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Integration of gamification for physical fitness inside the classroom through mobile and web technologies

Integración de la gamificación para la aptitud física dentro del aula a través de tecnologías móviles y web

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Abstract
Gamification is being used in health and education. Extracting non-game components and creating playful scenarios require Gamification techniques. The creation of a micro world (system) with goals, rules, narrative, choice, rewards, feedback and progress is proposed for the Physical Education teachers of the UCEVA, allowing the monitoring of physical, nutritional and cardiovascular performance of the players, who managed to visualize continuous progress in their performance, and boosting motivation levels
key words: gamification, playful scenarios, game theory, motivation in education

Resumen
La Gamificación se está usando en la salud y la educación. Extraer componentes del no juego y crear escenarios lúdicos requieren de técnicas de Gamificación. Se propone la creación de un micro mundo (sistema) con metas, reglas, narrativa, elección, recompensas, retroalimentación y progreso, para los docentes de Educación Física de la UCEVA, permitiendo el seguimiento de actividades físicas, nutricionales y rendimiento cardiovascular de los jugadores, que lograron visualizar un progreso continuo en su rendimiento, y potenciando los niveles de motivación
Palabras clave: gamificación, escenarios lúdicos, teoría de juegos, motivación en la educación

1. Introduction

Today, reforming pedagogical processes and educational contents is considered an essential requirement in the improvement of the quality of education, which is closely associated to the demands made by society as a whole. Therefore, it is increasingly frequent to resort to elements such as Information and Communication Technologies (ICT) and to entertaining applications that support and improve the educational process (Lozada y Betancur,

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2017). In general terms, ICTs refer to a set of technologies that currently have a high incidence in numerous social, cultural, business and educational scenarios.

These technologies make it possible to collect, consult, process and distribute information (Heinze et al., 2017), through ways which had never been thought of before, breaking paradigms of time, space and data quality, where characteristics such as digitalization, instantaneousness, interactivity, immateriality and the neutrality of architectures and communication channels, make this resource an indispensable element in the improvement of the conditions in fields such as education (Meneses, 2007).

In recent years, higher education institutions have discovered that ICTs constitute a potential instrument to transform the teaching-learning process, formulating diverse alternatives associated to its didactic, pedagogical and curricular implementation (Ardila, 2019). Similarly, as these technologies have been implemented in education, scientific and psychological studies have been carried out to measure the impact they can have on students' cognitive processing, especially in higher education, and how they can modify the stages of information processing (Castillo, 2015). Therefore, the use of cognitive tools, particularly those that allow students to learn with technology and in which there is a trained mediator available to accompany the learner while promoting the construction of knowledge, and not only the reproduction of information, is fundamental in any educational process (Aparicio, 2018). For teachers, the use of ICTs should be approached from three dimensions: a) instrumental, that is, the use of technological resources; b) cognitive, seeking to develop skills to find, select and integrate information; and c) attitudinal, referring to the development of values towards technology (Lucumi y González, 2015).

In this aspect, the incorporation of ICTs into the teaching-learning process in educational institutions has transformed pedagogy and didactics, building learning based on collaborative work with the help of technology, and in which there is great participation by all actors involved in the process (Hernandez, 2017). On the one hand, the task of university teachers, being this one of the main axes of the teaching and learning process, must transcend in a proper transmission of didactic contents, from a mediating role in the students' permanent learning process (Zepeda et al., 2016). And on the other hand, students, who go from a passive to an active state, feeling as a fundamental part of the generation and distribution of knowledge (Marín Díaz, 2015).

By means of ICTs, electronic devices can be used to create a bridge with society, where students can select and access relevant information for their training. Likewise, the teacher can use an important source of high quality and interactive educational resources, with high multimedia content, in different environments, such as the classroom, resulting in a motivating experience for students (Suasnabas et al., 2017). Accordingly, games are becoming a powerful learning tool, which stimulates the ability to teach, learn, and strengthen problem-solving, collaborative or communication skills, while being used in a wide range of settings, such as industry, business or education (Contreras y Eguia, 2016).

The use of the game as a problem-solving mechanism is studied by game theory, a branch of mathematics and economics, and it is applied in computer science, allowing the analysis of several contexts, in which the player is able to reason considering strategic aspects and instructive examples, in search of an optimal performance model (Gutiérrez, 2012). According to the type of methodology applied, there are three types of games that can be used as learning mechanisms, namely: a) simultaneous, where each player is not informed of what his opponent will do, so both must infer the actions and respond according to the planned strategy, b) sequential, where if one of the parties in stage 2 knows what the other player did in stage 1, the first could have a right of reply in a third

stage, and c) negotiation, where there is a "neutral" player called a judge who decides the distribution at the end of the game (Ramírez y Andrade, 2017).

