A didactic innovation project in Higher Education through a Visual and Academic Literacy competence-based program

Miguel Ángel Marzal García-Quismondo[a, *], Eduardo Cruz-Palacios[b] and Federico Castro Morales[c]

[a]University Carlos III of Madrid, Department of Library and Information Science, 28670, Spain
[b]Spanish National Research Council, Unit of Information Resources for Research, 28002, Spain
[c]University Carlos III of Madrid, Department of Humanities: History, Geography and Art, 28670, Spain
[*]Corresponding author: Miguel Ángel Marzal García-Quismondo, Madrid Street 126, 28903 Getafe, Spain. E-mail: mmarzal@bib.uc3m.es. Telephone: +34 916 249 219.

Abstract

This research paper describes the application of a didactic innovation project in Higher Education. We present the theoretical foundation of the project. Thanks to the evolution of the Web and the potential of image to disseminate and generate knowledge, visual materials have had an increasingly powerful projection in Education, especially for the development of new methods, media and didactic materials in Higher Education. As a result of researchers interested in it, Visual Literacy has emerged as an academic field developing research and didactic effectiveness of the image, and digital competences and academic literacy as instruments to be integrated into curriculum of higher education for its excellence. We analyse the didactic innovation project by presenting how we integrated a Visual and Academic Literacy competence-based program into a course at the Carlos III University of Madrid. We show its instructional design, didactic materials, pedagogical activities, planning and evaluation. Findings suggest the need for this type of programs for academic excellence in higher education.

Keywords: Visual Literacy, Academic Literacy, Digital Competences, Visual Competences, Information Competences

1. INTRODUCTION

The European Higher Education Area (EHEA), as a result of the Tuning Project, imposed a competence-based model, as opposed to the approach of acquiring knowledge that is liquid and permanently updatable, and to the use of specific tools that are increasingly volatile. Universities aim to include skills and competences in a specific area of knowledge in order to maximise the employability and professional development of educatees through lifelong and collaborative learning.

The grounds for these competences lie in their instrumental nature for the mobilisation of knowledge, methods and attitudes, from the learning contents, to solve scientific hypotheses and professional challenges, instilling initiative, knowledge and innovation in educatees. In the context of Higher Education, learners are no longer only required to acquire a set of information skills, they must also acquire full academic literacy that will enable them to produce new scientific knowledge and communicate it to society.

The evolution of the web, visual materials and virtuality offers numerous and varied possibilities. Education is rightly taking advantage of them in different spheres: learning objectives, teaching environments, teaching, didactic materials, tools, etc. However, in order to achieve true lifelong learning, which proves to be essential in the 21st century, learners must develop not only an understanding and analytical-critical capacity of the new digital media, but also the skills to use them effectively in their learning process and in communication and participation in collaborative media, a truly effective process in educational innovation [1]. The integration of visual literacy into the university curriculum has become a necessity.

These needs led us to develop this project, in which, through a competence-based programme based on visual literacy and academic literacy indicators, we tried to measure the effectiveness of visual materials and web video games for learning digital skills that allow the iconic and visual reading of web resources, the planned design and development of scientific works in a collaborative way, and their communication via social media.

2. ICONISM, VIRTUALISATION AND VISUALISATION

One of the clear factors in the development of the web is the progress of images as a channel of communication and information. Software with many different components, functionalities and applications allow the incorporation of images as a means of transmitting data, information and knowledge: 3D programs, virtual reality and augmented reality are tangible examples. Images thrive on the web driven by "iconism", meaning with its own syntax and semantics for reading images; "virtualisation" meaning in direct relation to the progress of digitalisation and preservation to underpin the digital continuity of documents and phenomena on the web; "visualisation", meaning providing signs and symbols that enable knowledge to be presented and generated.

2.1. Image and knowledge

Without going back to pictograms, illustrations are always a powerful support for text messaging, and comics are always a powerful stimulus to encourage comprehensive and

analytical reading, and also to better assimilate concepts. The media have made image messages universal while Information and Communication Technologies (ICTs) have contributed to the development of a full multimodality of visuals through the multiplicity of its codes, materials and representations, a reality that changes the didactics and pedagogy of the 21st century [2]. The communicative capacity of images has proven to be limited not only to perception, but their signs, characters and features imply a symbology with its own discourse and argumentation depending on how they is interpreted and decoded [3].

Images have a strong projection on the way of knowing: illustrations contextualise a concept to better assimilate it, as it is more effectively archived in one's mind and related to associated concepts; video games enable practical situations to develop spatial skills, design mental maps, make decisions and understand signs [4]. Images, by means of a figurative language, are a powerful instrument for the inference of data and information towards knowledge due to their power to capture the abstraction of concepts [5]. However, all these benefits rely on the spectators' ability to understand the signs and techniques within the meaning of visuals [6], that is, if they know how to "read" the image.

