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TWITTER AS A TOOL TO MONITOR ATTITUDES: THE STRATEGIC USAGE OF SOCIAL MEDIA

TWITTER COMO HERRAMIENTA PARA LA MONITORIZACIÓN DE ACTITUDES: EL USO ESTRATÉGICO DE LAS REDES SOCIALES

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ABSTRACT

This research delves into Twitter analysis, a well-known social media messaging service recently acquired by Elon Musk for $44bn, which we argue to enable researchers to better monitor (and try to solve) the status of the general population regarding the type of user and content of the received messages. With

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this analysis, it is intended to show the possibility of disseminating reliable, immediate, and high-quality messages (that would be unlikely obtained through official information channels), potentially provoking in this way an exponential impact afterwards. This idea in particular is key, due to any average social media population user and especially from 'Gen Z' (which hold 25% lower attention capacity and 40% lower check of the reliability of sources than its predecessor generation) could easily understand wrongly the massive (and unfiltered) amounts of information received, therefore generating false alarms, beliefs and in some cases, even own welfare losses.

To do so, along this paper we propose the development of a pedagogical activity with a multi-methodological approach through which to carry out a qualitative (and cross-sectional) analysis in the degree of 'Business Administration and Management' of EDEM-Business School. Thus, the aforementioned activity would constitute a successful teaching innovation exercise as regards to the acquisition of the required competencies and learning outcomes established within the course, as well as to the achievement of a (attainable and consensual) solution to a real problem faced nowadays and selected by the students: in this case, the increase of awareness about the cervical cancer, a type of cancer that is currently the fourth most common among women worldwide and one of the easiest to prevent through screening tests.

KEYWORDS
monitor attitudes, awareness, strategic usage, social media, Twitter

RESUMEN

El presente estudio profundiza en el análisis de Twitter, una conocida red social de mensajería adquirida recientemente por Elon Musk por 44.000 millones de dólares, a través de la cual se consigue fácilmente monitorizar (e intentar resolver) el estado general de la población en función del tipo de usuario y contenido de los mensajes recibidos. Con este análisis, se pretende mostrar la posibilidad de difundir mensajes fiables, de forma inmediata y de calidad (que difícilmente se obtendrían a través de los canales oficiales de información), provocando así potencialmente un impacto exponencial a posteriori. Esta idea en particular es muy relevante, debido a que cualquier usuario promedio de las redes sociales y especialmente de la 'Generación Z' (los cuales poseen un 25% menos de capacidad de atención y verifican un 40% menos la fiabilidad de las fuentes consultadas que su generación anterior) podría fácilmente entender de forma errónea la ingente cantidad de información recibida (y sin filtrar), generando por tanto posibles falsas alarmas, creencias y, en algunos casos, incluso pérdidas propias de bienestar.

Para ello, a lo largo de este trabajo proponemos el desarrollo de una actividad pedagógica con un enfoque multimetodológico a través de la cual llevar a cabo un análisis cualitativo (y transversal) dentro del grado de 'Administración y Dirección de Empresas' de EDEM-Escuela de Empresarios. De esta forma, la actividad mencionada constituiría un ejercicio de éxito dentro de la innovación docente a la hora de adquirir las competencias requeridas y los resultados de aprendizaje establecidos dentro la asignatura, así como la consecución de una

solución (alcanzable y consensuada) a un problema real seleccionado por los estudiantes y al que se enfrentan en la actualidad: en este caso, el aumento de la concienciación sobre el cáncer de cuello de útero, un tipo de cáncer que actualmente es el cuarto más común entre las mujeres en todo el mundo y de los más fáciles de prevenir a través de exámenes de detección.

PALABRAS CLAVE
monitorizar actitudes, concienciación, uso estratégico, redes sociales, Twitter

INTRODUCTION

Social media usage among the public has previously been demonstrated to significantly increase in cases of natural disasters, crises, and crucial events (Niles et al., 2019). For instance, the online social media tracking program TalkWalker reported that COVID-19 was referenced on social media 40.2mn times (only) from May 12, 2020, to May 18, 2020 (i.e., in six days). At the same time, during these processes, there are also (logically) more scientific discoveries and progress. For instance, as of May 19, 2020 (only two months after the World Health Organization announced the novel coronavirus disease 2019 –COVID-19– could be characterized as a pandemic), there were more than 14k articles on COVID-19 available on PubMed, making it nearly impossible to keep up with the most recent literature.

For its part, social media has also been demonstrated to be an effective tool for knowledge translation by shortening the time from publication to dissemination and application of information. Besides, during a time when information changes so quickly, it is critical for providers to keep up to date with the evidence, and social media can particularly facilitate this task (with the aforementioned increase of its use) (Gottlieb & Dyer, 2020).

However, it is also important to consider some of the limitations of social media in this setting. One major consequence of the massive amount of information being shared via social media is the underlying difficulty with filtering information. Thus, as the immense volume of social media information rises, it becomes more difficult to identify factual and reliable information. Additionally, social media allow any average population user of it to have a significant influence on information spread due to their specific number of followers, type of post, etc. regardless of the accuracy of the information. Hence, this can lead to rapid spread of incorrect information and significant potential for harm.

And this is especially relevant in the case of today's university students: the *'Gen Z'* students, which are tremendously different from students of past generations. In fact, they have different values, worries, thoughts, way of learning, and even, a different brain structure due to their compulsive and constant use of mobile phones and screens (Hutton et al., 2020), yet another proof, in this case tremendously objective (and even somewhat worrying), of these differences. But who exactly belongs to this *'Gen Z'* group? According to Murad, et al. (2019) *'Gen Z'* encompasses the set of people born from 1998 to 2010, which is also known as the *'generation of technology'.* They started surfing the internet and the web

even before they had begun to speak and have been guided and encouraged by their parents to use social networking sites since childhood. In other words, the *'Gen Z'* grew in a world completely connected with technology from the very beginning. In fact, at the university level, professors realize that most of the current university students (who are part of such *'Gen Z'*) do not use anymore the basic book or manual of the subject as the main way to obtain knowledge of the course as the students of the beginning of the decade of 2000 and before did. Instead, they use tablets, computers, and smartphones to obtain information, interact and socialize (Hutton et al., 2020; Pinar-Pérez et al., 2021). Thus, in Spain, for example, 92% of such students have a profile on social networks, 89.9% have a mobile phone, 76% a laptop and 69% a tablet (Google, 2019).

This situation has provoked that the different techniques and methodologies currently used by professors, usually based on a more traditional or classical methodology (e.g., master lectures, repetition of concepts and memorization) are not fully effective, generating a gap between the learning method used and the students, often materialized through a lack of motivation, and therefore hindering their learning and attention capacity (Winquist & Carlson, 2014). This is especially worrying for *'Gen Z'* students' whose attention is already 25% lower than its predecessor generation. On top of that, we should add to this particularity that this generation also tends to trust more in the veracity of the information they receive, barely checking the reliability of it, and specifically, 40% less than their predecessor generation (Google, 2019).

PROPOSED PEDAGOGICAL ACTIVITY

Methodological approach

To try to solve the aforementioned problem related with the particular characteristics of the *'Gen Z'* students and its use of social media, in this paper it is intended to propose the utilization of a learning system based on the fundamental principles on which the Montessori method is based (Kramer, 1976, Montessori, 1995). This methodology, world-renowned[1], was developed by Maria Montessori at the turn of the 20th century, and first explained to every educator of the world by its first book *"Il Metodo della Pedagogia Scientifica applicato all' educazione infantile nelle Case dei Bambini"* (published in 1909). This educational philosophy and methodology which firstly (and even nowadays) seemed somewhat provocative, ended up being used worldwide for more than a century to the present day, usually educating children from 3 to 12 years old. The proposal of such methodology is tremendously simple, specifically arguing that the educators would need to make sure to merely provide three key aspects (Cossentino, 2005, Montessori 1995): 1. Using simple and concise contents; 2. That stimulate latter on the autonomous and individual learning; 3. In a very cared, well-prepared, and propitious environment to facilitate the learning process. Thus, our goal in this document is to propose the extension of the basic philosophy and underlying ideas of the Montessori method to the university classes, in order to improve the outcomes in terms of student motivation, but also engagement, maturity, and critical thinking (Fernández-Moya et al., 2020).