For teachers, motivation is one of the most important variables, since it is closely related to the poor academic performance of students. The need to embrace new paradigms and teaching models is therefore evident. In this regard, Gamification emerges as a powerful strategy based on game theory to motivate learning, since through it the players (students) increase the time they spend on the proposal that was designed by the teacher, as well as their psychological predisposition towards it (Pérez et al., 2017). Gamification applies elements that make games attractive and identifies, within a non-game environment, those components that can be turned into games or play methods, in order to: a) integrate with users, b) encourage a change in behavior or transmit content, and c) create a meaningful and motivating experience for participants (Llorens et al, 2016). Significant examples of the use of this type of technique are The Dancing Traffic Light Manikin, which makes waiting for the traffic light fun while the device transmits people's dance, resulting in 81% of people being willing to wait (Martínez y Martínez, 2017), Nike+ oriented to physical activity, Volkswagen, with Fun Theory to combat road safety, sedentariness or climate change, or Weight Watchers to make weight loss more fun. In the corporate sector, Deloitte Touche Tohmatsu Ltda. is incorporating elements of video games with competition and reward strategies into its training processes (Ortiz et al., 2018).

However, the Gamification technique is not exclusive to the business or marketing sector; this technique is also applicable in areas such as education, in which there is an area of study called "Game Based Learning", focused on the development of games that test student memory and knowledge through dynamic and challenging activities, which are rarely applied in traditional education (Hernández et al., 2018). This can be reflected in the development of smart tutorials to accompany the learning process in areas such as Algebra, which through a cognitive model created by Artificial Intelligence, these are able to adapt to the student's knowledge through the history generated by the use of the system, which favors the selection of the most relevant activity (Montoya y Mateus, 2019). In this regard, it is important to note that the combination of mobile technologies, especially mobile learning (m-learning), a type of learning supported by devices such as mobile phones or tablets, and Gamification, promotes learning at any time and place, thereby expanding educational opportunities through more meaningful and equitable teaching that improves academic quality (Sierra y Fernández, 2019).

It is then, in this type of scenario where changes are called for within educational models, that teachers should become much more involved with the technological environment, in order to highlight the role of information and communication in the generation of new knowledge.

Currently, the Central Unit of Valle del Cauca (UCEVA) higher education institution evidences the absence of didactic applications that use elements of the game and that are integrated in the classroom. Such is the case of the Physical Education, Recreation and Sports (LEFRD by its Spanish acronym) degree program, which among its research processes requires the evaluation of the physical performance of students in the classroom, and of the different academic actors through the identification and measurement of the progress of activities, cardiovascular performance, and the monitoring of physical conditioning and nutritional plans applied to different users.

As such, this research is focused on developing a web and mobile information system that responds to these needs, through the representation of a micro world with elements of Gamification such as: goals, rules, choice, rewards, feedback and progress, that encourages the motivation and participation of users with a more

interactive and dynamic learning, and thus demonstrate a greater impact in terms of the progress and benefits that these may obtain.

1.1. Mobile technology

Texts In recent years, mobile technologies have been one of the preferred and adopted technological tools for exercise lovers, looking for information or help on how to do their physical exercises. Mobile applications have been developed that range from showing and suggesting exercise routines, follow-up and orientation in the nutritional part, to the use of sensors for monitoring heart frequencies. The use of mobile devices contributes to the efficient use of time, generating and enriching relationships between students. These also improve and reduce the evaluation process and facilitate more direct feedback between both parties (Quintero et al., 2018a).

Despite the large number of mobile applications found on the market, such as Run an Empire, 4Fitting App, Runmeter 5.0, TomTom MySports Connect, QPrun or PumaTrac, among others, no application is identified which integrates different elements of the sports context and which captures the heart rate, in order to carry out an analysis and interpretation of such data, and which provides information on the optimum frequency level according to certain physical activity that is being performed.

1.2. Gamification

The definition of the concept of Gamification is as varied as the number of authors who refer to it. In general terms, the concept can be defined as a process associated with the player's mindset and the game's techniques to attract users and solve problems (Zichermann y Cunningham, 2011), which by the use of mechanisms whereby aesthetics and the use of thought stimulate action (Kapp, 2012), influence the player's psychological and social behavior, increasing the willingness to remain in the game, by the use of certain elements such as badges, points, levels, bars, or avatars (Díaz y Troyano, 2013), aiming at improving knowledge, skills or abilities, using score-reward-target systems, transforming monotonous activities into creative and innovative ones (Pacheco y Causado, 2018), and focusing on user participation, consumer commitment and loyalty, as well as employee motivation (Romo y Sánchez, 2016).

