

Adapt to the Visual Age: Infographics an Innovative Didactic Resource for Teaching

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Abstract: This proposal tries to respond to some needs, fundamentally, to rethink new strategies for the transfer of knowledge in the classroom. Infographics are a good ICT resource, which, can be used as a study technique as it is a synthesis work that amasses various knowledge and adds images. This initiative can be valuable considering the process of transformation of teaching experienced as a result of the COVID-19 crisis. Whenever something has to be explained, both complex and simple, there is the resource of infographics that attracts due to its colors, shapes, elements, distribution, etc. It is very interesting to use in education. The use of infographics is increasingly widespread, in a knowledge-based society where there is more and more information and the most important thing is not to be able to memorize it, but to be able to discriminate which is the correct and important information. Our thinking is visual and we are able to better understand the ideas that arise through visual concepts and not only through abstract concepts. With this, classes could be improved, made more enjoyable and fun, where students are able to remember a certain illustration, graph or map of the infographic to explain complex concepts to define. Not all topics can be of interest with the same type of intensity, or students at some point can lose the thread, that's why infographics are a good resource to present a topic in an attractive way, getting the public to understand the keys that are presented, that does not go unnoticed and that improves student learning.

Keywords: Infographics, Education, Investigation, ICT Resource, Innovation

1. Introduction

Although the exam is the most used means of evaluation, there are other written means (for example, poster, portfolio or project) and oral means (for example, debate, presentation or exhibition) that constitute student productions and serve to demonstrate what the students have learned. In this line, various studies have analyzed the potential of infographics as a teaching resource in the learning process.

The preparation of infographics by the students themselves involves training in the analysis and treatment of information, as well as in the acquisition of other skills. Thus, previous research has concluded that this activity is rewarding and that students recognize the challenge of preparing the activity (their first digital infographic in most cases). These studies explore the development of skills that are key within the European Higher Education Area and endorse visual communication as a support for the construction of knowledge. Along with in-depth research on a topic, presenting in an infographic format, beyond the usual slide

presentations, can be more engaging for students. Likewise, the rest of the classmates can view the infographics within the virtual course at any time and place and the forums allow asynchronous communication between all the students, whether they are working on their own infographic or do not participate in the activity due to lack of time or other reasons.

2. About Infographics

2.1. What is an Infographic

“An informative contribution, made with iconic and typographic elements, that allows or facilitates the understanding of current events, actions or things or some of its most significant aspects and accompanies or replaces the informative text” [18]. In other words, an infographic is an informative visual representation, with a set of multidisciplinary activities, that translates, synthesizes and explains data figuratively.

In infographics numerous graphics and signs are used to

form descriptions, descriptive, argumentative or narrative sequences, or even personal interpretations that serve to explain the information in a more didactic way. In this way, infographic resources are enormously useful for explaining information that is difficult to understand from just text.

In today's society, infographics are very present, we can find them in books published in a new way, in scientific or informative magazines, even in media such as television or newspapers. Infographics cover various topics and can explain very different information in the field of Social Sciences. But they also serve in the scientific field to explain technological or research processes that are more complex and that could also be explained from a text, but their explanation, perhaps, could not be understood by all people.

2.2. *Origin of Infographic*

Word infographic: Although informatics means automatic information, info does not derive from the word informatics. In this case, infographics refers to written information, which is going to be printed journalistically or served in new and future online telematic services, written with drawings or photos, but no longer printed. Instead, graph comes from graph [9].

Infographics have been made over the years, although not as we know them now, hieroglyphs (formed by a binomial of text and image) could be one of the first origins related to infographics; the medieval bestiaries; cartographic maps; family tree diagrams; the various branches of scientific illustration (medicine, botany, engineering, etc.); the schematized, regulated and synthesized graphic stories of Leonardo Da Vinci who tried to transmit information with images supported by the text; Charles Darwin's drawings and annotations on evolution, the natural sciences, and maps. Also noteworthy are the scientific or cartographic illustrations by Alexander von Humboldt, these had an infographic character. Or the first plans of the London Underground by Harry Charles Beck in 1933 that have served as a reference in all the world's underground plans [2].