The reading of an image is based on a process that is similar to reading a text, with three levels of comprehension: a basic and superficial level on the encoding of signs (spelling, syntax); a textual structure level (textual grammar) where each sign and code has a meaning; a "situation model" understood as a cognitive representation to understand the narrative of the image by contextualising its signs in the spatial, temporal, causal, characteristic (actors of the story) and intentional dimensions [7].

Visuals therefore become an ideal source of knowledge, but to trigger this, its reading strategies must be defined, with special emphasis on the "symbolic" function of the image. In this sense, metacognitive reading strategies are particularly useful as they involve activating prior knowledge, mobilising contextual knowledge, raising questions, planning inferences, connecting, summarising and synthesising concepts related to the image [8].

2.2. Image and Education

On the other hand, "Competence-based" Education, which is taking shape for the 21st century, promotes a relevant educational projection of images through three factors. First, the web as an educational space in which the image is given educational value through visualisation and virtualisation processes [9] so that the shape of a web forms contents, while virtual and augmented realities become the experimental space for applied research and generate knowledge and learning away from laboratories [10]. Second, the educational environment which conditions the educational modality and that has gone from electronic learning to m-learning, being an ideal medium for didactic innovation, the updating of knowledge and collaborative learning [11]. In fact, these means have multiplied their effectiveness thanks to open data, data and open science, the emergence of MOOCs, SPOOCs and NOOCs [12], and the "flipped learning" method for lifelong, ubiquitous and timeless learning, whereas face-to-face classes become the arena for educational innovation and debate on what was previously learned in the digital space of a subject [13]. All of them are means whose educational efficiency relies on a powerful didactic use of images. Third, didactic materials, which were published on the web as Educational Digital Objects and Learning Objects and which have been

greatly enriched, not only by virtuality, but also by the educational use of Gaming and YouTube, a tripod that proves the educational power of images.

The educational effectiveness of images requires a symbiotic relationship between technological and pedagogical knowledge. This is the objective of the TPACK (Technology, Pedagogy and Content Knowledge) model where pedagogical objectives are designed according to technological principles and technological requirements conditioned by pedagogy and projected on educational content portals [14]. These portals become an opportunity for images in all their formats. This is the case with YouTube, a video-sharing website that soon proved its educational potential. In 2009, over 300 universities around the world partnered on YouTube EDU to share videos with an educational intent [15]. It quickly became a major factor in the development of online education as proven by the MIT's experience with Open Courseware (OCW) and online course networks among the universities of Stanford, Berkeley, Michigan, Pennsylvania and Princeton [16], where videos are analysed and labelled according to their subject matter and learning functionality. The basis for the development of a very attractive experience was laid down by Khan Academy, the educational organisation that provides online courses with videos for subjects with abstract content (Mathematics, Physics, Economics, Science, etc.) that are best assimilated through visualisation and interaction with the resource and between teachers and students [17].

The door is thus opened to a new educational scenario for images through the use of video games in Education, a path that led to editing video games to be applied in the educational process (gamification) or edited directly for curricular use (gaming), with the aim of stimulating learning, developing educational innovation, but also to very soon promoting new visual skills for the educatees [18]. This trend has become more pronounced when m-learning incorporated augmented reality for educational applications: it creates a powerful, localised learning mode, a greater engine for the development of TPACK in the educational process and for Mobile CSCL (Computer Supported Collaborative Learning) [19] in addition to a space for the greater educational effectiveness of video games [20].

However, the educational effectiveness of an image depends on the educatees (and the teacher) acquiring the skills required for their understanding and assimilation into knowledge and wisdom [21].

2.3. Visual Literacy

From the aforegoing, one could infer the need for an academic speciality that allows educatees to interpret and generate images to know, so that visual skills can be included in the academic curriculum as a "visual grammar" [22], even more so because due to the "informational behaviour" of digital natives who prefer graphic language over text language [23]. This speciality (visual literacy) had to respond to two challenges: a) developing skills to interpret and understand images, to communicate them effectively, producing visual images and using them to solve problems [24]; b) knowing the five major learning styles (visual, verbal, auditory, logical and physical), it seems convenient to develop a speciality in charge of developing transversal skills that would make the five learning skills more effective through spacial, visualisation, dynamism and interactivity skills [25].

In the 1960s, there was a debate about didactic methods for training and education through a critical analysis of images, a methodology that became more and more complex with the development of technologies, enriched with the theoretical foundations of Braden in 1993 and the works of J.L. Debes. This resulted in the "ACRL Visual Literacy Competency Standards for Higher Education 2011. Braden and Debes who worked at the University of Rochester, gave rise to the so-called "School of Rochester" which drew the strongest relationship between Visual Literacy and learning, since the correct understanding of images allows the development of the "language of creation" and the creation of meanings. Images are ideal for the way in which knowledge is transmitted in new technological environments and, furthermore, it allows the development of active, meaningful and permanent learning [26].

