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Social media: a distraction or an educational tool?

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Introduction

The use of social networks has been a growing trend worldwide for more than a decade (Nouri, 2018, p.1). In fact, social networks represent a huge business niche that is reflected in the various economic rankings, in which companies like Facebook remain in the top positions. Without going to such extreme successful examples, new network formats emerge every day aimed at specific users. Their benefits for the owners lie more in the profits coming from advertising (aimed at these users too) than in those linked to the subscriptions they may entail, if that is the case. However, profits do not stop there: the data collected by the companies that manage these networks are another source of wealth. Data that users give away in most cases without even knowing it and, of course, without receiving anything in return.

The growing use of social networks is closely linked to the evolution of society, not only with regard to an easier access to new technologies, but also to the society's new lifestyle and new models of interpersonal relationships. In a competitive world, we aspire to be the first to know the latest information. In that same world, we show the best of us (or create it, if necessary) so as not to be left behind by our "competitors". We even settle for immediate screen contact with our friends and family, because we assume there is no time for personal interaction. Social media are the vehicle for all these trends. Many studies (e.g. Wang, Lee & Hua, 2015, p.47, Romero-Rodríguez, Rodríguez-Jiménez, Ramos, Marín-Marín & Gómez-García, 2020, p.6) warn of a wide range of problems arising from excessive dependence on social networks: interaction problems, depression, deteriorating health, lack of concentration at work or during studies, etc.

With these data in hand, should parents prohibit their minor children from accessing such networks? Should governments conduct information campaigns against their use, as they do with alcohol or tobacco? Moreover, out of responsibility, should public institutions at least close down their communication channels through these networks? This is, of course, a utopia, but also unnecessary. If used correctly, social networks can and do play a very positive role in society. Their informative potential is indisputable (we just must

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search for the right sources of information) and they have already shown their usefulness, even, as a tool for law enforcement to find criminals or missing persons. Moreover, when direct social relationships are not possible (we are specially experiencing this need during the COVID-19 pandemic), social media help to maintain emotional ties. These enormous advantages also apply to education: the power and appeal of social networks can be used to innovate in teaching. Furthermore, it is possible to transfer their attraction and interest to the subject matter being studied through them or with their support (Putnik, 2016, p.434).

Recent years have seen the emergence of social networks designed specifically for teaching or knowledge-sharing purposes and targeting students, professors and even parents. Examples of these networks are Brainly, Edmodo and Docsity, among many others. These *ad hoc* social networks usually have specific goals. For example, Brainly is a "question and answer" forum on school and university subjects in which young students participate to solve their doubts, while Docsity is focused on the exchange of materials and information useful for the learning of other users (although it also allows for questions to be raised and answered by other members of the community). For their part, Youtube, Linkedin, Instagram, Facebook, Whatsapp or Telegram are examples of social networks that, without having been designed with an educational purpose, are being applied at different levels of the field. The use of these more open social networks as an educational tool can have different objectives depending on the users. For example, the simple conversion of traditional face-to-face master classes into online, synchronous or asynchronous classes, the encouragement of discussion on a previous explained topic among students, the complementation of the master classes with collaborative learning tasks such as the resolution of proposed exercises or the completion of assignments, tutorials, etc. In fact, these more general social networks can also complement non-traditional teaching-learning techniques such as project-based learning, question-based learning, flipped classrooms, crossover learning, etc., providing them with an extra degree of innovation. Ultimately, social networks can themselves become one of those non-traditional forms of teaching and learning.

In passive teaching-learning methodologies, professors give their master classes and expect students to assimilate the concepts communicated. To strengthen this assimilation, these theoretical classes are complemented with practical classes, which, depending on the subject, can be problem solving, experimental practice or a mixture of both. These methodologies respond to the traditional teaching model and are not in line with the spirit of capacity building promoted by the European Higher Education Area (EHEA) in Europe and other institutions all over the world. While brilliant students may be able to develop such skills from the information they receive, these methods do not ensure that others have not simply assimilated certain information in certain contexts (those included by professors in their lectures), but are not, for example, able to apply that same information (more precisely, the knowledge) to a different context. Students are not taught to be autonomous. Not only that, but also the role of the professor as a mere transmitter of information loses relevance, as the student nowadays can find the same information

not only in books, but on websites, online courses, etc. (Hamer, 2000, p.26). On the contrary, active teaching-learning techniques aim at having students learn in an active way, choosing their own path of advancement according to their individual scheme of reasoning and at their own pace to acquire the expected knowledge. In most cases, these methodologies are applied in any format of collaborative learning, which enriches the process encouraging debate and critical discussion, fostering the need for respect and cooperation, improving students' oral and written expression, etc. In any active learning technique, the professor's role is to provide an objective and a starting guide (sometimes sources of information too), to support the students during the whole practice and to value in a constructive way the final result of the learning process. In addition, if necessary, to make the students reflect, so that they can themselves redirect their work, and/or to mediate in case of conflicts (Andrini, Pratama & Maduretno, 2019, p.7). The use of social networks together with such techniques has a threefold advantage: *i)* they (can) serve as technological support for the learning process, *ii)* they facilitate the interaction and thus the collaboration between students and *iii)* their appeal and their capacity to disseminate information are an additional incentive for learners.