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[1] Likewise, it is important to state from the first moment that we are not Montessorian, which means that we simply offer an external vision of the Montessori education method with the aim of completely letting the reader develop its own opinion on this matter.

The present work tackles this aspect through the approach of a global pedagogical, motivating, and curricular activity based on these following aspects:

- The analysis of a social network.
  (at the completely choice of the students)
  In this case the chosen social network was Twitter, (possibly) due to its actuality and relevance thanks to the bought of the 9.2% of the firm by Elon Musk on April, 4th 2022, becoming the main shareholder of the company – Conger & Hirsch, 2022[2]–, just when the students had to make their final choice of the social network selected.
  Another point in favor of this social network was that most of its content is publicly available, which means that it would be accessible and analyzable (Moore, 2009), which would favor the development of this task.

- During a certain period of time.
  (at the choice of the students but no less than one month to avoid information bias)
  In this case during a 4-month period, from 1st December, 2021 to 31st Mach, 2022, that of course had to be prior to the development of the activity –in the second semester of the course 2021/2022– in order to be feasible and facilitate the work and analysis of students.

- To effectively analyze what happened in that social network regarding a specific event.
  (at the completely choice of the students)
  The chosen topic was 'the cervical cancer', that although at first, could be surprising by the origin of these students: 'Business Administration and Management' pupils, we base this choice on mainly four simple factors: 1. The cervical cancer is currently the fourth most common cancer among women and the easiest to prevent with regular screening tests; 2. During the decision period were included the 'Cervical health awareness month' (January), the 'World cancer day' (4th February), the 'International women's day' (8th March) and the 'Cervical cancer day' (26th March); 3. 'Gen Z' students are more focused on global issues that can improve the world they live in, in particular 60% of them share this mentality vs 39% of the prior generation ('Gen Y' or millennials) (Google, 2019); 4. The number of tweets about this topic was manageable with a total number of 510 (vs for instance, the previously mentioned 40.2mn of references to COVID-19 in only six days during May, 2020).

[2] *It is important to mention that Elon Musk, one of the world's richest men and owner of companies such as Tesla and SpaceX, eventually completed $44bn deal to own Twitter last October 27th, 2022. After months of waffling, lawsuits, verbal mudslinging and the near miss of a trial (that finally was not held) for trying unsuccessfully to wriggle out of the preliminary agreement, Mr. Musk bought Twitter (Conger & Hirsch, 2022).*

- Where all the groups composed by 5 students would work individually. *Sharing their progress in several work sessions established by the professor of the subject for this purpose (through different deliveries of preset assignments as we will explain in the next parapragh).*

Furthermore, following Mingers (1997)' insights, it is important to highlight that the present paper made use of a multi-methodological approach. With this, it was sought to obtain a superior learning outcome as a) not a single methodology can claim to be able to tackle a problem completely; and b) some methodologies may be more suitable than others to certain phases or parts of the problem, therefore complementing themselves (Mingers, 1997). As previously mentioned, according to prior literature the best way to learn is putting in practice what we know (Neck et al., 2014) and the most currently employed methodologies by teaching organizations (and companies) are those which organize the work *'by projects'* and that are *'agile'* (Ma & Morris, 2017). Consequently, both methodologies were applied in the activity we propose in this paper. With the first one, and thanks to the compartmentalization of work, it was achieved that the entire group geared towards reaching the same objective simultaneously (the development of the project materialized in deliveries/assignments). Meanwhile, with the second one, it was facilitated the response and adaptation of the team to the continuous changes and problems raised in a real organization/their own team (with the feedback obtained by the professor and reflections made by other teams in public).

It is worth mentioning that this combination of methodologies, despite being innovative, is not new, and has been already used previously in other environments, mainly in those related to software development (Nidagundi & Novickis, 2017).

Participants

This activity was deployed during the course 2021/2022 in the subject 'Introduction to Business Management Studies' (identification number: 36260), which is a compulsory training subject, taught during the second semester of the first year of the degree in 'Business Administration and Management' of EDEM-Business School[3] in Valencia (Spain). The subject is affiliated to the 'Business Administration and Strategy Department' and consists of a total of 6 ECTS[4], distributed in 30 sessions of 1 hour and 45 minutes each.

The activity reached a global number of 45 students. The pool of students of this subject was divided into 5-6 individuals' teams, generating a total of eight teams. When configuring the teams, only two baseline criterion was followed: 1.

[3] EDEM-Business School is a Spanish academic institution founded in 2002 under the auspices of the Valencian Business Association and with the main premise of providing the business sector of the Valencian region with a business school promoted by and aimed at the companies themselves. Currently, the institution is affiliated with the major public universities of the area: the University of Valencia and the Polytechnic University of Valencia; and has an education offering of 50 programs including pre-university, university, and senior management training. Likewise, EDEM-Business School has a total of 3,000 students each year and has the collaboration of more than 500 professors and researchers in its classrooms.

[4] ECTS is the acronym corresponding to the European Credit Transfer System and is the system adopted by all the universities of the European Higher Education Area (EHEA) to guarantee the homogeneity and quality of the studies they offer.

Teams were fully and randomly designed by the professor, therefore, not considering any student request; and 2. To form them, only one factor was considered: the maintenance of the heterogeneity among the members of all the different teams. Consequently, it was assured that gender and academic record was represented similarly and homogeneously in all groups.

General structure of the activity

- On the first day of this activity (coinciding with the first day of teaching this subject in February, 2022), there was a brief initial presentation of it, the general goals to be achieved were detailed (see 'Main objectives of the activity' below), the calendar of the deliverables was determined and teams were made known.
- Two months later, in April, 2022, with time and information enough proportioned by the professor in its classes, students voted the different proposals about their preferred social network and topic (that would be analyzed later on by all the groups).
- From this moment and until the end of the activity students worked autonomously in teams following the aforementioned calendar in order to develop their own progress and deliveries (through the corresponding assignments).
- To prevent students from giving up their efforts when they did not achieve the required progress in a particular assignment, after those deliveries, the professor of the subject publicly provided to all teams some tips and reflections on the contents already acquired in the subject and the desirable outputs within the different assignments. Thus, the students were able to know the correct development that was expected from them. Similarly, some teams were asked to discuss about their work and progress in their projects with the aim of serving as an example for the rest of the teams.
- On the last day scheduled, and to end the activity, each team publicly presented its work and conclusions, which was evaluated by their peers and a committee of experts in that matter. This grade accounted for 50% of the final grade of the continuous assessment of the subject (2 points of the total mark of the subject); meanwhile, the timely and adequate delivery of the different deliverables accounted for the other 50% (another 2 points of the total mark of the subject).

Main objectives of the activity

In line with the aspects raised above, the specific objectives proposed by this activity may be summarized as follows:

1. Students should be able to analyse and identify the existing differences among the messages received. Thus, not all messages will be equal/have the same effect on whoever reads them, with interesting differences between the *type of author* (e.g., it does not seem to hold the same credibility a well-recognized doctor than an average social media population user) and the *type of content* (e.g., it does not seem to hold the same effect a personal message wrapped in the warmth of a personal story than a generic, cold and simple awareness message).

2. Students should be able to criticize their work based on sample selection bias such as problems related with the time period selected, language analyzed, range of the analysis, coding of information (due to the existence of different team members and opinions), etc., therefore limiting the generalization of the results.
3. Students should be able to be aware that their work was a little bit "superficial", as they could delve into the origin of the problem analyzed and not merely remaining its analysis in identifying who speaks or how much about the selected problem.
4. Students should awaken their critical spirit when it comes the time to believe a piece of information received by a third party, similarly proposing different alternatives to improve the reliability (and check) of the message/source by social networks. This point would be of key importance due to the particular characteristics previously mentioned of such *'Gen Z'* pupils (25% lower attention capacity and 40% lower check of the reliability of sources than its predecessor generation).