Infographics, traditionally, has developed as an effective content within the written press, modern infographics is born in the press, grows and develops as a new journalistic genre [15]. Apart from that, today it is being reproduced, it is leaving this discipline and is invading other worlds such as the Internet, the company, etc. In fact, it is currently used even in science, its didactic and educational value makes infographics one of the most used online information activities in the health sector [11].

Infographics in the communication of organizations and in advertising assume information functions in the promotion of products, services or corporate processes. In addition, as Gerardo Karbaum Padilla states in his article "Infographics: representation of reality, advertising and organizational communication", it fulfills pedagogical and documentation roles for these services [15].

Infographics have always been used in the press, but they were becoming more and more complex, which caused

interest to be lost and demand to suddenly decline. The experts valued as the first infographic representation in the press the one published on May 7, 1806 in the London newspaper The Times, it showed an explanatory graphic about a murder [14]. With the arrival of new technologies, at the end of the 20th century, digital infographics were created, which modified the processes of diffusion, appearance and application areas.

The Guardian launched its Berlin format on Monday September 12, 2005, designed by Mark Porter, this was a radical change, it was the first national newspaper in the United Kingdom published in full colour, with a clean design and a modern graphic structure that made it reading something easy and appetizing [10]. After this moment, the editorial approach took a different infographic direction, the press realized the keys to improve understanding, the direction they should follow: use simple icons and easy-to-understand infographics. The images were no longer a filler or a complement, now each graphic had a meaning, "each line has a reason for being and each sign, no matter how small, has a meaning" [10].

This novel approach to visual language fascinated editors of other national newspapers, and their readers. After launching the Berlin Guardian, came The Observer. The same powerful visual content model and method of drawing only what needed to be shown was applied to the infographic process. A year later, The Independent on Sunday was redesigned and its graphics contained the symbolic iconic branding of the Guardian Media Group's Berlin redesigns, but an improved version [10]. In fact, it took current information to another level, introducing short news, that is, making the news in a space as small and simple as possible.

The influence of this new "infographic code" does not end here. The Independent begins to use this visual language. The late summer of 2007 saw the redesign of The Times, followed a year later by its Sunday installment, The Sunday Times; these two brought their own ingredient to this new data-driven infographic approach.

Until recently, infographics were produced by professionals, normally related to these media, but currently, the elaboration of infographics has been greatly facilitated by the presence on the Internet of some web 3.0 services specialized in the creation of this type of material, such as the Canva, Genially or Venngage applications, which can be used by any interested person [1].

2.3. *Objectives of Infographics in the Classroom*

- 1) Consolidate habits of discipline, study and individual and team work as a necessary condition for an effective performance of learning tasks and as a means of personal development.
- 2) Develop basic skills in the use of information sources in order, with a critical sense, to obtain new knowledge. Acquire basic training in the field of technology, especially information and communication.
- 3) Increase the entrepreneurial spirit and self-confidence,

participation, critical sense, personal initiative and the ability to learn to learn, plan, make decisions and assume responsibilities.

- 4) Promote visual education.
- 5) Develop transversal skills in teaching practice through the use of new web 3.0 tools and make them use information and communication technologies with solvency and responsibility.

2.4. Elements That Constitute the Visual Language in Infographics [2]

- 1) Pictograms, signs, icons, symbols, ideograms.
- 2) Diagrams and their different types (such as bar, line, circular or sector diagrams, tree diagrams, conceptual or mental maps, heat maps, etc.)
- 3) Plans, itineraries and maps.
- 4) Illustrations.
- 5) Geometric figures or shapes.
- 6) Color.
- 7) Arrows, signals, vectors and dividing lines.
- 8) Written text and typography.
- 9) Text containers.
- 10) Stream text and image.
- 11) Sizes of the elements that can intervene.

2.5. Typologies of Infographics [8]

2.5.1. According to Its Use

- 1) Static infographics, the most common: those that do not involve any type of interaction or movement, such as those in magazines or newspapers.
- 2) Dynamic infographics: they have some type of information, for example, GIFS or short videos that are presented in infographic mode.
- 3) Interactive infographics: for example, the hectometers during the elections, where the user can activate and deactivate the boxes of certain parties and in a certain bar the gaps are increased until the corresponding seats are obtained. These types of infographics are much more complex to make because they require a type of web programming, however, they are very useful for presenting a type of information that would otherwise be much more complex.

