



MUSIC AND TIKTOK IN SOCIAL SCIENCES A Didactics of Brain Languages

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ABSTRACT

Advances in neuroscience and cognition are key to addressing contemporary educational challenges. The study introduces a novel intervention through TikTok in 5th grade, using an interdisciplinary approach based on the 'languages of the brain'. It incorporates participatory learning, music integration and a natural language approach that includes choreography and video creation. Using quantitative and qualitative methods with 101 students, the results show a positive impact on the understanding of content about the Middle Ages. They highlight the effectiveness of this approach in improving student engagement in today's interdisciplinary education.

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1. Introducción

One of the fundamental objectives of schooling is to develop the unique cognitive abilities of human beings, those that enhance their ability to communicate in order to build vast systems that allow them to interact efficiently with their environment (Sorin, 2002, p. 87). The human species is the only one that not only expresses itself in words, but also creates vast mathematical, computerised and musical communication systems. When asked what these systems have in common, neuroscience shows that they are all languages of the brain. The latest contributions of brain imaging and its applications in education are helping to address old educational questions with new tools, where the role of interdisciplinarity is key. In short, the more we know about cognitive functioning, the greater the need to find solutions to the new educational challenges of the 21st century.

The question of the "languages of the brain" is at the forefront of contemporary thinking about the origins of human uniqueness. Marc Hauser, Tecumseh Fitch, and Noam Chomsky, in their now famous 2002 article "The faculty of language: what is it, who has it, and how did it evolve?", postulate that the emergence of the human faculty of language has its origin in the emergence of a unique operation: recursion; that is, the ability to produce complex representations by linking them together ad infinitum. However, is recursion an adaptation to communication restricted to natural language, or does it apply to many fields? In 2016, Marc Hauser and Jeffrey Watumull speculated that the human species is characterized by a "universal generative faculty" (universal grammar faculty), according to which the human brain allows the generation of hierarchical (actually fractal) structures ad infinitum, which are then "repurposed" for the use of language, mathematics, music, and moral behaviour. These different domains would differ only in the values (words, numbers, notes, events) that replace the variables in the generative procedures. Although this ability has traditionally been associated with natural language, language, one might ask whether there is a single brain mechanism behind these languages and whether it affects more scholastic disciplines.

In line with this hypothesis and reviewing the available data on the organization of mental representations in three areas -natural language, music and mathematics- research has been carried out in the line of creating teaching resources with the help of ICT, within the LabinTic research group at the University of Castilla-La Mancha. In this paper we will present an intervention that combines music and natural language to improve the understanding and memorization of certain contents of the subject of Social Sciences in the 5th grade of primary school.

1.1. Musical Language

Is it appropriate to speak of a 'musical language'? In 1973, in a series of lectures at Harvard, composer Leonard Bernstein challenged researchers to propose a musical grammar comparable to Noam Chomsky's 'generative grammar'. In response, composer and musicologist Fred Lerdahl teamed up with linguist Ray Jackendoff to propose a generative theory of tonal music (1983). This theory postulates the existence of four structures, all of which are hierarchical:

- 1) The grouping of motives, musical phrases, etc.
- 2) Metric structure and pulsation.
- 3) Time-span reduction (TSR), which builds on the previous two levels to form a temporal tree with several levels of interlocking structures.
- 4) Prolongation Reduction (PR), based on the increase or decrease of tonal tension.

The latter two structures are organised according to binary trees and in this sense resemble the structures postulated by linguists such as Katz and Pesetsky (2003), who go so far as to propose an extreme view: the lexicons of musical and linguistic structures are different, but the syntactic structures are the same. According to them, all differences between language and music are a consequence of differences between their basic building blocks: arbitrary combinations of sounds and senses in the case of language; notes and combinations of notes in the case of music. Otherwise, language and music are identical. Rhythmic structure would correspond to prosody and melodic structure to syntax.

Psychologist Roger Shepard (2009) shows that the psychological similarities between these musical objects obey fundamental rules, which can be represented in the form of a spiral, governing the sequence and embedding of tones and chords within a melody. The data show that subjects, even non-musicians, are sensitive to these structures and detect their violations. The premise of a 'musical syntax' is therefore not unreasonable. In the same vein, Slevc, Rosenberg and Patel (2009) argue that, on the

one hand, the rules of musical organisation and those of language are different and are activated in different areas of the brain. On the other hand, the way in which the syntactic rules of both music and natural language are executed shares several resources. Indeed, the auditory areas of the brain respond in the same way to the violation of musical notes or syntactic structures, so that it could be said that the rhythmic structure of music corresponds to the prosody of language, while the harmonic structure corresponds to syntax.

This being the case, it is relevant to propose didactic interventions in classrooms where two or more "brain languages" are worked on. This article deals with the relationship between musical language and human language, and how the two form communication vessels to help primary school pupils learn more effectively and playfully.

1.2. The Social Network TikTok

The current digital age is characterised by the transformations that ICT has brought to all human spheres, including education, which is faced with new and constant challenges, some of which stem from the digital world. Thus, the development of technological devices and their numerous applications make it necessary to integrate them into teaching practice, and the analysis of their educational use is an interesting and necessary field of study. Social and educational digitalisation requires digital literacy, in a continuous process of updating among teachers and students. Del Barrio and Ruiz (2014) believe that the best attitude towards technology is to consider it as an immense bank of opportunities for young people, so they should be aware of its lights and shadows and be prepared to use it and not abuse it, as humans are changing the management of the brain with the use of ICT. Therefore, it is essential to integrate ICT into the teaching-learning process in a creative, useful, positive and enjoyable way. In the new millennium, ICTs are in themselves the most important means of cultural transfer and socialisation (Vaucheret, 2004).

As a result of relentless technological development, social networks are emerging as tools for communication and entertainment, as well as for expressing and sharing emotional states. They are deeply rooted in young people's habits and students need to be aware of them in order to use them correctly in a safe digital environment.

In 2018, after the merger with Musically, a Chinese app created in 2016 ('douyin', 'shake the music') became known to the world as TikTok (Tejedor et al., 2022). It is the most downloaded social network in the world (more than a billion times) and was the most requested non-gaming app in 2020, overtaking WhatsApp and Facebook (Statista, 2020). Its main audience is young people, with a large uptake among children aged 10 and 12, who enjoy creating short videos (between 15 seconds and 3 minutes) with challenges, dances, comments, with or without music, usually presented as a performance with dances, dialogues and songs (Anderson, 2020). In these creations, the humorous tone prevails, which allows the incorporation of music, effects, filters, among others. Their purpose is to entertain the so-called "Generation Z", born in the digital age, with a huge technological adaptation and whose normalised communication sphere is that of social networks (García Cadenas, 2022).