Moreover, with this activity there were implemented the required competences of the subject (e.g., ability to use information and communication technologies (ICTs), ability to work in teams, ability in personal relationships, self-learning ability, ability to adapt to new situations, motivation for quality, or ability to contribute positively to the awareness of environmental and social issues), as well as its learning outcomes established (e.g., knowledge of the instruments of access to information, knowledge of the bibliographic services, knowledge of study techniques and personal work, or action respectful with human rights and in accordance with democratic principles, equality between men and women, solidarity, environmental protection, universal accessibility and design, and promotion of the culture of peace).

LITERATURE REVIEW

Social media, its massive use, and its potential effect on attitudes

Social media –commonly defined as a space to share ideas, opinions and information– (Chou et al., 2009) is used by billions of people around the world and has quickly become one of the key technologies of our time. Globally, the total number of social media users is estimated to grow to 3.29bn users in 2022, which would represent around 45% of the current world's population (eMarketer, 2018). Given the huge potential audience available who spend many hours a day using social media through their electronic devices (for instance, in the case of *'Gen Z'*, they check their smartphones at least 5 times per hour, and 7 out of 10 do it every 2 minutes – Google, 2019), marketers have embraced social media as a marketing channel to advertise their products by offering advertising services to anyone wishing to reach those audiences with digital content. Academically, social media has been embraced through many lenses, being the online word of mouth (WOM) one of the most relevant ones, with the aim of assessing the potential effect of social media on consumer behavior and sales.

Prior literature shows on average, a positive correlation between online WOM and sales (for instance, see the meta-analysis developed by Babić Rosario et al., 2016). Similarly, Trusov, Bucklin and Pauwels (2009) and Stephen and Galak

(2012) demonstrated that certain kinds of social interactions that now happen on social media such as “referring a friend” in online discussions/communities can similarly and positively provoke new customer acquisitions and sales. However, this effect will not be the same depending on the *type of author* and the *type of content* (Appel et al., 2020). Thus, some individuals or organizations (*type of authors*) are often seen as credible “experts” in what they post about, encouraging others to want to view the content they create and engage with them (Chang et al. 2019). Regarding the *type of content*, user-generated-content, also understood as someone’s personal experience, is on average 35% more memorable and 50% more trusted than other type of information (Appel et al., 2020), as this information via first person narration is considered to be “warmer” and more personal, and it is shown to be way more effective in engaging consumers (Chang et al. 2019). To understand this idea, we will put the example of the use of celebrities to influence others as a well-known marketing strategy (Knoll & Matthes 2017). For example, Selena Gomez has over 144mn followers on Instagram. Thus, in 2018, the exposure of a photo shared by her was valued at $3.4mn and a single post $0.8mn (Maxim, 2018).

However, putting high expectations on mere online exposures/collection of *likes* can be somewhat speculative, as academic research shows that acquiring *likes* on social media might have no effect on consumers’ attitudes if the message does not reach the sensitivity of the receiver, thus becoming a cold, distant and unconvincing message (John et al. 2017), even though it comes from a celebrity. Nonetheless, some individuals, without having the massive number of followers (and “foreseeable impact”) as celebrities, can be considered more trustworthy and authentic than them, better affecting consumers attitudes and behavior (Enberg, 2018).

As Appel et al. (2020) suggest, social media as a technology is interesting, but it is how people use social media and the associated attitudes generated what is ultimately of relevance to marketing academics and practitioners. Thus, in this document we will try to delve into this topic with the aim of considering the behaviors associated with those technologies and platforms.

How to strategically make the most of social media: a health example

Social media has become for a great part of the population the primary arena in which they receive massive (and unfiltered) amounts of information and share content and aspects of their lives with others, even though that information might be of questionable accuracy. As can be imagined, this aspect becomes even more important and strategic when we talk about health issues (as the one selected by the students in the activity proposed) due to its potential and relevant repercussions on the well-being of the population. In fact, as stated by Riyal and Lapinski (2009), attainable, quick, and credible health information is critical for improving public health outcomes, preventing illness, or helping people to take action during critical situations such as an outbreak (e.g., we might think about highly virulent viruses that affected a large part of the population such as the recent COVID-19 (Zhang & Cozma, 2022)). In this way, social media are seen as key tools to elaborate suitable high-quality contents and help in this informative and communicative process (McNab, 2009), approaching public health information to many more people (i.e., to a greater number of potential patients), more quickly and directly than at any time in the recent history. Instant and

borderless, it elevates electronic communication to a *face-to-face* interaction. Nevertheless, until recently, the predominant communication model had been *one authority-many receptors* –i.e., a health institution communicating to the general public–. Thereby, social media has totally changed the communication process from “monologue” to “dialogue”, where anyone with ICT access (e.g., through mobile phones, computers, tablets, e-watches, etc.) can be either a content creator or a communicator. Consequently, regarding the health area, social media can act as a priceless tool in different ways:

- Firstly, distributing preventive treatment information. An example of this includes Dr. Esther Choo (113k followers), Dr. Megan Ranney (36k followers) or many other “anonymous” organizations, experts or professionalas who have repeatedly utilized Twitter to increase awareness of health care crises and public health needs.
- Secondly, detecting, treating and responding health related messages to the population in real time.
- And thirdly, helping health organizations and professionals to propagate accurate and precise information (in contrast to the misinformation or false beliefs that the general population could have and, therefore, sharing information that was traditionally relegated to medical journals and hospital video sessions) (Xu et al., 2016).

In the literature there is a growing body of research on health information and social media, however nearly all is focused on how it can be used by advertisers and publicists to capture new consumers. Much more needs to be known and shared about what is the best (or least bad) use of social media to achieve desired public health outcomes. For that, research focused on daily-basis use of social networks and "learning by doing" experiences are vital (McNab, 2009).

Twitter: the selected social media

The mere availability of technology or institutional predisposition is not sufficient to be successful (McNab, 2009). Conversely, to warrantee the correct deploy of social media on the health area some simple, suitable, and accessible tools will be needed (McNab, 2009). An example of it is Twitter, the tool eventually selected by the students to analyze the impact of social media on people’s attitudes and behaviors.

Twitter is a public forum where users follow worldwide real-time information through short and concise messages (no longer than 140 characters) and with an account range from personal to organizational (Thackeray et al., 2013). Most of Twitter content is estimated to be publicly available (i.e., can be accessible and analyzed, which would favor the development of this activity) (Moore, 2009). Moreover, for the sake of follow up all the terms and distinctive issues of this tool, next we will define some vocabulary and terminology (see Table 1 below):

Table 1. Twitter terminology

• TWEET	A Twitter update, that may contain photos, videos, links and up to 140 characters of text.
• RETWEET (RT)	A *retweet* (RT) is added to a *tweet* to indicate that it includes text from another person's *tweet*, optionally adding original content. Often used to pass along news or other valuable discoveries on Twitter. *Retweets* always retain original attribution.
• HASHTAG	Any word or phrase immediately preceded by the # *symbol*. When a user clicks on a *hashtag*, he will see other *tweets* containing the same keyword or topic.
• LIKE	Liking a *tweet* indicates that the user appreciates it.
• FOLLOWER	Another Twitter user who has followed you to receive your *tweets* in their Home stream.

Source: Prepared by the authors based on corporate information provided by the firm: https://support.twitter.com/articles/166337

Its use is all spread around the world being, for example, the second most popular US social networking site (behind Facebook). Among its different utilities we might define Twitter as a potential useful source of information to better spread health-related information and to promote both positive and negative/inappropriate health behaviors (Prier et al., 2011) (e.g., users can follow health conferences, a developing health story, search for information or share web links instantly from their mobile devices). Therefore, numerous organizations and health care campaigns use Twitter as a way to promote health and education.

