A TOOL FOR ASSESING MULTILITERACY IN HIGHER EDUCACATION

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Abstract

This study describes the premises underlying Voremetur, a project conducted in the context of higher education. It hypothesises the need to support a competence education method adapted to new educational formulas (from e- to m-learning), new educational challenges (e-science, big data) and the convergent competences now characterised as info-communication literacy, which has favoured the transition from edu-communication to multiliteracy. Such competences should be organised into competence programmes, where the assessment of the beneficial results for learners and the university should be included as an essential element. The article discusses an assessment model for new literacies, including its conceptual framework, ideal evaluation tools and conversion into an ad hoc questionnaire. Lastly, the paper describes model application to a target group and analyses the results most relevant to information behaviour.

Keywords: Metaliteracy; Academic literacy; Information literacy; Info-communication literacy

1 Introduction

Our early twenty-first century culture is multi-modal because it produces, consumes and 'prosumes' through a number of codes and formats that have developed along with the internet (the deep internet, the internet of things). More extensive effects are visible in the social web, however, which pursues user inter-connections and deems the web to be a platform for collective intelligence. As connectivity has progressed it has paved the way for the semantic web, which rests on two functions. The first consists in standard formats for data integration and interoperability (via semantic vocabularies and schemes). The second is language designed to better express and represent the content of structured digital collections from which logical inference can be automatically drawn (via intelligent 'agents', ontologies). The semantic web heralds the intelligent web through the internet of things (web-based services) and Web 4.0, whose milestones are the use of natural language as web computer code to incorporate context in the recovery and representation of content, designate the most suitable intelligent agent for our information needs and provide for user interaction through mobile devices.

Knowledge and innovation must be supported by distributed models. The user needs to define effective connections between specialised nodes which, for new approaches to teaching, has become the objective of connectivism. Defining effective connections calls, in turn, for competent use of the

objects of information (location, selection and evaluations); interaction with stakeholders or experts through relationships of trust, understanding, dialogue and interaction; and read/write competence in keeping with web development, which has given rise to a host of new literacies, together constituting multiliteracy.

Voremetur, the research project introduced here, defines 'multiliteracy' as the various semiotic, narrative, trans-media browsing and hence read/write competences mobilised by people for whom the simultaneous deployment of different semiotic codes (irrespective of any metaliteracy) can generate knowledge in their natural environment, the web. In that endeavour, multiliteracy finds support in powerful emerging specialities such as new media literacy and metaliteracy, support which depends on the presence of methods and epistemology apt for the scientific milieu of higher education.

Analysing the competence required for that endeavour and its impact on education is one of the objectives of the Voremetur project. This study, deemed as preliminary empirical research in pursuit of a metaliteracy model, reflects on the application of information and communication competence and the literacy they involve and describes an ad hoc evaluative tool.

2 Background and working hypothesis

Our mobile device- and social network-mediated hyperconnected society spawns a phenomenon driven by media-, image- and big data-based culture. In e-science, the phenomenon at issue, progress and research build on partnering that draws from big data and benefits from visualisation; on education, where new educational domains (outreach classrooms) and formats (e-learning, blended learning, m-learning) are being established; on new realms (social, mobile and semantic web); and on new forms of reading/writing. The inference is that literacy as a notion evolves, for each medium features particulars that determine how information is communicated. Reading/writing needs to be redefined to include new competences involving collaborative reading and the here denominated 'associative and inter-related knowledge' characteristic of networking (Mackey and Jakobson, 2011) in an environment where information and communication competences converge.

For some time information competence, the object of study of information literacy, has been understood as the convergence of knowledge (knowing) and skills (knowing how), the basis for progress in acquiring competence. Communication competence, the object of metaliteracy studies, is defined in turn as a suite of abilities underlying the constructive interaction with others and cooperative contributions to knowledge networks. The social web has prioritised the shared creation and

distribution of content, together with collaborative editing, giving rise to the convergence of information and communication skills. That merger was made the more necessary by the blossoming of social networks as platforms for managing opinions, tendencies, digital identities and web reputations. In 2010 Unesco acknowledged the convergence of the two competences, endorsing a new speciality (Wilson et al., 2013), 'media and information literacy (MIL)'.

The benefits of info-communication literacy for education and learning soon became visible, giving rise to a new dimension, 'edu-communication', that embodies a dual approach: instrumental (prioritising a command of technology) and dialogical (prioritising collaborative and participatory action in knowledge building), the former aligned with digital literacy (Barbas, 2012) and the latter with MIL.

Edu-communication has not been unfazed by web development and info-communication literacy. Rather, it has been enhanced by the notion of 'media education' where education is understood as the process, literacy as the result and competence as the means (Dornaleteche-Ruiz et al., 2015). Two definitions can be put forward on the grounds of that conceptual framework.

