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Research Article

Social networks and gamification in physical education: A case study

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ABSTRACT

Recent research and studies on training plans in physical education agree on the need to incorporate digital technologies in teaching contexts. At the same time, the introduction of active methodologies, such as gamification, has become one of the major trends of recent years. In this paper we present the perception of teachers and students about a gamified proposal for physical education in secondary education that uses social networks as a way for communication, collaboration, and promotion of physical activity among students. *Edmodo* has been used to carry out this experience because, as a vertical social network, it has an attractive interface for students and protects their privacy by not requiring any personal data.

This is a qualitative research, with a case study methodological design, which has used the focus group and group interview as data collection techniques. The sample consisted of 10 teachers, which represents all the teachers participating in the experience, and 56 students. The results show the positive assessment, both by teachers and students, of the *Edmodo* social network as a virtual teaching-learning environment for physical education in secondary education, and gamification as an active methodology. Likewise, the influence that the proposal, based on the use of digital technologies and gamification, has had on the promotion of physical activity among pupils has been high.

Keywords: physical education, social networks, gamification, secondary education, digital technologies

INTRODUCTION

In recent years, the initial and continuous training plans for physical education teachers have demanded the incorporation of digital technologies (Almusawi et al., 2021; Gawrisch et al., 2020; Phelps et al., 2021; Wyant & Baek, 2019), as well as such as the incorporation of active methodologies such as gamification (Cañizares & Carbonero, 2018; Fernández-Río et al., 2020; Sotos-Martínez et al., 2021). The combination of gamification, as a methodological strategy, and the use of digital technologies to carry out didactic situations within the framework of physical education in the school context, is materializing in innovative experiences such as those carried out by Lizandra et al. (2020), Monguillot et al. (2015), Montiel-Ruiz (2022), Ordiz (2017), Ortí (2018), and Quintero González et al. (2018).

From educational technology, digital tools can facilitate the management of the elements that make up a gamification process. Therefore, it is one of the lines of research and work in this field of knowledge according

to Cabero (2016). Likewise, research such as that of Baydas et al. (2015), and more recently Dağhan and Gündüz (2022) highlight the game-based learning and educational game and game design as trends in research in educational technology for the coming years. In this sense, thus, we have to consider the importance of properly integrating educational resources into gamification strategies. Educational resources do not work in isolation, but in a specific and complex context, and in fact, it is the didactic strategy and the pedagogic project the ones which give meaning to the use of educational resources (Cabero, 2004; Clark, 1983; Salomon & Clark, 1977).

Intervention designs mediated by ICT in physical education are based on the idea that technology is not a mere knowledge management tool, but also a facilitator of movement and physical activity of students. This results in the use of the characteristics of some mobile apps such as motion sensors or the GPS system, used for the development of specific physical education content (Almusawi et al., 2021; Casey, 2014; Casey & Jones, 2011; Cheng & Yin, 2019; Monguillot et al., 2014; Moreno et al., 2015; Pulido et al., 2016; Wyant & Baek, 2019).

In the learning processes mediated by ICT in physical education, different tools and virtual learning environments have been used, trying to start from the principles of collaborative work. Social networks are mainly used to form a collaborative learning community, whose specific applicability to the area of physical education has been analyzed in various investigations (Carpenter & Linton, 2018; Casey et al., 2017; Goodyear et al., 2014, 2019; Harvey et al., 2020).

A detailed analysis of the Spanish context shows that the curricular regulations for the area of physical education at secondary education stage include different methodological guidelines for teachers. These include encouraging students to do physical activity outside school hours independently, prioritizing the use of active methodologies and gamification as teaching strategies. In addition, the use of technological resources to mediate the teaching-learning process is also recommended by authors such as Almusawi et al. (2021), Casey et al. (2017), Gawrisch et al. (2020), Phelps et al. (2021), and Wyant and Baek (2019), among others. All this makes even more sense if we consider the fact that we are dealing with a population sector that is clearly sedentary and in which ICT use is inevitably linked to physical inactivity (Golpe et al., 2017).

In this respect, the aim of this work has been the design of an educational proposal, using social networks and gamification, with the aim of promoting physical activity among secondary school students. In this article, we focus on two of the specific objectives we defined in the research:

1. To find out the perception of the participating teachers and students on the design principles that should be prioritized in the development of intervention programs for teaching physical education in secondary education defined by the use of social networks and mobile applications.
2. To promote reflection on the implications of the use of social networks to guarantee student privacy.