Several studies support the effectiveness and utility of them, highlighting that about one third of health consumers identified this social media as a natural habitat for health discussions (Health Research Institute, 2012) and that 26% of Twitter users have read or watched someone else's experience of health issues over the past twelve months (Fox & Jones, 2009). In the same vein, physicians are highly engaged with online networks and with this social media in particular (Fox & Jones, 2009). Indeed, nearly 90% of them use at least one site for personal use, and over 65% for professional purposes (Modahl, Tompsett & Moorhead, 2011). Consequently, it seems that the two main characters of this story will easily favor its communication.

Cervical cancer: the selected topic

As previously mentioned, the chosen topic to analyze by the class through Twitter was the cervical cancer. Some potential reasons of this selection were previously depicted such as: 1. Being one of the deadliest cancers and, at the same time, the easiest to prevent; 2. Being relevant along many days during the selection period of the topic to be analyzed; 3. The different mentality of *'Gen Z'* students, which are more focused on global issues that can improve the world they live in; 4. The manageable number of *tweets* to analyze ("only" 510).

In any case, cancer is considered by the World Health Organization (WHO) as one of the most deadly illness. However, among all different types of cancer, cervical cancer (in the case of females) is the easiest cancer to prevent with regular screening tests and follow-up. Consequently, it is the only gynecologic cancer for which population-based routine screening is recommended worldwile. Unfortunately, cervical cancer is the fourth most common cancer among women and each year an estimated number of 527,624 new cases of cervical cancer are

diagnosed in all the world (Bruni et al., 2014; Lapointe, Ramaprasad & Vedel, 2014).

The screening test to prevent cervical cancer is usually called *Pap test* or *Pap smear*, is performed by the gynecologist or midwife, and is recommended for all women between 21 and 65 years of age (although these screening recommendation varies between countries and clinical guidelines) (Centres of Disease of Control, 2016). Regardless its effectiveness and proved utility, there have been described several barriers to access to this screening. The most important is the lack of awareness of the importance of screening (Sudenga et al., 2013). Here, several studies show a significant low level of knowledge about cervical cancer and its early detection with *Pap smear* in a large percentage of women around the world, either in developed or undeveloped countries (Abiodun, et al., 2013; Basu, et al., 2014; Dhendup & Tshering, 2014) (other reasons, although less majority and more difficult to solve, also include inadequate access to health services, lack of funding and insufficient use by health professionals (Aswathy et al., 2012; Were, Nyaberi & Buziba, 2011). And it is that the lack of knowledge of the population reaches up to not knowing the really purpose of a *Pap test*, actually believing that it screens for multiple gynecologic cancers or sexually transmitted diseases (which may possibly hinder the perception of risk compared with other type of cancer such as for instance, breast cancer). Psychological aspects play a big role too as an example of lack of awareness, being placed as relevant barriers due to the shame itself of the screening, the fear of the procedure itself, the fear of discovering cancer, or the fear of being treated by a professional male (Augusto et al., 2013; Basu, et al., 2014; Learmonth, De Abreu & Horsfall, 2013).

Likewise, it is important to underline that only a few studies have analyzed Twitter content into a health-related topic and even less have pinpointed cervical cancer, which opens an opportunity for our study (Lyles, et al., 2013; Lyles, et al., 2016; Thackeray et al., 2013).

METHODOLOGY

It is worth mentioning that this paper, despite following the scientific methodology, intends to adopt an experimental and applied approach with the objective of serving as a guide for universities and educators in the implementation of different transformational tools in educational processes. Thus, in particular, following the instructions of the deliverables and contents already acquired in the subject, the students conducted a cross-sectional qualitative analysis to explore supportive or stigmatizing attitudes (and similarly, potential awareness) throughout Twitter toward the cervical cancer´s screening: the *Pap smear*. To do so, the students gathered and stored English-language messages (*tweets*) from such social network site during a 4-month period from 1st December, 2021 to 31st Mach, 2022.

Tweets were collected using two search terms: #*papsmear* and #*papsmears*, the most common way to refer to this preventive screening test. To do so, students applied content analysis to the publicly available Twitter webpage using the website: www.twitter.com. Besides, following some prior research, *tweets* were categorized in two different and independent categories (Lyles, et al., 2013; Thackeray et al., 2013): 1. *type of author* and 2. *type of content*, that at the same

time were carefully analyzed with the aim of identifying potential relationships with the low awareness obtained about a disease (and test) as deadly and "easy to prevent" as cervical cancer:

- The first one concerned the *type of author* who published the *tweet*, differentiating between *'individuals' (1.1.)*, *'health professionals' (1.2.)*, *'organizations' (1.3.)* and *'verified accounts' (1.4.)* (Twitter establishes the authenticity of the identity of some relevant accounts related with several areas of key interest such as music, acting, fashion, government, politics, religion, journalism, media, sports, business, etc.).
  To classify the *type of author* of the *tweet*, the students centered their attention on the user name, the description of the profile and the photograph of each account (if necessary). A user was mostly identified as an *'organization' (1.3.)* whether its user name or profile description included one or more of the following keywords as indicated by prior research (Lyles, et al., 2013; Thackeray et al., 2013): 'foundation', 'organization', 'firm', 'company', 'committee', 'department', 'office', 'agency', 'clinic', 'labs woman', 'country', 'government', 'society', 'politics', 'cancer', 'care', 'cervical', 'cure', 'feminine', 'women', 'fertility', 'health', 'medical', 'medicine', 'news', 'nursing', 'ob/gyn', and 'reproductive'. As for *'health professionals' (1.2.)*, students mainly looked for the following words: 'Dr', 'doctor', 'physician', 'gynecologist', 'health promotion worker', 'nurse', 'midwife', 'pathologist' and 'PhD' (Lyles, et al., 2013; Thackeray et al., 2013). Eventually, the authors were categorized as *'individuals' (1.1.)* whether above keywords did not appear on their description and were not marked as Twitter verified accounts (Lyles, et al., 2013; Thackeray et al., 2013). In case the latter occurs, these authors were coded as *'verified accounts' (1.4.)* (Lyles, et al., 2013; Thackeray et al., 2013).
- The second one was referred to the *type of content* of such *tweets* (regardless of who was the author of them), distinguishing between *'personal experience'* with the *Pap smear (2.1.)*, *'awareness promotion' (2.2.)*, *'research findings' (2.3.)* and *'advertising' (2.4.)* (Lyles, et al., 2013; Thackeray et al., 2013). Furthermore, within the *'personal experience'* section students delved a little deeper and also discerned among the specific content of the *tweet*: *'positive' (2.1.A.)*, *'negative' (2.1.B.)*, *'neutral' (2.1.C.)*, *'ironic or sarcastic' (2.1.D.)*, if requesting information (*'queries'*) *(2.1.E.)* or focused on comments about *'government cuts'* to the screening test *(2.1.F.)* (Lyles, et al., 2013; Thackeray et al., 2013).

In the first case (*type of author*), *tweets* were classified by only one category at the same time (i.e., items were exclusive on one another and the total sum was always 100%). However, in the second case (*type of content*), as we did not want students to bound their results, *tweets* were able to be classified by diverse categories at the same time (i.e., items were not exclusive on one another and the total sum was able to be more than 100%). To do so, *tweets* were compiled in an Excel spreadsheet (one per group) to directly compare and establish its categorization across coders (in this case, the members of each group). Discrepancies were resolved internally by regular meetings and discussion among them. Similarly, areas of ambiguity were discussed and agreed upon by

consensus. However, as mentioned before, the professor of the subject publicly provided to all teams some tips and reflections on this matter, discussing some examples, and guiding therefore the students towards the achievement of a right analysis.

Eventually, students also kept record for these *tweets* regarding the number of *retweets* and *likes* obtained both for the *type of author* and for the *type of content*.