✓ Media competence can be defined as a factor in the development of language capacity (understanding of code), technology (skilful use of technical tools), interaction (assessing, self-assessing, selecting aptitudes from participatory communication), production and dissemination (command of media messages), ideology and values (critical thinking and reading) and aesthetics (analysis of formal and thematic innovation) (Ferrés and Piscitelli, 2012)

✓ The competent learner as prosumer is understood to be someone able to organise resources to generate and evaluate innovative content; engage in expert innovative creation; standardise quality criteria in content generation; use information and editing tools proficiently; detect and eradicate stereotypes and mala praxis on the web; and skilfully drive interaction among virtual communities (García-Ruiz et al., 2014).

New media literacy afforded the answer to a need identified for an academic speciality to develop media and info-communication literacy in the context of edu-communication enhanced by media education. That speciality is particularly suited to developing productive competences in keeping with social web requirements and participation in keeping with collaborative guidelines, fostering responsible and ethical behaviour in these environments, re-mixing and building a digital identity. Metaliteracy, in turn, was defined as a speciality between 2011 and 2014 to address knowledge construction through the collaborative acquisition, production and exchange of content. Its contributions included an object of study, info-communication literacy; an approach, the adaptation of the scientific method using web content management tools for expert use of emerging technologies; and an objective, effective participation in social and knowledge networks for ongoing innovation and learning.

Against that backdrop, one of the stages of the Voremetur research project, launched in 2017, was 'Metaliteracy-based development of educational competence programmes for the instructional use of technological art repositories'. Its targets include the formulation of a metaliteracy model and an educational design for a competence programme. The working hypothesis for this study is that competence assessment is an essential element of any such programme.

2 Material and methods

The conceptual framework for this study rests on information literacy standards. In the the Association of College and Research Libraries (ACRL) listing, such standards are duly numbered and feature semantic labels, definitions, competence objectives and indicators to establish the acquisition of the competence at issue. The scientific literature discusses the assessment tools developed on the grounds of the indicators for standards such as the ACRL' 2001 Information Literacy Competency Standards for Higher Education, the Australian and New Zealand Information Literacy (ANZIIL) Standards, the Information Skills Survey for Assessment of Information Literacy in Higher Education (ISS) the ALA/ACRL/STS Information Literacy Standards for Science and Engineering/Technology.

A review conducted of the methods for assessing multi- and information literacy reveals a preference for quantitative tools in those disciplines, although with a qualitative bias (Walsh, 2009). Assessments can be identified, for instance, that deploy quantitative tools characteristic of library science and scientometrics (citation analysis and impact factor, among others), alongside qualitative approaches based on semi-structured interviews, a mixed method.

The most prominent tools identified in the aforementioned review include surveys to obtain effective data and conduct quantitative and qualitative analyses, duly classified to ensure quality; questionnaires in which quality rests on the support drawn from a previously designed indicator scorecard; and structured or semi-structured interviews that pose questions of interest to focus groups to analyse their arguments and discourse.

The method followed in this study was conceptually defined within the realm of information literacy, but implemented by speciality, i.e., new media literacy and metaliteracy. The aforementioned elements (standards for mixed qualitative and quantitative methods) were applied in the evaluative methodology and the tool ultimately chosen was the questionnaire. The research consequently included formulating an indicator scoreboard from which the questions were derived.

Scoreboard and indicator design sought inspiration in Towards Media and Information Literacy Indicators (Moeller et al., 2011) and the Guide to Measuring the Information Society (OECD, 2011). The indicator model drew from the guidelines set out by Lee et al. (2015), who enlarged upon a scheme proposed by Lin et al. (2013). The model rests on three principles: a) Likert scale measurement of learners' independence in the educational realm, their assent to the rules defined in that realm and the frequency of their contributions; b) operational definitions in the web to measure learners' skill, sociability, productivity and critical thinking; and c) data interpretation using Bloom's taxonomy.

The indicators were defined to meet certain requirements. They were integrated in the scoreboard, which reproduces an evaluative 'argument' for improving the data gathered. That entailed their classification under the categories and sub-categories that afford the scorecard its structure. Secondly, they explicitly stated the competence measured and its functionality, establishing its objectives translated into questions in the questionnaire. Thirdly, they were worded to reflect very closely what they measure and the accuracy of the measurement, and lastly they were tested for reliability.

The resulting indicator scoreboard was organised into three categories, as described in Marzal and Borges (2017). Information competence indicators measured the perception of the need for information, along with access to and assessment and organisation of information and content production. Communication competence indicators measured effectiveness in establishing and maintaining communication in new environments, creating bonds in the digital learning community and building knowledge in collaboration with others. Metaliteracy competence was measured with a single overarching, self-assessing indicator for digital content management and production (Marzal and Borges, 2017).

