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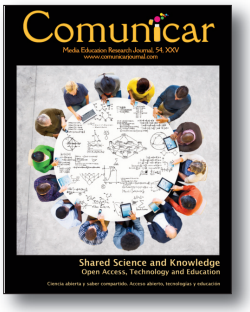

Critical thinking of young citizens towards news headlines in Chile

Pensamiento crítico de los jóvenes ciudadanos frente a las noticias en Chile

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ABSTRACT

Strengthening critical thinking abilities of citizens in the face of news published on the web represents a key challenge for education. Young citizens appear to be vulnerable in the face of poor quality news or those containing non-explicit ideologies. In the field of data science, computational and statistical techniques have been developed to automatically collect and characterize online news media in real time. Nevertheless, there is still not a lot of interdisciplinary research on how to design data exploration platforms supporting an educational process of critical citizenship. This article explores this opportunity through a case study analyzing critical thinking ability of students when facing news dealing with the social mobilization "No+APF". From data collected through 4 online exercises conducted by 75 secondary school students, 55 university students and 25 communication specialists, we investigate to what extent young citizens are able to classify news headlines and ideological orientation of news media outlets. We also question the influence of the media's brand name and the subjectivity of each participant in regards to the social mobilization "No+APF". The results underline the importance of group work, the influence of the brand name and the correlation between critical-thinking abilities and having a defined opinion.

RESUMEN

Fortalecer el pensamiento crítico de ciudadanos frente a noticias de Internet representa un desafío educativo clave. Los jóvenes ciudadanos parecen vulnerables frente a noticias de mala calidad u orientaciones ideológicas poco explícitas. Desde la ciencia de datos se desarrollan técnicas informáticas y estadísticas para recopilar prensa digital en tiempo real y caracterizarla automáticamente. Sin embargo, existe poca investigación interdisciplinar para diseñar plataformas de exploración de datos al servicio de un proceso educativo de ciudadanía crítica. Este artículo investiga esa oportunidad, mediante un estudio de caso en Chile que analiza la capacidad crítica del alumnado frente a noticias de un hecho social relevante: la movilización social «No+AFP». A partir de cuatro tareas en línea −realizadas por 75 estudiantes de secundaria, 55 estudiantes universitarios y 25 especialistas en comunicación− preguntamos en qué medida los jóvenes son capaces de calificar titulares de prensa y orientaciones ideológicas de medios de comunicación. Por otra parte, analizamos la influencia de la marca del medio y de la subjetividad que, frente al movimiento social «No+AFP», imprime cada participante al pensamiento crítico. Los resultados obtenidos destacan la relevancia del trabajo en grupo, la influencia de la marca del medio de prensa y la correlación entre tener una opinión definida y la capacidad crítica.

KEYWORDS | PALABRAS CLAVE

Critical citizenship, critical thinking, media education, social mobilization, educational software, technology innovation, collective intelligence, textual analysis.

Ciudadanía crítica, pensamiento crítico, educación en medios, movilización social, software educativo, innovación tecnológica, inteligencia colectiva, análisis textual.

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1. Introduction

1.1. On the vulnerability of the young citizens when facing digital news media

Recently, Reid, Radesky, Christakis, Moreno, and Cross (2016) published an article that examined the benefits and risks of digital media in the development of the youth. This research study highlighted the importance of fomenting critical thinking abilities in the youth to improve cognitive deficits, such as the scarce capacity to understand thoughts and feelings of other people after a long exposure to bad quality digital content. Similarly, interdisciplinary research works on the Information and Communication Technologies (ICT) question the spread of rumors and fake news in social networks (Kwon, Bang, Egnoto, & Raghav-Rao, 2016; Jong & Duckers, 2016). The concept "bad information" is not new; however, the social networks have considerably intensified their dissemination and impact. The phenomenon of disinformation has political and economic aspects. For example, the surge of "re-information agencies", which imitate the discourse of news organizations, but with ideological or marketing objectives that are very often not too ethical, should be pointed out (Maigrot, Kijak, & Claveau, 2016). In this sense, filtering and critically interpreting the information consumed has become more complex for the citizens, especially the young.

