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Uncovering Information Literacy's Disciplinary Differences through Students Attitudes: An empirical study

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Abstract
This paper uses a self-assessment questionnaire (IL-HUMASS) with a wide sample of university students. The questionnaire puts forward a scale of attitudes that aim to measure "belief in importance" and "skills self-assessment" regarding diverse information competences. We use a group of twenty-six information sub-competences gathered in four categories (searching, evaluation, processing and communication-dissemination). The results show some considerable differences in these categories when statistically comparing seventeen university degrees related to five branches of knowledge. It is proved that attitudes appreciably vary between branches, in reverse relation with the interdisciplinary differences we have found. An improvement regarding students' informational attitudes will help reduce the interdisciplinary differences. The results of this case study suggest the feasibility of shared training actions for some information competences in the branches of Sciences, Engineering & Architecture, and Health Sciences. The branches of Arts & Humanities and Social & Legal Sciences show considerable widespread attitudinal differences that advise against that shared training.

Keywords: Information Literacy, self-assessment, interdisciplinarity, empirical study, case study.

Introduction

The knowledge of the University of Granada (Spain) on the levels of information competence of its students is highly limited. The situation is indeed similar in most universities in Spain. This is certainly due to the poor relevance that institutions give to Information Literacy training. Nonetheless this scene is changing, and a new awareness, both individual and collective, on the relevance of Information Literacy is arising.

A first approach aiming to learn about the Information Literacy levels of our students should not be a sort of traumatic process in which, suddenly, they discover and describe their evident lack of information competence. Instead, it would be preferable to undertake this process so that it may ease the discovery of the poor levels that actually our students have. In the case of Spain, we may assume these poor information competence levels due to the limited training developed in this field. Thus, we think that a first approach to the students should be subjective, trying to diagnose not their levels of knowledge but their attitudes and self-perceptions regarding Information Literacy. That would mean the assessment of the self-perceived competences, which could be an interesting starting point for subsequent objective assessments. Learning about the students' subjective perception of their knowledge would be useful for the development of training proposals, taking into account the subjective components of learning, and the fact that the border between learning and assessment is becoming more and more blurred.

If we agree that students from different disciplines usually have different informational attitudes, we need an initial diagnostic self-assessment that could report on their attitudes towards information competences and could help us to know what they think and how they assess the relevance of those competences. Thus, it would be possible for the academic units and academic heads to undertake different training actions for the real improvement of IL levels. The IL-HUMASS (Information Literacy in HUMAnities and Social Sciences) questionnaire used in our research offers a scale for attitudes regarding the following two dimensions: "belief in importance" and "skills self-assessment". "Belief in importance" allows knowing the student degree of awareness in relation to the relevance he or she gives to informational competences in his or her academic training. On the other hand, "skills self-assessment" provides data on the level of self-esteem that the student has regarding the practice of a certain competence.

Aims of the study

The arrival of Information Literacy to Higher Education institutions has developed from generic approaches to more specific ones in which the context, and mainly the disciplinary context, is becoming increasingly prominent. But

sometimes discipline-based training has been carried out without taking an adequate knowledge on the diverse student attitudes according to disciplinary differences. During the last years we have observed that disciplinary needs and specificities are beginning to become an essential part of Information Literacy training. According to this trend, there are a number of goals to this study. First, we want to know the self-perceptions of a representative sample of students from the University of Granada, gathered in five branches of knowledge, on the informational competences related to information search, evaluation, management and communication.

The second aim is to ascertain if students' attitudes towards the aforementioned four competence categories differ significantly in relation to their areas of knowledge. In the event of proving the existence of differences between areas, we would want to know which areas, competence categories and attitudinal dimensions they refer to. We think this information could be highly useful for the design of student-centred training programmes that could be applied in diverse areas. Finally, we try to know if the student's attitudes interdisciplinary differences regarding information competences are related to some criterion.

Literature review

In the field of Information Literacy the literature on both self-assessment and, to a lesser extent, disciplinary differences play an increasingly important role. But there are only few studies that explicitly deal with the information self-perceptions of the students and their self-assessment, regarding diverse disciplines. From a closely related view, we find some interesting studies: on the relation between disciplinary training and competence development in order to use information resources (Nicholas, Rowlands, Jubb, et al., 2010); on the disciplinary differences regarding the relationship between information resources use and theoretical perspectives (Hjørland, 2002); or how the relevance criteria for information search and assessment could vary according to the discipline, due to the different ways of thinking (Talja & Maula, 2003). But these approaches delve into Information Literacy objective parameters. We have not found studies that deal with an interdisciplinary view of students information attitudes, which are subjective. In spite of this gap in the existing literature, a review of the studies that are related to the main concepts of this research is provided.

Information Literacy has been an area of constant research in the last decades (Rader, 2002). Indeed, institutions of higher education are aware of the essential need to produce graduates "with the knowledge, skills and abilities needed to live and work in the information age" (Oakleaf 2008, p.233). We agree with Freeman and Lynd-Balta when they state that "it is imperative that

faculty of all disciplines introduce students to effective strategies to filter and analyze information and then provide them with increasingly complex tasks that are discipline-relevant to cultivate critical thinkers and the skill set necessary for lifelong learning" (Freeman and Lynd-Balta 2010, p.114).

But "information literacy consists of a broader array of competencies than our instructional practices and competency standards would suggest" (Ward 2006, p.396). According to Maybee (2006, p.79), "designing information literacy instruction without incorporating the student perspective leads to un inappropriate pedagogic strategy". Most of the studies put forward the relevance of a diagnostic assessment, which is subjective, of information competences (Resnis, Gibson, Hartsell-Gundy, et al., 2010). In the last years, this method of subjective assessment has increased as initial and/or complementary tool for objective assessment processes. As Seamans (2002, p.112) states, perceptions of "first-year students are the focus of much library instruction at colleges and universities". In this sense, we may also mention Green & Macauley (2007, p.318), who try to know student's "realms of engagement with information".

A diagnosis of the perceptions of students regarding their own information literacy and its competences can be achieved through the application of self-assessment tests, and their respective "self-report measures" (Oakleaf & Kaske, 2009; Pinto, Fernández-Ramos, Sánchez, et al., 2012). There is a large number of works that make use of self-assessment as a diagnostic method that provides information about students' training perceptions and needs (Green & Macauley, 2007; Colthart, Bagnall, Evans, et al., 2008; Gross & Latham, 2007; Korobili, Malliari & Christodoulou, 2009; Pinto, 2010, 2011). This is sometimes used as the main method (Walsh, 2009).