THEORETICAL FRAMEWORK

Gamification as a Strategy in Physical Education

Gamifying implies bringing the dynamics, strategies, and characteristics of games to the classroom to work on aspects such as motivation, effort, and collaboration in the educational field (Hernández & Mayorga, 2022). For Kim et al. (2018, p. 28), "*Gamification is a set of activities and processes to solve problems.*" Along the same lines, Werbach (2014) points out that:

> Gamification should be understood as a process. Specifically, it is the process of making activities more game-like. Conceiving of gamification as a process creates a better fit between academic and practitioner perspectives. Even more important, it focuses attention on the creation of game-like experiences, pushing against shallow approaches that can easily become manipulative. A final benefit of this approach is that it connects gamification to persuasive design (p. 266).

The conception of gamification as a process allows students to become protagonists of their own learning process (Ardoy, 2017). There are three basic elements to gamify in educational contexts (Fernández-Río et al., 2020):

1. **Dynamic:** They are related to stories and narratives in progress in which the gamification process is immersed.
2. **Mechanics:** They refer to the rules and guidelines given to carry out the process.
3. **Components:** They are the scoring, tracking, or reward elements.

Cañizares and Carbonero (2018) explain that the game could be the communication or language system in a group, especially in the subject of physical education, but that gamification does not consist in creating a game but in applying its elements to a learning process. Therefore, carrying out gamified experiences implies the creation of activities and tasks with the combination of gamification elements such as levels, points, and badges. The points obtained during the sessions or tasks allow you to level up to progress. The team element allows different levels of achievement to be obtained through cooperation that translate into insignia, medals, or badges. A research on gamification carried out with 275 physical education students concluded that the gamified initiatives in physical education increase the students' motivation (Sotos-Martínez et al., 2021).

Gamification in the classroom stimulates five factors:

1. **Positive dependency:** There is a need to achieve the objectives, achievements, or goals from the group, from the community, so that positive dependence between peers is created during the learning process.
2. **Curiosity:** It is a factor that is developed thanks to the experiential learning that occurs due to the narrative in which the project is set.
3. **Motivation:** Outstanding factor to push the growth and permanent learning of the students. It is necessary to design activities that go in the direction of promoting a self-determined motivation that arises from the participant's own interest.
4. **Autonomy:** The collaborative work necessary to achieve the objectives does not exonerate us from assuming the individual work responsibilities that each student must face independently.
5. **Error tolerance:** Feedback from the teacher involved in the process and from peers in search of improvement and the common good is essential to develop problem-solving skills and obtain a perception of error as a possibility for growth.

Social Networks for Innovation in Physical Education

Social networks are those communication tools that are organized around personal or professional profiles that aim to connect users (Castañeda et al., 2011). The COVID-19 pandemic and its consequences on social interactions have shown the importance of social networks in such important aspects as physical activity and sports. For example, there were different initiatives to promote physical activity at home, and it was social networks the ones that made contact between people possible (Almusawi et al., 2021; Cojocaru et al., 2022; Hayes, 2020).

However, integrating social networks in an area such as secondary education entails several risks and ethical aspects to consider:

1. **Legal aspects:** Student data protection. Organic Law 3/2018, of December 5, on Data Protection and Guarantee of Digital Rights (in the Spanish context) and the General Data Protection Regulation (EU) 2016/670 of the European Parliament and the Council of 27 of April 2016 protects the privacy of individuals and has an impact on the use that teachers and centers can make of student data (Ley Orgánica, 2018).
2. **Ethical aspects:** These may be generated by the misuse of the tools by the students. The role of social networks in education is questioned, since integrating this type of tool in our teaching-learning process is not an easy task, because as Arévalo (2020) indicates, "some of the potential le problems that we can come across when incorporating these types of digital tools in the classroom are privacy and the uncritical use of mobile devices" (p. 20). Along the same lines, Almusawi et al. (2021) indicate that "Themes such as positive tracking, vital information and flexible connections urge collaborations that require interconnectivity between both ministries, and accessibility for different databases and user information. It does, however, require an immense level of security to maintain users' privacy" (p. 13).