To understand this phenomenon, current works in data science and artificial intelligence seek to program automated methods to evaluate the quality, truthfulness and degree of confidence of digital content (Middleton & Krivcovs, 2016; Webb & al., 2016; Maigrot & al., 2016). However, we believe that a purely technical focus does not provide solutions to the problem of strengthening the critical-thinking ability of the citizens. Data science should be integrated into methodologies that allow working on the relationship between the youth and the active reading of media. Thus, Barranquero-Carretero and Lema-Blanco (2015), for example, propose the fostering of the visualization of media from the community and/or non-profits to activate critical thinking skills. The technological contribution does not aim to replace human cognitive processes, but favor conditions for accessing better information or filtering it adequately. The present work consists of the first stage, the evaluation of how to integrate data science as part of an educational methodology on critical thinking, a challenge which will be worked on beyond the scope of this study.

1.2. Towards an educational method for critical thinking supported by data science

In education, various research works introduce pedagogy that is based on the concept of critical thinking citizenship (Costandius, Rosochacki, & Le-Roux, 2014; Johnson & Morris, 2012). For Johnson and Morris (2010) and Davies and Barnett (2015), this pedagogy encourages critical thinking about the past and the imagination of a possible future based on social justice, tolerance, diversity, human rights and democracy, with the objective of learning to co-exist. From the proposals by Johnson and Morris (2010), we can summarize that critical-thinking citizenry possesses two dynamics: a) Seeks the scientific rationality to analyze the data from the past; b) Recovers subjectivity and values the individuality of each individual to actively construct their thinking and their actions in the present. This is an integrated process in which both dynamics are mutually supported. Also, in the past few years, various educational methodologies have been proposed which define critical thinking when faced with printed news and propose criteria that can be worked on in the classroom (Alvarado, 2012; Fedorov, & Levitskaya, 2015). Our work does not consist on proposing a new methodology, but we seek to define guidelines to explore how data science can provide methodological and technological foundations to observe and measure critical thinking. More specifically, this article seeks to establish a baseline for the critical reading of news by a group of Chilean students, so that in the future, data science can be integrated into the construction of educational strategies.

1.3. What can data science provide to educational methodologies on critical thinking?

The term data science refers to the extraction of knowledge from a set of data to support human activity. This interdisciplinary science groups a set of mathematical, statistical and computer science tools that facilitate the gathering of data in real time, the pre-analysis and the organization of results in a visual and even interactive manner (Song & Zhu, 2016). There is a great number of research studies on data science that apply the automated analysis of online news, in Twitter or Facebook, for example, to characterize events (Quezada, Peña-Araya, & Poblete, 2015) or to identify publishing strategies (Vernier, Cárcamo-Ulloa, & Scheihing, 2016).

It is important to point out that in the last few years, various platforms of interactive exploration of data have been implemented to ease the work with large volumes of news articles (Devezas, Nunes, & Rodríguez, 2015; Leban, Fortuna, Brank, & Grobelnik, 2014). These resources allow for the monitoring of world events and the

identification of trends, but a tool at the service of an educational process for critical-thinking citizenry has not been designed as of yet. Starting with the results obtained in the experiment that the present article describes, we will improve "Sophia" (Vernier & al., 2016), an exploration tool of information from the press, based on text mining and data visualizations, which organizes information gathered from 290 Chilean communication outlets. The Sophia platform is available in a beta version at www.sophia-project.info. This initiative presents the press as an educational object of study that can be used to discuss social, environmental and cultural events.