Based on indicator design, 23 questions were formulated for the questionnaire and listed in random order. The aim was to measure respondents' info-communication literacy and behaviour in terms of the four analytical categories defined by Lee et al.: functional consumption or the ability to access and understand content; critical consumption or the ability to assess content contexts; functional 'prosumption' or the ability to participate in the creation of content in collaboration with others; and critical 'prosumption' or the ability to assess content creation.

The questionnaire was tested by three specialists (two documentalists and one expert in communication) to verify the relevance of the questions to the objectives and by three students (one undergraduate, one master's and one doctoral student) to verify question intelligibility. The target group

defined was master's students, a community that has requested specific training in such competence with a view to publishing quality academic papers and internalising the scientific method. Students from different countries were selected because the aim was not to measure the quality of a given education system or university model, but competence and behaviour. The sample consequently included students from Spain's Carlos III University of Madrid, Uruguay's University of the Republic, Mexico's College of Mexico and Brazil's Federal University of Bahía. Affiliation of Voremetur research group members with all the universities selected guaranteed effective survey implementation, management and processing.

The tool chosen for the study was a multiple-choice questionnaire distributed online to reach the population (a total of 85 respondents) in all four countries involved. To minimise the questionnaire's primary weak point, namely the collection of overly superficial information, questions that assess not only skills and abilities, but mainly skills and attitudes in actual situations. Respondents were asked how they had reacted the last time they assessed information, participated in a debate and so on.

3 Results

The aim here is not to address the vast amounts of data obtained, but rather to confine the analysis and discussion to only the findings for certain representative questions by way of demonstration of the evaluative tool. By 'representative' it is meant questions aiming to measure behaviour, while competence is defined in terms of communication with the media and with others. Two groups were distinguished, Spanish speakers (SS) and Brazilians (BR) and the 'mean' percentages were calculated.

Further to the replies to question 4 on the 'understanding of different types of information' (Figure 1, in appendix), the students showed sufficient understanding of all the types proposed, although they acknowledged some difficulty with statistical data (32.8 %) and to a much lesser degree, the interpretation of graphic information.
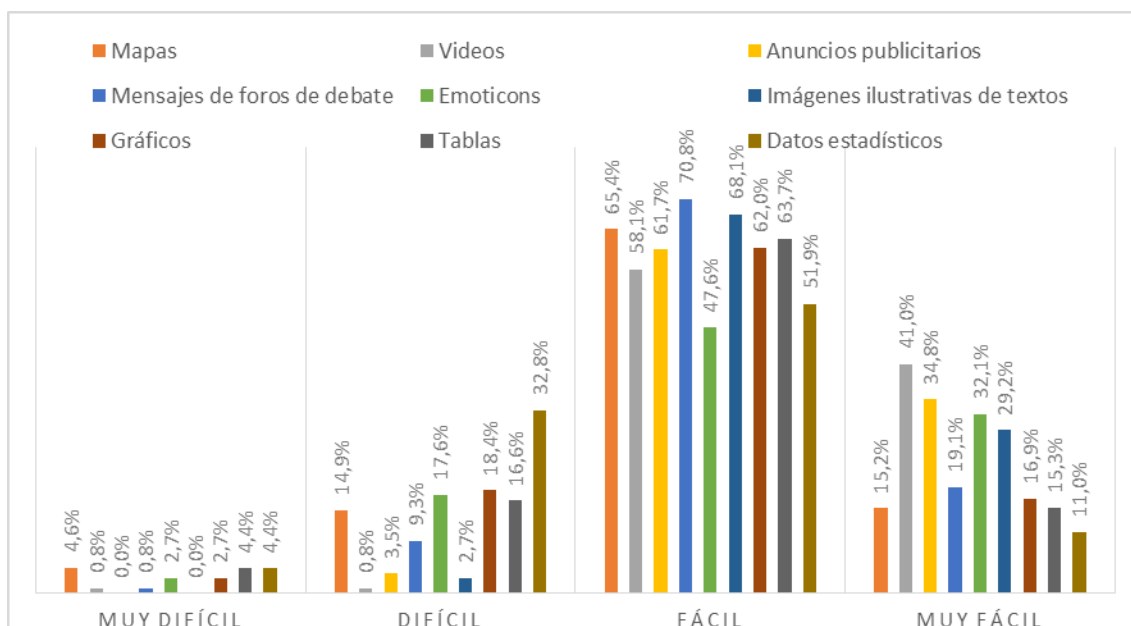
Figure 1. *Understanding of different types of information*

Rótulos fig. 1

Original	Traducción
Mapas	Maps
Vídeos	Videos
Anuncios publicitarios	Advertising
Mensajes de foros de debate	Debate platform messages
Imágenes ilustrativas de textos	Pictorial illustrations
Gráficos	Graphics
Tablas	Tables
Datos estadísticos	Statistics
MUY DIFÍCIL	VERY DIFFICULT
DIFÍCIL	DIFFICULT
FÁCIL	EASY
MUY FÁCIL	VERY EASY

The most conspicuous inference drawn from the data was the need for competence pro-grammes to include training in statistics (envisaged in data literacy) and maps. The ability to interpret statistical information has a substantial impact on everyday life, business-related aptitudes and employability and on the exercise of responsible citizenship by understanding official data to better

monitor governmental transparency and accessibility. Such understanding is very useful for a population with a low or medium level of schooling, while affording citizens with a higher level sound competence in big data and open sourcing.