The potential of the TikTok social network allows it to be used as a learning tool. It can be integrated into educational processes through different pedagogical, didactic and innovative activities. It can be used to address different issues, ranging from emotional education (what and how people post on social networks), knowledge acquisition and the achievement of important aspects for students, such as a sense of personal identity, increased cooperation in carrying out group tasks or projects, the discovery of new academic uses of the digital world, as well as fun uses, a sense of belonging to a group, motivation to learn by carrying out fun technological tasks, and the development of innovation and creativity (Europa Press, 2021).

Tejedor et al. (2022) reflect the state of studies on TikTok, highlighting that it is a research topic on the rise: in the political field (Cervi et al., 2021; Medina Serrano et al., 2020), in health (much work by the Chinese literature), in entertainment (Masciantonio et al., 2021; Ballesteros-Herencia, 2020), in educational uses (Escamilla-Fajardo et al. (2021), in the creation of virtual communities promoting digital literacy (Rach and Lounis (2021), in the impact on adolescents and children (Pérez-Rodríguez and Delgado-Ponce (2012); (Fueyo et al., 2018). And they believe that emphasis should be placed on analysing their methodological possibilities and their training potential in formal learning

environments, as well as in teacher training. Finally, we should add the interesting and recent literature review by Caldeiro and Yot (2023) on the didactic possibilities of TikTok.

2. Methodology

The methodology used in this work includes both quantitative and qualitative aspects, following the definitions of Osorio and Castro (2021): the quantitative approach looks for quantity, frequency, intensity, percentage; on the contrary, the qualitative approach looks for quality, essence, uses words to study the internal, based on opinions, feelings and attitudes.

Thus, the quantitative approach is used to objectively collect data for subsequent analysis, on the basis of which different hypotheses are made and conclusions are drawn (Sampieri et al. 2003), while the descriptive design, in this case by means of a survey, can be defined as a scientific method that involves observing and describing the behaviour of a subject without influencing it in any way (Shuttleworth, 2019). On the other hand, the qualitative approach, Alvarez-Gayou (2004) points out that this method usually uses research questions and collects data that have no numerical measurement. It is a flexible process that moves between the occurrences and events that take place and the interpretations that are made of them. It aims to reconstruct reality and is usually referred to as a 'holistic' method, based on inductive schemes in which premises, the truth of which supports but does not guarantee the conclusion.

It was decided to use the questionnaire tool carried out in the exploratory phase to assess student satisfaction. This intervention covers the quantitative aspect. In addition, the tools used to evaluate the teaching-learning process, direct observation and rubrics (the latter designed to assess attitudes to work and behaviour with peers), deal with the qualitative aspect.

Before presenting the results, it was necessary to go through two stages in order to analyse and process the data. Accordingly, the methodology section is divided into three sections, which reflect the stages of extracting the relevant results from the surveys. Firstly, we will focus on the preparation prior to the statistical analysis phase, which was carried out using the Microsoft Excel programme. Once this initial coding has been completed, in a second part we will explain all the work carried out using the Google Forms programme to deal specifically with the quantitative data we exported from this modified Excel.

Pre-Coding

Firstly, it was necessary to work with Excel to export and format the data into numerical form. In the questionnaire response file, much of the data was in both nominal and numeric form. There were also many variables in the form of scales and conditional variables.

Once all the previous work had been done in Excel and the nominal variables had been converted to numerical codes, the data was analysed using Google Forms. The results were imported numerically and the different variables were coded according to the changes in the Excel programme. Three types of information had to be processed and coded: nominal data that allowed only one answer to be chosen, according to the range in which the respondent was located or according to the answer to be proposed by the respondent. For these types of questions, numbers were suggested for each different answer.

The use of the Google Forms programme allows us to have a graphical and tabular view of the different variables once the descriptive analysis of each piece of information has been carried out. Depending on the data we are dealing with, it is better to have pie charts or histograms to compare the data. First, we will work with the tables that collect the data before we can analyse them visually.

2.1. Participants

The intervention presented in this research was carried out in a school located in the centre of the city of Albacete, with families of medium socio-economic and cultural level. This school opened its doors in 1924 in response to a humanist and Christian educational demand, defending an integral approach to education between faith and culture. At present, it is a bilingual English school that teaches at the infant, primary, secondary and basic vocational levels.

The teaching activity was carried out in the Primary 5A class, a group of 25 students (13 girls and 12 boys), aged between 10 and 11 years old, where there was a good community and working atmosphere. We worked on content related to the social sciences, specifically the Middle Ages. The methodology used

was participatory, as the students were continuously involved in the sessions and were highly motivated as they were involved in the design and planning of each session.

The intervention consisted in using the social network TikTok to enhance the students' learning process. Using this tool, the students created a performance, which was recorded in several videos, in which they sang the content of the history topic they were working on in class in the Social Science subject.

3. Objectives

The aim was twofold: on the one hand, to see if singing and body language could help students retain the theoretical content of social studies. On the other hand, we wanted to find out if this activity favoured the integration and socialisation of the pupils.

As a secondary objective, we wanted to find out whether the use of social networks combined with music facilitates the teaching-learning processes of primary school pupils.

4. Results on Preferences, Knowledge and Use of Social Networks

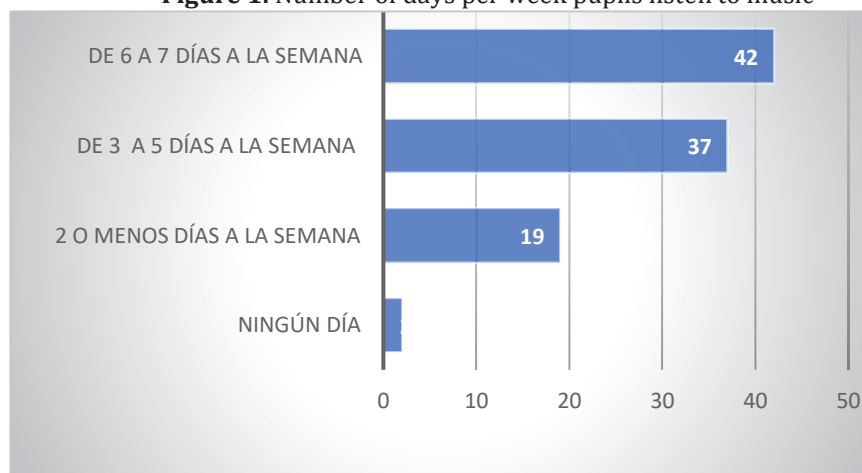
The first step was to obtain parental consent and permission to film the students, who were minors, by means of a letter detailing the activity to be carried out. Consent was unanimous, as no family refused. Before starting, a questionnaire was prepared on the students' musical preferences, knowledge and use of social networks and their usefulness in the learning process. The information collected was the starting point for programming the work sessions according to the students' knowledge and preferences. The didactic intervention was carried out with the students of group A of the 5th grade of primary school, although the questionnaire was given to the two 5th grade classrooms and the two 6th grade classrooms with the intention of increasing the number of participants in order to strengthen the representative value of the opinion of the students of this age. A sample of 101 primary 5 (47%) and 6 (53%) pupils was obtained.