1.4. Education on communication media for the citizenry

Education in and with media in Chile has an important tradition that alternates emancipative and instructional proposals: experiments in popular education within the context of democratic struggle against dictatorship (Iglesias, 2011), proposals of addition of news media in study plans and programs (De-Fontcuberta, 2009), and educational innovation with Web Social to foment socio-communicative competencies (Arancibia, Cárcamo, Contreras, Scheihing, & Troncoso, 2014). De Fontcuberta (2009) proposes, for the Chilean curriculum, the possibility of contemplating the communication media as objects for study at school, through the analysis and interpretation of television or news programs. For this author, learning is conducted through the critical understanding of media content and the reality they describe. Another possibility is a more pro-active exercise, such as creating school newspapers that can be transformed into expression tools for the students.

> The technological contribution does not aim to replace human cognitive processes, but favor conditions for accessing better information or filtering it adequately. The present work consists of the first stage, the evaluation of how to integrate data science as part of an educational methodology on critical thinking, a challenge which will be worked on beyond the scope of this study.

Thinking about the media for a critical-thinking citizenry can also be related to the idea of digital "prosumers" (Islas, 2010), which has occupied a place in the school of the 21st century as a didactic innovation (Cárcamo-Ulloa, Flores, & Ramírez, 2014). However, the implementation of an educational innovation requires thinking about media competency of the school children (Ferrés & Piscitelli, 2012), considering that they face a context of media intoxication (Aguaded & Romero-Rodríguez, 2015). Today, it is necessary to keep on fostering the right of information of young citizens (Aguaded, 2014) and the development of critical thinking about the information from the press. Although we now live in an age of globalization of information, this does not create a direct link with the understanding of the world (Wolton, 2011). From education for critical thinking, Paul and Elder (2005: 11) point to the fact that without any competency in the culture of information, the students cannot become educated persons as they will not know which information they should accept and which they should reject. This critical thinking is the one that will provide the tools for the evaluation of information.

The idea of young reporters has been enriching since the time of the school newspaper by Celestín Freinet (1927) to the present. Today, the technologies of the Web 2.0 seduce us with their potential for content creation, but it is necessary to promote the production of school messages in exercises of critical thinking that also comprise the ecology of media. Scolari (2015: 29) states that the ecology of media should be understood from the following basic idea: "the communication technologies, from writing until the digital media, create environments that affect the subjects who utilize them". Bombarded with information, today the citizenry construct opinions that are very often simplistic. Ruiz, Medina, & García (2001) became aware that a group of students made the opinions of newspaper columnists in Huelva their own, without a greater knowledge of ideological positions.

1.5. Understanding the critical-thinking capacity of young citizens beginning with a specific case

The observing of critical-thinking ability to evaluate social events is a complex ideological challenge. This article

presents a study of an experimental case that seeks to characterize the critical-thinking capacity of young Chilean citizens with regards to news media. To define the main research question, we will posit the need to understand how the critical thinking of a young group of citizens acts against an important social event, by choosing the social movement "No+AFP". From that point on, we pose the following specific research questions:

- To what degree are the youth able to qualify the ideological orientations of a news media?
- To what degree are young citizens able to differentiate news headlines that present facts in favor, neutral or against a social movement?
- Do knowledge and/or opinion as declared by the youth about social mobilizations have an influence on the capacity to qualify the media and headlines?
- Does the media's brand have an impact on the young citizens in the way they analyze news headlines?

Section 2 of this article presents the material and methodology used in the study. Section 3 summarizes the results obtained. Lastly, section 4 discusses and reflects on these results to answer the four specific questions of the study to obtain conclusions that can guide the future development of the Sophia platform.

2. Materials and methods

2.1. Context of the case study

During the year 2016, one of the most important political events in Chile was the social mobilization against the inequalities produced by the Administrators of Pension Funds (APF). The movement, named "No+APF" (originally "No+AFP" in Spanish), was transformed into the greatest social mobilization in the last few years and was able to manage a great number of family-attended demonstrations (1.3 million people mobilized on the streets the second day). Also, the movement allowed for concentrating the public discontent, building a national coordination with representation in the main cities. The "No+APF" Coordinator (www.nomasafp.cl) is defined as: "a citizen group that is aware that when they reach old age, they will have a pension that is a third of their current income". According to the reports by comptroller organisms, the average amount of the pensions in Chile today rise to 197,726 pesos (300 US dollars). This figure is below the national minimum wage that is about 385 dollars, creating pockets of poverty in older adult groups.