In this context of research, Pinto (2012) has carried out a self-assessment of Spanish history students. The ACEJMC (Accrediting Council on Education in Journalism and Mass Communications) survey measures the perceptions of journalism students (Singh, 2005). IL has been assessed within Biology studies by a number of tools at Macquarie University (Vickery & Cooper, 2002). In this context of self-assessment "health literacy" stands out (Elder, Barber, Staples, et al., 2012). In this area there is preference to analyze the "attitudes of students in the healthcare professions towards computers and e-learning" (Wilkinson, While & Roberts, 2009, p.755), and specially the tendency towards the "fair access to informatics and technology-rich clinical settings" (Fetter, 2009, p.86). Fetter uses the TIGER (Technology Informatics Guiding Educational Reform) tool to self-assess a set of information technology competences among nursing students. Other studies focus on "the effectiveness of self-assessment on the identification of learner needs, learner

activity, and impact on clinical practice" (Colthart et al. 2008, p.124). CAUL ISS (Council of Australian University Librarians Information Skills Surveys) is a standardised, twenty-item self-report inventory of information literacy skills of higher education, that was applied to medical students (Clark & Catts, 2007). Likewise, the Research Readiness Self-Assessment (RRSA) was used to measure the health information competencies of university students (Ivanitskaya, O'Boyle & Casey, 2006).

Above all, the "knowledge about the internal or subjective side of these students' information literacy is scarce. This personal facet includes their academic behavior, feelings and attitudes" (Pinto 2011, p.145). As Scales & Lindsay (2005, p.519) put forward, "attitudes toward information literacy are complex and varied but are measurable and could perhaps be used to further the development of information literacy pedagogy".

Among these attitudes, there are two we are specially interested in: "belief in importance" and "skills self-assessment". Some experts, as Weiler (2004, p.47), relate "belief in importance" to critical thinking in the context of the learning theory. On the other hand, "skills self-assessment" is closely related to "self-efficacy", a concept suggested by (Bandura, 1982, p.123) in the sense of "self-percepts of efficacy", as "people's judgments of their capabilities additionally influence their thought patterns and emotional reactions during anticipatory and actual transactions with the environment". Self-efficacy affects choice of tasks, effort, persistence, and achievement (Usluel, 2007).

Nevertheless, self-assessment initiatives don't usually come up in an isolated way, and there are many instances in which self-assessment is combined and/or compared with an objective assessment (Bandyopadhyay, 2012; Patterson, 2009). It is a matter of knowing "how students' self-assessment of their ability compares to their actual skill as demonstrated through testing" (Gross & Latham, 2012, p.576). This combination of objective and subjective tools provide a look at the "association between scores on an IL skills test and students' estimates of their IL skills" (Gross & Latham, 2012, p.578). Alternatively, self-assessment methods have also been applied to psychology studies to diagnose information competences, along with expert assessment, as Thaxton (2002) work shows. There are also mixed methods that triangulate data gathered from in-class task assignments with questions relating to students' process of solving information-related problems, and from semi-structured interviews with students (Julien & Barker, 2009). A work on multiple information-related students' perceptions through questionnaires, tests, focus groups, and tasks was published recently by McKinney, Jones & Turkington (2011).

Other interesting avenues for assessing information competences from perspectives which are more closely addressed to particular tasks are also becoming available, such as authentic evaluation (Diller & Phelps, 2008; Brown & Kingsley-Wilson, 2010) or the use of portfolios (Fourie & van Niekerk, 2001).

These last trends of mixed (subjective and objective) methods, such as authentic evaluation (including the use of rubrics and/or portfolios) are related to phenomenography, a research school that "provides researchers with a means of constructing rich, multifaceted representations of the variation regarding phenomena" (Boon, Johnston, and Webber 2007, p.210). In this context, "a phenomenographic conceptual framework investigates learning from the perspective of the learner, with the aim of reflecting on the features that this approach shares with information literacy education" (Andretta 2007, p.152). This methodology is contributing to the improvement of academics' conceptions of, and pedagogy for, information literacy.

The fact is that "information literacy as a discrete phenomenon is still perceived as being a relative newcomer to many disciplines" (Boon, Johnston, and Webber 2007, p.224). However, "despite the increasing emphasis on collaboration between the library and the discipline-based faculty in teaching IL, the skill emphasized in the IL literature are, in fact, generic" (Grafstein 2002, p.198). Indeed, "an assessment to determine the IL skills level of a specific student body is crucial to developing a comprehensive approach to IL instruction" (Anderson and May 2010, p.499). The discipline involved is essential in IL literature from the phenomenographic viewpoint: "the concept of IL is one that contextualizes it within the structures and modes of thought of particular disciplines" (Grafstein 2002, p.202).

Methodology

We have used a quantitative methodology, based on the dissemination of the IL-HUMASS online questionnaire and the statistical and inferential processing of data.

Data collection

The questionnaire. The questionnaire design is based on a wide corpus of literature on Information Literacy, regarding rules of general nature (Corrall, 2007; Webber & Johnson, 2006; ALA/ACRL, 2000; SCONUL, 1999; Bruce, 1997; Bloom, Engelhart, Furst, et al., 1956), as well as specific aspects of empirical user-centred research (Limberg, 2005; Maybee, 2006; Tuominen, Savolainen & Talja, 2005). Nonetheless, the initial design of the questionnaire was related to its priority use in Spanish and Portuguese universities (Pinto, 2010). For this reason, we have not taken into account all the dimensions of the several questionnaires designed in other settings.

The goal of IL-HUMASS is to provide a self-assessment of information competences in the context of higher education, gathering students' opinion, to get to know which competences are useful in the teaching-learning process, and thus be able to include in the curricula appropriate contents that may contribute to a strategic training based on competences. This questionnaire collects data, through twenty six questions, on four interrelated competences: searching, evaluation, processing, and communication-dissemination of information (Pinto, 2011). Each question has to be answered from three dimensions: belief in importance; skills self-assessment (both using a Likert scale of nine points) and preferred habit of learning (Pinto, 2012).

The underlying competences, or categories, are the following: *searching* - 1) use of printed sources of information, 2) enter and use automated catalogues, 3) consult and use electronic sources of printed information, 4) use electronic sources of secondary information, 5) know the terminology of your subject, 6) search and retrieval of Internet information, 7) use informal electronic sources of information, 8) know information search strategies; *evaluation* - 9) assess the quality of information resources, 10) recognize the author's ideas within the text, 11) know the typology of scientific information sources, 12) determine whether an information resource is updated, 13) know the most relevant authors and institutions within your subject area; *processing* - 14) schematizing information and abstracting, 15) recognize text structure, 16) use database managers, 17) use bibliographic reference managers, 18) handle statistical programs and spreadsheets, 19) install computer programs; *communication-dissemination* – 20) communicate in public, 21) communicate in other languages, 22) write a document, 23) know the code of ethics in your academic/professional field, 24) know the laws on the use of information and intellectual property, 25) create academic presentations, 26) disseminate information on the Internet.