The questionnaire designed was structured in four blocks of questions: description of the respondent (gender, age); personal musical preferences; knowledge and use of social networks; use of music and social networks in education. It was subjected to expert judgement by 3 university professors, specialists in the field. Before filling in the questionnaire, the students were explained how to do it and their doubts were clarified.

4.1. Musical Preferences

The results of the analysis of the responses to the questionnaire are presented below. 49.5% of the sample were female and the remaining 49.5% were male. Almost the entire sample said they liked music (98%) and more than three quarters listened to music three or more days a week (Figure 1).

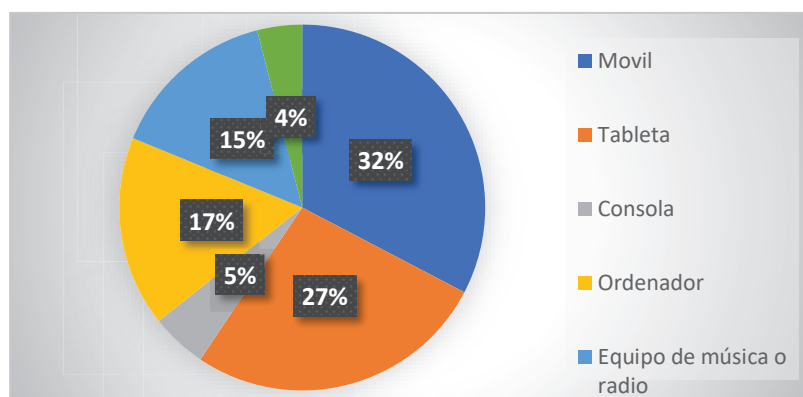
Figure 1. Number of days per week pupils listen to music



Source: Own elaboration, 2023

In terms of time spent listening to music, more than half (54.46%) spend less than 30 minutes per day and a small proportion (13.86%) spend more than an hour. The most used device is the mobile phone, followed by the tablet, which together account for 57% of the total sample (Figure 2).

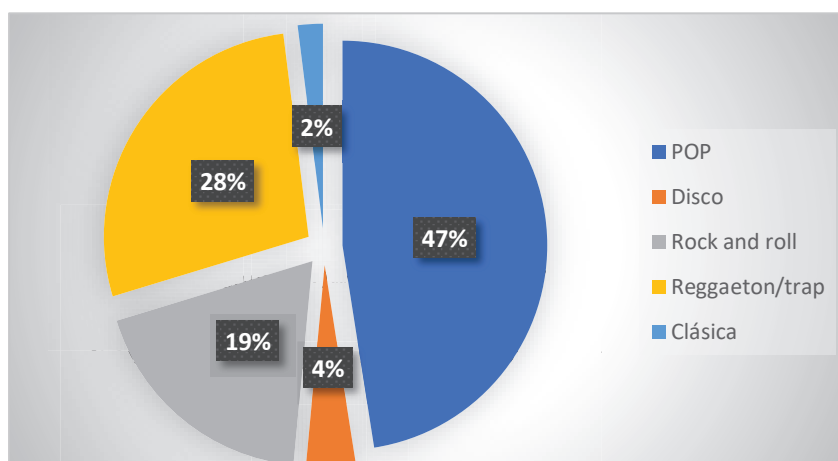
Figure 2. Devices on which students listen to music.



Source: Own elaboration, 2023

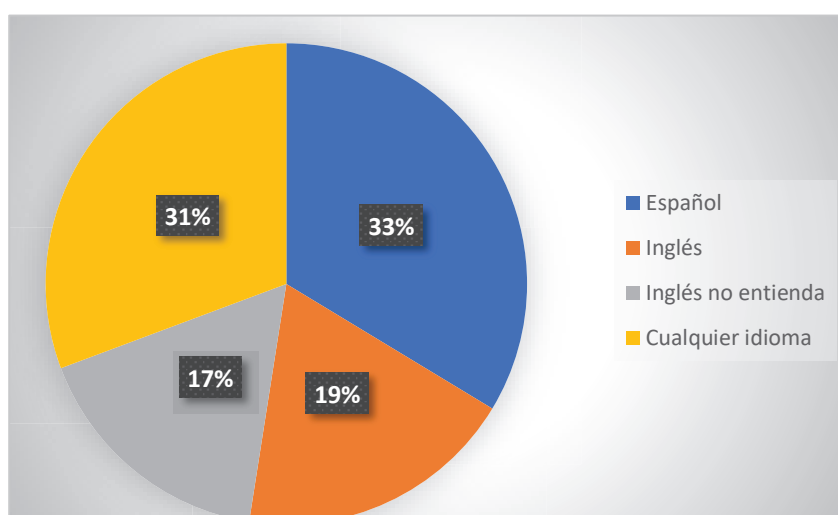
Figure 3 shows that pop music is listened to the most (47%) and classical music the least (2%). In terms of language, about a third of the sample prefers to listen to songs in Spanish, another third in English, whether they understand the lyrics or not, and the last third say they don't care (Figure 4).

Figure 3. Preference of music style listened to



Source: Own elaboration, 2023

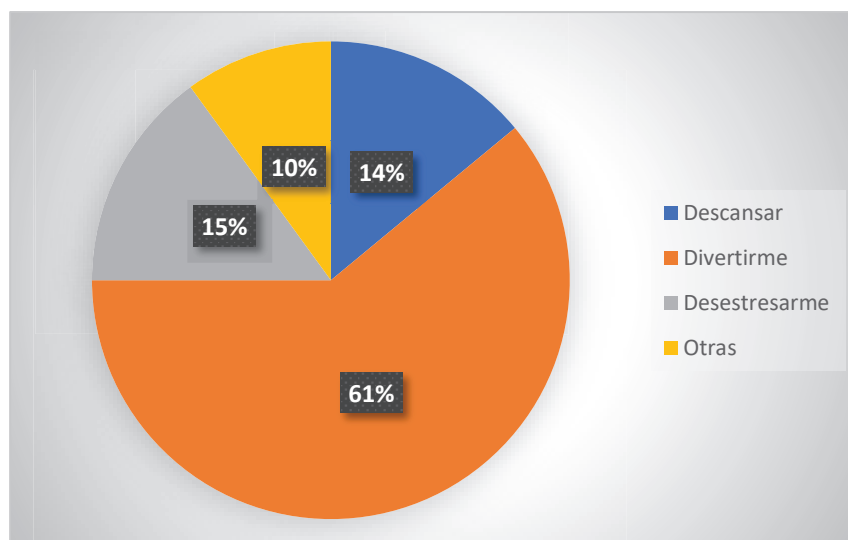
Figure 4. Language preference of songs listened to



Source: Own elaboration, 2023

Over half of the respondents (61%) listen to music for fun and about 30% use it to relax and de-stress (Figure 5). However, there are no major differences in whether they listen to the same type of music when they are sad or happy (51.49% say the same type), suggesting that musical preferences prevail over emotions.