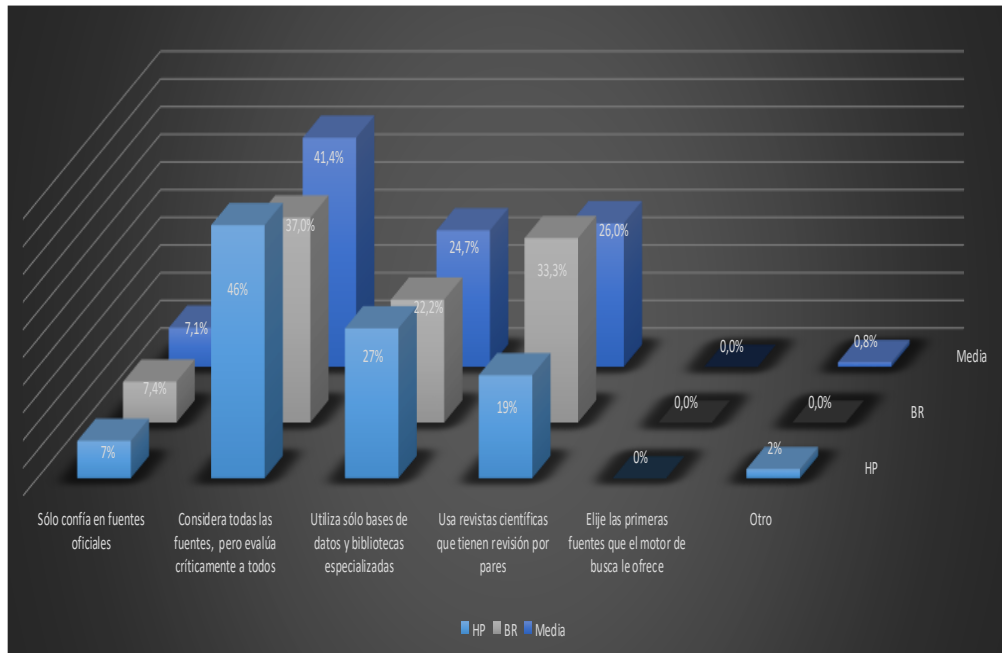Question 2 inquired about behaviour around 'selecting sources of information' (Figure 2).

Figure 2. *Selection of formal and informal sources of information*

Rótulos fig. 2

Original	Traducción
Solo confían...	I only trust official sources
Considera todas las fuentes...	I take all sources into consideration, but view them critically
Utiliza solo...	I use only specialised databases and libraries
Usa revistas científicas...	I use peer-reviewed scientific journals
Elige las primeras...	I choose the first source listed by the search engine
Otro	Other
HP	SS
Media	Mean

The findings identified a certain duality in informational behaviour. Whereas students as citizens adopted a non-discriminating attitude, using all manner of sources of information, in particular those generated by other social network users (up to 94 %) and bloggers (91%), they were greatly

concerned about the quality of information, with a propensity for sources subject to certified assessment (peer-reviewed scientific journals).

In addition to the ability to retrieve and read information, students' information organisational competece was also deemed worthy of assessment, as the first stage in acquiring knowledge.

Question 6 consequently asked about the use of conceptual maps, metadata and informational organisation to 'synthesise information'. The findings (Figure 3) showed that students tended to use metadata to organise and retrieve information (35.5 %)
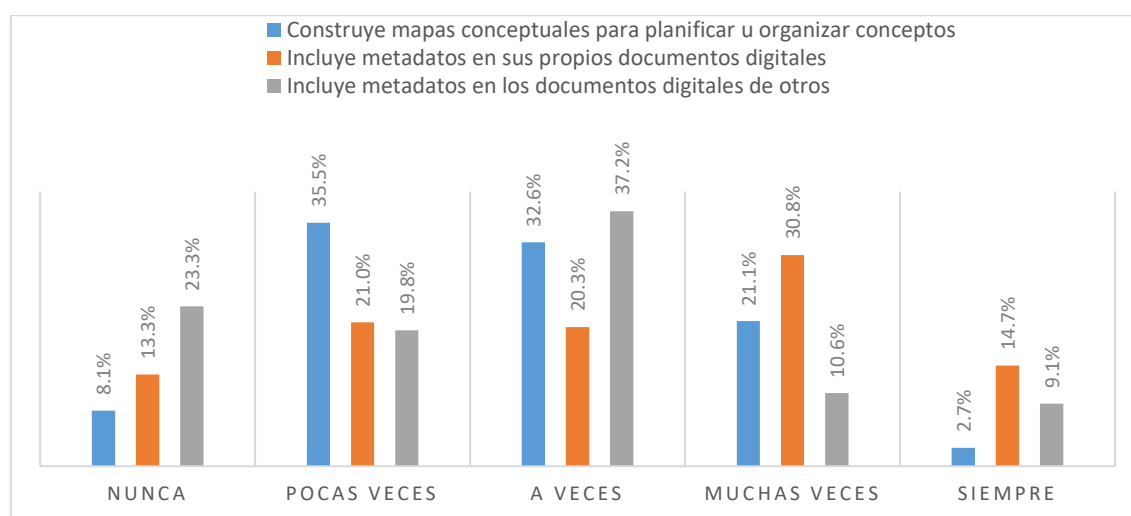