RESULTS

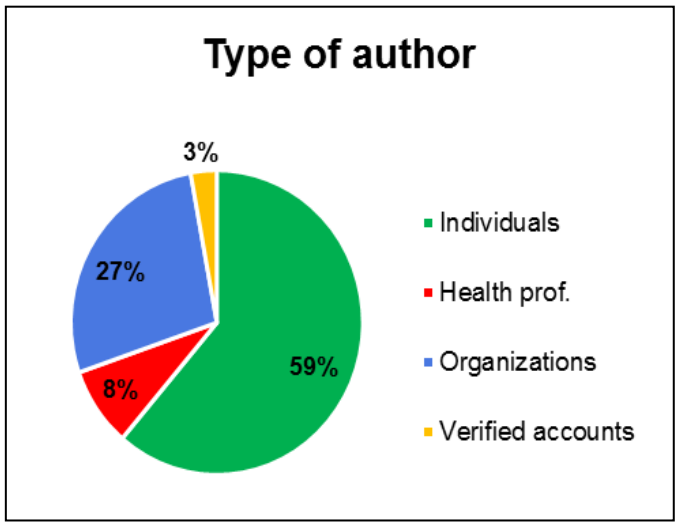
As can be imagined, a total of eight different solutions were presented (as many as teams) and publicly defended by the students. However, in this section the desirable results that each group should have obtained if they had followed the recommendations and instructions of the professor/activity to the letter will be presented.

Type of author and type of content

A total of 510 *tweets* should have been coded: 241 for *#papsmear* and 269 for *#papsmears.* However, 10 *tweets* should have been discarded for not being related to cervical cancer prevention or for being spam *tweets* (even though, of course, they contained the hashtags *#papsmear* or *#papsmears* –and that is why they were part of the sample–). Again, this particular circumstance was a good test and learning outcome for such *'Gen Z'* pupils, which hold 25% lower attention capacity and 40% lower check of the reliability of sources than its predecessor generation.

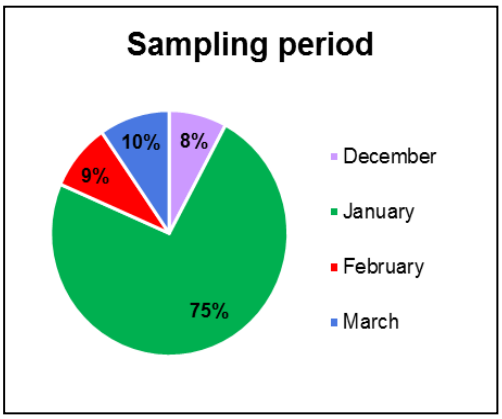
Most *tweets* should have come from *'individual'* accounts (59%), followed by *'organizations'* (27%), *'health professionals'* (8%) and *'verified accounts'* (3%). Moreover, the most tweeting month should have been January (75%), established as the 'Cervical health awareness month/cervical cancer awareness month' (see Figure 1 below).

Figure 1. Type of author distribution and extra sample characteristics

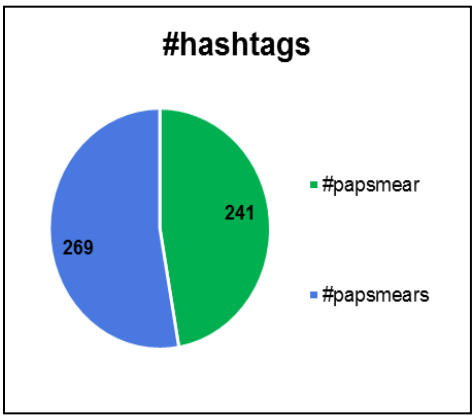


Source: Prepared by the authors. Note that *tweets* were able to be classified by only one category at the same time based on its *type of*

author (i.e., items were exclusive on one another and the total sum was always 100% – however, as the total initial number of *tweets* was 510 but unfortunately 10 were discarded, this sum of *tweets* was lower than 510, and therefore the percentage of it too: in particular, 97% instead of 100%).



Source: Prepared by the authors.

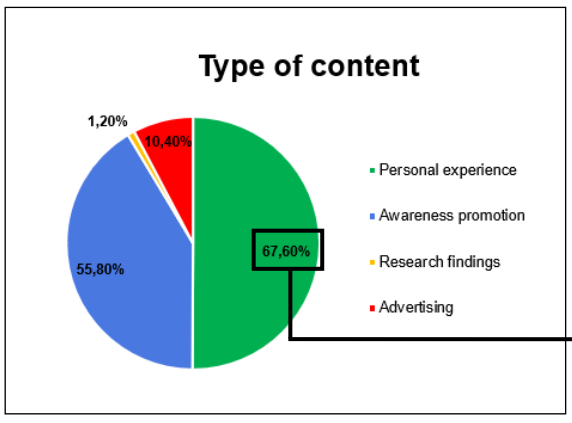


Source: Prepared by the authors.

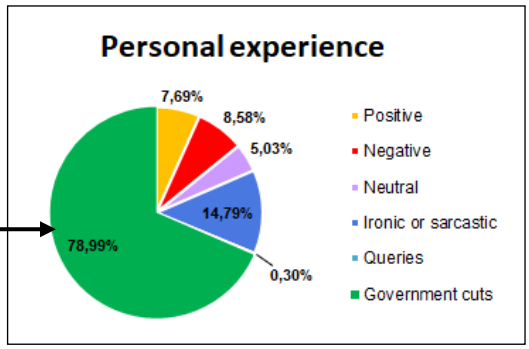
In the second place, according to the content of the message, 67.60% should have been related to *'personal experience'*, 55.80% to *'awareness promotion'*, 10.40% to *'advertising'* and 1.20% to *'research findings'* (for a deeper information of the specific number of *tweets* received per each category and even examples of each of them, see Table 2 below, which was proportioned to all teams after the corresponding assignment with the aim of achieving a correct follow-up by all of them –and similarly avoid them to give up or be left off the hook–).

Digging into these results, students should have also found that among *'personal experience' tweets*, 78.99% were comments or critiques about *'government cuts'* to the screening test. On the other hand, 14.79% of the messages were *'ironic or sarcastic'*, whereas 8.58% and 7.69% of the *tweets* got a *'negative'* and a *'positive'* insight correspondingly. Meanwhile, lowest percentages were hold by *'neutral'* messages, 5.03%, and *'queries'*, 0.3% (see Figure 2 below).

Figure 2. Type of content distribution



Source: Prepared by the authors.



Source: Prepared by the authors.

Table 2. Type of content: definition of categories, number and percentage of the tweets received per category, and examples

Type of content	Definition	Number of *tweets*	%	Examples
• PERSONAL EXPERIENCE	Describes personal experience or view with the screening	339	67,60%	
✓ 'Positive'	Indicates a positive attitude towards *Pap smear*	26	7,69%	○ "I was part of the Jade effect and it saved my life *#cervicalcancer #papsmear*" ○ "I got no less than 3 pieces of *#mail* today from *#SeattleV.A*. My (normal) *#PapSmear* results were printed on official federal letterhead! :-D"
✓ 'Negative'	Indicates a negative attitude towards *Pap smear*	30	8,58%	○ "I hate when u go 2 the dr. 4 something like say an earache & 1st thing they say is we need 2 do a *#papsmear* wtf?!" ○ "Just had my first ever *#papsmear*... I deserve some @RedMango for this torture 😫 😫 😫 "
✓ 'Neutral'	Indicates a neutral attitude towards *Pap smear*	18	5,03%	○ "So I stared at this while waiting for a *#papsmear #endocrine #testicles* @ Evergreen Primary Care PC https://www.instagram.com/p/BDV1OsNiuyd/" ○ "Pls kindly *retweets* my posts on *#papsmear* screening. Thank you @doctorjulz"
✓ 'Ironic or sarcastic'	Describes personal experience with humorous phrases or emoticons	51	14,79%	○ "*#ThatAwkwardMoment* when your *#fatherinlaw* finds out you went to the *#obgyn* & wants to know if we have *#goodnews #no #papsmear #italians*" ○ "Getting ready for the gynecologist feels like getting ready for a *#Tinderdate*. *#papsmear #prettypussy #snatchchat*"