Under these principles, Visual Literacy developed as a speciality, and since the last century, it has received very different definitions from very different researchers. However, there is a consensus that it is a speciality that does not stop at a critical analysis of an image for assimilating and interpreting, it also develops the skill to use its meanings, enrich them with new ones, evaluate its results and be able to generate new visual messages from them [27]. Visual Literacy was developed in parallel with Information Literacy, but its necessary confluence was evident. In 2010, during the process of developing the Visual Literacy Standards, B. Harris aligned his skills with those of Information Literacy to make its educational application more effective, a process of competency integration that would be confirmed when the "Framework for Information Literacy and the Visual Literacy Standards [28] was published in 2015.

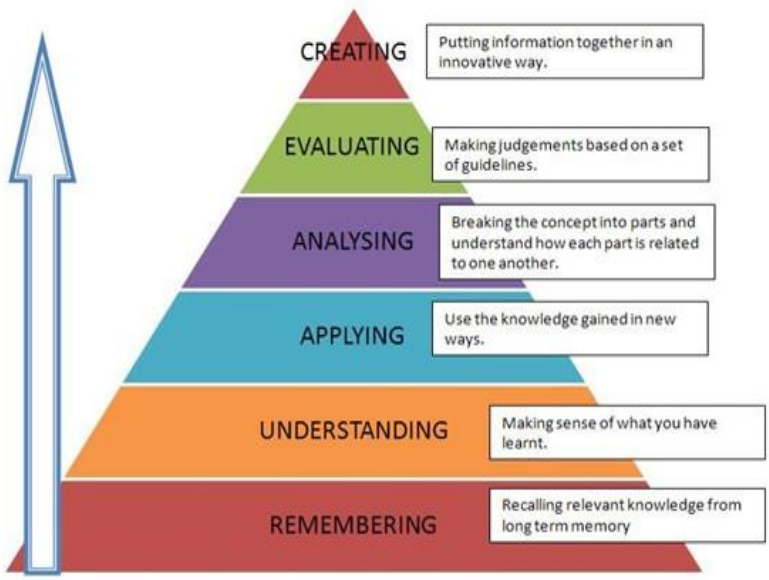

Fig. 1. Cognitive Domains of Visual Literacy. Source: https://literacyteaching.net/

Visual Literacy has opened a space for itself within the training activities of university libraries so that courses to train future information professionals have begun to include abilities to analyse, describe, process and apply images in academic information units [29], with particular teaching success in experiences of use in Life Sciences, Linguistics, Architecture and Social networks.

3. VISUAL COMPETENCIES FOR HIGHER EDUCATION

At the end of the 20th century, models and applications for "competence-based education" began to be developed. Skills need to be projected onto a specifically educational. University curricula must have these incorporated in a methodical, practical way.

3.1. Digital Competences in Higher Education

The incorporation of skills for the effective educational use of digital content in universities has experienced three waves: (a) the incorporation of "computer competences" aimed at the expert use of ICT tools (communication channels) for an effective application in a given domain (academic disciplines, professions, etc.); (b) 'information skills', aimed at semantics, i.e. the meaning of digital content through the development of skills for web content management, collaborative editing of digital content and the educatee's assessment (and self-assessment) of digital content in order to obtain knowledge, a process containing three levels, 'foundational knowledge' (technological skills) ,'conceptual understanding' (skills for applying skills) and 'procedural understanding' [30]; (c) 'digital competences' formulated by the European Union under the 'DIGCOMP' project which proposed a framework for digital competencies [31] and the educational application of which was formulated in "Promoting Effective Digital-Age Learning: A European Framework for Digital-Competent Educational Organisations" [32]. Furthermore, digital competences have been incorporated into the European Digital Agenda, following a process of conceptual and terminological refinement [33], as an element for sustainable and inclusive development [34]. In this context, "information and communicational competences" for collaborative and social networked learning and "visual competencies" understood as the object and field of study and experimentation of Visual Literacy, should soon be incorporated.

Fig. 2. DIGCOMP 2.0: The Digital Competence Framework for Citizens. Source: [31]

In the context of digital competencies, visual competencies therefore aimed at developing skills in visual literacy, an innovation that fosters self-interactivity on the Web [35]. In this sense, a process of conceptual refinement has also been necessary to define visual reading and writing: (a) “aesthetic reading and writing” analyses images according to a historical, artistic and aesthetic analysis and documentary description principles (b) 'iconic reading' aims to analyse images by means of morphological analysis (shapes, lines, points, illumination), morphosyntactic analysis (elements of the visual alphabet and their 'grammatical' function in images), semantic analysis of image factors, aesthetic and ethical analysis [36]; (c) 'visual reading and writing' is that which follows the principles of the ACRL Visual Literacy Standards and measures the achievement of competencies by applying its indicators. Precisely the educational applications of images are giving rise to the development of a specific pedagogy, such as GBP (Game-Based Pedagogy) [37].