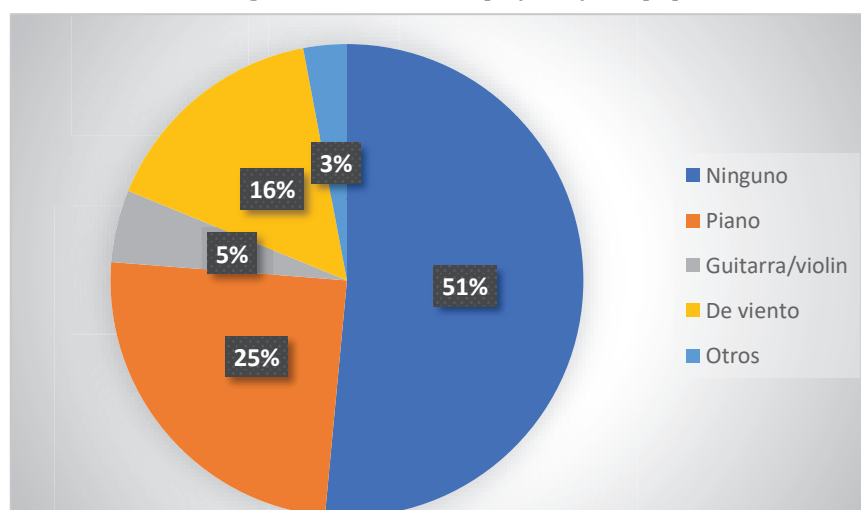
Figure 5. Reasons why pupils listen to music.



Source: Own elaboration, 2023

The vast majority of respondents said they liked music, but the percentage of students who play an instrument is less than 50%. Of these, almost half play the piano (Figure 6): they usually practise two days a week for an hour and a half each day. None play two or more instruments.

Figure 6. Instruments played by the pupils.



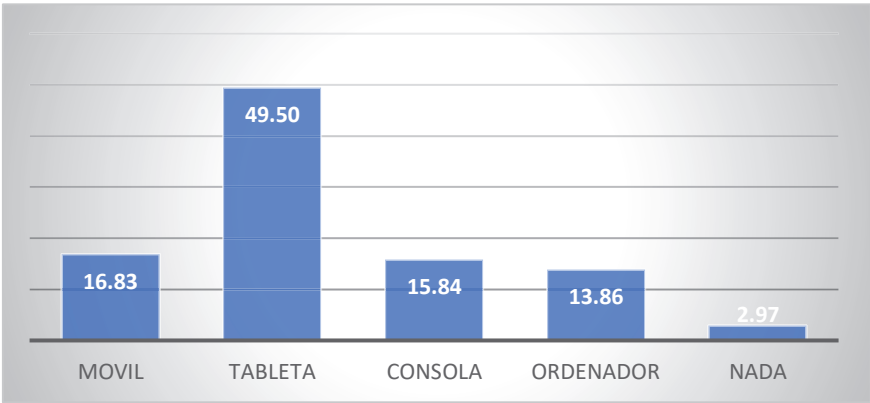
Source: Own elaboration, 2023

4.2. Social Networks

The following results were obtained in relation to the use of social networks:

With regard to the electronic devices available to them, where students had more than one, they were asked to indicate which one they used most. Thus, 50% of the students surveyed have a tablet for their own use, compared to 13.86% who use a computer; only 3% have none (Figure 7).

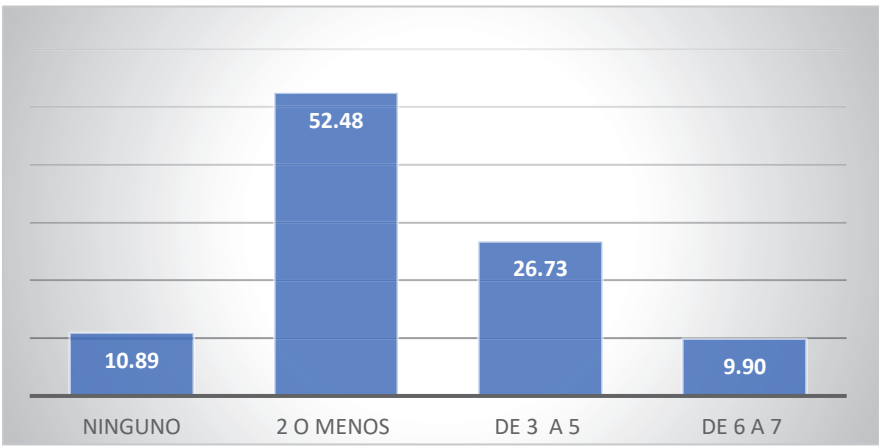
Figure 7. Type of own electronic device



Source: Own elaboration, 2023

Figure 8 shows the percentage of students using electronic devices for classroom work and how many days per week. More than 50% of students report using them two days a week or less.

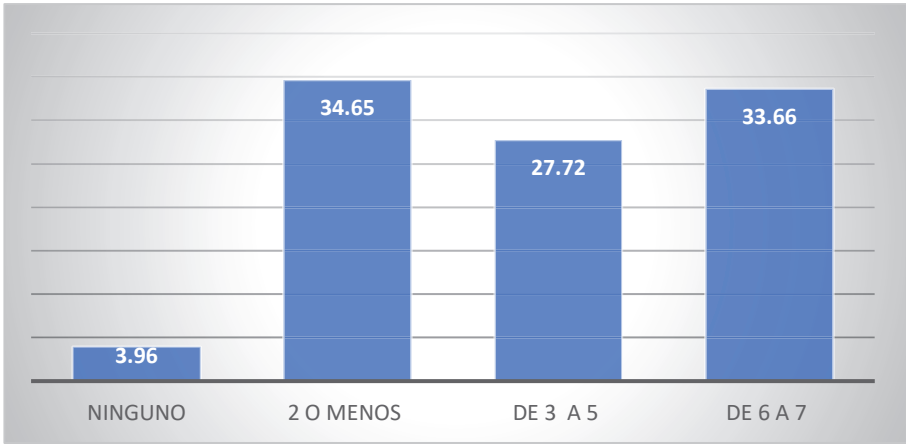
Figure 8. Use of electronic devices for classroom tasks and days per week



Source: Own elaboration, 2023

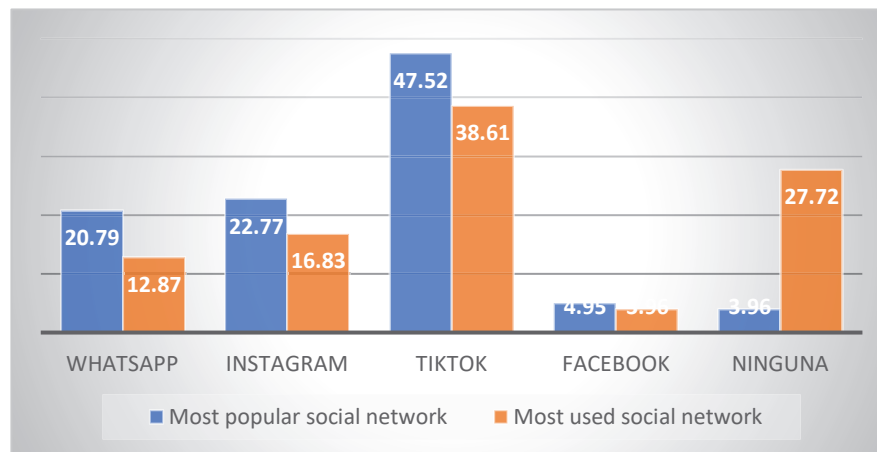
Similarly, Figure 9 shows that 34.65% of students use these devices for leisure two days a week or less, compared to 33.66% of students who use them for leisure 6 or 7 days a week.