Under the label "No+APF", three national marches were convened by the most important communication media. This media coverage can be explained, as the movement caters to a social problem that directly or indirectly afflicts most of the Chilean population. One of the first versions of our Sophia platform points to the fact that 290 communication media outlets mention "No+APF" in 2371 occasions in Twitter (Figure 1). The mentions rise slightly at the end of February 2016 and are maintained until the last week of December. However, they gain strength in July, coinciding with the first day of protest (July 24th). Obviously, the greater visibility does not necessarily imply diversity in political orientations in the press, and even less a direct empathy of the media with social demands, but it is because it is a social movement that becomes part of the journalistic agenda, which is slow to disappear.

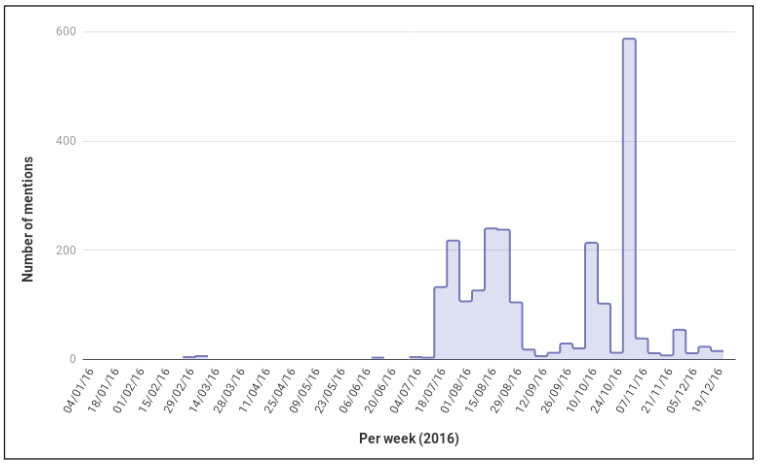

Figure 1. Evolution of mentions in the news case "No+APF" in the Chilean media's tweets (www.sophia-project.info/tweets).

2.2. Participants

With the aim of answering the research questions that were previously presented in section 1.4, our methodology was based on a series of experimental tasks conducted by 155 participants at the end of the year 2016 through an online questionnaire (we detail the design of the tasks in section 2.3). The participants were divided into three

categories (Table 1). The first category included 75 secondary school students from the region of Los Rios in Chile, who belonged to two education centers, a municipal center, and another public/private center, thereby diversifying their socio-economic status. The students' ages ranged from 14 to 17 years of age. The second category was composed of 55 university students from the same region. They were aged 18 to 27 years old, and originated from different faculties from the Austral University of Chile: Engineering (20), Sciences (17), Medicine (7), Philosophy and Humanities (5), Economic and Management Sciences (3), Architecture/Arts (2) and Forestry and Natural Resources (1). The third category was comprised of 25 journalists, who had more than four years of professional experience in social communication. These were professional journalists who worked in state-owned (7) and regional (7) media, public institutional chambers (6) and journalism professors (5). The invitation to participate in the online experiment was voluntary and was presented through social networks for the experts and university students. In the case of the secondary school children, the support of two education centers was handled by the Language and Communication teachers, who offered the children the opportunity to participate, and the children voluntarily went to the computer laboratory of the education center to perform the exercises.

During the performing of the tasks, the participants were asked to indicate their gender, their opinion concerning the usefulness of the "No+APF" movement, and their perception of their knowledge about the social movement. The distribution of these variables is shown in Table 1. We note the important disequilibrium in the distribution of the variable "Opinion on the usefulness of the movement" in favor of the answer "necessary" (70% and 92% according to the groups), which could suggest a bias in the selection of the participants. However, this result is coherent with the national poll conducted by Cadem (2016), a public opinion research company with 40 years of experience. This study points out that 84% of those polled deemed that it was necessary to reform the forecast system of the APF.