The aim of this research was the application and subsequent evaluation of a mixed innovative technique of collaborative learning, based on the elaboration of informative videos and their dissemination on social networks, in the teaching of the subject Applied Physics among first-year civil engineering students of the University of A Coruña (UDC) in Spain. The level of knowledge acquired by the students by means of this mixed technique as well as its degree of acceptance were compared with those related to the traditional master classes.

Methodology

This initiative was proposed at the beginning of a term (January 2020) to a group composed of 11 students. Once the subject was introduced, they were explained that only part of the course would be taught using traditional methods. For the rest, rather than receiving master classes and doing guided exercises/practices on a certain topic, they would have to learn actively. The proposed active learning method would be a kind of flipped classroom but students, instead of presenting the topic worked on orally to their classmates as usual, would have to design and produce a short informative video on it. All this with an added incentive: the videos that met the expectations would be disseminated through the social networks of the Civil Engineering School, the University of A Coruña, the professors and the students themselves. Of course, this activity would also be part of the final subject grade. Students received detailed information on the assessment criteria, their basis and the weights of each criterion.

Since one of the objectives of this activity was to increase the students' interest in the subject and, as far as possible, to adapt it to their preferences, they were given a lot of freedom from the very beginning. In this sense, the professor only gave them the following initial instructions:

- The students had to work in groups of 3-4 members, which could be freely configured.
- They were able to choose any specific topic (a law, a principle, a phenomenon, etc.) in the field of magnetism, waves or fluid mechanics. Given the great variety of topics to be discussed, it was not expected that they would coincide in their choice. If this had happened, a draw would be made and the losing group would have to renew its choice.
- All students in a group had to participate in all the phases of the methodology, from the choice of the topic to the elaboration of the video, in which they all had to speak/appear.
- The professor (the center) would provide the recording equipment (camera and professional support). They did not have to incur costs to produce the video, but had to use the means at their disposal. They were only allowed to spend a few euros in case they wanted to buy some low-cost material.

As they were university students and therefore had access to a lot of information both inside and outside the university itself, we really wanted to foster their ability to be autonomous. In this sense, the professor did not provide them with any material, but they had to look for it themselves and learn to discard the bad or the too advanced for their level. Once the sources of information of any format (books, articles, videos, etc.) had been chosen, they had to work together on the material, reflect and discuss on it, summarize it orally or in writing, etc. This process should continue until they felt that, in their opinion, they had acquired knowledge equivalent to that expected after attending a master class. Once this knowledge was consolidated, they had to prepare the script of an informative video about 5-10 minutes long, in which, in a concise but precise way, they explained the chosen topic to a profane audience. The phrase "*If you can't explain it simply, you don't understand it well enough*", (mistakenly) attributed to Einstein, was used as a leitmotiv. The format of the video was also free (experiments, images and voice-over, students explaining the topic with the support of a blackboard, etc.). This part of the methodology was equally critical than the previous one. First, the short duration of the videos required not incurring in digressions or generalities and this, in turn, demanded a very wide degree of understanding about the chosen topic. Bearing in mind that the videos were intended to be disseminated on social networks and therefore to the general public, they had to show and explain the subject matter in a simple, pleasant and attractive way. In addition, coordination between group members was especially necessary in this phase. They had to recognize each other's skills (e.g. who had the greatest creativity, the deepest computer knowledge or more sense of humor) and establish synergies between them in order to achieve the best possible end result.

Before starting to work on the video, students had to fill in a form prepared by the professor summarizing the chosen topic, the type of video they intended to make, the materials to be used, the distribution of work among the members of the group, etc. The main objective of this form was to check that students were on the right track before starting

to prepare their video. In any case, before reaching this point, group work sessions had already been carried out during class hours, in which the professor resolved the students' doubts and/or asked them questions about the chosen topic, to verify that their knowledge was increasing. More joint sessions were planned during the whole term. A date was also set for a final rehearsal, as well as the final day for the recording of the videos.