3.2. Academic Literacy

Undoubtedly, this whole compendium of skills required not only a speciality, but also an area for its appropriate incorporation into the university curriculum, and in order to respond to this challenge, "academic literacy" has been emerging since the 1980s. Its first applications were aimed at developing skills for excellence in reading and writing in university students which would serve as a basis for optimising study techniques and the preparation of academic papers, guaranteeing the correct transmission of acquired knowledge, a critical analysis capacity and the assimilation of a specialised language from the area of knowledge under study [38].

The evolution of universities by the 21st century, competence-based education and the challenges of cyberspace have led to broadening the scope of academic literacy: new educational modalities, media and materials pose new requirements (web publishing skills, digital and visual literacy, ethics, plagiarism, etc.), as well as the need to attract excellent students and guarantee their employability in line with their expectations, make academic literacy a "label" for identifying actions and strategies aimed at promoting the benefit of Higher Education competencies [39], through techniques derived from the scientific method to optimise learning for newly admitted university students and the employability and scientific excellence of graduates [40].

Fig. 3. Researcher Development Skills Framework. Source: University of Canberra

Therefore, Academic literacy must have three dimensions: the first aimed at linguistic competence in its broadest sense; the second a capacity for assimilating the ”discourse" of each area of knowledge; and the third a critical social perspective on practices, norms, methods and ethics in academic discourse [41]. This third perspective allows for the development of a suitable method of observation and practice in text production, data collection from multiple sources, detailed linguistic analysis of texts and hypertexts [42]. In any case, the progress of academic literacy in universities is based on its unquestionable potential to support the academic performance of the student with excellence [43], through its connection with the objectives, methods and strategies of information literacy [44].

4. DESIGN OF A COMPETENCE-BASED VISUAL LITERACY PROGRAMME FOR AN ACADEMIC LITERACY STRATEGY

Based on theoretical approaches and models the above exposed, the experience of including Visual Literacy competences was proposed as part of a strategic action of academic literacy, from the obtaining of a Project of Teaching Innovation that annually summons the Vice-

Presidency of Strategy and Digital Education of the Carlos III University of Madrid in its 14ª Call of Support to Teaching Innovation Experiences, year 2017-2018. The Scientific Report moved to implement the project:

4.1. Instructional Design

a. Justification: The technical possibilities for visualising information on the web and an efficient use of images for knowledge on the web through Gamification, Virtual and Augmented Reality allow the convergence of: *Visualiteracy, New Media Literacy* (with its competences in *transmedia browsing*); *judgement* or evaluation; *appropriation*; *play*; *distributed cognition*; *behaviour*; *collective intelligence*; *negotiation*) and *Metaliteracy* (empowering critical awareness of one's own informational behaviour in collaborative environments and in social media). These *multi-literacies* have had an important curricular integration in Higher Education either as "formal education" through specific subjects in Degrees and Postgraduate Studies, or "non-formal education" through specific educational services from Academic Skills Centres, as evidenced by field studies and Anglo-Saxon university literature (USA, Canadian, Australian, British, Dutch and Swedish in Europe), to the point of becoming measurable elements for academic excellence.
b. General Objective: To incorporate Gamification activities as didactic material in some Didactic Units, and also as audio-visual museum resources in virtual and augmented reality, to make web-based learning for knowledge more effective, together with applying an appropriate evaluation system to measure the achievement of competencies through a system of competence-based indicators.
c. Specific objectives: i) To select audio-visual resources and museum virtual and augmented realities, applying the Visual Literacy Competence Standards as a learning method, checking progress through classroom exercises; ii) To schedule activities (description of purpose, competence-based objectives, presentation of the method, task and evaluation) in some didactic activities, according to the instructive design of Gamification; iii) To define ad hoc competence indicators for the evaluation of the students' competence-based progress.
d. Methodology: This project would be the base for developing an evaluative method, based on research by Lee et al. (2015), new media literacy and metaliteracy programming and indicators [45] and competence-based program indicators [46]. The aim was to implement a set of good practices developed in Anglo-Saxon universities for university excellence and ranking impact. The groups must be small, and this was the reason for selecting a Humanities course, "Art and Digital Culture" with 26 students of different nationalities. The level of innovation of the project was based on two aspects: i) Programming an instructive design of web materials and competence-based practices-exercises based on audio-visual material, virtual and augmented reality, museums as part of a Gamification; ii) Defining a "competence-based rating system", within the diagnostic, continuous and summative or final assessment modalities, since the achievement of competencies is an indicator of academic excellence for universities, which is projectable in the ranking; iii) Developing an academic literacy programme for academic excellence at university, based on the

models designed for Anglo-Saxon ASCs, biased towards digital and virtual competences. The project established some work phases with its tasks: starting with digital and virtual educational documents, making an initial evaluation test with a questionnaire as a diagnosis; then carrying out activities with a Gamification instructive design aimed at the competences to be achieved according to the indicators model; finally, a final evaluation test with more complex contents for measuring the level of success in achieving the competences.