3. **Risks:** There are other risks of the networks that we must consider, such as addiction, fake news, or cyberbullying. Some studies indicate that almost half of secondary school students have suffered some experience of cyberbullying in the last year (González-Calatayud, 2018). Regarding physical education, the use of social networks and mobile devices can generate doubts in teachers, as it could even lead to distraction in students (Almusawi et al., 2021).

Taking these aspects into account, we cannot forget that since childhood, we learn by observing and executing the behavior of other people (Chaudron et al., 2019). In addition, we live in a world where social networks have a great impact on many areas of our lives. The study of social networks carried out by IAB Spain (2020) indicates that 87% of people over 16 years of age use social networks. Out of that 87%, 21% are people between 16 and 24 years old. In the field of secondary education, the networks have a presence of 36%. This study also indicates a new trend, which is eSports, although there are still few studies that have analyzed its implications (Funk et al., 2017; Yamanaka et al., 2021)

Therefore, when integrating a social network in secondary education, the choice of the tool is a fundamental question, which has to consider the aspects indicated above. It is important that although it may have the characteristics of a social network, it allows an adequate use of the data and limits the experience, in such a way that the teacher can make decisions. Another fundamental aspect is ethics and guaranteeing the privacy of students.

Montiel-Ruiz (2022) shows us, in this sense, the potential that the educational social network *Edmodo* can have, due to the fact that it is a platform that highlights the ability to generate a safe environment for teachers and students while maintaining privacy, allowing the creation of anonymous users through a profile name and password not associated with any email or any type of personal data of the student. In addition, communication systems that make private relationships between students impossible are established which ultimately allow virtual learning to be managed effectively in education through fluid and rapid communication without wasting time.

Beyond this, *Edmodo* is a platform with an intuitive interface, with a web version and also a native mobile application, which allows you to organize groups and subgroups, create homework assignments and evaluate them in your own environment, as well as share any type of file and communication (Sáez et al., 2013). Another relevant factor for its selection is the possibility it offers of integrating the Google Suite and Microsoft Office 365 tools for free, facilitating work from a single space and resulting in a fantastic combination of a social network and a content management system (Trust, 2017). So, with *Edmodo*, we can make the most of a learning management system (LMS) for teachers and students and we get the possibility of generating learning communities and networks with resources and different topics of conversation for teachers, along with the different private communities created for each of the classrooms.

Edmodo allows organizing groups and subgroups, creating task assignments and evaluating them in the environment itself, as well as sharing any type of file and communication (Sáez et al., 2013). For the Office of Tele-Education of the Polytechnic University of Madrid (2014), social networks transform the role of the student, from a passive agent to an active participant who shares and participates (Solano-Fernández et al., 2021). But access to networks through a computer does not reflect the reality and mobility of people. Therefore, mobile devices, due to their ubiquity, are the perfect ally to make the most out of social networks.

In addition, we must assess the potential of integrating these tools to promote self-regulated learning, an aspect that, as Tur et al. (2022) state, has been so far scarcely explored. These authors indicate that it is important to keep in mind that digital resources are of great importance from the personal learning environment (PLE) approach because "it opens the initiative for the integration of different digital resources and tools in the future design of didactic strategies" (p. 50).

In addition, for Bayburtsyan (2016) the platform has a wide variety of features that facilitate "efficient course management and can positively affect interaction between teachers and students. In the hands of a creative teacher, *Edmodo* can become a great tool to instill independent learning skills in the 21st century learners" (p. 83).

Edmodo's potential lies not only in its technological possibilities, but also in the affordances it presents. Let us remember that for Gibson (1979) *affordances* are the possibilities that any object offers for action. However, this does not mean that an object does not have particular properties, since these properties only emerge

through the interaction between the actors and those objects. *Affordances* do not only refer to static features, but to features that can be seen by users as having a number of potential actions associated with them. Thus, in our case, we could say that the affordances correspond to the technical potential of the Edmodo platform if appropriate strategies are used to get the most out of it at a pedagogical level.

Edmodo provides instant access to people, resources, and knowledge that help improve teaching practice. Additionally, teachers engage in learning in these spaces in order to overcome feelings of isolation, to seek emotional support, and to connect with individuals outside of their local networks. This allows teachers to access multiple perspectives and discover diverse ideas, information, and resources for their practice. The common construction of resources and their reuse is key to the development of these communities.