2.5.2. According to Its Purpose

- 1) Commercial infographics: through advertisements or pamphlets it is seen that they give us information about a certain product through infographic elements that break down the characteristics of certain objects [6].
- 2) Journalistic infographics: these report on a certain event and do so in a detailed manner through prior documentation and evidently visual information management.
- 3) Scientific infographics: those that may be of most interest in this work, address a certain content, of an academic nature and do so rigorously, but above all with an informative intention, promoting the transfer of knowledge to non-specialized audiences.

- 4) Geographic infographics: those that provide data of a spatial nature, related to countries, places, territories. Sometimes it does not represent geographic objects realistically and symbols are placed.
- 5) Chronological infographics: another of the most interesting for this work. They represent events that are happening in time through any type of temporality. They are very useful to explain chronology, or events that are going to be triggered consecutively.
- 6) Sequential infographics (space-time sequences): an event that happens in time is developed, indicating its different stages in a single graphic, generating a form of representation of the time sequence.
- 7) Biographical infographics: useful for the subject of Social Sciences. They are dedicated to a single character and analyze their most important contributions.
- 8) Statistical infographics: with rates, percentages, graphs, logarithmic values, that is, they provide numerical data. The results of different variables, votes cast and shots, etc. Lines, point clouds, circular surfaces or color changes can be formed that provide influences in a given sector compared to others, generating sets of variable density or chromatism related to the frequency of the data [19]. These can also be seen in the sports field.
- 9) Mixed infographics: they are the most common, those that combine different types of information. These can use graphics of various types, giving rise to numerous combinations, since it is possible to divide an infographic into multiple vignettes.

2.6. Characteristics That an Infographic Should Have

It must provide meaning to full and independent information, that is, it does not have to depend on information that is not inside, it must provide all the data necessary to understand a certain subject, or all the most relevant data so that the viewer can build a business idea. Another second characteristic is that the information given is up-to-date. It must allow the event that occurred to be understood, that is, it must not explain a certain event without delving into its background. Another peculiarity is that it contains information written in typographical forms. Another singularity has to do with the informative entity itself and that the infographic is self-explanatory.

A factor to take into account is the aesthetic sensation and originality, all the elements must keep a certain proportion. It must not contain errors, contradictions or inconsistencies. Finally, as Jordi Català points out in his article "Whenever science needs to reach others, it is very well understood with infographics", it must contain iconic elements with great precision, that is, the images that are placed must be in harmony internal with the topic of infographics [14]. These images apart from keeping harmony must have their own value, they are no longer a complement to the text, but the explanation itself.

2.7. Basic Principles that Govern the Aesthetics of an Infographic

- 1) Simplicity: the less common and more complex the chosen graphic form is, the more detailed and extensive the explanations must be about how to read the graphic and what the reader should extract from it. Do not be afraid to add texts that guide the reader or introductory texts that point out some important curiosities since they help to understand the operation of the interactive [3]. It must be organized in a direct and intuitive way since they appeal to innate cognitive mechanisms.
- 2) Both visual and textual coherence: all the iconic elements of the infographic must be in harmony, such as colours.
- 3) Proportion: the main elements have to be located in a place where the viewer can see them directly, and an accessory element can be placed around the main elements. The really important elements cannot go in a corner or in a very small size because the viewer will not understand their importance.
- 4) Universality: the chosen theme has to be treated in a universal way, it has to be a global theme that can be understood by all types of viewers.

3. Visual Education and Its Effectiveness in Infographics

3.1. Visual Education

According to Colle (1998), there is a complement between verbal and visual languages:

Verbal language is analytical: it divides and compares in stages that follow each other over time, and understanding arises from the study of the parts and the apprehension of their meaning"; while the visual language is more synthetic, because through "vision it is possible to perceive a significant form in its entirety [7].