4.2. Teaching Environments and Teaching Materials

The learning process took advantage of the characters of the web as an educational space, which led to its own development of blended learning. The LMS Global Classroom, built on the Moodle platform at UC3M was used, a) to provide access to teaching materials, organised according to the planning of the competence-based programme; b) as a communication channel with students; and c) to manage the educational process.

The teaching materials include: a) a theoretical framework that gathers the essential knowledge of the subject and illustration web resources; b) learning objects that include video games and information resources on works of art in museums; c) tests to measure the level of knowledge acquisition; and d) final works that require understanding the concepts and knowing how to use the tools and methodologies taught.

4.3. Planning of Educational Activities

The Planning of the Teaching Innovation Project is shown in table 1, which includes teaching sessions, educational activities and their description.

Planning of Pedagogical Activities of the Educational Innovation Project	
Session	**Activities**
1st	The Educational Innovation Project is explained within the course on Art and Digital Culture.
	The theoretical framework of the project is presented considering the following points and illustrating the arguments with web resources: a) hypermedia and its reading; b) images and virtuality; c) the functionalities of the web image and virtuality on museum and artistic heritage; and d) educational video games in art and digital culture.
	Students are asked to play and finish the video game *A Closed World* before the next teaching session.
2nd	Students are asked to take a test, the questions being based on competence-based indicators, which require a visual reading of the web resource on the painting *Las Meninas* of the Prado Museum.
	The video game *A Closed* World is analysed together with the students, using an *ad hoc* template developed for this project in which the essential aspects to analyse a video game are elucidated, namely, parts of the design (history, mechanics, technology and art) and the underlying psychology of the game (Motivation and Gamification).

3rd	The ACRL standards for Visual Literacy in Higher Education are explained.
	Students are asked to prepare questions based on academic literacy and visual literacy competence indicators to evaluate the respondent, and these should require the use of the video game *The Mystery of the Looks at the* Thyssen Museum as didactic material.
	Students are asked to take a test to assess their level of knowledge on video games, their design and use, and to check whether the video game *A Closed World* was played and competed.
	The video game's integration into the digital culture of the 21st century is presented, relationships between art and video games are shown, and professional applications of video games and gamification are shown in the disciplines of law, economics and tourism.
	For the course's final work, they are required to: • Make an iconic and visual reading of the web resource on the painting Las Hilanderas (The *Spinners) or* La Fábula de Aracne (The Fable of *Arachne) at* the Prado Museum. • Design a video game related to the students' studies and a proposal for their professional application.

Table 1. Planning of the Pedagogical Activities of the Teaching Innovation Project. Author's compilation

5. RESULTS AND DISCUSSION

The results have been obtained from the teaching of iconism and gamification, the edition of *ad hoc* web didactic materials, exercises, questionnaires, and practices, following a scalable (each exercise and practice was based on the competences acquired in the previous one) and modular (the instructional design has been proposed in "blocks", each one aimed at achieving a specific didactic objective) criterion. Due to the nature of the project, the results are presented qualitatively and quantitatively.

In the first didactic unit, the project needed a detailed and illustrated explanation of the concepts and terms required to understand what visual reading and writing is and what it implies as well as the strategies and methods to master its competences. A "0 diagnostic assessment" was necessary, so students were offered to represent the painting by Velázquez *Las Meninas*, in the Prado Museum (with all its visualisation strategies) which they were required to comment on with their previous knowledge. The answers responded to two explanations, what was known about Velázquez and the painting, that is to say, the students made an artistic analysis. We then proceeded to explain, by applying the concepts learned theoretically, the difference between aesthetic and iconic reading, showing them the worksheet with the specific elements in an iconic reading activity, which is shown in Table 2. After understanding the difference, the students applied the narrative elements of this worksheet to another painting by Velázquez, Las Hilanderas (The Spinners).

Elements worksheet for Iconic Reading	
Type of Analysis	**Analysable Elements**
Morphological	Basic flat geometric shapes

	Geometric and visual force lines
	Points of perceptual and symbolic interest
	Lighting diagram
Morphosyntactic	Points
	Lines
	Contours and shapes
	Textures
	Zoom, frame and movement
	Angulation and point of view
	Lighting and tonality
	Colour
	Text
Semantic	Points
	Lines
	Contours and shapes
	Textures
	Zoom, frame and movement
	Angulation and point of view
	Lighting and tonality
	Colour
	Textual language
	Scenography
	Symbols and logo
	Text
Aesthetic	Expressive beauty
	Relational beauty
Ethical	Explanation of the values and counter-values it transmits

Table 2. Elements worksheet for Iconic Reading. Source: J.A. Ortega Carrillo

Likewise, the terminological determination and illustrated explanation considered video games, differentiating them from serious games, Gamification and Gaming. Then, given the characteristics of the course, integrating video games into the culture of the 21st century was justified and different relationships between Art and video games were outlined, always from a professional and academic perspective in this humanistic discipline.