METHODOLOGY

Methodological Design

This research was conducted following the basic principles of design-based research (McKenney & Reeves, 2012; Reeves, 2006). In the words of Plomp and Nieven (2013), design-based research is conducted to:

> design and develop an intervention (such as programs, teaching-learning strategies and materials, products, and systems) as a solution to a complex educational problem as well as to advance our knowledge about the characteristics of these interventions and the processes to design and develop them or alternatively to design and develop educational interventions (about for example, learning processes, learning environments and the like) with the purpose to develop or validate theories (p. 15).

However, in this article we have not been able to address the complete participatory design process of the entire innovation proposal, as we focus on the perception that teachers and students have of the implementation process of the proposal carried out, we present the data framed in a case study design. We assume in this study the definition given by Hamilton and Corbett-Whittier (2012) when considering that the case study:

> "should be seen as an approach to research or (...) as a genre, that aims to capture the complexity of relationships, beliefs and attitudes within a bounded unit, using different forms of data collection and is likely to explore more than one perspective" (p. 10).

The suggested combination of case study and design-based research principles suits the subjectivity and research perspectives of technology acceptance in social and human experiences, such as the research project presented by Al-Adwan (2017). In this way, as Trigueros et al. (2018) indicate, the intention is not to transform the words, feelings, beliefs, or theories of our participants into numerical data. Quite the contrary, the interpretation and understanding of those words will be the purpose of our study.

Educational Intervention

Focusing on the problem, an educational innovation proposal called #RetoWOPE (WalkOnPE) was carried out, the main elements of which are published on the project website (https://retowope.webnode.es), and for the time being, it has been published in Montiel-Ruiz (2022) and Solano-Fernández et al. (2021). The innovation proposal is based on the following key points:

1. It ran for one academic year (from September to June).
2. Students engaged in autonomous and self-regulated physical activity in their free time.
3. Students captured autonomous physical activity on their mobile devices via GPS applications or video recording.
4. Each student shared the physical activity they performed in their private class group on the educational social network *Edmodo*.
5. Students earned points for their classroom group and cooperated with each other to achieve common goals in a gamification process.

Table 1. Professional profile of participating teachers

Participant	Gender	Teaching experience	Experience using ICT	Position
D01	Male	11 years or more	Between 2 and 5	Permanent
D02	Male	11 years or more	Between 5 or more	Permanent
D03	Male	11 years or more	Between 5 or more	Permanent
D04	Male	11 years or more	Between 5 or more	Permanent
D05	Male	11 years or more	Between 5 or more	Permanent
D06	Male	11 years or more	Between 2 and 5	Permanent
D07	Male	11 years or more	Between 5 or more	Permanent
D08	Male	Between 0 and 5	Between 0 and 1	Temporary
D09	Male	Between 0 and 5	Between 0 and 1	Temporary

Sample

A total of 10 physical education teachers from eight educational centers in Spain participated in this study, seven of them located in the region of Murcia (Southeast of Spain) and another in the Canary Islands. The participating teachers were all men, the majority with a teaching experience of more than 11 years and with a permanent position (**Table 1**).

The teachers taught classes to 17 groups of secondary education of the 4th year of compulsory secondary education and 1st baccalaureate levels (a total of 372 students, 189 girls and 184 boys). The students who have participated in the group interviews have been 56 (31 girls and 25 boys). The class groups chosen were the one with the highest and the lowest contribution of kilometers in the #RetoWOPE.

Instruments

For the collection of information that we present in this article, different instruments and information collection techniques have been used:

1. **Focus group carried out with the teaching staff participating in the experience:** For Trigueros et al. (2018), the central objective of a focus group is to collect information on a specific topic, but it is done in a group form because it is understood that individual participation can be enriched through the interaction between the members of said group.
2. **Group interviews with students:** The interview questions were validated using the expert judgment technique, which is a strategy with great potential to be applied in the context of studies on technology in education (Cabero & Llorente, 2013). The objective is to consider the perspective of the students and to know their opinions regarding the effects of the project.