Reliability and validity. Basic properties of any measurement tool are reliability and validity. The reliability, or consistency, measures the extent to which an instrument produces the same results on repeated attempts. One of the more extended formulae for internal consistency is Cronbach's alpha coefficient (Cronbach, 1951). If the individual items are highly correlated with each other, one can be highly confident in the reliability of the entire scale. In this case the weighted average of the correlations between the items (Cronbach´s alpha coefficient) is 0'948, and therefore the questionnaire is reliable. That is, “answers in the survey are most likely to differ because respondents have real differences of opinions, not because the survey is confusing or has multiple potential interpretations” (Garde, Harrison, and Hovenga 2005, p.12).

On the other hand, a tool is valid if it is possible to confirm that it measures what it purports to measure. The IL-HUMASS questionnaire fulfills the two validity criteria that are generally considered as more important: “content” (does each question test the property that the designers intended?) and “construct validity” (does the whole test measure the ‘idea’, i.e. ‘information literacy’, that it was intending to measure?) were tested (Pinto 2010, p.97).

The sample. The overall universe of students at the University of Granada, in the seventeen degrees selected for this study, amounts to 20.5822. The sampling process was a probabilistic stratified method for each of the degrees selected for this study. A sampling error of ±5%, with a level of confidence of 95%, was assigned. The estimate of the sample size (sample random) was developed using the statistical programme StatsTM 2.0, which offered the preliminary result of n=1.036 sample units. As a preventive measure, we increased our sample size up to 1.530 fulfilled questionnaires. 110 of them were discarded because they were incomplete. Thus the sample amounts n=1.420. The survey was distributed among students from January to May 2010 in the computer laboratories, ensuring that they were representative of the five branches of knowledge: Arts and Humanities (424, out of 3998 students), including the degrees in English Studies, Spanish Studies, History and Translation & Interpreting; Social Sciences and Law (537, out of 6028 students), including the degrees in Information Studies, Law, Education and Psychology; Sciences (108, out of 2632 students), including the degrees in Biology, Environmental Sciences and Mathematics; Health Sciences (109, out of 2126 students), including the degrees in Medicine and Dentistry; Architecture and Engineering (242, out of 5798 students), including the degrees in Technical Architecture, Civil Engineering, Computer Engineering and Chemical Engineering. In the overall sample of 1420 students, 914 were women and 506 were men. The gathering of data addressed all academic years, with more emphasis on first, third and fifth years (the curricula of the degrees analyzed in this research last five academic years).

Data analysis

With the selected data, diverse statistical analysis have been carried out, both descriptive and analytical, using the SPSS 20.0 programme.

Criteria of analysis. The IL-HUMASS survey aims to analyze the subjective data provided by the student in each of its twenty six variables, or information competences, from a triple perspective directly linked to the established three dimensions: 1) student´s belief in importance of the informational competence; 2) skills self-assessment in the exercise of that competence; and 3) preferred habit of learning. For the purposes of this paper, we have not taken into account this third dimension, due to the fact that it's qualitative nature demands another kind of analysis, that we will develop in future studies.

The twenty six questionnaire variables are gathered in four categories: searching, evaluation, processing and communication-dissemination of information. The analysis has been carried out with these categories in all the discipline areas of our sample. But the sample does not fulfil the needed conditions of statistical normality and homogeneity in order to develop a

parametric analysis (one-way ANOVA and post-hoc test) that could help us compare the behaviour of the four competence categories in the five branches of knowledge. Due to the impossibility to display a parametric analysis, we have turn to non-parametric procedures. The Kruskal-Wallis test is the nonparametric test equivalent to the one-way ANOVA, and an extension of the Mann-Whitney U test to allow the comparison of more than two independent groups (Lund & Lund, 2013).

Findings and discussion

The average values offered by the analysis in the scale of attitudes are, for all variables, clearly higher in the dimension “belief in importance”. The overall average score in this attitudinal scale (7.15) stands out over the overall average score in the dimension of “skills self-assessment” (5.88). A significant difference is appreciated in between both scores, which put forward the possibility to set out improvement initiatives, because it is clear that students consider that information competences are relevant. Also, we observe, in both dimensions, high scores in the categories of searching and evaluation, in comparison with the categories of processing and communication (figures 1 and 2). It could be said that the surveyed students consider searching and evaluation in a similar way, with close scores and, from a positive attitude, with higher scores over the overall average. This similar consideration repeats when we observe the categories of processing and communication-dissemination of information. But in this case, they are considered from a less positive attitude, with scores below the overall average.

We have not found IL diagnostic interdisciplinary studies which variables could be compared with those of the present paper, because studies such as Head (2008), or Head & Eisenberg (2010), are already focused on procedural aspects regarding information-seeking strategies, research process and research difficulties of college students, or in analyzing the limited academic engagement and subsequent learning outcomes, such as (Arum, Roksa & Cho, 2012). Others, such as Comas, Sureda, Pastor, et al., (2011) deal with a random sample of university students regarding information seeking for academic purposes.

In our study, if we compare the average values diagnosed in the different branches of knowledge, it may be observed that there is a slight superiority of the values in the four competence categories, and a higher degree of concentration of all of them, in the branches of Arts & Humanities and Social and Legal Sciences. In the branches of Sciences and Engineering & Architecture the values are slightly lower and more dispersed. Nonetheless, the highest dispersion of average values is seen in the branch of Health Sciences, with the lowest results in the competences of processing and communication-

dissemination (figures 1 and 2). At this point it seems relevant to point out that, of the 17 degrees analyzed, only two of them (Translation & Interpreting and Information Studies) have a subject on information competences included in the curriculum. Also, there is some subject on clinical documentation, in Health Studies, lectured from the same area of Health Studies.