Once this skill had been acquired, in the second didactic unit, the project was to undertake a new module of competence. The students had to read carefully and understand the indicators for obtaining the Visual Literacy Competence Standards in order to understand the difference between iconic and visual reading: these indicators were applied to the painting by El Veronés painting, The Wedding Feast at Cana. The Visual Literacy indicators correspond to the third to fifth standards of the American College & Research Libraries' framework for Visual Literacy Competences in Higher Education (http://www.ala.org/acrl/standards/visualliteracy), as the indicators define the different standards by orienting them towards an effective application towards learning and knowledge. Once the application had been learned by following the explanations, the students had to apply the indicators individually to the painting *Las Meninas*, thus verifying the competence-based distinction and progress between the two readings.

Only then does the project introduce the qualitative leap of reading images. First, students are provided with a worksheet to analyse and read video games which was developed *ad hoc* for this project, and was inspired by the complexities concerning the design of video games established by [47] and the underlying psychology of the game studied by Gamification, the elements of which are shown in Table 3. Afterwards, a guided exercise was carried out, and it involved analysing and reading the video game A Closed World, using this worksheet.

Video Game Analysis and Reading of Worksheet	
General Information	Name, responsible for the design and development, genre, distribution channels to the public, release date(s) by region, languages available, PEGI and ESRB labelling systems for target audience suitability according to content and functionality, game series or saga, and intent.
Technology	Development (hardware and software) and execution of the game (proprietary game console, computer or web).
History	Type (level of explicitness, plot, theme), how it is narrated (linearity, ending, parallel stories, narrative media and structure), characters (role and attributes), places, and transmedia worlds.
Art	Elements that require aesthetics (places and objects, characters and actions), aesthetic factors (visual, sound and musical, audio-visual), artistic currents, socio-cultural references and assignment of aesthetics to functions.
Mechanics	Game modes and objectives, relationship between the elements of the game and psychology, and virtual reality physics.

Game Psychology	• Dynamics (extrinsic and intrinsic motivations psychology): in view of the game experience and the emotions unleashed in the player, the dynamics are the elucidation of system and the player relations.
	  ○ Relationship: social status, social connections and sense of belonging.
	  ○ Autonomy: actions, creativity, choices and responsibilities.
	  ○ Mastery: learning, personal and skills development.
	  ○ Purpose: altruism and meaning, why.
	  ○ Rewards.
	  ○ Hacking or possibility to change the system.
	• Mechanics: these types of rules or game modes allow developing dynamics. Examples: narrative, competition, development software, challenges that take the player out of a comfort environment, ways to interact with other players, player rating systems, and video game feedback.
	• Elements: these are the elements associated with the two former ones (dynamics and mechanics), and their type and quantity vary depending on the creativity with which the system is developed, and they are quantifiable elements that allow assessing the progress of the game experience. Examples: achievements, gifts, conquests and/or progresses, customisable avatars, created mods, badges, final level chiefs, combats, unlocking of items or scenarios, player levels and progress, team building and media, points and rankings.

Acceptance by the public	Ratings (top-down or bottom-up), review sources (aggregators, specialised media, social networks and forums), creation of communities and developments not managed by game managers (specialised wikis, video tutorials on YouTube, pages and groups on FB, and mods) and stories and conversations based on the game experience.
Sociocultural Aspects and Values	Examples: visibility of women in professional sports video games, paradigms of life in social simulators and their understanding in certain cultural contexts, war video games and the social reality of those involved, purpose of serious games.
Educational benefits	The video game as a virtual, immersive and interactive medium; the casuistry of video games; and its didactic application.

Table 3. Video Game Analysis and Reading Worksheet. Author's compilation

In the third didactic unit, our undeclared objective was to measure the achievement of a competence, i.e. not only to check the progress made in the understanding and application of the criteria and rules of the different readings (an area corresponding to skills and abilities), but also that students are active in the use of images to acquire and produce knowledge by image. To this end, the information and visual competence indicators to be applied were explained, and had been generated specifically for Visual Literacy programmes but as indicators of a plan for academic literacy.

The simple scoreboard proposed came from the definition of a Scoreboard for Academic Literacy, derived from information literacy indicators and metaliteracy indicators, that researchers had defined in previous research projects and then published. Eight indicators were selected from the table for being the closest to the Teaching Innovation Project. A simple scoreboard (presented in table 4) was therefore edited, with the following structure: (a) the 'label' or name of the indicator was noted, which serves to determine the scope or purpose of application of the indicator to ensure the effectiveness of the measurement; (b) the

application is established by defining the indicator, which is nothing other than determining the measurable object to determine the quality and progress in achieving the indicator; c) three categories of indicators, abilities (expert use of tools), skills (intelligent use of tools and their potential) and competences (mobilisation of knowledge for hypothesis, problem or decision solving) are identified, each of these categories is projected into measurement objectives by the indicator and it is precisely from these objectives that the questions in the questionnaires applied in the teaching innovation project were derived.