To facilitate data triangulation, both the script for the focus group with teachers and the group interview with students had a script of topics to be discussed:

1. Design and implementation of the project with RRSS/apps.
2. Motivation and physical activity levels.
3. Learning.

Additionally, the focus group for teachers also included prospective questions aimed at proposing improvements around the project, and a suggestive question about how they perceive the teaching of Physical Education in Secondary School within 10 regarding the use of digital technologies. The script of both instruments and the protocol carried out are available at the following URL: http://hdl.handle.net/10201/125223

Research Procedure

The data collection that has been the object of this analysis was carried out once the educational intervention was completed. A focus group was held with the teachers by videoconference, since having the perception of all the teachers participating in the design and development of the proposal was considered essential; a group interview with the students was held as well. Regarding the latter, it was carried out on the last school day of class in two different educational centers, allowing us to know the real opinion of the students without being subjected to the possibility that their words could have an impact on already closed and known grades.

Data Analysis

The data analysis has been qualitative in nature and has been developed from the NVivo 12 software. The qualitative data analysis strategy has been content analysis based on the information collected with the instruments described above. The use of these instruments has allowed the triangulation of data as a strategy for educational research, thus valuing the reliability of this qualitative research. As Aguilar and Barroso (2015) state triangulation will allow us to obtain greater quality control in the research process and guarantee the validity, credibility and rigor of the results obtained. Nowadays, content analysis is based on the conjunction of different documentary analysis methods whose priority is the meaning of the texts and whose analysis presents more complexity and rigor, as well as breadth and versatility, regarding the different methodologies and trends that make up the qualitative paradigm such as ethnographies or case studies (Rodríguez et al., 2005).

For Solano-Fernández (2018) it is necessary to reflect on the need for greater visibility in impact journals of qualitative studies on Educational Technology, evidencing the richness offered by these investigations whose value "*does not lie in the representativeness of the sample, but in the methodological rigor that leads to the reliability of the research*" (p. 9). Hence, with this research we intend to value the valuable information obtained from qualitative research.

FINDINGS AND DISCUSSION

The data analysis in NVivo on the information extracted in this case study has allowed us to establish four main categories with various contributions from both students and teachers. These four categories are shown in **Figure 1** and are: the *Edmodo* social network; the importance of a responsible use of mobile devices and social networks; the opportunities offered by gamification; and the influence on the physical activity of students.

The use of an educational social network such as *Edmodo* has allowed virtual collaboration between teachers, between students and between both of them, from private classroom spaces, and ethically respecting the personal data of all the participants in the network in an autonomous learning process for each student. It is evident that social networks, when used correctly, become a powerful tool to promote healthy lifestyle habits in adolescents.

In this case study, the importance of using mobile applications to monitor physical activity and share it with peers in a common virtual space such as *Edmodo* in which gamification processes with rankings and rewards are carried out, has been observed. This is also the case of Moreno et al. (2015) and Pulido et al. (2016) who used the *Endomondo* and *Runtastic* apps, respectively, to record the physical activity of secondary school students, ordering it in different classifications, improving student participation and involvement. Such use of mobile apps to improve teaching in physical education is in line with Díaz-Barahona (2020) who concluded that these applications and the use of mobile features such as geolocation, videos, or social networks enrich the learning process.

A platform like *Edmodo* makes it possible to generate the usual communication processes of social networks as well as integrate the learning management features of an LMS, and all of this leads to a useful and motivating environment for establishing interpersonal relationships among students who share physical activity. Sobejano et al. (2016) reported similar results in motivation and involvement after an experience with secondary school students who had to share and report the physical activity carried out in their free time on the *Edmodo* platform.

All this leads to the possibility of promoting physical activity during non-school hours for students, thanks to the use of educational social networks such as *Edmodo*. Thus, students will dedicate their free time to an activity that positively impacts affective, cognitive, and emotional processes, as concluded by Salazar-Ayala and Gastélum-Cuadras (2020) in a meta-analysis on the theory of self-determination in physical education.

On the other hand, regarding the responsible use of social networks and mobile devices, teachers show the importance of teaching their students about the critical use of this type of tool. All this from a didactic approach taking advantage of its full potential for educational purposes.