Figure 9. Use of electronic devices for leisure by number of days per week



Source: Own elaboration, 2023

The most popular social network among students is TikTok (almost 50%) and the most used (38'61%). Facebook is the least known technological tool for social use (4'95%) and about 4% admit to not knowing anything about social networks (Figure 10).

Figure 10. Well-known and used social networks.

Source: Own elaboration, 2023

Almost 50% of students say that they have received most of their information about how to use social networks safely from their parents; 14.85% say that they have received this information from school and 14.85% admit that they have not received any information about how to use these technological tools safely. Almost three quarters of students say that their parents always or almost always monitor their use and behaviour on social networks.

When asked if they have used songs to learn multiplication tables, the alphabet or other educational content, the majority say yes (68%). In addition, more than 80% think that music can help them learn other subjects. Finally, when asked if they would like to participate in an educational TikTok to learn social studies content, 74% said yes.

After learning about the students' musical preferences and their level of knowledge and use of social networks, the intervention was structured into five sessions.

Intervention Procedure

A brief description of the process would be as follows: three melodies without lyrics, taken from karaoke, were brought into the classroom so that the students could choose one by voting, and the one chosen was the song "Despacito" by Luis Fonsi. Each group made a summary of a part of the medieval theme to work on the historical aspects. With the help of the teacher, the lyrics of the future song were written, trying to rhyme and respect the musical accents, thus helping to memorise the lyrics. Several singing rehearsals were held, supported by the karaoke melody. The singing with the melody and the different group scenes, sound and image, were recorded separately so that the video would be of higher quality. The students designed all the staging, movements, choreography and costumes. The teacher, using the TikTok application on his mobile phone, recorded the various small groups in different areas of the school to later create the final video montage.

The methodology used in the sessions was inspired by participatory and collaborative learning (Palacios, Toribio and Deroncel, 2021), as all the students worked together to choose the music, write the lyrics of the song, create the choreography, choose the decorative elements of the costumes and stage the video with the different materials they had designed, prioritising intercommunication. At the time of filming, the health alert caused by the Sars-Cov2 virus had improved and although it was still compulsory to wear masks indoors, it was possible to carry out this collaborative activity.

The curricular content has been taken from Decree 54 of 2014, which develops the curriculum for primary education in Castile-La Mancha. The contents corresponding to the area of Social Sciences, specifically Block 4, The Traces of Time, belonging to the didactic unit The Middle Ages, have been the basis of this intervention proposal.

Work has also been carried out on the understanding of concepts such as historical time and its measurement, through the study of the great historical stages. In this particular block, work is carried out with maps and other appropriate graphic representations, with the aim of arousing the pupils' curiosity to learn about ways of life in the past, as well as strengthening their appreciation of the

importance of cultural heritage, with the aim of respecting and valuing it. On the other hand, the intervention carried out has developed individual and collective working habits, with personal effort being the priority in all of them. Without forgetting to highlight the use of ICT, since today's school requires digitally competent professionals, and it is very important for teachers to know and control the use of information and communication technologies, because they can be used as motivational resources in the teaching-learning process.

Finally, it should be noted that assessment is an essential part of the teaching-learning process and deserves special attention (Asiú Corrales, Asiú Corrales and Barboza Díaz, 2021; Mendoza, Cedeño, Espinales and Gámez, 2021). The use of rubrics in the assessment process allows students to construct their learning by knowing what they need to learn, how to learn it, what strategies to develop and how to achieve it. In addition, it makes the student strive to improve the activities in order to meet the criteria specified in the rubric. For all these reasons, rubric assessment is a very positive tool for formative assessment (Chávez Rosas de Saavedra, 2021).

In the first stage of the intervention, direct observation was used to evaluate the teaching-learning process, in particular the attitude towards work and behaviour towards classmates. Table 1 shows the evaluation rubrics used:

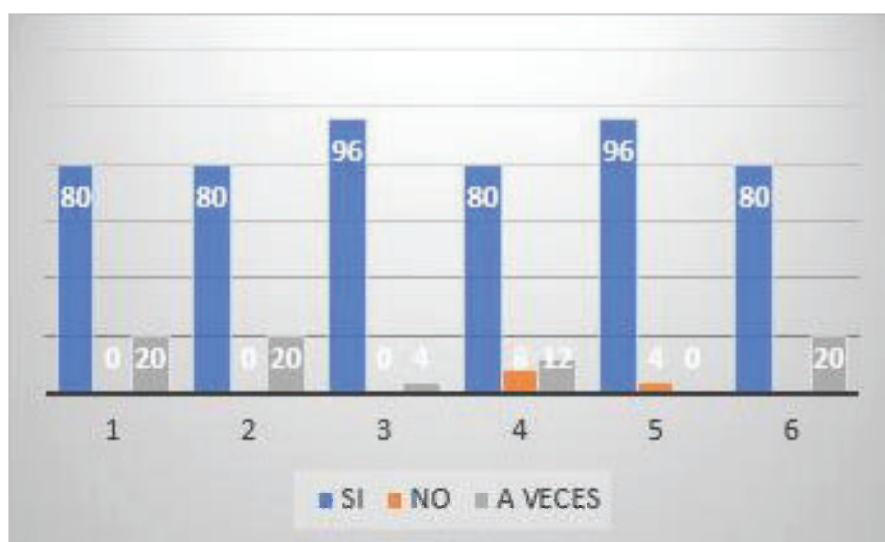
Table 1. Evaluation rubrics

		YES	NO	SOMETIMES
1	Shows interest in the proposed activities			
2	Collaborate with the working group			
3	Respect the school's rules of coexistence.			
4	Use appropriate language in the classroom			
5	Shows good attitude and behaviour in their work group.			
6	Helping those in need			

Source: Own elaboration, 2023

Figure 11 shows the class average obtained in the assessment rubrics.