Competence-based Indicators in Academic Literacy in Higher Education		
Labels	**Application**	**Category: Skills Indicators**
Indicator (object)	**Definition**	**Objectives**
1-2. Use of educational resources in the digital environment to access and consume information (capture).	Use of digital resources as educational and information-consuming resources to achieve learning objectives. Understanding the design of resources and their flexibility as a way to access information. Identifying parts and elements from physical observation (of web pages and resources) and distribution and location of information to practice intelligent hypertext reading.	2.- Understanding and interpreting the design of resources and their flexibility as a way to access information. 3.- Locating information as well as its parts and elements by the physical observation of resources and interpreting their distribution. 4.- Semantic hypertext reading (plotting a route according to your learning objectives).
1-3. Optimisation of the cognitive impact of the resource and its application to learning objectives.	Skills in the use of applications, software, computer programs, which are suitable for managing and communicating information. Students' ability to optimise the cognitive impact of the resource and apply it to their learning objectives. Adaptation and appropriation of other digital environments, which can be oriented to personal needs. Recognition of the importance of accreditation in ICT competence.	3.- Optimising the cognitive impact of educational resources and applying it to learning objectives. 4.- Appropriating the applications and tools to make up a personal learning environment (PLE).
Labels	**Application**	**Category: Skills indicators**
Indicator (object)	**Definition**	**Objectives**

2-1. Mastering reading comprehension.	Mastering the reading comprehension and analysis process to take responsibility for learning in formal settings. Ability to identify the main parts and ideas of the content. Development of reading comprehension skills in different types of reading, including textual, polytextual, hypertextual, semantic, visual, collaborative, etc.	3.- Reading comprehension skills in different types of reading: textual, polytextual, hypertextual, semantic, visual, collaborative, etc.
2-5. Management of learning based on digital reading and writing for learning and communication purposes.	Ability to organise information, mastery and knowledge of digital reading and writing techniques and the importance of labelling in managing information in accordance with one's own cognitive and learning objectives.	2.- Managing information and meta information according to one's own cognitive and learning objectives. 3.- Creating new products that can be stored and communicated.
Labels	**Application**	**Category: Skills indicators**
Indicator (object)	**Definition**	**Objectives**
3-1. Design of strategies to achieve autonomous learning and management of personal digital identity.	Skills in information management for autonomous work and learning; development of self-learning strategies, digital identity management to solve knowledge or training needs. Recognition of the importance of generic skills (languages, communication, uses of ICT) in order to be responsible for learning them and to design their path of continuing education.	1.- Developing strategies and using information for autonomous learning.
3-2. Representation of knowledge to create new knowledge and objects that facilitate learning and research.	Categorisation and representation of knowledge, orienting its treatment towards management to facilitate learning and research. The ability to create an information organisation and management system requires competence in digital space (reading and writing) and in interpreting large amounts of data.	1.- Applying methods to represent information and knowledge. 2.- Representing knowledge to create new knowledge and objects that facilitate learning and research.

3-3. Creation of new knowledge through the scientific method.	Theoretical and procedural knowledge of the phases of the scientific method. Level of confidence in the use and application of information for the preparation of academic papers.	1.- Managing the information in the phases of the scientific method.
3-4. Communication of information in learning.	Ability to communicate and transmit new learning and collaborative knowledge in a face-to-face, online and collaborative way.	1.- Recognising the importance of communication as a process in learning.

Table 4. Competence-based Indicators in Academic Literacy in Higher Education. Source: Author's compilation

Once the characteristics and features of these academic literacy indicators for Visual Literacy competence programmes had been understood, the students had to propose a simple design of a Visual Literacy didactic unit for their own hypothetical students, and ask the necessary questions, derived from these indicators, in a questionnaire aimed at measuring the visual skills of these hypothetical students: it was the step from "knowing" to "knowing how to". Finally, exercises were proposed to be carried out outside the classroom, with a practical attempt that involves understanding the theory and the use of tools and methods, both for an iconic and visual reading of the web resource about the painting *Las Hilanderas* (The Spinners) at the Prado Museum, and for the design and application of a video game in a students' professional context.

The exercises to check the competence-based progress after each didactic unit showed the progress made. The results obtained from the teaching of iconism and gamification, the publication of *ad hoc* web-based teaching materials, exercises, questionnaires, practices and exams, show that objectives 1, 2 and 3 of the project have been fully met.

In the application of a test after the second didactic unit with 10 open-ended questions, brief comments were observed in all the answers, which seems to indicate that the meaning and objective of the questions was not understood and that the criteria for analysis and use of visual materials were not known and understood.

In the exercise of developing questions based on competence-based indicators in the third didactic unit, all the papers showed that the students carried out the analysis from a Visual Literacy perspective using the specific academic literacy indicators proposed. The students showed an improvement in understanding the characteristics of visual materials and analytical-critical capacity according to the criteria of morphological and morphosyntactic analysis of iconic reading and Visual Literacy standards. The quantitative data were clear, as four-fifths of the exercises delivered were outstanding, while only one fifth was rated with a pass.