Table 1. Demographic profile of the participants (N=155)

		Students (Ages 14-17)		Students (Ages18-27)		Specialists		Total	
Gender	Female	35	46.7%	19	34.5%	9	36%	63	40.6%
	Male	40	53.3%	36	65.5%	16	64%	92	59.4%
Perception of your own knowledge of No+APF	I don't know anything	9	12%	2	3.6%	1	4%	12	7.7%
	I know little	35	46.7%	15	27.3%	7	28%	57	36.8%
	I am aware	28	37.3%	33	44%	16	64%	77	49.7%
	I know a lot	3	4%	5	9.1%	1	4%	9	5.8%
Opinion on the usefulness of the No+APF movement	Needed	53	70.7%	45	81.8%	23	92%	121	78.1%
	Unnecessary	2	2.7%	3	5.5%	0	0%	5	3.2%
	No opinion	18	24%	2	3.6%	1	4%	21	13.5%
	No answer	2	2.7%	5	9.1%	1	4%	8	5.2%

2.3. Design of the tasks for gathering of data

The participants individually conducted four tasks, without external help, in an interval of time of up to 20 minutes. In the case of the secondary school students, the teachers were explicitly asked not to help in the performing of the task during the protocol. The tasks were created in the shape of a questionnaire, with the tool e-encuesta.com, where each task corresponded to a different webpage, without the possibility of backtracking.

The first task consisted in classifying 11 Chilean press media outlets by answering the following question: "Do you believe that the following media have a defined political orientation?". The participants had five possibilities for answering: "Right-wing", "Centrist", "Left-wing", "Independent", "I cannot classify it". These tasks intentionally imply complex or imprecise concepts (i.e. "Independent", "Right/Left-wing"). These are concepts that are often used to define the media in common language, but do not have, a priori, an agreed-upon definition. In this sense, this task does not have "true" or "false" answers, although it does reveal the perceptions and the critical-thinking system of analysis of each participant. To construct this task, we relied on a recent work within the context of Chilean media (Vernier et al., 2016) to select 11 Chilean media outlets on the basis of their notoriety, but maintaining a range of media outlets with different publishing strategies (i.e. "La Tercera", "El Ciudadano", "Emol", "CNN Chile") as well. According to the Sophia platform, these 11 media outlets corresponded to 34.5% of the total volume of news published on "No+APF" in 2016 in the Chilean media.

In the second task, the participants had to classify the same media by answering the following question: "Do you believe the following media offer information that is preferentially in favor, neutral or against the No+APF movement?". This tasks sought to verify if the participants believed or not that some of the media had a pre-concei-

ved notion towards the social movement. Evidently, a reader of the press frequently shapes an idea on the position that a media outlet adopts about the social movement. It should be mentioned that the participants always had the choice of responding that they did not know.

In the last two tasks, 22 news headlines had to be classified (44 headlines in total, all were different) starting with the question "Do you believe the following headline presents information that is in favor, neutral or against the No+APF movement?", and with four possible answers: "In favor", "Neutral", "Against" o "I could not classify it". However, in task 3 the headline was the only information available when in task 4 the headline was accompanied by the name of the media outlet. To illustrate, 4 examples of the headlines from the 44 total are presented:

- "No+APF: Protesters drive off a group of hooded persons who tried to slip into the march".
- "No+APF: The delivery scheme allows the duplication of pensions immediately".
- "Why, even though the APF is the theft of the century, is the Bravo Commission not aware of it?".
- "The APF respond: 'In Chile we have received recommendations from people that do not take responsibility for it".

To construct this task, we selected 4 news headlines for each of the 11 media outlets. Duplicated or similar texts were filtered, trying to diversify the themes and headline styles. In order to evaluate the influence of the presence of the media's brand on the task of classifying the headlines, two versions of the same poll were prepared, only reversing the headlines from tasks 3 and 4. Half of the participants completed the first version of the poll and the other half completed the other version.