Figure 11. Results of the evaluation rubrics



Source: Own elaboration, 2023

Subsequently, a systematic assessment was carried out to check that the students had learned the contents of the subject, according to the evaluation criteria established in the principles of Decree 54/2014 of 10/7/2014, Primary Education Curriculum in Castilla - La Mancha). In accordance with the evaluable learning criteria for the specific content of Unit 5 of the fifth year of Social Sciences, the objective assessment test was carried out by means of a test with 10 varied questions: development, matching dates and fill in the blanks.

The scores obtained are shown in Table 2:

Table 2. Grades obtained by students.

Qualification	Absolute value	Percentage
Excellent	1	4%
Very Good	15	60%
Good	8	32%
Satisfactory	1	4%
Insufficient	0	0%

Source: Own elaboration, 2023

5. Results on Qualifications and Motivation

In order to verify that the objectives of the intervention had been achieved, on the one hand, the scores obtained in the evaluation of the unit were used to confirm that music facilitates the retention of knowledge. On the other hand, in order to demonstrate whether motivation had been increased and whether integration and socialisation among the students had been facilitated, a new questionnaire was developed to find out the level of satisfaction of the students with the TikTok activity carried out in class.

This questionnaire consists of 15 questions designed on a Likert scale, where 1: "Strongly disagree"; 2: "Disagree"; 3: "Agree"; 4: "Strongly agree"; 5: "Don't know, don't answer". The central term "Neither agree nor disagree" was omitted; in this way, as the middle term does not appear as a possible answer, it is easier for students to position themselves in favour of or against the activity. The questionnaire was completed by the students after the teacher's explanation and evaluation of the unit.

Table 3. Satisfaction with the intervention questionnaire

	1	2	3	4	Ns/ Nc
1 The teacher has clearly explained the activity.					
2 The teacher is orderly and systematic in his presentations.					
3 The TikTok activity makes the class fun and enjoyable.					
4 The TikTok activity has managed to keep my attention throughout the class.					
5 The TikTok activity has helped me to better understand the subject matter explained.					
6 The TikTok activity has made it easier for him to retain or memorise the contents of the subject.					
7 The TikTok activity has made me feel more integrated in my class group.					
8 With the TikTok activity I have made new friends in class.					

9	The TikTok activity has made him participate more actively in class.
10	Now I like music more.
11	I find music useful for memorising content.
12	I believe that ICT and in particular the social network TikTok should be used by teachers of other subjects.
13	The exam on the Middle Ages was easier for me because I knew it better.
14	I would like to repeat this activity in more units.
15	I would like to have another lesson with this teacher.

Source: Own elaboration, 2023

Table 4 shows the results of the questionnaire evaluation of the intervention carried out in the classroom with the incorporation of TikTok.

Table 4. Results of the intervention evaluation

	Strongly disagree	Disagree	Agree	Strongly Agree	Don't know/ No answer
1	0	0	8	92	0
2	0	0	32	68	0
3	0	0	20	80	0
4	0	16	48	36	0
5	4	0	16	80	0
6	0	8	28	64	0
7	4	4	60	32	0
8	34	8	20	36	0
9	4	20	28	48	0
10	8	16	20	56	0
11	4	4	44	48	0
12	0	12	24	64	0
13	4	0	40	56	0
14	4	4	12	80	0
15	0	8	16	76	0

Source: Own elaboration, 2023

100% of pupils found the intervention enjoyable and fun. 84% said that the intervention managed to keep their attention throughout the lesson. 96% of the students felt that the intervention helped them to understand the subject of the Middle Ages better and 92% were able to retain or remember the content more easily, so it is clear that significant learning was achieved. On the other hand, 92% felt more integrated in the class after the intervention, 56% stated that they had made contact with classmates with whom they had less contact and 76% stressed that

they had participated more actively in the class, which leads to the conclusion that group work favoured integration and a good class atmosphere. In addition, 72% said that they liked music more after the intervention and 92% found it useful for memorising content. This shows the importance of music and musical activities in any teaching-learning process. Finally, 84% felt that the use of ICT, especially the social network TikTok, should be increased in the classroom. In addition, 96% found the subject of the Middle Ages easier and 92% would like to repeat this activity in more lessons.

These results regarding the level of student satisfaction with the intervention show that the combination of music and social networks can facilitate the teaching-learning process, while at the same time motivating students and promoting communication in the classroom.

6. Conclusions

Thanks to the latest discoveries in neuroscience, which describe a mind in which there are "brain languages" whose cognition is similar, the school of the 21st century must be a school of interdisciplinarity. An example has been proposed of how music and natural language find points of union for the sake of greater comprehension and memory efficiency and greater social integration of pupils. This was confirmed after carrying out a didactic intervention in the field of social sciences with pupils of the 5th grade of primary school, in which music was introduced through the use of the social network TikTok.

The activity, which focused on the recording of a TikTok music video about the Middle Ages, allowed the students to focus on a specific piece of knowledge in order to deepen and better understand it. In addition, the process of designing and making the TikTok helped the students to develop their critical and creative thinking skills and highlighted their increased motivation to learn more elements of the history topic. Audiovisual formats are an attractive and useful didactic resource, as they have a positive impact on the educational processes of younger students, who are much more receptive to them, transmitting knowledge, developing skills and creating positive attitudes (Meléndez & Huerta, 2023).

In the previous exploratory phase, which aimed to find out the students' musical preferences and their knowledge and use of social networks, it was concluded that more than 60% of the students listened to music for fun; 47.51% said that the most popular social network was TikTok and 38.61% said that it was the one they used the most. These data led to the development of an intervention based on the use of the social network TikTok for playful learning.

Regarding the intervention itself, Álvarez et al. (2016) confirm the usefulness of music in all disciplines in primary education, agreeing with Linares (2015), who states that aspects related to nature, environment, society and culture can be learned through an active musical methodology. His results are similar to those of the present study, which shows that music facilitates the retention of knowledge in the field of social studies, with 92% of the participating students stating that it is useful for memorising content and 96% highlighting that it makes learning easier.

100% of the students indicated that the use of music, and in particular the group singing that took place during the intervention, made the lessons more enjoyable and fun. This is in line with the aforementioned study by Álvarez et al. (2016), where the degree of enjoyment of the pupils in the classroom activities in which group singing was used reached 90%, and also with the work of Juan-Rubio and García-Conesa (2016), where it is evident that the results are improved when music is used correctly in its most playful aspect.

The intervention carried out has improved the social relationship between classmates and the classroom environment, which is consistent with the result of Román and Cardemil (2016), who show that musical games improve relationships with others. Thus, 84% of respondents believe that similar activities should be carried out in other subjects.

It is necessary to learn the correct use of technologies and social networks as media or tools that create spaces for well-being, communication and enjoyment. In addition, social networks have been shown to have advantages in education, such as providing quick access to information of all kinds, helping to acquire digital literacy, promoting autonomy in students' learning,

facilitating communication between teachers and students, and getting used to the correct use of ICT (De Moya et al., 2023).