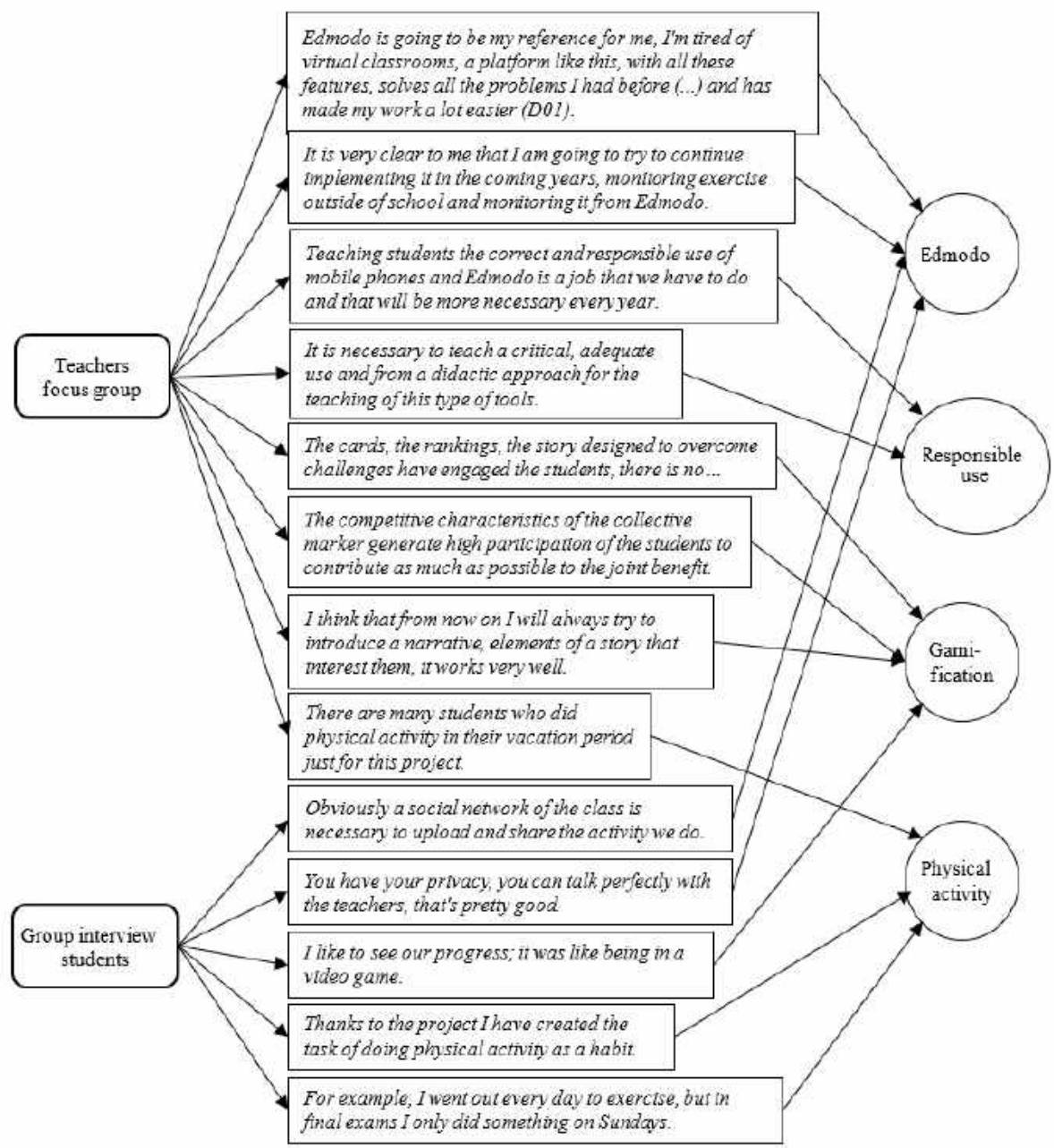

Figure 1. Content analysis on the perspective of teachers and students (Source: Authors' own elaboration using Nvivo)

Gamification has been a strategy that has gained vital importance in this study. It has been shown that when opting to gamify the teaching-learning process, the gamification of the intervention program must integrate a follow-up of the student's progress through badges, rankings, levels, and rewards through digital means that facilitate its use. All this must be built on a linear narrative or story that guides students towards a final goal. Thus, the use of gamification strategies with a linear narrative and a final objective using cooperative strategies such as the collective marker facilitates the promotion of physical activity in students. Similar results are gathered by Victoria (2020) in a bibliographic review that relates gamification to the use of technology in physical education, highlighting elements such as a level system, points, classifications or badges and the use of mobile applications for their motivating effect on students towards the regular practice of physical activity and sports.