On the other hand, the test referring to the reading of the video game had 10 questions, each one rated with a maximum of 1 point out of 10. It consisted of 3 closed questions, 3 open

questions, 2 true or false questions, and 2 association questions. The average score was 7.83 out of 10. The questions were grouped into 3 blocks: a general one about video games, one about the video game A Closed World, and another one about how to use video games, and the average score for these blocks was 9.47, 6.77 and 9.20, respectively. Therefore, the greatest difficulty for students was reading the video game.

As proof of the achievement of visual competence, a final paper was presented for the video game design practice. The following elements were to be considered: a) parts of the design for a virtual, immersive, interactive system subject to rules (history, mechanics, art, technology); b) playful elements and their relationship with the psychology of motivation (Gamification); and c) the application of the video game according to the possibilities of the game and the needs of a learning context. In the students' designs, there is an excellent understanding of the video game as a system and the parts of its design, but there are difficulties in terms of Gamification (only 1 sixth of the deliveries considered it correctly) and professional application (no distinction is made between the experience of playing the game and the use of the video game together with other educational activities).

Satisfaction with the concepts learned, the techniques tested, and the new perspective given to the students by this new "literacy" is evidenced by the teachers' evaluation surveys which were very positive when the university's academic services carried out the course's evaluation survey. The students feel that they have acquired relevant knowledge in digital culture. The development of the project seems to have provided them with methodologies and tools to be able to think critically about the visual media and video games that can be found in digital culture, in addition to proposing designs for solutions in their respective professional areas.

Specifically, with respect to Visual Literacy, the results of exercises and practices were designed as scalable blocks, designed to prove the competent handling of visual reading, seeking two levels of success: a "disciplined" reading, according to their own semiotic and semantic codes which must be learned for their efficient use; and an agent reading which transforms information into knowledge from an iconic passive contemplation to an applicative action.

As for video games, the test is proof that students know how to analyse them. The final work served to verify that they know how to design them, considering 3 aspects: a) parts of the audio-visual, immersive and interactive system subject to rules (history, mechanics, art and technology); b) the underlying psychology of the game (Motivation and Gamification); and c) the proposal of educational activities. However, in the students' designs, difficulties were observed in the last 2 points. In fact, with regard to the entertaining elements, only one delivery considers them correctly.

The innovation project, as indicated above, was within a subject called "Digital Art and Culture" which had its own teaching programme. The experience was all the more illustrative because the skills achieved by the students in the three didactic units of the project were applied to the educational dynamics of the subject, so its contents were part of the final evaluation, both in questions that were perfectly identified in the final test, and in the final work that the students had to do. The very positive responses provided a vision of how

students contextualised and applied the skills learned in learning domains other than those of the innovation project.

6. CONCLUSIONS

There is no doubt that, except for the service of Academic Skills Centres in Anglo-Saxon universities with a compendium of good practices, an action plan in academic literacy can make undeniable progress in the academic excellence of universities. The centralised planning of these actions should then be developed in programmes for the development of competences, digital in general, visual, info-communication and in particular in metaliteracy.

Images in any format, act as a powerful stimulus for learning by eliciting motivation. To generate knowledge, pedagogical activities must ensure that "visual concepts" are "labelled" in educatees' mind for their assimilation enabling subsequent reuse in the resolution of hypotheses and decision-making in scientific, academic and everyday life [48]. In this case, academic literacy should incorporate the design of Visual Literacy programmes.

The absence of these visual competence programmes means that the educational use of images is hampered by two problems: their inoperability due to the predominance of "prejudices", that is to say, the values learned in the use of images by analysing them from an advertising perspective, as an illustration of the written text, an aesthetic and testimonial vision; the use of images as a flat and linear mode of contemplation, of passive and evocative visualisation, without taking into account an active, participative and interactive use, as a way of immersion in realities capable of replicating the experiments of the tangible world [49]. The project's 0 assessments and diagnoses provided clear evidence of this situation [50].

The development of the teaching innovation project also provided other evidence: specific web-based teaching materials are needed for these programmes, a line of research that is progressing steadily in the field of digitalisation and virtualisation, but which must produce clearer results. The exercises and practices of Visual Literacy must necessarily result from the specific objectives and competences of the areas of knowledge whose development depends on the efficient use of images to train future professionals**.** The curricula design of these programs must be based on appropriate pedagogical theories, so the principles of Connectivism seem to be ideal. As usual, the effectiveness of these programmes requires a highly qualified evaluation system to measure the level of competence achieved by the educatees and the quality of the programme for the university's excellence. The design, development and application of visual competence-based indicators, derived from Visual Literacy Standards but with important contributions from New Media Literacy and Metaliteracy, is essential to create indicators specific to academic literacy.

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