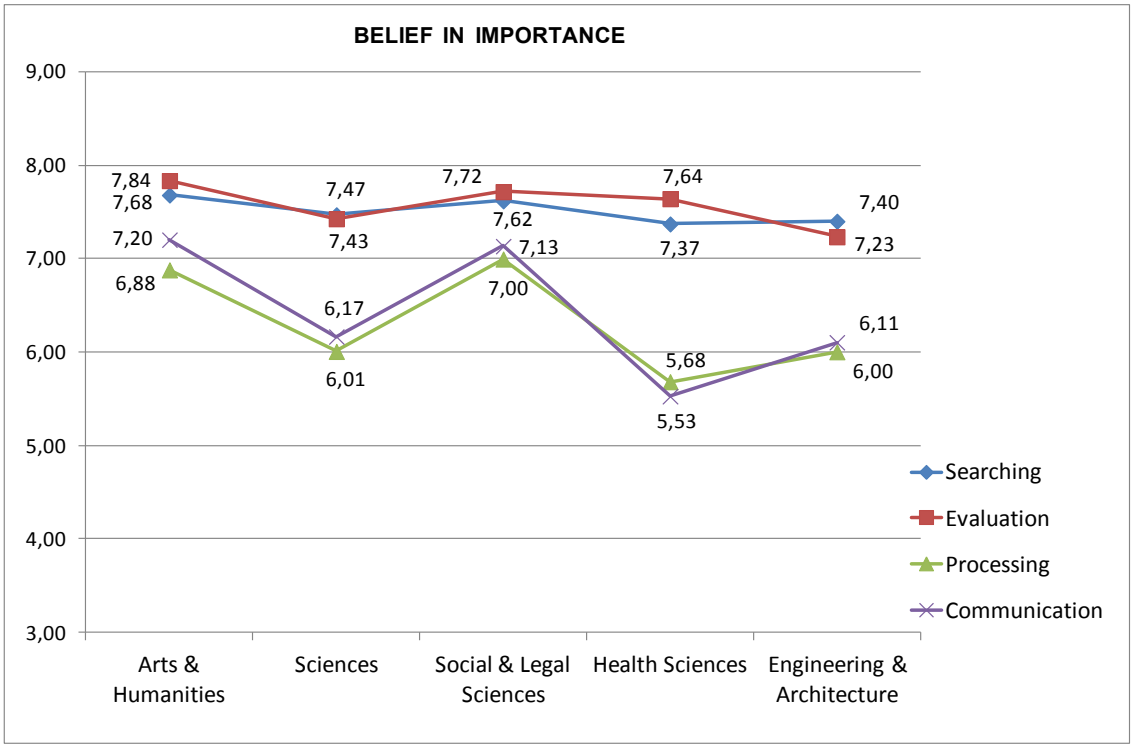

Figure 1. Comparison of average values on “belief in importance” in information competences between disciplines

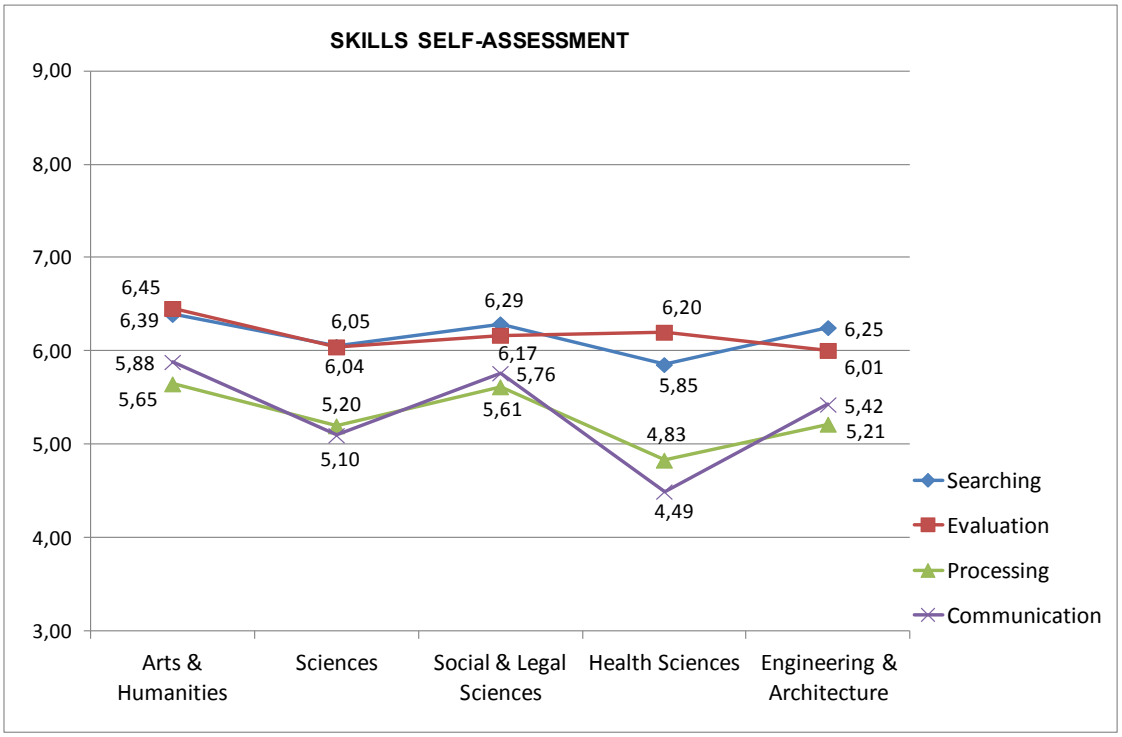

Figure 2. Comparison of average values on "skills self-assessment" of information competences between disciplines

We have also used the non parametric tests of Kruskal-Wallis and Mann-Whitney, clustering the results of the analysis in four groups, which correspond to the four competence categories of the questionnaire. For each of them, all variables haven been taken into account, and the results have been matched with all the possible pairs of branches of knowledge, in order to check if there are statistically significant differences. That allowed us to put forward some area groupings for the future design and development of training programmes in information competences.

A first global approach allows us to check that there are statistically significant differences between the attitudes in the five branches of knowledge, regarding the four competence categories and the two dimensions of the scale (table 1). From this overall perspective, which considers the five branches of knowledge as the grouping variable, we see that only the category of searching, regarding the dimension "belief in importance", does not put forward significant differences between branches. This could be considered as a positive data, because it reveals that in spite of the infoxication that surrounds students in the digital age, their perception on the importance of the searching information competence is clear.

Test Statistics [a,b]

	Belief in Importance				Skills Self-Assessment			
	search	evaluation	processing	communication	search	evaluation	processing	communication
Chi-Square	5,906	39,263	162,808	181,107	13,600	21,752	53,138	94,206
df	4	4	4	4	4	4	4	4
Asymp. Sig.	,206	**,000**	**,000**	**,000**	**,009**	**,000**	**,000**	**,000**

a Kruskal Wallis Test

b Grouping variable: Branch

Table 1. Kruskal-Wallis test applied to the four information competence categories in both dimensions (belief in importance and skills self-assessment).