In addition, it is highlighted that these gamification processes must be flexible to coordinate different long-term activities, being similar to the study carried out by Fernández-Río et al. (2020) who concluded that gamification implemented in the long term increases student motivation beyond the initial novelty effect.

Finally, by getting to know the perspective of the participants, it is evident that the students carry out more physical activity during non-school hours when they have more free time. Mainly when they do not have other tasks or activities to which they give preference- excepting the interruption of the performance of physical activity when exams of the rest of the subjects are taking place- it is considered that the program has a great capacity to increase the number of hours dedicated to physical activity by part of the students, and this is partly influenced by external elements such as the grade, gamification scores or the improvement of their health. Similar results are given in Monguillot et al. (2014) when classifications immersed in a gamified narrative are used to increase the levels of physical activity of secondary school students. Besides, the fact of using mobile applications entails a greater involvement of students, in line with what Casey (2014) reports; he concludes that the use of different technologies impacts positively on physically active students, with a greater involvement in physical activities.

Practical Implications

Mobile learning and the possibilities of connected and ubiquitous learning have opened up a solid avenue for teachers to assess their students' out-of-school time physical activity. This is evidenced through monitoring with sensors dependent on mobile applications and after being shared in a private educational social network of the class group. This allows the teacher to know the motor engagement time of their students, a factor reduced prior to the two or three weekly sessions. In this way, physical education can encourage and monitor the 60 minutes of physical activity per day recommended by the World Health Organization.

Thus, the use of technology allows us to extend the time students and teachers spend doing physical activity in what we could call the extended classroom. Following the terminology used for the inverted classroom, in which technology can relieve the theoretical contents in order to practice them in the classroom, in this case we can speak of virtually extending the time for motor engagement both inside and outside the classroom, since videos are also used to explain theoretical contents. In short, no traditional teaching-learning process is reversed as proposed by the flipped classroom, but motor engagement time and theoretical concepts are gained outside the classroom with the integration of the designed environment.

Another element to be considered is that the performance of autonomous and healthy physical activity requires a learning process, being an objective of secondary physical education. This study has provided teachers with evidence of the importance of motivating their students to achieve this and the possibilities offered by the inclusion of gamification strategies in student participation.

In short, it is observed that, as in other research such as that of Durrani et al. (2022) and Safapour et al. (2019) the implementation of flipped classroom, gamification, and self-learning methods improves the intrinsic motivation of students and that adopting the social media method becomes lifelong learning and promotes creativity.

In addition, it is observed that the use of technology has a positive effect on the perception of usefulness of students, as well as cooperative learning in social networks and the beneficial influence of these on the improvement of their educational activity, as was also concluded in the study. research by Ad-Adwan et al. (2020).

CONCLUSION

A compelling method of work has been implemented for teachers to evaluate the physical activity carried out by their students during non-school hours. It is evidenced after being shared in a vertical educational social network of the class group. This allows the teacher to know the motor commitment time of their students, a factor previously reduced to two or three weekly sessions. In this way, physical education can promote and control the performance of 60 minutes of physical activity daily, constantly recommended by the World Health Organization.

Thus, the use of technology allows us to extend the times of physical activity of the student and the supervision of the teacher in what could be called an extended classroom. In short, the traditional teaching-learning process proposed by the flipped classroom is not reversed, but time is gained for motor participation and theoretical concepts outside of class with the integration of *Edmodo* in secondary physical education.

The experience has been positive itself, due to the incorporation different elements of great interest in educational contexts such as the possibility of motivating students by designing a teaching strategy using ICT, gamification, the promotion of sports and healthy habits. But in addition to all this, we consider that the theme tackled and developed in this experience is up to date and necessary due to the predominance of bad habits in adolescents, such as sedentary lifestyle or low motivation for physical activity, since this can lead to cardiovascular diseases or obesity, resulting in a very relevant problem for our society.