✓ 'Queries'	Asking for information or explanation about the screening	1	0,30%	○ "*#cytopathology #papsmear #gynaecpath* What is the significance of foamy histiocytes in *Pap smear*? *#pathology*"
✓ 'Government cuts'	Express a disagreement with a cut in government regarding the *Pap smear*	226	78,99%	○ "*Pap smears* & pathology tests must stay free of charge *#papsmears*" ○ "How many times will we need to say *#papsmears* on *#qanda* this year to get government to stop messing with women's health?"
• AWARENESS PROMOTION	Promotes awareness of the screening	280	55,80%	○ "A *#PapSmear* is vital for detecting *#STIs #STDs* and *#CervicalCancer*! Learn more: http://bit.ly/1LarWtx" ○ "You could have cervical cancer and not know it *#CervicalCancerAwareness* Know the basics *#papsmear* http://goo.gl/RWB2EN"
• RESEARCH FINDINGS	Describes the outcomes of a research study	6	1,20%	○ "Study shows use of two screening tests catches more *#CervicalCancer*" (@HoustonChron) http://ow.ly/Zt3fl *#HPV #SmearTest #PapSmear*" ○ "Research shows women that experience #domesticviolence are at risk of higher rates of *#papsmear* abnormalities"
• ADVERTISING	Advertises a product or service for sale	52	10,40%	○ "Get your #papsmear and *#hpvtest* at CHS today! Let's lower this rate!" ○ "Want to know more about what a *#PapSmear* is? Call us at (973) 291-2052 to schedule a check-up to find out! *#OBGYN #NJ*"

Source: Prepared by the authors. Note that unlike what happened with the *type of author*, *tweets* were able to be classified by diverse categories at the same time based on its *type of content* (i.e., items were not exclusive on one another and the total sum was able to be higher than 100%).
Note that the exact same explanation may be applied for the subcategories of *'personal experience'* (i.e., items were not exclusive on one another and the total sum was able to be higher than 100%).

Retweets and likes

In terms of *retweets* and *likes*, *'individuals'* should have received around 55% of them, followed by *'health professionals'*, *'organizations'* and Twitter *'verified accounts'*, with around 15% each of them (similar to the 59% for *'individuals'*, 27% for *'organizations'*, 8% for *'health professionals'* and 3% for *'verified accounts'* described in general before for the 510 *tweets* analyzed).

Regarding the *type of content* obtained, students again should have described similar outcomes either for *retweets* or *likes*, where around 80% should have been *'personal experience'*, 40% *'awareness promotion'*, 0% *'advertising'* and 1% *'research findings'* (quite similar to the 67.60% for *'personal experience'*, 55.80% for *'awareness promotion'*, 10.40% for *'advertising'* and 1.20% for *'research findings'* pinpointed in general before for the 510 *tweets* analyzed).

Again, digging into the results, students should have also found that among *'personal experience' tweets,* all of them –i.e., 100%–, should have been comments about *'government cuts'* to the screening test (similar to the 78.99% pinpointed in general before for the 510 *tweets* analyzed).

It is important to highlight that depending on the number of those *retweets* and *likes* it would be possible to capture and predict the "snowball effect"/impact that such *tweets* would have. Hence, students should have reached the conclusion that both, *retweets* and *likes,* show a very similar behavior as the global 510 *tweets* analyzed before, therefore following the same pattern (and so, they could not do anything other than extrapolate the same conclusions).

However, before doing this analysis, students could have perfectly thought that *'organizations'* or *'health professionals'* accounts would be more relevant (having more *retweets* and *likes*) than *'individuals'*. Nothing further from reality, as *'individuals'* present 55% of them versus 15% of *'health professionals'* and *'organizations'* (as we mentioned in the paragraph above), therefore following a very similar behavior –and conclusions– as the one obtained for the global 510 *tweets*.

DISCUSSION

The pedagogical activity presented in this paper and developed in the framework of the degree in 'Business Administration and Management' of EDEM-Business School, constituted a successful teaching innovation exercise as regards to the acquisition of the required competences and learning outcomes established within the subject, but also to the generation of an adequate practical and teamwork environment. Hence, throughout this activity students made use of both their goal-orientation and synthesis skills in an integrated way with the main objective of reaching a feasible and consensual solution that answered a real problem faced by them and its generation. With this, it was possible to approach the students –in a controlled and guided environment– to the business world where they will definitely be required to develop innovative and analytical ideas either internally (intrapreneurship) or externally (entrepreneurship) in order to improve the performance of their companies.

Moreover, due to the topicality of the areas covered and their free selection of them, it is noteworthy that participants showed a high motivation, involvement,

and proactivity at all times that, in fact, was key for a correct development of the project. And this has not been achieved by chance, but as a consequence of the application of the non-traditional schooling approach of the Montessori method, easily materialized and combined through the previously mentioned *'by projects'* and *'agile'* methodologies.

Hence, it would be easy to identify that this activity would not follow the traditional or classical methodology (e.g., using master lectures, repetition of concepts and memorization) but a totally different one, applying the precepts introduced by the aforementioned Montessori methodology to achieve an adequate intrinsic motivation and fit with the *'Gen Z'* students: 1. Using simple and concise explanations of the contents and assignments to deliver (and therefore adapting them to the characteristics of these students: with 25% lower attention capacity and 40% lower check of the reliability of sources than its predecessor generation); 2. That stimulate latter on the autonomous and individual learning of the group (by individually applying the concepts and tips previously provided by the professor in class and by valuing this continuous work in the same way as the final output obtained by the groups –2 points each one of the final grade of the subject–); 3. In an environment that is created conscientiously to generate such proper intrinsic motivation and implication in the student and its learning process (by dividing the students in homogeneous groups that had to work in stages, where they had to deliver a series of assignments, and where the professor made sure that no team was left off the hook, therefore generating wrap-up sessions and providing tips and reflections about the desirable outputs in each of those assignments).

In this way, it is relevant to determine that in this activity, and due to its multiple benefits, it was applied a multi-methodological approach to all tasks and activities proposed.

Regarding the objectives proposed for the activity, we may establish that the four of them were successfully achieved. However, in order to facilitate its comprehension and understanding, we will individually define each of them, jointly providing its corresponding discussion.

Objective 1. Students should be able to analyze and identify the existing differences among the messages received

It should be noted that this objective will be the one dealt with greater depth since it is about analytically evaluating all the *tweets* selected in the sample, as well as drawing conclusions about the use of social networks (differentiating between the *type of author* and *type of content* of the *tweets*) within a specific problem selected by the students: the cervical cancer (and the apparently low awareness obtained among population despite its "easiness" to be prevented).

In this way, students should have shown the scarce interaction of *'health professionals'* and *'organizations'* (with only 8% and 27% of representativeness respectively), suggesting a potential change on their participation due to the relevant effect they have on implementing and disseminating reliable, immediate, informative, prevention, screening, and treatment messages to the general public through Twitter. Hence, this trustworthy and accurate information would more easily arrive and penetrate within *'individuals'* (the most participative collective on Twitter and primary objective of prevention health policies) who would increase the outreach of the *tweets* or messages (and therefore its impact) with their

queries, testimonies, irony, commentaries, etc. (noting that these actors hold around 59% of representativeness and 55% of all *retweets* and *likes* in the sample). As a result, an impersonal, distant, and "cold" message (but importantly: reliable) would become closer, more personal, and "warm" through information about *'personal experiences'* (which represents 67.60% within the whole group *type of content vs* 55.80% of *'awareness promotion'*, 10.40% of *'advertising'* and 1.20% of *'research findings'*).

Consequently, students should have recommended obtaining more messages from *'health professionals'* and *'organizations'*, the actors that generate the most reliable and precise information (and that, in turn, may help more to promote cervical cancer awareness); which, of course, later on would increase exponentially thanks to the *retweets* and *likes* of the *'individuals'* through its *'personal experience' tweets*. In other words, these former actors would therefore have more impact in the society (that is, more related messages, *retweets* and *likes*) if they were more involved (that is, increasing their number of *tweets*), offering a greater amount of interactivity/comments/implication with truthful, quality, and useful information in order to serve as social agents and positively influence the knowledge and awareness of the general population.