However, this first overall result does not show where the attitudinal differences between areas are. For that, we should apply a non-parametric analysis of independent samples (Mann Withney test), matching one by one all the branches of knowledge with the eight variables of the category *searching*, and in both attitudinal dimensions (table 2). The bold-type scores show a significant difference of this variable regarding the two branches that are being compared, that is, the paired areas.

	Belief in Importance								Skills Self-Assessment							
Paired Areas	i1	i2	i3	i4	i5	i6	i7	i8	n1	n2	n3	n4	n5	n6	n7	n8
1_2	**,002**	,900	,940	,272	**,000**	**,000**	**,000**	,489	**,005**	,809	,324	,618	**,000**	**,000**	,718	,787
1_3	,210	,429	,975	,595	**,001**	**,001**	**,005**	,127	,766	,621	,682	,389	**,004**	**,029**	,061	**,003**
1_4	**,000**	,348	,254	,585	**,000**	**,000**	**,002**	,944	**,000**	,129	**,005**	,309	**,000**	**,000**	,699	,434
1_5	**,000**	,755	,953	,826	**,000**	**,000**	**,000**	,145	**,014**	,257	,774	,053	**,000**	**,000**	,077	,070
2_3	**,019**	,532	,958	,135	**,000**	**,020**	**,006**	,076	**,010**	,601	,211	,308	**,000**	**,000**	,468	**,026**
2_4	,684	,391	,388	,226	,200	,544	,393	,596	,205	,183	,154	,241	,226	,160	,568	,365
2_5	,933	,732	,932	,375	,008	,559	,655	,645	,357	,577	,452	,400	,238	,501	,397	,294
3_4	**,003**	,666	,257	,749	**,000**	**,001**	,136	,296	**,000**	,231	**,002**	,603	**,000**	**,000**	,143	,259
3_5	**,002**	,761	,939	,492	**,000**	**,033**	**,000**	**,004**	,029	,118	,545	**,007**	**,000**	**,000**	,805	**,000**
4_5	,576	,551	,359	,551	,115	,223	,171	,328	**,012**	**,034**	**,013**	**,025**	,832	**,018**	,128	**,036**

1) Arts & Humanities; 2) Sciences; 3) Social & Legal Sciences; 4) Health Sciences;
5) Engineering & Architecture

Table 2. Mann Withney test. Significant differences between paired branches for the several variables of the category *searching* in both attitudinal dimensions

It is seen that there are no statistically significant differences in any of the variables, in both attitudinal dimensions, when matching the perceptions of the students from the area of Sciences with those from the areas of Health Sciences and Engineering & Architecture. Likewise, we observe that there are

four competences that do not show differences between the different areas. These variables refer to the "belief in importance" regarding *entering and using automated catalogues* (i2), and also *consulting and using electronic sources of primary information* (i3) and *secondary information* (i4), and the "skills self-assessment" in the *use of informal electronic sources of information* (n7).

The attitudes of "belief in importance" of *knowing information search strategies* (i8), and "skills self-assessment" on *entering and using automated catalogues* (n2), *consulting and using electronic sources of primary information* (n3), and *using electronic sources of secondary information* (n4) hardly show significant differences. Regarding this competence category, the greatest statistical differences are found between the areas of Social & Legal Sciences and Engineering & Architecture, because the number of competences which show differences is higher.

Also, we have applied the Mann-Withney test to the five variables of the competence category *information assessment*, in the two attitudinal dimensions (table 3). In this case, the areas of Sciences and Health Sciences do not show significant differences. On the contrary, the areas of Arts & Humanities and Engineering & Architecture reveal the greatest number of statistically significant differences.

	Belief in Importance					Skills Self-Assessment				
Paired areas	i9	i10	i11	i12	i13	n9	n10	n11	n12	n13
1_2	**,000**	**,000**	,805	,197	,426	**,000**	**,001**	**,005**	,119	,380
1_3	,043	,059	,357	**,008**	,109	**,000**	,297	**,000**	**,000**	,671
1_4	**,002**	**,020**	,302	,159	,179	**,000**	**,000**	,502	,083	,407
1_5	**,000**	**,000**	**,001**	**,000**	**,001**	**,000**	**,000**	**,000**	**,037**	,617
2_3	**,003**	**,007**	,789	,807	,896	**,001**	**,009**	,612	,506	,223
2_4	,471	,281	,350	,983	,683	,145	,898	,084	,812	,886
2_5	**,047**	,173	,069	,065	,138	,811	,565	,742	,887	,637
3_4	**,045**	,190	,103	,833	,725	,163	**,003**	,081	,415	,255
3_5	**,000**	**,000**	**,006**	**,008**	**,025**	**,000**	**,000**	,754	,420	,357
4_5	**,004**	**,012**	**,002**	,051	,233	,131	,480	,069	,767	,723

1) Arts & Humanities; 2) Sciences; 3) Social & Legal Sciences;
4) Health Sciences; 5) Engineering & Architecture

Table 3. Mann Withney test. Significant differences between paired branches for the several variables of the category *assessment* in both attitudinal dimensions

The variable regarding “skills self-assessment” on *knowing the most relevant authors and institutions within your subject area* (n13) does not show significant differences between areas.

We have also applied the same test to the variables of the category *information processing* (table 4). It turns out that significant differences increase in comparison with the competence categories of *searching* and *assessment*. However, the areas of Sciences and Engineering & Architecture do not show differences in any of the competences of this category. On the contrary, the differences involve all the variables when matching the areas of Arts & Humanities and Health Sciences.

	Belief in Importance						Skills Self-Assessment					
Paired Areas	i14	i15	i16	i17	i18	i19	n14	n15	n16	n17	n18	n19
1_2	**,000**	**,001**	**,000**	,348	**,000**	**,000**	**,000**	**,000**	**,000**	**,000**	**,000**	,408
1_3	,352	**,035**	**,015**	**,037**	**,000**	**,002**	**,007**	**,007**	,226	**,009**	**,030**	**,000**
1_4	**,000**	**,003**	**,000**	**,029**	**,000**	**,000**	**,000**	**,000**	**,000**	**,005**	**,000**	**,000**
1_5	**,000**	**,000**	**,000**	,231	**,000**	**,000**	**,000**	**,000**	**,001**	**,000**	**,001**	**,014**
2_3	**,000**	**,031**	**,000**	**,029**	**,000**	**,026**	**,000**	**,000**	**,000**	**,000**	**,000**	,084
2_4	,686	,695	**,002**	,383	**,005**	,111	,249	**,046**	,050	**,005**	,050	**,008**
2_5	,105	,140	,945	,944	,535	,673	,860	,545	,149	,192	,193	,347
3_4	**,000**	,077	**,000**	**,000**	**,000**	**,000**	**,000**	**,004**	**,000**	,174	**,000**	,138
3_5	**,000**	**,000**	**,000**	**,004**	**,000**	**,017**	**,000**	**,000**	**,000**	**,000**	**,000**	,284
4_5	**,019**	**,027**	**,000**	,278	**,000**	**,023**	,127	,088	**,000**	**,018**	**,000**	**,018**

1) Arts & Humanities; 2) Sciences; 3) Social & Legal Sciences;
4) Health Sciences; 5) Engineering & Architecture

Table 4. Mann Withney test. Significant differences between paired branches for the several variables of the category *processing* in both attitudinal dimensions

The category *communication-dissemination* puts forward similar results to those of the category of *processing*, because the areas of Sciences and Engineering & Architecture hardly show significant differences between variables, except for the variable “belief in importance” of *writing a document* (i-22) (table 5).