Figure 3. *Conceptual maps and metadata*

Rótulos fig. 3

Original	Traducción
Construye...	I chart conceptual maps to plan and organise ideas
Incluye metadatos...	I include metadata in your own digital documents
Incluye metadatos... otros	I include metadata in others' digital documents
NUNCA	NEVER
POCAS VECES	RARELY
A VECES	SOMETIMES
MUCHAS VECES	OFTEN
SIEMPRE	ALWAYS

One positive finding in connection with transitioning from information to knowledge was the fact that the students routinely described and labelled their own digital documents (often, 30.8 %; always, 14.7 %), although not those from other sources (37.2 % did so sometimes).

Another issue addressed was digital identity and the need to protect one's own personality in digital environments: presence, respect and defence of one's own image in web 2.0 settings. Question 13 on the questionnaire therefore attempted to measure students' 'presence' as internauts and members of a virtual community. The data (Figure 4) revealed a difference in behaviours: Spanish speakers, while concerned about their image, were also prone to upload photos and videos (45.8 %) as well as links (42.4 %), in a desire to interact. Brazilians appeared to be less interested in catching the eye of internauts (48.1 %), targeting only an audience chosen for their tastes or preferences (40.7 %).
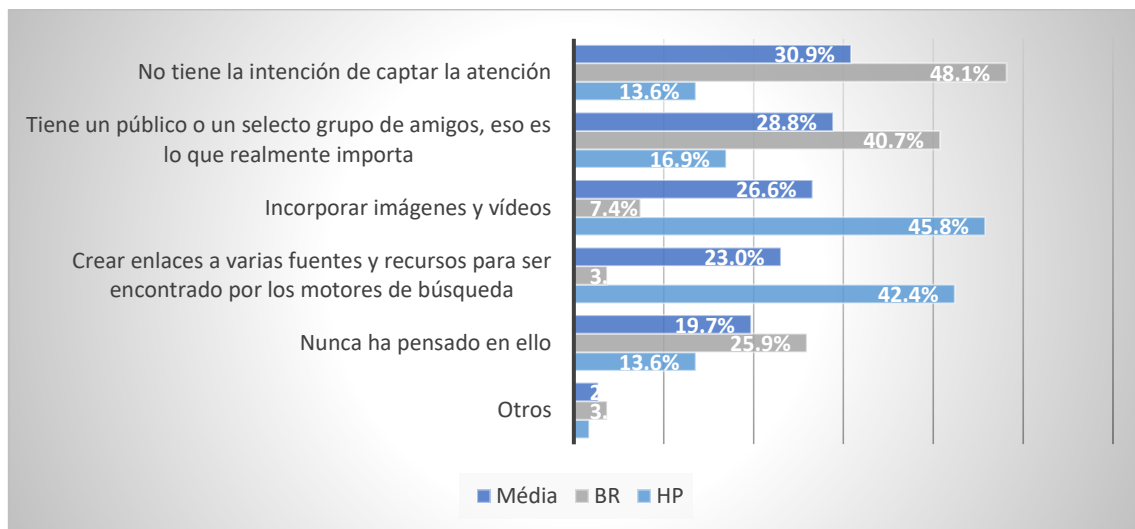

Figure 4. *Attracting attention in digital environments*

Rótulos fig. 4

Original	Traducción
No tiene la intención...	I don't intend to attract attention
Tiene un público...	I have an audience or select group of friends, which is what matters most to me
Incorporar...	I upload photos and videos
Crear enlaces	I create links to sources and resources to be identified by search engines
Nunca...	I don't give this a thought, ever
Otros	Other
Media	Mean
HP	SS

In line with the preceding question, question 20 asked about how much or little students agreed with the statements around privacy listed in Figure 5 to determine their behaviour in that respect.