However, students should have also stated that with this categorical conjecture they were inadvertently making a possibly incorrect assumption: since there were more messages from *'individuals'* (59%) and more *'personal experience' tweets* (67.60%), it could be considered that these users would mainly generate this *type of content*. For its part, as there were less messages from *'health professionals'* and *'organizations'* (8% and 27%) and less *'awareness' tweets* (55.80%), it could also be assumed that these users would mainly generate this *type of content*. All this is true (in part), but students would be surprised (and more capable of making accurate assumptions –together with the achievement of a better grade in the activity–) if they had analyzed in more detail the relationship that exists between the *type of author* and the *type of content*. It is presented in detail in Table 3 (see below, which again it was also proportioned to all teams after the corresponding assignment with the aim of achieving a correct follow-up by all of them –and similarly avoid them to give up or be left off the hook–):

- Thus, with this information underneath, students should have more precisely encouraged now *'health professionals'* and *'organizations'* to *tweet* more, as they mainly generate *'awareness' tweets:* around 80% (*vs* 42% of the *'individuals').* Nothing different from prior hypothesis.
- However, students should have also found out that surprisingly, these authors were similarly able to convert such impersonal, distant, and "cold" messages (but importantly: reliable) into closer, more personal, and "warm" ones through *'personal experiences' tweets,* as they also represent 24% and 40% of their messages (*vs* 85% in the *'individuals').* Therefore, encouraging *'health professionals'* and *'organizations'* to *tweet* more would not mean a drastic reduction in such type of "transformative" and "warm" messages, as they would similarly be "substantially" represented; something beneficial for the aforementioned purpose of improving the

awareness about this deadly disease and, therefore, something that it would be important to "keep".

- Likewise, students should have either stated something that was previously unknown: that indeed *'individuals'* generated 85% of *'personal experiences' tweets* (and also, 42% of *'awareness'* ones). Again, this would be positive for the purpose of disseminating the awareness and reliable messages about this illness, as it would mean that reducing the proportion of *tweets* of these authors (*'individuals'*) –as the final aim would be to encourage *'health professionals'* and *'organizations'* to proportionally *tweet* more– would not drop too low such close, "warm" and convincing communications, as they would also be represented with a high proportion through these authors.
- With information of Table 3, students should have similarly suggested to advise *'health professionals'* and *'organizations'* to reduce their *'advertising'* messages, which could generate "noise" and a lack of confidence in their *tweets*, since they present a high 24% and 25% (*vs* only 1.4% in the *'individuals'*). Likewise, they should have determined that if this action was not taken and this type of messages increased a lot in the future (currently they represent a not worrying 10.40%), it would probably produce a "lack of attention and interest" on its content, which would "hinder" our purpose of increasing public awareness through these reliable accounts.
- Regarding *'verified accounts'*, as they hold such a low percentage of the total messages (currently they represent just a 3%), students should have indicated that the behavior of this *type of authors* would not matter that much. However, as this distinction is used by Twitter to establish the authenticity of the identity of some relevant accounts, students should have also highlighted the missed opportunity for *organizations'* and *'health professionals'* in order to launch (even more) reliable messages to the population, affecting (even more) its behavior and attitudes due to such discernment.

Table 3. Type of author and type of content: where does each tweet come from?

		Type of author			
		Individuals *(59% of the total)*	**Health professionals** *(8% of the total)*	**Organizations** *(27% of the total)*	**Verified accounts** *(3% of the total)*
Type of content	**Personal experience** *(67.60% of the total)*	**85%**	24%	40%	**93%**
	Awareness promotion *(55.80% of the total)*	42%	**83%**	**80%**	28%
	Research findings *(1.20% of the total)*	0,7%	5%	2%	0%
	Advertising *(10.40% of the total)*	1.4%	24%	25%	7%

Source: Prepared by the authors. Again, note that *tweets* were able to be classified by diverse categories at the same time based on its *type of content* (i.e., items were not exclusive on one another and the total sum was able to be more than 100%). For its part, *tweets* were able to be classified by only one category at the same time based on its *type of author* (i.e., items were exclusive on one another and the total sum was always 100%).

Potencial further reflections from students about 'objective 1'

As a bottom line of this first objective, students should have somehow reflected about the high responsibility of *'health professionals'* and *'organizations'* in being strategic, identifying what needs to be said and why, to whom and when; not only "passing down" information (especially important when we talk about health issues) and therefore being able to understand the reality and problems which worry the general public, add value to the conversation, help to correct rumors or misinformation, provide feedback or personal experience in relation to the massive amount of information being shared via social media, etc.

Thus, they could disseminate reliable, immediate, informative, prevention, screening and treatment messages, faster and to more places than most virulent viruses, that are unlikely to be obtained by the population through official information channels, and similarly generating such exponential impact and messages afterwards (Anderson & Speed, 2010; Fuster-Casanovas et al., 2022; Yip et al. 2022).That is to say, they could not bring health to all, but are definitely able to help bringing accurate health information, consciousness-raising and prevention to many more people than ever before.

And is that any average population user of Twitter (or any other social network) could easily understand wrongly health issues and problems, generating false alarms or, in the case of our activity and problematic selected, a lack of awareness in the face of a tremendously deadly disease that, at the same time, is highly easy to cure if identified early (Xu et al., 2016). Because there are numberless blogs, websites and social media platforms on health topics written by specialists and non-specialists that are read, commented and shared globally;

but, are they credible and accurate? If so, they should be encouraged and supported (Christakis & Fowler, 2008). As mentioned before, ICT devices dramatically increase the number of potential publishers and receptors globally, which should generate a sense of responsibility and ethics among professionals and experts of the area (Christakis & Fowler, 2008).

In a similar vein, students could have also further underscored that those specialists should spotlight on the specific social media tools relevant to the audience and use them consistently, prudently and sagaciously, due to, as established by McNab (2009), a pinch of abandoned or scarcely tended social media accounts could strongly hurt their credibility.

Finally, it is important to highlight that for this activity and specific topic, the participation of *'health professionals'* and *'organizations'* promoting awareness and reliable information seems to be key. However, it could be that for other topics such as some possible policies to be applied in a country, it would be better to know "simply" the opinion of *'individuals'* (citizens), not being interested in "influence" them in any way. That is, in this case, politicians would like them to be as "virgin" and "uncontaminated" as possible, to really see what they think. An example of these potential measures could be the incorporation of the health co-payment, the minimum vital income, the exceptional taxes on the highest incomes during times of crisis, etc.

Objective 2. Students should be able to criticize their work based on sample selection bias

In the case of objective 2, it will help students to understand that like any research, theirs has also limitations that suggest additional research possibilities. Likewise, these limitations could similarly be seen as responses to the required competences and learning outcomes established previously for this activity.

We will highlight the following ones. Firstly, the analysis could suffer from sample selection bias such as problems related with the coding of categories or *tweets*, specific time range selected in the sample, etc. In that event, own woes and decisions of the students could affect the overall analysis, limiting the generalizability of the findings.

Secondly, pupils' future work examining additional keywords and *tweets* over time would be particularly appropriate and informative. Thus, to expand the search and implications of the activity, it would be appropriate to search for other synonym *hashtags* such as *#paptest*, *#papanicolaoutest*, *#cervicalcancerprevention* or *#cervicalcancerawareness*. However, for the sake of simplicity and due to its scanty appearance and harder association with the test, students did not go further deep in this activity.

Thirdly and closely related to the previous point, students could also compare results among different languages (and consequently among different cultures and beliefs), for instance, between English speaking *vs* Spanish speaking countries, nordic *vs* latin american countries, European *vs* Asian countries, eastern *vs* western countries, etc., with the aim of noticing potential differences among them. This would be especially interesting (and could also require an extra effort in the scrutiny) for disentangling latent dissimilarities, and therefore, an interesting research avenue for future activities.