To see the problem from another perspective, visually representing ideas and data in infographics engages more parts of the brain. "The eyes are one of the routes of entry of knowledge most used by the human being, perhaps one of the most important routes of access to culture" [16]. For Valero Sancho the image, even the abstract one, is increasingly involved and immersed in the process of writing information and is used in mixing it with the written text [17].

It is necessary to begin to consider its use as something daily in the newsrooms and reach all the information, since any topic with the support of visual components can be treated:

The man is acquiring experience and familiarity with the images and that supposes a whole learning and a base to read by means of a system of signs different from those that are learned in the school where it is taught by means of more or less literary verbal codes [18].

The power of retention of knowledge by the brain is linked to the type of sensory experience by which the information

has been perceived. It is different to receive this by ear than by sight, and in turn, it is different to receive images than text.

The symbols that we use in our thought processes are not always of a verbal or textual nature, they are not expressed only in that internal language" [...] on the contrary, the brain not only processes visual information captured from the environment; it also generates internal images [4].

The sale of visual communication is very remarkable, it is quantified as 85% compared to 20% of reading and 10% of oral comprehension, under equal conditions [5]. But before retention, that information must engage the viewer, and at this point the visual also has an advantage. In most cases, the visual makes the information understood for much longer.

Over time, educational centers have been integrating resources to improve the work of teachers and help them in their work. From blackboards, to today, computers or tablets. Teachers have always used visual materials for their explanations, for example, a skeleton to show anatomy lessons, teach geometry lessons, or give geology lessons. All of these are used as mediation to communicate with the student more easily and reach their senses directly through their interaction with objects [12].

Specialists have detected that students pay much more attention to the drawings, images or signs in their books than to the text, although teachers rarely emphasize these. Two characteristics are essential for an image to be more striking and better understood than another: first, the colors, shapes and sizes, for example, colors such as yellow or red attract more attention than black or gray. The second characteristic is how realistic an image is, the more realistic it is, the faster its meaning is understood.

Visual education is a field in which it is necessary to delve deeper, in schools it is not valued enough. The Plastic Education subject has great potential, it is based on the visual, but hardly any importance is given to it, it is usually placed in the afternoon when the students are tired and need to relax, and it is not related to other subjects either. This matter is in the background, it is normally used for the manual and the playful and not to work on the use of images and their essence.

Making a copy of a drawing does not mean understanding it, you have to extract its essence and drawing something means interpreting it, it can only be interpreted if it is understood (Idem). An image is not something passive, it not only exposes, but also manifests a problem, makes the viewer ask questions and arrive at a solution.

3.2. Infographics and Education

The teaching team, and, above all, those who teach in Compulsory Secondary Education, encounter obstacles every day to motivate their students, capture their attention and stimulate them to learn.

New technologies provide the teacher's work with the possibility of transmitting and presenting the didactic element more easily. Frequently when we are presented with information, whether educational or journalistic, the first thing we do is read the headline, then we look at the images

and finally we are interested in the text [9].

Infographics are normally used in the journalistic field, however, with infographics we can present facts, develop situations, explain stories, describe processes, etc., so their use is beginning to spread to other fields, such as education, making it possible to make an innovative and attractive exhibition, capable of capturing all the eyes of the public and absorbing content more effectively with a "blow of the eye".

Its use in education is still very new, and has two aspects: on the one hand, as a way to present information in the classroom and draw the attention of students; and on the other hand, that the student makes an infographic so that they develop skills such as search, acquisition and assimilation of information.

That students know how to present an infographic gives them transversal skills, resources for oral presentations and skills that are increasingly in demand in the labor market, especially in the profiles of students related to the Humanities and Social Sciences where they communicate information and in a novel way. represents an added value.

Knowing how to create infographics stimulates creative thinking in various fields because in order to translate certain information into infographics, you have to know a certain topic in depth and be able to represent it in a didactic and visual way, and that implies training in synthesis skills, of summarizing information and translate it properly, but in a comprehensive way, all these types of infographic skills contribute to digital literacy and also to the improvement of the culture of innovation that makes students increasingly prepared to face challenges that still exist [1].