We also believe that it is a key issue, as it promotes a change in the practical teaching-learning methodology, and it could lead to changes at the level of future educational policies. With this, we need to meet the demands to promote didactic experiences, from applied research, of the use of educational technology in Physical Education, as evidenced by the works of Almusawi et al. (2021), Gawrisch et al. (2020), and Wyant and Baek (2019). On the other hand, it is an easily applicable experience in other contexts from teaching creativity to adapt to resources that are rapidly updated and improved, such as mobile apps and social networks.

There is a particularly interesting aspect, and it is the extension of the teaching-learning process to extracurricular hours. Technologies can help us to develop this type of mobile learning experiences, and in this way, influence the educational and social life of students, promoting in this case a healthy lifestyle.

In the development of this experience, it has been decided that *Edmodo* is a great option to overcome the usual disorganized mix of tools available to teachers. It involves the conjunction of a platform with an attractive interface for students, whose functionality resembles that of a social network with posts, likes, comments and multimedia material, but which at the same time can be managed in a private environment between teachers and students (private messages without the need to enter the student's mobile number or email; one-way private communication only teacher-student avoiding private student-student messages; possibility of moderating all comments on the wall prior to publication). In addition, it incorporates quite interesting possibilities for carrying out collaborative work, calendar, file cloud, subgroups, integration of office 365's suite, google files (drive)... and even elements to gamify the learning journey, such as badges, which were used in this experience.

To conclude, it is necessary to emphasize the possibilities of educational technology for the teaching of physical education and the characteristics of mobile and connected learning in today's totally digitized world must be considered. We consider that a specific VLE for physical education must be implemented that integrates the characteristics of three major tools. The possibilities of an LMS, the possibilities of an educational social network with open and private spaces. Let us not forget also that it is important to use technologies, both to carry out the teaching work and for the students to carry out the physical education activities. In the first case, videos and infographics can be used to present the gamified narrative. On the pupils' side, the use of their smartphones with apps to monitor physical activity is perceived as an important device at the secondary education stage.

In the light of the results, we consider that it is necessary to continue to carry out experiences such as the one carried out that allow reflection on the guarantee of privacy of students using social networks and mobile technologies, achieving a balance with the possibilities of being part of a learning community contributing to be part of and share good practices of physical activities.

A multitude of new questions arise, and possible lines of future intervention arise. To demonstrate the transferability of the design framework, it is proposed to replicate the co-designed intervention program in other contexts, introducing the generated design principles.

On the other hand, it would be interesting to replace the use of mobile phones with health and activity bracelets for monitoring physical activity. The use of the smartphone would be limited and the monitoring capacity of a multitude of variables would be gained thanks to the sensors of these devices. Content such as healthy heart rate zones, calories, body mass index, or sleep status could be worked on. Theoretical contents, sometimes abstract, that the students would come to know and measure in their own body and physical activity. The students would not share these data for privacy, but they could apply the theory of these contents for the understanding and identification of said variables in the first person.

An obvious limitation has been that the designed educational intervention program has been implemented only during one academic year. Therefore, it is necessary to continue these types of programs.

In contrast to the critical perspectives on technology and education in recent years, we think that this article emphasizes educational technology as a discipline aimed at the use and reflection of technology, not necessarily digital, to improve teaching, always supported by the didactic elements that give it meaning and solidity, such as methodological strategies. We are therefore focusing on pedagogical aspects that give meaning to the didactic proposals that are put forward using technology, and in so doing, we are highlighting the value of educational technology as a discipline, as against the instrumental value of these technologies. On occasions, technology has been set against the promotion of physical activity and healthy habits; there are those who refer to the difficulty of technology to promote unhealthy lifestyle habits, the tendency to promote greater user isolation, the loss of social skills, etc. (Parra-Reyes, 2018; Vidales-Bolaños & Sádaba, 2017). However, technologies, properly used and embedded in innovative didactic proposals, with methodologies and teaching strategies that allow for a good binomial with technology, can contribute to the improvement of students' learning experiences (Prendes-Espinosa, 2018). In this way, the design of didactic proposals enriched with technologies can contribute to increase the feeling of community and nurture the benefits of collaboration (Chatterjee & Correia, 2020), and in terms of physical activity, promote healthy habits and encourage sport (Almusawi et al., 2021; Casey et al., 2017; Wyant & Baek, 2019, among others). Further research along these lines will contribute to enriching educational technology as a discipline, in so far as it is the basis for promoting innovative educational practices that achieve educational improvement in its specific field, in this case physical education.

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