	Belief in Importance							Skills Self-Assessment						
Paired Areas	i20	i21	i22	i23	i24	i25	i26	n20	n21	n22	n23	n24	n25	n26
1_2	**,000**	**,000**	**,000**	**,000**	**,022**	**,000**	**,001**	**,000**	**,000**	**,000**	**,001**	,908	**,000**	**,021**
1_3	,765	**,001**	**,000**	,329	,744	,530	,978	,530	**,000**	,274	**,032**	,807	,247	,715
1_4	**,000**	**,000**	**,000**	**,000**	**,000**	**,000**	**,000**	**,000**	**,000**	**,000**	**,000**	**,026**	**,000**	**,000**
1_5	**,000**	**,000**	**,000**	**,000**	**,000**	**,000**	**,000**	**,018**	**,033**	**,000**	**,001**	,148	**,000**	,084
2_3	**,000**	**,000**	**,000**	**,000**	**,037**	**,000**	**,001**	**,000**	,837	**,000**	**,048**	,987	**,000**	**,007**
2_4	**,002**	**,001**	,184	,068	**,007**	**,001**	**,045**	**,001**	**,000**	,647	,073	,063	**,000**	,229
2_5	,971	,917	**,009**	,977	,490	,780	,709	,050	,034	,686	,310	,363	,060	,250
3_4	**,000**	**,000**	**,000**	**,000**	**,000**	**,000**	**,000**	**,000**	**,000**	**,000**	**,000**	**,016**	**,000**	**,000**
3_5	**,000**	**,000**	**,000**	**,000**	**,000**	**,000**	**,000**	**,009**	**,001**	**,000**	,189	,187	**,000**	**,038**
4_5	**,000**	**,000**	,126	**,026**	**,009**	**,000**	**,048**	**,000**	**,000**	,899	**,001**	**,002**	**,000**	**,005**

1) Arts & Humanities; 2) Sciences; 3) Social & Legal Sciences; 4) Health Sciences; 5) Engineering & Architecture

Table 5. Mann Withney test. Significant differences between paired branches for the several variables of the category *communication-dissemination* in both attitudinal dimensions

All in all, we observe how the significant differences between branches of knowledge regarding information competences vary depending on the category. The categories of searching and evaluation show a similar number of statistically significant differences. Something similar is observed regarding the categories of processing and communication-dissemination, because the number of variables with statistically significant differences between areas presents almost identical results. Therefore, the increase of the percentage of statistically significant differences regarding the categories of processing and communication-dissemination coincides with the decrease of the attitudinal scores in these categories. We could speak about a reverse relationship between average values of self-assessment on competencies (figures 1-2) and number of significant differences between paired branches (tables 2-3-4-5), depending on the pair of information categories. The highest average values of self-assessment on competencies are observed in the pair of searching and assessment (figures 1-2), and precisely these two categories are the ones which show the lowest number of significant differences between paired branches (tables 2-3). On the contrary, the smallest average values can be seen in the pair processing and communication-dissemination (figures 1-2), and these categories are precisely the ones which show the highest number of significant differences between paired branches (tables 4-5).

Conclusions and recommendations

The average values assigned by the surveyed students to the attitudes regarding information competences, in the dimension “belief in importance”, are outstanding in all areas, which suggests the students’ degree of awareness of the relevance of information competences as a key element in the learning process. These values are considerably higher than those regarding the dimension “skills self-assessment”, which confirms that the self-esteem of those same students in relation to the knowledge and practice of these competences does not match up with the relevance they assign to them, from a sound self-critical exercise. In this attitudinal context, there is a clear and significant difference between the scores related to both dimensions. The ideal situation would be one where that difference could be minimal. Thus, we consider the priority need to improve students’ informational self-esteem by means of the development of adequate training actions. The attitude “belief in importance” can be strengthened through promotional training actions that alert the students to their need and relevance. The attitude “skills self-assessment” could be improved by means of training actions that stress kwowledge acquisition and also know-how. Such actions, according to the results of this study, should take into account the characteristics of the different branches of knowledge and the nature of information categories.

With regard to attitudes to information literacy categories, the average values expressed by the students show two levels: an outstanding attitude regarding searching and evaluation, and a passable attitude in relation to processing and communication- dissemination. Taking this aspect into account, we consider that any educational proposal referred to searching and evaluation could be dealt with from an “advanced” level, taking advantage of the students’ supporting attitude. On the other hand, processing and communication-dissemination of information should be preferably tackled from a “basic” training level, to try to improve the student’s motivation (table 6).

To think about training proposals taking into account the students’ viewpoint, we have considered the combination of the average values of competencies in both dimensions, “belief in importance” and “skills self-assessment” (figures 1-2), and the significant differences between paired areas (tables 1-2-3-4). We have related the dimension “belief in importance” with the theoretical formative action for the students (know-what, awareness), and the dimension “skills self-assessment” with practical formative action (know-how, training). Doing so, and combining the average values of competencies regarding these two dimensions and the significant differences between paired branches, we have been able to distinguish three sub-groups of knowledge branches. In the first one, with slightly higher values and a higher degree of

data concentration, we locate the students from Arts & Humanities and Social & Legal Sciences. This first sub-group shows the highest statistically relevant differences, not only comparing these areas but also comparing each one of them with the rest (tables 2-3-4-5). If we take these differences into account, the formative actions should be specific and independent for each one of these two areas (Arts & Humanities and Social & Legal Sciences). On another hand, as both areas show the highest average values of self-assessment on competencies, this specific action could be an advance level formative action, considering the students' high score.