The findings were very interesting. Whilst students were sensitised to privacy issues, up to 13.3 % acknowledged having been hurt by thoughtlessly published information, particularly on social networks. At the same time, 31.6 % of the students thought it acceptable to publish private information on people in the limelight, which may be a questionable behavior, for everyone is entitled to privacy, even people who live public lives.
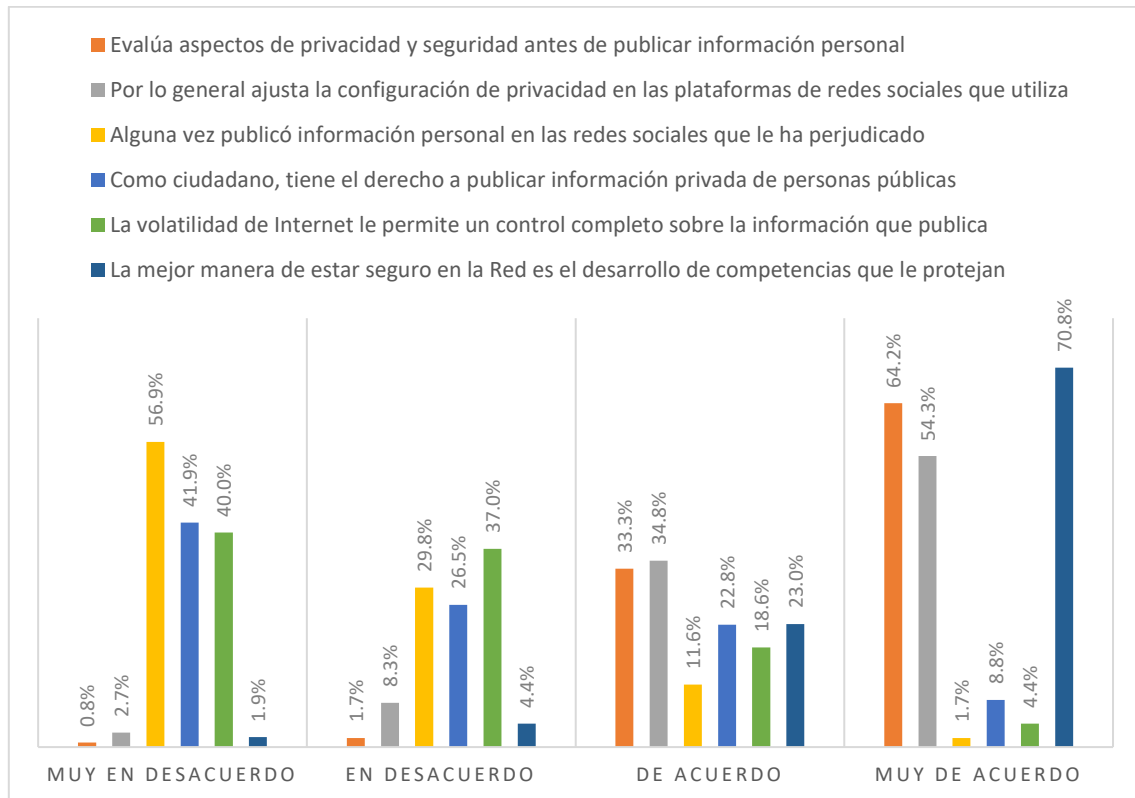

Figure 5. *Privacy*

Rótulos fig. 5

Original	Traducción
Evalúa aspectos...	I assess privacy and security issues before uploading personal information
Por lo general...	I normally personalise the privacy settings in the social networks I use
Alguna vez...	On occasion I've published personal information on social networks that proved to be troublesome
Como ciudadano...	As a citizen, I have the right to publish personal information about people who lead a public life
La volatilidad...	Internet volatility affords me full control over the information I upload
La mejor manera...	The best way to stay safe on the internet is to develop competences that protect me

One common feature of web-related activity found was the reuse of information, the capitalisation on others' texts, pictures or videos, the 'remix culture'. Question 21 was geared to measuring capacity and propensity in that regard, i.e., to exploring how digital content is not only accessed and filed, but appropriated by users to create new forms of expression.