2.4. Statistical analysis

The participant's responses were statistically processed with R-Project, mainly through the use of three methods. The first method was used to calculate Kappa's coefficient (Fleiss, 1971) to evaluate the reliability of agreement between the participants in each task. This measurement calculated the degree of agreement k in a classification task concerning what could occur by chance. When $k=1$, it means that there is total agreement among the participants. When $k\leq 0$, it means that the agreement is less than if the agreement occurred by chance. There is no consensus on the scale to be used to interpret k, but it is considered light ($0.20\leq\kappa<0.40$), medium ($0.40\leq\kappa<0.60$) o important ($0.60\leq\kappa<0.80$). This method was adapted to the context of the study to analyze the degree of intra-group and overall agreement.

The second method seeks to analyze to what measure the student's answers were relevant. The answers provided by 25 journalists were used as the reference when at least 13 of them were in agreement on the classification of a media outlet or headline. It is important to note that the veracity of the participant's responses was not being measured, but instead, to what degree did the responses come close to the most frequent response by the experts was evaluated. In this method, we took into account the metrics of precision (P) and sensitivity (S), which are frequently used in statistics to evaluate classification tasks. For a given category, for example, "right-wing media", when $P=1$ it meant that all the media that were classified as "right-wing" by a participant were classified as "right-wing" by the reference. When $S=1$, it meant that all the "right-wing" media given by the reference were correctly recognized by the participant. To summarize the information, we used the F1-Score (F1) metric, which represents the harmonic mean between Precision and Sensitivity. Lastly, the Pearson's test was used to evaluate the degree of correlation between the relevance of the answer in the classification of media and headlines task, the perception of the knowledge of the movement "No+APF" and the opinion on the movement. Pearson's test measures the linear dependency r between variables X and Y. When $r(X,Y)=1$, it means that there is a perfect linear correlation between the variables.

3. Results

3.1. Analysis of intra-group agreement

Table 2 summarizes the agreement within each group of participants, according to each task and each response possible. In general, we can observe that the students were in disagreement in all the tasks. The concept of "independent media" was the object of the greatest disagreement among the students ($k=-0.01$). At first sight, the tasks were very complex for the university students and the specialists. There is disagreement in all the groups except for the concepts of "right-wing" / "left-wing" media (k between 0.23 and 0.57) and the headlines "in favor" / "against" the "No+APF" movement (k between 0.26 and 0.48). It was observed that the student body, the students, and the specialists were more in agreement when recognizing a right-wing media outlet and a left-wing one. Task 2 was, undoubtedly, the most "subjective" and the least favorable to a light agreement even for the specialists.

3.2. Analysis of the relevance of the answers

In Table 3, the column "individual" shows the average relevance of the student body for each task. Individually, the relevance of the student body was fairly low (the overall F1-Score varied between 0.27 and 0.39 according to the tasks). The student body was somewhat more able in classifying news headlines in favor or against, but the score stayed below 0.5. As shown in the previous section, the student body did not reach an agreement amongst themselves and did not have the same criteria of interpretation as the specialists. However, in the column "group", we took into account, for the calculation of relevance, the most-common response given by each group of participants. It was observed that collectively, the student body responded with a relevance of 0.90 when classifying media, and between 0.62 and 0.75 when classifying headlines. These results were similar, or sometimes better, than the results obtained individually by an average student or specialist.