In the second sub-group, with intermediate values of competencies, there are the students from Sciences and Enginering & Architecture. The students from the branch of Health Sciences, with lower scores and a higher data dispersion between categories, move away from the rest. Overall, the areas of Sciences, Health Sciences and Engineering & Architecture show lower average scores and it is possible for these areas to share formative actions. These educational initiatives could be of an advanced or a basic level, depending on the information category. As stated above, regarding formative actions we have distinguished between theoretical actions, related to "awareness", or students' declarative knowledge, and procedural actions, related to "training" or practical knowledge (see table 6). For the category of searching, advanced level formative actions could be shared by the areas of Sciences, Health Sciences and Engineering & Architecture, regarding the students' theoretical or declarative knowledge, that is, the "awareness" related to the "belief in importance". Also regarding the category of searching, the areas of Sciences and Health Sciences could share formative actions as well, but on a procedural or "training" level, related to the students' "skills self-assessment".

On the other hand, the areas of Sciences and Engineering & Architecture could share basic level formative actions, both regarding awareness and training, for the categories of processing and communication-dissemination of information (table 6).

		Formative Action	
IL category	Educational Level	Awareness	Training
Search	advanced	2-4-5	2-4
Evaluation	advanced	2-4	2-4-5
Processing	basic	2-5	2-5
Communication	basic	2-5	2-5

2) Sciences; 4) Health Sciences;
5) Engineering & Architecture

Table 6. A proposal of formative actions on information literacy categories that could be shared by diverse areas

The branch of Health Sciences is the most needy regarding improvement of students' attitudes towards Information Literacy in general terms, and above all in relation to processing and communication-dissemination of information (figures 1 & 2). Any training initiative on these two categories is advisable for this area.

In any case, this study confirms that the Information Literacy paradigm is discipline-dependent, and it should be made singular and specific for almost all disciplines. When it comes to students' IL, there are plenty of attitudinal differences between disciplines, thus, specific training IL actions should be fostered. Probably, this would contribute to reduce the attitudinal differences between students when we compare diverse academic disciplines.

All in all, it would be desirable to be able to provide students with a sound Information Literacy training, and foster a perception similar to the one diagnosed by Scales & Blakesley (2005, p.521): "A majority of the students tied information literacy to human development or to the desire to learn or understand something, either for the sake of learning or to fulfill a need. A minority saw it as related only to libraries and specific class projects."

Information Literacy is embedded in the activities of particular groups and communities of practice; that is, information competences evolve in disciplinary contexts, and they are practiced by communities according to their dynamic needs. For sure, it is also a fruitful area for the "various potentials of transdisciplinary" (Shenton and Hay-Gibson 2011, p.171). It is indeed a training that needs to be strengthened in all disciplines, deeply and specifically. A diagnosis of the students' attitudes towards information competences may be a sound starting point to take action.

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References

ALA/ACRL (2000) Information Literacy Competency Standards for Higher Education. Available from: http://www.ala.org/acrl/standards/informationliteracycompetency (accessed 14 April 2013).

Anderson K and May FA (2010) Does the Method of Instruction Matter ? An Experimental Examination of Information Literacy Instruction in the Online,

Blended, and Face-to-Face Classrooms. *The Journal of Academic Librarianship*, 36(6), 495–500.
Andretta S (2007) Phenomenography: a conceptual framework for information literacy education. *Aslib Proceedings*, 59(2), 152–168.
Arum R, Roksa J and Cho E (2012) *Improving Undergarduate Learning: Findings and Policy Recommendations from the SSRC-CLA Longitudinal Project*. Brooklyn, NY.
Bandura A (1982) Self-Efficacy Mechanism in Human Agency. *American Psychologist*, 37(2), 122–147.
Bandyopadhyay A (2012) Measuring the Disparities between Biology Undergraduates ' Perceptions and Their Actual Knowledge of Scientific Literature with Clickers. *The Journal of Academic Librarianship*, 39(2), 194–201.
Bloom BS, Engelhart MD, Furst EJ, et al. (1956) *Taxonomy of educational objectives: Handbook I: Cognitive domain*. New York, David McKay Company.
Boon S, Johnston B and Webber S (2007) A phenomenographic study of English faculty's conceptions of information literacy. *Journal of Documentation*, 63(2), 204–228.
Brown CP and Kingsley-Wilson B (2010) Assessing organically: turning an assignment into an assessment. *Reference Services Review*, 38(4), 536–556.
Bruce C (1997) *The Seven Faces of Information Literacy*. Adealide, Auslib Press.
Clark C and Catts R (2007) Information Skills Survey: Its application to a Medical Course. *Evidence Based Library and Information Practice*, 2(3), 3–26.
Colthart I, Bagnall G, Evans A, et al. (2008) The effectiveness of self-assessment on the identification of learner needs, learner activity, and impact on clinical practice: BEME Guide no. 10. *Medical teacher*, 30(2), 124–45.
Comas R, Sureda J, Pastor M, et al. (2011) La Busqueda de Informacion con Fines Academicos entre el Alumnado Universitario. *Revista Española de Documentacion Cientifica*, 34(1), 44–64.
Corrall S (2007) Benchmarking strategic engagement with information literacy in higher education: towards a working model. Available from: http://informationr.net/ir/12-4/paper328.html (accessed 14 April 2013).
Cronbach LJ (1951) Coefficient alpha and the internal structure of tests. *Psychometrika*, 16, 297–334.

Diller KR and Phelps SF (2008) Learning Outcomes, Portfolios, and Rubrics, Oh My! Authentic Assessment of an Information Literacy Program. *portal: Libraries and the Academy*, 8(1), 75–89.
Elder C, Barber M, Staples M, et al. (2012) Assessing Health Literacy: A New Domain for Collaboration Between Language Testers and Health Professionals. *Language Assessment Quarterly*, 9(3), 205–224.
Fetter MS (2009) Graduating nurses' self-evaluation of information technology competencies. *The Journal of nursing education*, 48(2), 86–90.
Fourie I and van Niekerk D (2001) Follow-up on the use of portfolio assessment for a module in research information skills: An analysis of its value. *Education for Information*, 19(2), 107–126.
Freeman E and Lynd-Balta E (2010) Developing Information Literacy Skills Early in an Undergraduate Curriculum. *College Teaching*, 58(3), 109–115.
Garde S, Harrison D and Hovenga E (2005) Australian Skill Needs Analysis of Health Informatics Professionals Volume 1 : Rationale & Methods , Key Findings & Conclusions. 1(June), 1–34.
Grafstein A (2002) A Discipline-Based Approach to Information Literacy. *Journal of Academic Librarianship*, 28(4), 197–204.
Green R and Macauley P (2007) Doctoral Students' Engagement with Information: An American-Australian Perspective. *portal: Libraries and the Academy*, 7(3), 317–332.
Gross M and Latham D (2007) Attaining Information Literacy: An Investigation of the Relationship Between Skill Level, Self-Estimates of Skill, and Library Anxiety. *Library & Information Science Research*, 29, 332–353.
Gross M and Latham D (2012) What 's Skill Got to Do With It ?: Information Literacy Skills and Self-Views of Ability Among First-year College Students. *Journal of the American Society for Information Science and Technology*, 63(3), 574–583.
Head AJ (2008) Information Literacy from the Trenches: How Do Humanities and Social Science Majors Conduct Academic Research? *College & Research Libraries*, 69(5), 427–446.
Head AJ and Eisenberg MB (2010) *Project Information Literacy Progress Report, Truth Be Told: How College Students Evaluate and Use Information in the Digital Age*. Washington DC.
Hjørland B (2002) Domain analysis in information science: eleven approaches - traditional as well as innovative. *Journal of Documentation*, 58(4), 422–462.
Ivanitskaya L, O'Boyle I and Casey AM (2006) Health Information Literacy and Competencies of Information Age Students: Results from the Interactive Online Research Readiness Self-Assessment (RRSA). *Journal of Medical Internet Research*, 8(2).