Consequences of the Covid-19 pandemic

On 13th March 2020, the University of A Coruña suspended the on-site classes as a result of the global pandemic. All subjects in all faculties had to be taught online and the access to the centers was also banned. In this context, the joint preparation of the videos, rehearsals and recordings that had been scheduled for the collaborative learning activity was not feasible. Not only that, the population of A Coruña, as well as that of the rest of Spain, was confined to their homes, allowed to leave only for essential reasons and on an individual basis. Moreover, meetings between people of different family units were prohibited. In other words, it was not possible for the members of each group to meet in a particular house or library to prepare their work together. At that point in time, students had just submitted the form with their overall ideas for the video. The professor, taking into account that the preparation of the videos was still at this very early stage, gave the students the possibility of replacing this activity with more traditional tasks, i.e., with the individual drafting of a document explaining the chosen topic. However, students showed their enthusiasm for the previous learning initiative and decided to go ahead. They were clearly motivated. The meetings both between the members of each group and with the professor were carried out through the Microsoft Teams platform that the University of A Coruña made available to the entire university community. In this phase, the professor did not set a fixed calendar, but tutorials were set at the request of the students. The recording of the videos was done with the means available to each person at home, as it was impossible to use the professional material of the center. This meant an extra effort for the students, since in most cases this recording was made using individual's mobile phone or computer, which required a subsequent editing and publishing to combine the contributions of each member of the same group.

Results and discussion

The success of the initiative was proved in many different ways. Firstly, by means of the aforementioned involvement of the students, who decided to continue with it even in adverse conditions. Secondly, because of the marks obtained in this part of the subject, with all students receiving 95-100% of the maximum score. The videos produced by the students (3 on different subjects) were of a high quality in terms of content, but also in terms of their presentation and editing. This was a clear sign that they had spent a significant of time working on them, exceeding what was expected. Table 1 includes the main features of each video. One thing to note is that a similar participation of each member

was observed in each group video. Although this was a requirement, both authors have previous experience (with other teaching techniques) in which this equal participation was not met satisfactorily, either due to a lack of interest on the part of some students, or due to an excessive shyness that restricts some of them from participating in collaborative learning methodologies.

Table 1. Main features of the videos

Title	Topic	Duration (min)	Type	No. of students	Grade (% max.)
Ondas en el mar (Waves in the sea)	Fluids (waves)	13:52	Voice-overs accompanying the image. Serious tone, documentary type. Explanation of the theoretical phenomenon and its applications to the field of civil engineering	3	100
Principio de Arquímedes (Archimedes' Principle)	Fluids	9:11	Students take turns on the screen to explain the historical context and/or theory with the support of images or blackboards, as well as to conduct experiments. Informative tone with humorous notes	4	90
Efecto Doppler (Doppler Effect)	Sound (waves)	11:36	Students take turns on the screen to explain the theoretical phenomenon as well as its applications to the field of civil engineering, supported by images. A lot of humour	4	100

To analyze more precisely the goodness of the methodology, students were also asked to answer a survey with 25 questions. They had to give a score from 0 (totally disagree) to 5 (totally agree) according to the Likert scale (Lickert, 1932, p.14) to some questions related both to the innovative methodology applied and to the traditional methodology of master classes (that is, they gave 50 scores in total). The questions sought to quantify, among other things, how these methodologies had influenced the degree of motivation, the ease of learning, the acquisition of leadership skills, oral expression, etc. of the students. These questions were grouped into two blocks: development of specific

competences (own skills and/or those linked to the degree of civil engineering) and development of general competences (skills necessary for personal and professional development regardless of the studies/profession chosen). The latter were in turn divided into instrumental (time organization, problem solving, decision making, planning, computer use, information search and database management, verbal communication, written communication), systemic (creativity, management by objectives, project management, intellectual stimulation, delegation) and interpersonal (self-motivation, ethical sense, interpersonal communication, teamwork, conflict management, negotiation, leadership). The questions on specific competences sought to analyze whether the methodology applied helps to contrast the knowledge learned in the classroom with its application in real situations. That is, whether it helps to bridge the gap between theory and practice. In addition, whether it facilitates the learning of the subject, whether it involves the students in their own learning and whether it creates an attitude of active participation, among others. In addition to answering these fixed questions, students were able to add one particular scored item they considered important. No additional comment was provided. Figure 1 shows the results both for all students in the class and also in a gender-based analysis.