Table 2. Intragroup agreement in the different tasks (Fleiss' Kappa κ)

		Students (Aged 14-17)	Students (Aged 18-27)	Specialists
Task 1: Classify media according to their political orientation	Right-wing	0.07	0.33	0.57
	Left-wing	0.03	0.23	0.48
	Centrist	0.03	0.07	0.18
	Independent	-0.01	0.02	0.04
	Overall agreement	**0.03**	**0.17**	**0.35**
Task 2 Classify media according to ideological orientation against No+APF	In favor	0.01	0.14	0.32
	Against	0.05	0.21	0.20
	Neutral	0.02	0.12	0.17
	Overall agreement	**0.03**	**0.13**	**0.16**
Task 3: Classify headlines knowing the name of the media outlet	In favor	0.08	0.26	0.28
	Against	0.08	0.30	0.48
	Neutral	0.03	0.15	0.19
	Overall agreement	**0.05**	**0.21**	**0.28**
Task 4: Classify headlines without knowing the name of the media outlet	In favor	0.10	0.34	0.27
	Against	0.10	0.36	0.44
	Neutral	0.03	0.18	0.10
	Overall agreement	**0.06**	**0.26**	**0.25**

Lastly, a difference was observed in the classification of headlines results when the participants knew the media outlet or did not. For example, the headline "The APF" responded: 'In Chile, we have received recommendations from people that do not take responsibility for the media outlet". "El Desconcierto" (literally "The Bewilderment"), was classified as "Against" the No-APF when the specialists did not know the media, and "In favor" when they knew it. According to the specialists, "El Desconcierto" is a "left-wing" media. Of the 44 headlines that were to be classified, five headlines were classified differently by the specialist's group when they knew the media outlet, six headlines by the student body group and four headlines by the student group. All the changes went in the direction of the ideological stereotype associated to the media outlet by the group in question.

3.3. Correlation analysis

Tables 4 and 5 show the results obtained by the correlation analysis when taking into account all the participants (Table 4) or only the secondary school students (Table 5). In the first place, it was observed that there was a clear correlation between having a great degree of relevance in task 3 (F1_T3) and task 4 (F1_T4) (r=0.76 for the participants, r=0.68 for the student body). They were similar tasks. The correlation between a

Table 3. Relevance score of the answers (F1-Score)

		Students (Aged 14-17)		Students (Aged 18-27)		Specialists	
		Individual	Group	Individual	Group	Individual	Group
Task 1: Classify media according to their political orientation	Right-wing	0.33	0.89	0.66	0.89	0.83	1.00
	Left-wing	0.27	1.00	0.48	1.00	0.73	1.00
	Centrist	0.22	0.80	0.29	0.80	0.57	1.00
	Overall agreement	**0.27**	**0.90**	**0.48**	**0.90**	**0.71**	**1.00**
Task 3: Classify headlines knowing the name of the media outlet	In favor	0.41	0.58	0.60	0.81	0.69	1.00
	Against	0.40	0.80	0.66	0.90	0.81	1.00
	Neutral	0.37	0.47	0.54	0.76	0.65	1.00
	Overall agreement	**0.38**	**0.62**	**0.60**	**0.83**	**0.72**	**1.00**
Task 4: Classify headlines without knowing the name of the media outlet	In favor	0.49	0.86	0.72	1.00	0.63	1.00
	Against	0.41	0.81	0.69	0.91	0.75	1.00
	Neutral	0.27	0.58	0.47	0.80	0.58	1.00
	Overall agreement	**0.39**	**0.75**	**0.63**	**0.90**	**0.66**	**1.00**

high relevance for the classification of media outlets task (F1_T1) and a high relevance for classifying headlines (0.53<r<0.65) was more interesting. This result tended to show that classifying headlines was not only a text analysis task, but it also implied a certain knowledge of news media outlets. It could also be interpreted that the abilities of text analysis were perfected when one knows the discourse mechanisms of the press. Later, especially when considering the student body, a stronger correlation was observed between the knowledge perceived on the No+APF and the relevance when classifying headlines (0.38<r<0.45). This result can re-enforce the idea that becoming interested in events of social mobilization and the analysis of text are mutually supported competencies.