The data in Figure 6 on the reuse of third party content in the form of texts, images, videos or other formats reveal that the remix culture, the creation of something new or with a new meaning from works authored by others, seems to have been fully assimilated by respondents.
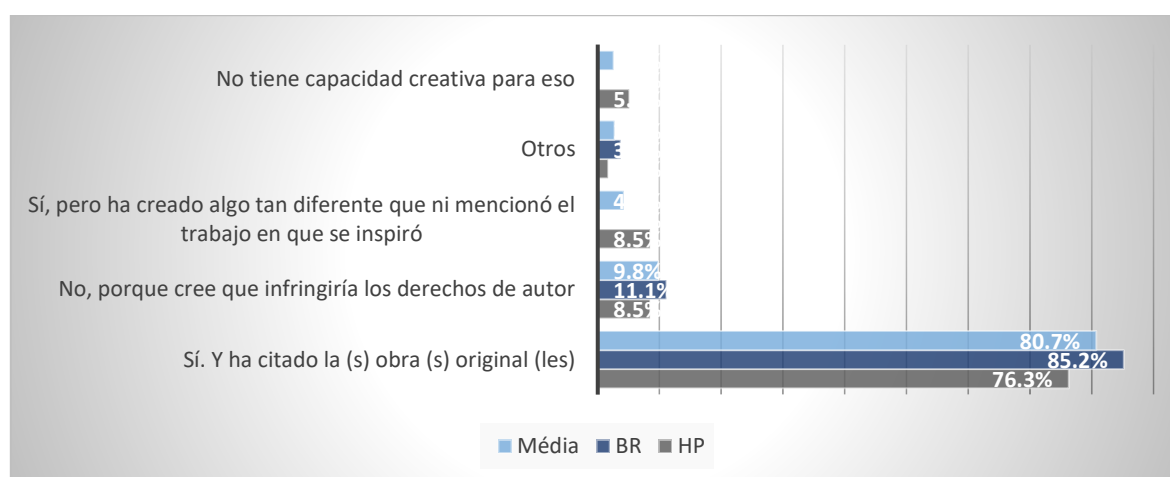

Figure 6. *Remix*

Rótulos

Original	Traducción
No tiene capacidad creativa para eso	I don't feel creative enough for that.
Otros	Other
Sí, pero he creado...	Yes, but I created something so different that I didn't even mention the source of my inspiration.
No, porque cree...	No, because I believe that's plagiary.
Sí. Y ha citado...	Yes, and I cited the original work(s).

Lastly, question 23 aimed to relate info-communication literacy to lifelong learning. The findings (Figure 7) were likewise relevant to competence programmes: a mean of 70.6 % students acknowledged ICT weak points and the need for lifelong learning. They also revealed an unexpected informational attitude: although regarded as 'digital natives', students appeared to realise that a command of ICTs does not infer competence in converting into knowledge the digital content accessed and retrieved.

The findings attested to an essential feature for competence programme design and a suitable assessment scheme: potential targets did not appear to be sure about what is involved in specific info-communication literacy training. They seemed to confound information with message (news) and communication with a command of the media.
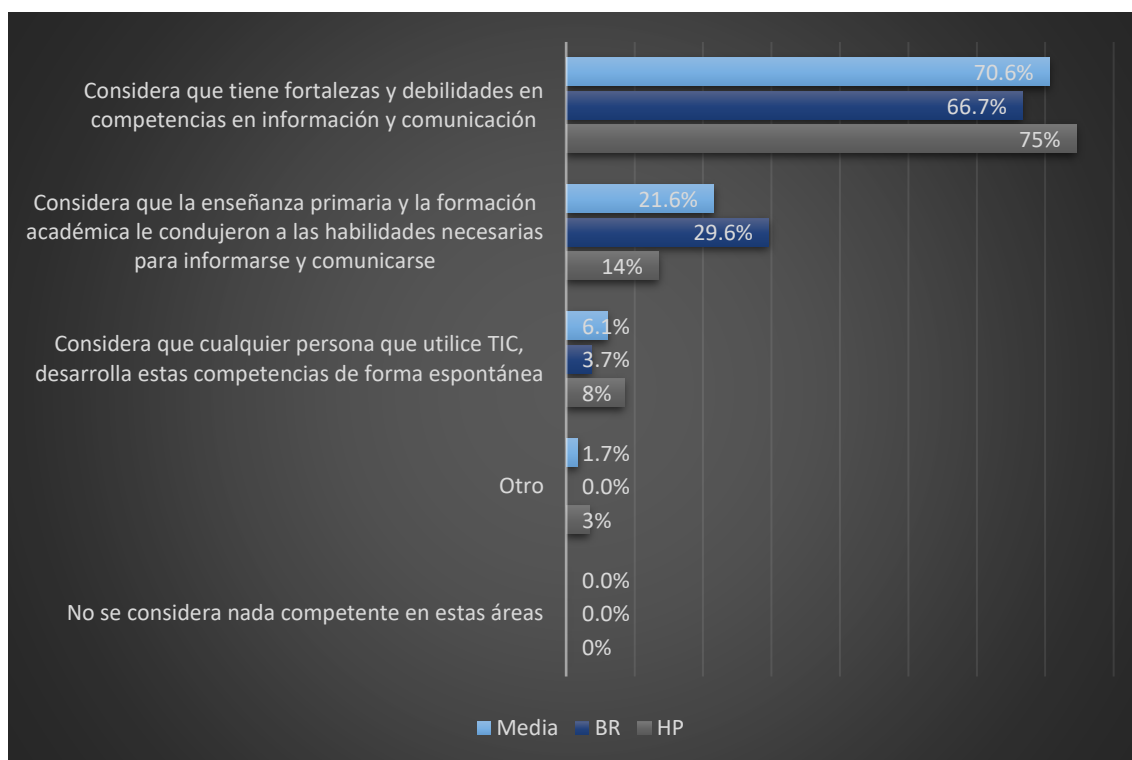