Julien H and Barker S (2009) How high-school students find and evaluate scientific information: A basis for information literacy skills development. *Library & Information Science Research*, 31(1), 12–17.
Korobili S, Malliari A and Christodoulou GN (2009) Assessing information literacy skills in the Technological Education Institute of Thessaloniki, Greece. *Reference Services Review*, 37(3), 340–354.
Limberg L (2005) Informing information literacy education through empirical research. In: Henri J and Asselin M (eds), *The Information Literate School Community 2: Issues of Leadership*, Wagga Wagga, NSW, Centre for Information Studies, Charles Sturt University, pp. 39–50.
Lund A and Lund M (2013) Kruskal-Wallis H Test using SPSS. *Laerd Statistics*, Available from: https://statistics.laerd.com/spss-tutorials/kruskal-wallis-h-test-using-spss-statistics.php (accessed 20 April 2013).
Maybee C (2006) Undergraduate Perceptions of Information Use: The Basis for Creating User-Centered Student Information Literacy Instruction. *The Journal of Academic Librarianship*, 32(1), 79–85.
McKinney P, Jones M and Turkington S (2011) Information literacy through inquiry: A Level One psychology module at the University of Sheffield. *Aslib Proceedings*, 63(2/3), 221–240.
Nicholas D, Rowlands I, Jubb M, et al. (2010) The impact of the economic downturn on libraries: With special reference to university libraries. *Journal of Academic Librarianship*, 36(5), 376–382.
Oakleaf M (2008) Dangers and Opportunities: A Conceptual Map of Information Literacy Assessment Approaches. *portal: Libraries and the Academy*, 8(3), 233–253.
Oakleaf M and Kaske N (2009) Guiding Questions for Assessing Information Literacy in Higher Education. *portal: Libraries and the Academy*, 9(2), 273–286.
Patterson A (2009) A needs analysis for information literacy provision for research: a case study in University College Dublin. *Journal of Information Literacy*, 3(1), pp. 5 – 18.
Pinto M (2011) An Approach to the Internal Facet of Information Literacy Using the IL-HUMASS Survey. *The Journal of Academic Librarianship*, 37(2), 145–154.
Pinto M (2010) Design of the IL-HUMASS survey on information literacy in higher education: A self-assessment approach. *Journal of Information Science*, 36(1), 86–103.
Pinto M (2012) Information literacy perceptions and behaviour among history students. *Aslib Proceedings*, 64(3), 304–327.

Pinto M, Fernández-Ramos A, Sánchez G, et al. (2012) Information Competence of Doctoral Students in Information Science in Spain and Latin America: A Self-assessment. *The Journal of Academic Librarianship*, Elsevier Inc., 39(2), 144–154.
Rader HB (2002) Information Literacy 1973-2002: A Selected Literature Review. *Library Trends*, 51(2), 242–259.
Resnis E, Gibson K, Hartsell-Gundy A, et al. (2010) Information Literacy Assessment: A Case Study at Miami University. *New Library World*, 111(7/8), 287–301.
Scales BJ and Blakesley E (2005) Qualitative Assessment of Student Attitudes Toward Information Literacy. *portal: Libraries and the Academy*, 5(4), 513–526.
SCONUL (1999) Information skills in Higher Education: a SCONUL position paper. Available from: http://www.sconul.ac.uk/groups/information_literacy/papers/Seven_pillars.html (accessed 22 May 2013).
Seamans NH (2002) Student perceptions of information literacy: insights for librarians. *Reference Services Review*, 30(2), 112–123.
Shenton AK and Hay-Gibson N V. (2011) Information behaviour and information literacy: The ultimate in transdisciplinary phenomena? *Journal of Librarianship and Information Science*, 43(3), 166–175.
Singh AB (2005) A Report on Faculty Perceptions of Students ' Information Literacy Competencies in Journalism and Mass Communication Programs : The ACEJMC Survey. *College & Research Libraries*, 66(4), 294–311.
Talja S and Maula H (2003) Reasons for the use and non use of electronic journals and databases: A domain analytical study in four scholarly disciplines. *Journal of Documentation*, 59(6), 673–691.
Thaxton L (2002) Information Dissemination and Library Instruction in Psychology Revisited. *Behavioral & Social Sciences Librarian*, 21(1), 1–14.
Tuominen K, Savolainen R and Talja S (2005) Information Literacy as s Sociotechnical practice. *Library Quarterly*, 75(3), 329–345.
Usluel YK (2007) Can ICT usage make a difference on student teachers' information literacy self-efficacy. *Library & Information Science Research*, 29(1), 92–102.
Vickery S and Cooper H (2002) Confidence or competence? – auditing information literacy skills of biology undergraduate students. In: *Celebrating teaching at Macquarie*, Sydney, Macquarie University Research Online, pp. 1–7.
Walsh A (2009) Information literacy assessment Where do we start? *Journal of Librarianship and Information Science*, 41(1), 19–28.

Ward D (2006) Revisioning Information Literacy for Lifelong Meaning. *The Journal of Academic Librarianship*, 32(4), 396–402.
Webber S and Johnson B (2006) Working towards the Information Literate University. In: Walton G and Pope A (eds), *Information literacy: recognising the need*, Oxford, Chandos, pp. 47–58.
Weiler A (2004) Information-Seeking Behavior in Generation Y Students : Motivation , Critical Thinking , and Learning Theory. *The Journal of Academic Librarianship*, 31(1), 46–53.
Wilkinson A, While AE and Roberts J (2009) Measurement of information and communication technology experience and attitudes to e-learning of students in the healthcare professions: integrative review. *Journal of advanced nursing*, 65(4), 755–72.