The aim of this intervention was to demonstrate that social networks are a valuable technological tool for use in primary school classrooms, as they allow teachers to share information with students, as well as different materials and resources for learning (Cabero Almenara, 2017). In this case, TikTok has been chosen because it is an application of the aforementioned social networks that is very popular among students in the last years of primary school. Thus, it has been confirmed that it is a motivating element for students and that it promotes their learning thanks to the playful strategy of creating videos with a touch of humour, using the theoretical content studied in the classroom. Furthermore, this tool makes it possible to share these educational videos with the educational community via mobile phones and computers, with the aim of contributing to the acquisition of skills (learning to learn, responsible use of ICT) and promoting collaboration in the classroom, thanks to the design and development of group projects where ideas are shared and creativity and teamwork are developed (García Cadenas, 2022; Tejedor Calvo et al., 2022).

Personal values, ideas and preferences are shared and disseminated through human networks, which in turn influence other people's ways of feeling, thinking and acting (Christakis and Fowler, 2009).

The unstoppable advance of ICT brings with it a pedagogical creativity that requires profound reflection in the faculties of education that train future teachers, since university classrooms cannot and should not remain on the sidelines of these social, technological and didactic transformations, but should always be viewed through a humanistic prism. The challenges that we are facing foreshadow the fact that all human knowledge is being dumped on the Net in order to make it available to everyone: organising it, using it and defining its limits for the sake of ethical use are our greatest challenges.

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References

- Álvarez, T.; Bertrán, C.; Caballero, A.; Cebrián, A.; Gómez, L.; Luque, P.; Mas, N.; Meraga, N.; Nieto, Y.; Perich, M.; Solé, A.; Terradellas, A. M.; Tintó, S.; Trius, I.; Vicario, C.; Villacampa, E.; Vicens, M.; Whitehouse, A.; Zafra, J. r (2016). La música vista a través de futuros docentes: ¿la formación musical sirve a los maestros generalistas de Primaria? *ARTSEDUCA* 14, 52-75. <https://www.e-revistas.uji.es/index.php/artseduca/article/view/2135>
- Anderson, K. E. (2020). Getting acquainted with social networks and apps: it is time to talk about TikTok. *Library Hi Tech News*, 37(4), 7–12. <https://doi.org/10.1108/LHTN-01-2020-0001>
- Asiú Corrales, L. E.; Asiú Corrales, A. M^a y Barboza Díaz, Ó. A. (2021). Evaluación formativa en la práctica pedagógica: una revisión bibliográfica. *Conrado*, 17(78), 134-139. http://scielo.sld.cu/scielo.php?script=sci_abstract&pid=S1990-86442021000100134
- Ballesteros Herencia, C. A. (2020). La propagación digital del coronavirus: Midiendo el engagement del entretenimiento en la red social emergente TikTok. *REVISTA ESPAÑOLA DE COMUNICACIÓN EN SALUD*, 171-185. <https://doi.org/10.20318/recs.2020.5459>
- Cabero Almenara, J. (2017). La formación en la era digital: ambientes enriquecidos por la tecnología. *Gestión de la Innovación en Educación Superior*, II (2), 41-64. <http://hdl.handle.net/11441/67192>
- Caldeiro-Pedreira, M. C. & Yot-Domínguez, C. (2023). Usos de TikTok en educación. Revisión sistemática de la aplicabilidad didáctica de TikTok. *Anàlisi: Quaderns de Comunicació i Cultura*, 69, 53-73. <https://doi.org/10.5565/rev/analisi.3630>
- Carneiro, R.; Toscano, J. C. & Díaz, T. (coords.) (2021). *Los desafíos de las TIC para el cambio educativo*. Fundación Santillana. <https://eduteka.icesi.edu.co/articulos/oei-desafios-tic-para-cambio-educativo>
- Casals Ibáñez, A.; Carrillo Aguilera, C. & González-Martín, C.. (2014). La música también cuenta: combinando matemáticas y música en el aula. *Revista Electrónica Europea de Música en la Educación, LEEME*, 34, 1-17. <https://ojs.uv.es/index.php/LEEME/article/view/9861>
- Ceballos, Y. S. (2020). *Tiktok como innovación educativa en el Ipem N 193*. [Bachelor's thesis]. <https://repositorio.uesiglo21.edu.ar/handle/ues21/19291>
- Cervi, L., Tejedor, S. & Marín Lladó, C. (2021): TikTok and the new language of political communication: the case of Podemos. *Cultura, Lenguaje y Representación*, 26, 267-287. <http://dx.doi.org/10.6035/clr.5817>
- Chávez Rosas de Saavedra, B. Z. (2021). *Las rúbricas de evaluación y el rendimiento académico en el área de Comunicación de los estudiantes de primer grado de la IE "Luis A. Sánchez Sánchez"*. [Tesis para obtener el Grado académico de Maestra en administración de la educación. Universidad César Vallejo]. <https://repositorio.ucv.edu.pe/handle/20.500.12692/67625>
- Christakis, N. A. y J. H. Fowler (2009), *Connected: How Your Friends'Friends'Friends Affect Everything You Feel, Think, and Do*. Nack Bay Books. [Ed. cast.: Conectados: El sorprendente poder de las redes sociales y cómo nos afectan, Taurus, 2010.]
- Decreto 54/2014, de 10/07/2014, por el que se establece el currículo de la Educación Primaria en la Comunidad Autónoma de Castilla- La Mancha. *Boletín oficial de Castilla La-Mancha*, 132, de 11 de julio de 2014. <https://www.educa.jccm.es/es/normativa/decreto-54-2014-10-07-2014-establece-curriculo-educacion-pr>
- De Moya Martínez, M^a. V.; Segura Tornero, A.; Robles De Moya, M^a.V.; Bravo Marín, R. (2023). Música, tecnología y redes sociales: hábitos y beneficios. En Ana M. Vernia Carrasco (dir. Ycoord.), *Artes y salud. Calidad de vida en los entornos sociales y educativos*, Dykinson, S.L, 29-38. <https://dialnet.unirioja.es/servlet/articulo?codigo=8877936>
- <https://www.digitaliapublishing.com/a/127268/artes-y-salud.-calidad-de-vida-en-los-entornos-sociales-y-educativos>
- Del Barrio Fernández, Á. & Ruiz Fernández, I. (2014). Los adolescentes y el uso de las redes sociales. *Revista INFAD De Psicología. International Journal of Developmental and Educational Psychology*, 3(1), 571-576. <https://doi.org/10.17060/ijodaep.2014.n1.v3.537>