Therefore, as can be observed much remains to be done and various pathways are still open to those who wish to replicate and enrich the aforementioned activity on the process of cervical cancer prevention.

Objective 3. Students should be aware of the lack of pragmatic depth of this study

Similar to prior goal, in the case of objective 3, students should be able to identify several pragmatical limitations which at the same time would serve to make the proposed teaching innovation activity a successful tool in regard to the acquisition of the required competences and learning outcomes established within the subject. Consequently, students should awaken their critical capacity and dig into the origin of the problem analyzed and not merely remaining its analysis in identifying who speaks or how much about the selected problem.

Thus, firstly and due to the low risk perception/awareness of this type of cancer (regardless being the fourth most common cancer among women worldwide and the easiest cancer to prevent with regular screening tests and follow-up (Abiodun, et al., 2013; Basu, et al., 2014; Dhendup & Tshering, 2014)) derived from unfortunately high levels of shyness among female population: e.g., the shame itself of the screening, the fear of the procedure itself, the fear of discovering cancer, or the fear of being treated by a professional male, etc., complementary field research studies could be carried out for better understanding of women perceptions, even only about the female students themselves, their relatives, and acquaintances.

Secondly, due to the bearing of the present matter, it could be advocated that there could also be incongruity or scarcity among the obtained results. Thus, for instance, of the estimated 342,000 cervical cancer deaths in 2020, more than 90% occurred in low- and middle-income countries (Rojas, 2022), which would lead to think that inadequate access to health services, lack of funding, and insufficient use by health professionals could also have a word in this matter (Aswathy et al., 2012; Were, Nyaberi & Buziba, 2011). Consequently, students should clarify the effect of the economy on these deaths or if, on the contrary, the mere lack of awareness (of general population, government and health professionals) could suppose a greater weight in these countries. Hence, this study could be replicated to allow to reach fine-grained conclusions depending on the origin of the sample selected by the pupils.

On the last place, there could be a need to apply new methodologies from computer science and statics to examine Twitter publicy available content. In this sense, some studies have used Twitter's new streaming Application Programmer's Interface (API): an interface that allows a more efficient search than by a mere advanced search (Signorini, Segre & Polgreen, 2011). However, it is important to consider that students should delve into the literature to conclude that not all public *tweets* are delivered when using the Twitter public API. Besides, there is no way to determine the likelihood of this possibility. Accordingly, students should identifiy this potential limitation but similarly not make use of it.

Objective 4. Students should be broadly critical with social networks and similarly be able to propose improvements

Social media has become for a great part of the population the primary arena in which they receive massive (and unfiltered) amounts of information and share content and aspects of their lives with others, even though that information might be of questionable accuracy. As can be imagined, this aspect becomes even more important and strategic when we talk about health issues (as the one

selected by the students in the activity proposed) due to its potential and relevant repercussions on the well-being of the population.

On top of that, we need to add that *Gen Z'* students, the pupils developing the activity proposed in this paper, are constantly hooked to social media through their electronic devices (for instance, they check their smartphones at least 5 times per hour, and 7 out of 10 do it every 2 minutes – Google, 2019), but also have a worrisome 25% lower attention capacity and 40% lower check of the reliability of sources than its predecessor generation. Thus, it is noteworthy that this latter objective was way more related with general aspects and reflections on social media, and not specific with the particular cancer awareness treated along the activity proposed in this paper (and the three prior objectives).

Therefore, firstly, students should be able to identify the key goal of training the general public (and specially them) to properly evaluate the reliability of social media resources. This should include proposals such as looking beyond the mere headline and question everything (e.g., consulting the existing literature, prior studies, etc.), or such as creating online videos using real examples from social media to demonstrate the importance of being critical with information in a more tangible manner.

In second place, students could propose social media companies to adapt their algorithms, so that more reliable information appears at the top of search indices. This could be also complemented by "special verified checks" to certain accounts (or public lists of reliable experts, accounts, or organizations), as well as amplifying these types of messages, so they can wide their outreach.

In third place, students could also propose a system by which some of the inaccurate social media messages were vetted (by a third and independent party) to ensure reliability. Besides, these outlets could be publicly displayed in some sections of the social networks in order to inform the general public of the notoriously misleading information.

As a conclusion, students should be able to determine that social media is nowadays more important and used than ever but, however, that users are also not very aware of the advantages and potential limitations that they present. Moreover, students should similarly know that physicians, professionals, and experts have repeatedly proved their leadership and importance on the front lines of each crisis since their onset (for instance, in health, war and economic crises), but that this key role of these key actors could be simply magnified if they similarly adopted such leadership and responsibility in social media.

Potential aspects within the literature review

Once the topic to be analyzed has been chosen by the students and before the activity ends, professors (or facilitators of the activity) could carry out a review of the literature to find out if academically, the pedagogical project carried out by them made sense.

In this case, as mentioned before, in the literature there is a growing body of research on health information and social media, however nearly all is focused on how it can be used by advertisers and publicists to capture new consumers. Thus, only a few studies have analyzed Twitter content into a health-related topic and even less have pinpointed cervical cancer, which opens a great opportunity for this activity (Lyles, et al., 2013; Lyles, et al., 2016; Thackeray et al., 2013). Among these studies, some of them (for instance see Le et al., 2019 or Rojas,

2022) "simply" assess the relative frequency of themes treated by Twitter to better understand the breadth and depth of general social media conversations about health. In the same way, some other research focuses on "merely" specific and "individual" awareness campaigns carried out in determined countries, such as the one developed in United Kingdom with the *hashtag #SmearForSmear* in 2015 (Lenoir et al., 2017).

For its part, the ones that are more resemblant to this activity are few, and normally focus on the analysis of similar categories: *type of author* and *type of content* of the *tweet* (Lyles, et al., 2013; Thackeray et al., 2013). However they do so without going into the depth students do in this activity, simply focusing on describing the percentages and general distribution of the sample (which, by the way, coincides in general terms with the results obtained by the pupils). Moreover, another shortcoming in these studies is the time range used: usually (and "only") some individual weeks (such as the 'European cervical cancer prevention week' in January) or months, normally January, coinciding with the 'Cervical health awareness month'. Thus, oftentimes during these weeks or months*, 'awareness' tweets* are artificially inflated +10%-20% over their regular representativeness (55.80% in the sample of this activity), something that the students of this activity could be able to decipher as in their sample they consciously (and following the instructions of the proposed activity) collected a higher time range (4-month period), hence eliminating any type of anomalous behaviors (c.f., Teoh et al., 2018). Similarly, it is important to highlight that during these periods, the number of *tweets* per *'individuals' vs 'health professionals'* and *'organizations'* are alike in these pieces of work, indicating (again) the great missed opportunity for those actors, as well as the more than likely increase in *'awareness' tweets* made by *'individuals'* (thus momentarily exceeding their 42%, see Table 3).

Potential aspects to improve the activity

To finalize this work, next we will detail a series of points that, from our perspective, should be considered for future applications of the activity.

Firstly, when organizing the work teams, the professor (or project manager) should also consider the potential existence of repeat students or international students. The former students are not obligated to attend class, where a large part of the assignments and work is done. For its part, the latter ones may have difficulties when correctly understanding some of the problems identified by the national students (for instance, because they can be culturally specific to that country). Thus, the expected level of knowledge and contribution from these students should be totally different.

In second place, the activity should also consider that some contents, despite being part of the course, they could not have been covered yet at the start of the activity (in April).

In third place, this activity could even constitute an interesting starting point in the process of identification of students with potential entrepreneurial orientation, therefore helping them in their path and providing appropriate training and resources.

In fourth place, given the success of the activity, its application could be considered in other degrees related (or not) with technical studies or even in real cases posed by enterprises. In the same way, the composition of work teams

including students from different degrees and courses could also be considered, as it could generate a multidisciplinary approach that, in turn, could enrich the quality of the solutions and analysis proposed.

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