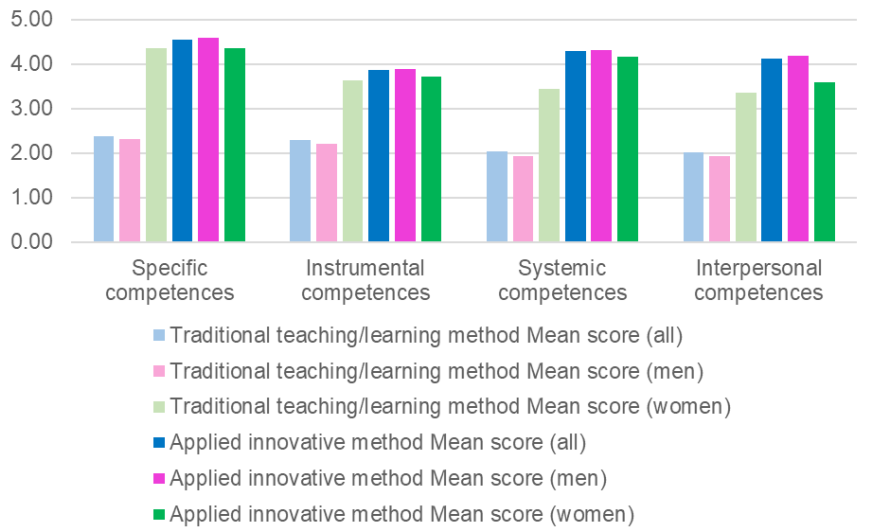

Figure 1. Scores for both methodologies (all students, men-only, women-only)

As the chart legend indicates, the light-colored bars correspond to scores of the traditional methodology, while the corresponding dark-colored ones correspond to the innovative initiative launched. It can be seen that, both in the overall analysis and in the gender-specific analysis, the students considered that all competencies were best developed by applying this collaborative activity. From a global point of view, the students considered that the new methodology had been 30% more positive than the master classes. This was particularly advantageous in the development of systemic competences, followed by the specific and interpersonal ones. The differences regarding instrumental skills were less, but not negligible. In the analysis by gender, the same results were observed for men, but

just the opposite for women. In fact, for females, in general, competence development was very similar using the traditional or the innovative methodologies. Moreover, just the opposite of men, collaborative learning scored best for the case of systemic competence development. However, it must be highlighted that these women's results cannot be generalized, as the percentage of females in the class (9.1%) was much lower than that of males. The specific attitudes of these particular female students or even the fact that they felt as a minority in the groups could have influenced their scores.

The last positive sign about the goodness of the methodology was the public acceptance of the videos. Many students, but also professors, professionals in the field of the topics dealt with, etc. showed their satisfaction with the initiative in the social networks themselves by means of likes and messages and/or through their collaboration in the diffusion. Figure 2 shows the publication of one of the videos on a social network belonging to a strategic research cluster linked to the University of A Coruña.

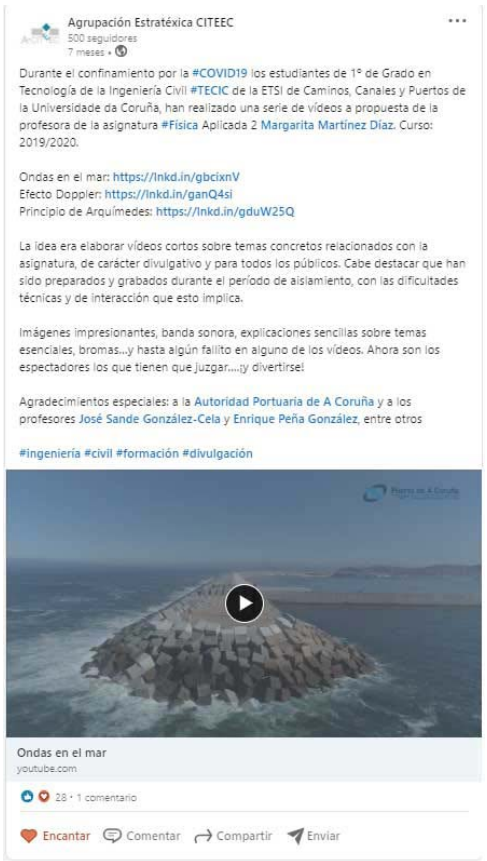

Figure 2. Dissemination of one of the videos by a strategic research cluster linked to the UDC

Conclusions

This research is a promising starting point for teaching in the university environment and, more specifically, for students in the first year of studies with a high level of difficulty. It has been shown that social networks combined with other collaborative learning techniques can serve as an incentive and a focus of attraction for newly arrived students, even decreasing the stress that some of them experience with the change linked to university access.

The authors want to continue applying and improving this technique in successive years, in more topics and subjects, to confirm its goodness and its influence on the success rate of the students. In this way, it will be possible to verify whether the outcomes obtained were the result of chance or whether they were conditioned by the limitations of the analysis, for example the low number of participating students and the situation of confinement of the population. In principle, the authors think that, on the contrary, the great acceptance of the initiative even under these circumstances is a sign of its potential. In this sense, it must be taken into account the difficult and novel situation experienced by the students, who had to adapt to a new online teaching mode from one day to the next and who could therefore have considered this activity as an additional overload. In any case, this assumption must be verified. Undoubtedly, the greatest limitation of this research lies in its gender perspective, as the percentage of female participants is clearly unrepresentative of the global university students. Nevertheless, it should be noted that this fact is often a reality in most STEAM careers (NASEM, 2020, p.38), where men are still a majority.

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