As can be read in the article "The integration of ICT in the university: Training and use of infographic and multimedia applications" in Educational Profiles, the incorporation of information and communication technologies (ICT) into the educational world has It has been slower and later than expected, and in the face of the COVID19 health emergency, it has been more noticeable than ever.

3.3. Some Data That Prove the Effectiveness of Infographics

The report dedicated to commenting on the potential and challenges of technology, carried out by UNESCO in 1998, in its article 12, indicates that ICTs will change the way of realizing, acquiring and transmitting knowledge. To make matters worse, he points out that they will enable the renewal of the content of the courses and pedagogical methods, and will expand access to higher education. This article refers to the figure of the teacher, pointing out that ICTs modify their role in relation to the learning process [13].

The concern for the training of teachers so that they can meet the requirements of the effective use of ICT is reflected in the e-learning program of the European Union: one of the lines of action focuses on cohesion measures related to training in order to establish the new basic skills linked to the use of ICT and e-learning. In the analysis of institutions and research cited, it is verified that technological services have increased significantly in educational centers and

infrastructures have improved, however, the levels of implementation have not been as high as expected, reflecting a contrast in the integration of ICT by teachers [13].

There are some studies that prove the benefit of this type of communication. The National University of Córdoba (Argentina) carried out an investigation, in which it worked with two groups of students between 13 and 14 years old who went to different educational centers. The two groups were shown a complicated topic (related to genetics); to one group through a CD of interactive infographics and to another with the absence of this tool. The answers of the students to the question about "what did you think of the CD?" they were very positive, with most stating that they found it "very good for learning" [18].

José Luis Valero Sancho did a study giving infographics to some university students. Despite the high prior knowledge that the students had regarding eight varied topics that were given to them, the infographic increased knowledge by 86% and increased the total knowledge acquired by the 125 students. This study also showed that when students interpret some of the themes of a digital infographic, of which they have certain concepts thanks to the transfer of other information or cultural sources such as a textbook, they considerably increase and clarify their level of knowledge. on those issues [18].

According to the percentages published in the article "Infographics as innovation in scientific articles: evaluation of the scientific community", within the teaching field, it was investigated whether teachers encourage students to use infographics as a didactic resource. 32.6% of those surveyed never encourage them, 25.6% do it sometimes, 18.6% often encourage them, 9.3% almost always and 14% always. In the field of research, percentages were also made that said the following: 34.9% of the subjects never use infographics to investigate, 27.9% sometimes use them to investigate, 27.9% often and 9.3% almost always. In this case there are no subjects who use them always [20].

Another of the investigations that I want to name in this work is the one carried out by myself in a Secondary school classroom with my own students. At the end of the infographic sessions I conducted some surveys, the results were very positive and revealing, 90.7% considered that the infographic captured their attention, 97.7% responded that infographics facilitated imagination and promoted creativity, 86 % infographics helped them remember concepts better and longer and 95.3% value infographics as a useful tool for transmitting knowledge.

In conclusion, infographics can become an object of teaching and a form of expression, so they cannot be ignored but rather valued as educational. Infographics are even beginning to be introduced in different work proposals in textbooks.

Nowadays, infographics are rarely used in schools and when they appear, most of the time they are not mentioned as such or the activities are limited to their reading and understanding, almost always to complement other texts [1]. Despite this, the new possibilities with the Internet give way

to students to be readers, analyzers and producers of this type of text.

4. Conclusion

Through this study it has been possible to see the importance of students actively participating in their learning process. If the students become the protagonist in the acquisition of their own knowledge, this will make them understand it better and for a longer time, instead of passively listening to classes day after day sitting in a chair, listening to the teacher to memorize something that they will forget after the exam.

Students find it increasingly difficult to organize themselves, structure information in order to understand it and be autonomous and creative in their study. We are facing a different reality, in which we must adapt to the circumstances that may come, and COVID19 is proof of this. There must be an education that reaches the classrooms, but also homes, hospitals, students with special needs, etc. Visual education is one of the great lines of the future of education and we must make the most of it, so that our students can absorb it to the fullest. Another of the great lines of our educational future is ICT. I wanted to join these two together to find a solution to the great current problem that is to make something theoretical enjoyable and that students know how to understand it.

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