4,42	1,012	3,0	4,0	8,9	16,3	67,8	1158
1. Recover, print and sabe information	4,41	,838	1,1	1,4	12,1	26,4	59,0	1157
7. Use search engines	4,37	,936	1,7	3,6	10,8	23,6	60,2	1154
16. Download music from programs	4,28	1,148	5,0	5,2	10,0	16,0	63,8	1155
17. Download music from a CD	4,26	1,148	5,1	4,9	10,8	17,1	62,0	1156
14. Download software from internet	4,15	1,917	6,3	5,4	12,7	22,8	52,7	1154
3. Make a presentation with texts, images…	4,14	,960	1,6	4,6	16,5	32,5	44,8	1143
8. Participate in chats, forums, blogs…	4,08	1,192	5,5	7,2	12,9	22,9	51,5	1152
2. Install and execute programs	4,03	1,055	2,8	6,1	18,9	29,2	43,0	1156
21. play games online with people	3,90	1,299	8,0	8,4	16,5	19,5	47,6	1155
13. Edita on entry on a blog	3,85	1,316	9,4	8,4	13,9	24,7	43,7	1154
12. Create a blog	3,47	1,390	13,7	11,3	21,0	22,4	31,5	1157
10. Upload videos to YouTube	3,37	1,527	19,2	12,0	17,0	16,5	35,4	1154
5. Find data in a data-base	3,31	1,238	9,4	16,8	28,2	24,7	20,8	1147
4. Use calculation sheets	3,21	1,222	9,8	18,6	30,9	22,3	18,4	1155
15. Buy things through internet	2,89	1,513	28,1	14,0	20,0	16,0	21,8	1149

*Mean and typical deviation obtained from a scale between 1 and 5 (1=Nothing; 3=Something; 5=A lot)

Results show that the students have a medium-high knowledge ($\overline{X}$ > 2,8) in all abilities presented, being specially high in those related to leisure time ($\overline{X}$ > 4,5), like watching videos or share videos, music or images. On the other hand, activities in which those polled state to have moderate knowledge ($\overline{X}$ < 3,5) are those related to the academic sphere, like using calculation sheets or find data in a data-base; or related to information popularization, like upload videos or create a blog. In relation to the item on which those polled declare to have less commandment (*Buy things through internet*), we can find similar cases in the study (Elogia Ipsofacto, 2009) developed by the Interactive Advertising Bureau (IAB), where only a 23 % of those polled declares to have bought something through internet.

If we relate these data with those obtained in some other studies, such as the one carried out at the Camilo José Cela University (Sánchez Burón, Rodríguez, & Fernández Martín, 2009), actions mostly performed by students of Secondary Education online are those related to the access to social networks, Messenger and multimedia downloads. Apart from this, the study of the IABon the use of social networks in Spain (Elogia Ipsofacto, 2009), it points out that one of the most used social networks, only beatted by Facebook, is Youtube, with an 84 % of integration.

3. CONCLUSIONS

The aim of this paper is to emphasize the relevance of informational literacy as a nuclear integrative competence, not only in the technical use of ICTs, but also in the efficient management of all the information process.

Likewise, with the study developed, we try to show evidences on the students believing themselves experts in the use of ICTs, a fact that is actually turned into a lack of internalization of processes that should be carried out in a correct management of information. Besides this, students declare that they should know more about selection processing and popularization of information.

Students show a high use of computing tools, but have a low level of acquisition in terms of informational competences.

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