Table 4. *r* correlation scores between variables (*p* value < 0.01)

	Knowledge	Opinion	F1_T1	F1_T3
Opinion	0.29	-		
F1_T1	0.32	0.18	-	
F1_T3	0.36	0.36	0.65	-
F1_T4	0.30	0.35	0.60	0.76

Table 5. *r* correlation scores between variables only with student's data (*p* value < 0.01)

	Knowledge	Opinion	F1_T1	F1_T3
Opinion	0.40	-		
F1_T1	0.30	0.10	-	
F1_T3	0.45	0.44	0.53	-
F1_T4	0.38	0.40	0.54	0.68

4. Discussion and conclusions

The results presented allow us to answer specific research questions, to later provide some general thoughts that will allow for the development, in future works, of a methodology that uses data science to the service of critical thinking when dealing with journalistic information. These proposals ratify the needs raised by media education research (Alvarado, 2012; Fedorov, & Levistkaya, 2015) of proposing strategies that contribute to the critical reading of information.

4.1. Critical-thinking ability of the young citizens with regards to news media and headlines

In light of the results, the tasks could have appeared difficult for the secondary school students, as they had little agreement amongst themselves, and their answers had a weak average relevance. It was also observed that for this group of students, the average percentage of the answer "I could not classify it" was 56% for the media outlets and 19% for the headlines, as compared to 13% and 2% for the specialists (12% and 10% for the university students). However, it was observed that the wisdom of crowds could help resolve the challenges well. The concept of wisdom of crowds (Surowiecki, 2004) proposes that often, the decision or evaluations that the group defines are better than what a single individual could think of. Under these principles, and in agreement with Ruíz and others (2001), we can conclude that the secondary school students effectively have an individual capacity that is very fragile, but it is sufficient for contributing to the group's thinking. The university students have a critical-thinking ability that is more refined, but it would also be more effective to compare their thoughts as a group. On the other hand, concepts such as "independent/centrist media" were very subjective for secondary school and university students. It should also be pointed out that these categories were also somewhat confusing even for the specialists.

4.2. Previous knowledge and brand: factors of influence on critical-thinking capacity

Our last research questions were focused on the impact of the three variables on critical-thinking ability: a) previous knowledge of the social movement, b) personal opinion on the movement and c) the influence of the media's brand. The results obtained showed that in secondary school students, more than in the other groups, the degree of knowledge of the social movement and having an opinion was correlated with the capacity of classifying headlines. This results corroborates the definition of critical-thinking citizenry by Johnson and Morris (2010), indicating that the subjectivity of the critical-thinking citizenry (having an opinion on the No+APF movement, or at least being aware of it) is correlated to an analytical dynamic (thinking about the meaning of a statement and the orientation of a source).

Lastly, the secondary school and university students seemed to be more influenced by the media's brand, but just as the specialists. They took into account the source of information for the re-evaluation of a statement within its context. We believe that this shows a certain critical-thinking ability that could be strengthened through the development of the ability to identify the news source and the analysis of its potential ideological orientations, specifically when the source is unknown. These situations are in agreement with proposals by Fedorov and Levitskaya (2015).

4.3. Strengthen the critical-thinking citizenry with data science tools

The study presented contributes clues or reflections for the design of exploration of data platforms to the service

of critical thinking about the news. We suggest the adoption of instructional design that foments group work for the performing of analysis of media tasks. The platform could gather the opinion of each participant and highlight the differences in points of view. Also, it would be interesting to show the different ideological orientations of the media outlets and constructively debate to understand why each individual has a different opinion. The data science techniques can help with the compilation of diverse data, incorporating third sector media and exploring the relationship of the youth with this media type (Barranquero-Carretero & Lema-Blanco, 2015), and could also technologically support a diverse, independent and decentralized critical reading to drive human analysis. This last is irreplaceable when designing critical thinking. In this sense, we suggest that the platform propose a scenario of data exploration through the use of a set of tags to qualify media outlets, news, headlines or signs of subjectivity, while at the same time allowing the users to create their scenarios of analysis and tags. Lastly, the application could highlight interesting cases to be interpreted or citizen's problems that, for the teaching staff and/or the student body, promote critical-thinking exercises and the use of data science to drive network interactions.

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