- Escamilla-Fajardo, P., Alguacil, M., & López-Carril, S. (2021). Incorporating TikTok in higher education: Pedagogical perspectives from a corporal expression sport sciences course. *Journal of Hospitality, Leisure, Sport & Tourism Education*, 28, (1). <https://doi.org/10.1016/j.jhlste.2021.100302>
- Europa Press. (2021). Los niños aumentaron un 76% su uso de las redes sociales durante 2020. 8 de abril europapress.es. <https://www.europapress.es/portaltic/socialmedia/noticia-ninos-aumentaron-76-uso-redes-sociales-2020-20210408152750.html>
- Fitch, W. T. (2014). Toward a computational framework for cognitive biology: unifying approaches from cognitive neuroscience and comparative cognition. *Physics of Life Reviews*, 11(3), 329–364. <https://doi.org/10.1016/j.plrev.2014.04.005>
- Fueyo, A., Rodríguez, C., y Hoeschsman, M. (2018). Construyendo Ciudadanía Global en Tiempos de Neoliberalismo: Confluencias entre la Educación Mediática y la Alfabetización Digital. *Revista Interuniversitaria de Formación Del Profesorado*, 32(1), 57-68. <https://bit.ly/3p3dtZe>
- García Cadenas, L. (2022). *Las redes sociales en el aula de primaria: el ejemplo de TikTok*. [TFG en Educación Primaria. Universidad de Valladolid]. *Trabajos Fin de Grado UVA* [24846] <https://uvadoc.uva.es/handle/10324/58614>
- Juan Rubio, A. D. & García Conesa, I. M^a. (2016). Las canciones como herramientas pedagógicas para la enseñanza del inglés en la Educación Primaria. *Revista Electrónica del Lenguaje*, 3, 1-24.
- Hauser, M. D.; Chomsky, N.; Fitch, W. T. (2002). The faculty of language: what is it, who has it, and how did it evolve? *Science*, 298(5598), 1569–1579. <https://doi.org/10.1126/science.298.5598.1569>
- Hauser, M. D. & Watumull, J. (2017). The Universal Generative Faculty: The source of our expressive power in language, mathematics, morality and music. *Journal of Neurolinguistics*, 43, Part B, 78-94. <https://doi.org/10.1016/j.jneuroling.2016.10.005>
- Katz, J. & Pesetsky, D. (2011). The identity thesis for language and music. <http://ling.auf.net/lingBuzz/000959> <http://ling.auf.net/lingbuzz/000959/v1.pdf>
- Linares, M^a. C. (2015). La pedagogía de la imagen: las láminas escolares como recurso histórico y museográfico en la historia de la educación. *Revista Iberoamericana de Patrimonio Histórico-Educativo*, 1(1), 68-82.
- Lerdahl, F. & Jackendoff, R. S. (1983). *A generative theory of tonal music*. The MIT Press.
- Masciantonio, A., Bourguignon, D., Bouchat, P., Balty, M., y Rimé, B. (2021). Don't put all social network sites in one basket: Facebook, Instagram, Twitter, TikTok, and their relations with well-being during the COVID-19 pandemic. *PLOS ONE*, 16(3), e0248384. <https://doi.org/10.1371/journal.pone.0248384>
- Medina Serrano, J. C., Papakyriakopoulos, O., y Hegelich, S. (2020). Dancing to the partisan beat: A first analysis of political communication on TikTok. *Social and Information Networks*, 12, 257–266. <https://doi.org/10.1145/1122445.1122456>
- Meléndez Chávez, S. & Huerta González, S. (2023). Cinema at home: a means of communication and an effective tool for teaching. *VISUAL REVIEW, International Visual Culture Review / Revista internacional de cultura visual*, 13 (3), 1-9. <https://doi.org/10.37467/revvisual.v10.4579>
- Osorio González, R. y Castro Ricalde, D. (2021). Aproximaciones a una metodología mixta. *NovaRua: Revista Universitaria de Administración*, 13(22), 65-84. https://www.researchgate.net/publication/353084328_Aproximaciones_a_una_metodologia_mixta
- Patel, A. D. (2003). Language, music, syntax and the brain. *Nature Neuroscience*, 6(7), 674–681. <http://doi.org/10.1038/nn1082>
- Palacios Núñez, M. L.; Toribio López, A. y Deroncele Acosta, A. (2021). Innovación educativa en el desarrollo de aprendizajes relevantes: una revisión sistemática de literatura. *Universidad y Sociedad*, 13(5), 134-145.

- Pérez-Rodríguez, A., & Delgado-Ponce, Á. (2012). De la competencia digital y audiovisual a la competencia mediática: dimensiones e indicadores. *Comunicar*, 39, 25-34. <https://doi.org/10.3916/C39-2012-02-02>
- Rach, M., y Lounis, M. (2021). The Focus on Students' Attention! Does TikTok's EduTok Initiative Propose an Alternative Perspective to the Design of Institutional Learning Environments? En T. Antipova (Ed.), *Integrated Science in Digital Age 2020*, 241-251. https://doi.org/10.1007/978-3-030-49264-9_22
- Román, M. & Cardemil, C. (2016). Juego, interacción y material educativo en el nivel Preescolar. ¿Qué se hace y cómo se aprende? *Revista Iberoamericana de Evaluación Educativa*, 7(1), 43-62.
- Shepard, R. N. (2009). One cognitive psychologist's quest for the structural grounds of music cognition. *Psychomusicology: Music, Mind and Brain*, 20(1-2), 130-157. <https://doi.org/10.1037/h0094217>
- Slevc, L. R., Rosenberg, J. C., & Patel, A. D. (2009). Making psycholinguistics musical: self-paced reading time evidence for shared processing of linguistic and musical syntax. *Psychon Bull Rev*, 16(2), 374-81.
- Sorin, N. (2002). L'élève : sujet cognitif ou sujet connaissant ? *Revue internationale d'éducation de Sèvres*, 29, 85-90. <https://journals.openedition.org/ries/1880>
- Statista. (2020). Global social networks ranked by number of users 2020. <https://bit.ly/3c2GNto>
- Tapia Felipe, A. J. (2021). *Reconocer los rasgos básicos de las metodologías cuantitativas y cualitativas, utilizadas en la investigación social y educativa*. <https://www.entornointeligente.com/reconocer-los-rasgos-bsicos-de-las-metodologas-cuantitativas-y-cualitativas-utilizadas-en-la-investigacin-social-y-educativa/>
- Tejedor Calvo, S; Cervi, L.; Robledo-Dioses, K. & Pulido Rodríguez, C. (2022). Desafíos del uso de TikTok como plataforma educativa: Una red multitemática donde el humor supera al debate. *Aula abierta*, 51(2), 121-128. <https://reunido.uniovi.es/index.php/AA/article/view/17689>
- Trigueros Cano, F. J.; Sánchez Ibáñez, R. & Vera-Muñoz, M^a. I. (2012). El profesorado de Educación Primaria ante las TIC: realidad y retos. *REIFOP*, 15 (1), 101-112. <https://www.redalyc.org/articulo.oa?id=217024398008>
- Vaucheret García, G.E. (2004). El adolescente y los medios de comunicación. En: Castellano Barca, G.; Hidalgo Vicario, M. I., Redondo & C., Romero A. M. *Medicina de la adolescencia. Atención integral*. Ergón