Figure 7. *Lifelong info-communication literacy*

Source: formulated by the authors

Rótulos fig. 7

Original	Traducción
Considera que tiene...	I deem my information and communication competence to be characterised by strengths and weaknesses
Considera que la enseñanza...	I believe that primary education and academic training have enabled me to acquire the skills needed to gather information and communicate
Considera que cualquier...	I believe that anyone who uses ICTs develops these skills spontaneously
Otro	Other
No se considera nada ...	I don't feel at all competent in any of these areas

The use the respondents claimed to make of ICTs and web information attested to that misunderstanding. They preferred answers to a specific information need (data search) to understanding the

use of a service, indisputably denoting 'Google information' conduct. They preferred to receive conclusive data for immediate use than to understand their significance for statistical analysis with a view to the intelligent use of transparency and governance. They preferred the conversational tone and informal expression of opinion in social networks. They found metadata useful for labelling conversations and especially their own photos and videos on YouTube. They deemed that personal criteria for assessing digital content is of relative importance only, relying rather on the solvency of a colleague's unverified opinion, an attitude that reinforces the web's post-truth culture. They claimed to be respectful, communicative and social, but exhibited little interest in dialogue (understanding others' discourse) or interculturality (acceptance of others), while exhibiting no respect for digital authorship (success of remixing) or the implications for their own image and privacy.

4 Conclusions

The conditioning factors discussed in this study are relevant to the design of competence programmes, the social and academic benefits of which should be actively disseminated and publicised, stressing all the particulars that target audiences are unaware of needing. 'Evidence-based policy' is required, programming competence objectives into curricula and teaching units in connection with the following.

The close relationship between competence and data literacy programmes should be addressed, given their natural connection to big data and sound scientific method training., In other words, data literacy programmes should be based on the efficient use of data in research (Calzada and Marzal, 2013). Such training should be associated with citizen development, the defence and exercise of social rights and democratic and transparent governance.

The object and purpose of content assessment should be redefined, not only in connection with how to better turn information into knowledge by developing digital reading competence, but also through other concerns. These include digital identity and web reputation, with particular attention to ethical issues (Ke, 2016) and protection against plagiary; and the impact of private information on one's own image and the right to privacy, with particular attention to post-truth; the importance of argument in collaborative digital environments as a competence for effectively articulating electronic discourse and productive dialogue tending to knowledge, further to proposals put forward by Radcliff and Wong (2015), who used the Toulmin method to analyse their findings.

Particular attention should be paid to tools such as NodeXL (https://nodexl.codeplex.com/) and Gephi (https://gephi.org/), in which competent use facilitates and optimises cooperative work to generate knowledge in digital environments.

All the aforementioned content should rest on sound conceptual foundations addressed through four successful lines of research.

The first explores the impact that the understanding of the static, moving, virtual and enlarged image should have on information for knowledge. That in turn requires competence exercises and especially a qualitative assessment model, along with competence indicators deriving from visual and in particular new media literacy (Young, 2015). The inclusion of iconic language in higher education curricula is being successfully proposed on the grounds of new media literacy principles to optimise learning performance (Ungerer, 2016) through specific skills (Koc and Barut, 2016).

In the second, programmes are integrated with plans for applying 'academic literacy' in universities in pursuit of excellence through beneficial impact. That approach affords university students tangible and verifiable benefits, strengthening their command of the scientific method (Adams et al., 2016).

The third measures the acquisition of information literacy competence while items specific to new media literacy pose the question of the suitability of using methods of a model based on 'phenomenography' (Åkerlind, 2012).

Lastly, the growing importance of digital competence has integrated a whole suite of information-related competences. In its 2012 Rethinking Education strategy, the European Union acknowledged digital competence to be a pre-requisite for students to optimise their learning and knowledge, approving the DIGCOMP Project (implemented by JRC-IPTS IS), set out in the paper 'The Digital Competence Framework for Citizens'.

The logical conclusions to be drawn from the findings, debate and discussion set out above include the following.

Further to the need to adapt to Web 2.0 and 3.0, the conceptual and methodological development and application of information literacy in education involves a change from the contributions of new media literacy, convergence with which is driving the consolidation and more visible impact of media literacy.

Information competence needs to be redefined in light of the importance of: a) communication for web information and knowledge and the generation of one's own competence; and b) the accurate definition of info-communication literacy as a societal development factor to eliminate individual gaps in digital literacy.

A suite of indicators should be proposed that should necessarily lead to the formulation of an assessment model apt for competence programmes. The approach adopted should draw from information and communication competence, and contain suggestions for metaliteracy-specific competence.

Notes

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