To implement a successful Gamification strategy in the educational field, six elements must be considered; 1) to clearly define the educational objectives to be achieved in the classroom, 2) to outline the knowledge, attitudes or skills to be promoted in students, 3) to establish the role of each player, to design activities relevant to their real interests, 4) to determine the methodology of Gamification (game mechanics, order of events, interaction, among others), 5) to define the level of fun that is included in the strategy, and 6) the tools to be used for the development of the strategy (measurement, monitoring, indicators, etc.) (Corchuelo, 2018).

Recent studies aimed at evaluating the use of Gamification in professional careers in physical activity and sport sciences, demonstrate a high degree of satisfaction of the apprentices in terms of the acquisition of fundamental knowledge when developing the role of educators. Furthermore, they highlighted the importance of play as a motivating factor for the creation of participative learning environments, and the high transfer of learning to their future professional practices (Escaravajal y Martín, 2019). Similarly, they identify in this technique a mechanism to achieve emotionally significant learning by bringing technology closer to the classroom. Furthermore, from the teachers' perspective, the Gamification technique has been identified as a way to achieve curricular objectives and skills, improving the teaching process as a whole (León et al., 2019).

In the context of Physical Education, several educational projects focused on the use of Gamification can be mentioned. For instance; a) ExpandEF (Expanded Physical Education), a project developed in 2017 at the Instituto de Educación Secundaria, IES Güímar, on the island of Tenerife, this had two objectives, 1) to help achieve the objectives of the Physical Education subject and, 2) to promote the development of areas such as safety, information research, communication, and problem solving, among others. In this application, each player (student) had to answer an initial questionnaire, with which a specific role was assigned within the game (Quintero et al., 2018b), b) "80 vueltas al rededor de un libro" (80 turns around a book), is an interdisciplinary proposal of Gamification between the areas of Language to encourage reading on 4th grade of Primary Education, and Physical Education that was used as a resource to promote the reading habit, in such a way that the student does not associate reading with something boring and systematic, c) "TrekkingChallengeNaranco", a project of Gamification for the area of Physical Education, focused on potentializing habits such as healthy eating and personal hygiene, developing skills in areas such as, teamwork, decision making and basic physical abilities such as resistance and strength, d) "Do sport with me", application of Gamification based on the cooperative learning methodology that motivates players to record and share all the beneficial actions for health that they manage to perform, seeking to increase the interest and willingness to the practice of physical activity (Fernández, 2019), e) "The Guardian of Health", which consists of seven challenges that the Guardian of Health (the teacher) proposes to the players, to eliminate their unhealthy habits in order to save their lives (Pérez, 2009), and f) "Play The Game", which focuses on knowledge and interaction with the physical world by experiencing aerobic resistance tasks, social and citizen competence by achieving gamified and organized challenges through a system of levels, points, rankings and badges (Monguillot et al, 2015).

2. Methodology

The research process was divided into four main tasks: 1) interviewing the people directly involved in the context of the study in order to analyse in a qualitative and descriptive fashion the processes that take place in the offices of the LEFRD programme of the Faculty of Health Sciences of the UCEVA, 2) identifying the time variables, which were described in terms of how time-consuming and lengthy the processes being studied are, and thus the variables were evaluated qualitatively, 3) processing and analysis of the collected data, which allowed the identification of the problems, and 4) the implementation stage of the platform's set of applications called SIMAFI, using the Mobile-D development methodology.

2.1. Mobile-D methodology

The Mobile-D method was developed under "ICAROS" a Finnish project in 2004, which was conducted by researchers from the Finnish Research Institute (VTT). This agile software development methodology is designed for a group of up to 10 people, in proposed working cycles, in order to complete the fully functional product in less than 10 weeks (Gamboa et al, 2017). Mobile-D is based on features of agile methodologies such as eXtreme Programming (XP) and Crystal Methodologies, as well as Rational Unified Process (RUP) for the definition of each of the stages within the software life cycle (Aldas, 2018).

Mobile-D is composed of five phases: 1) Exploration, which is responsible for the project formulation where the product architecture, environment and system functionalities are established, 2) Initialization, where critical development problems are identified and all physical, technological and communication resources are prepared for production activities, 3) Production, which aims to implement the product functionality by applying an iterative and incremental development cycle, 4) Stabilization, where the integration of modules independently

developed is carried out, and 5) System testing, which aims to check the functionalities required by the client and correct any errors found (Meneses y Laveriano, 2016).

2.2. System architecture

The system's architecture is made up of three main components: 1) a web and database server, 2) the mobile application, and 3) the web platform where the teacher can administer and monitor the students, by introducing new training routines, nutritional plans and visualizing the results and progress of each student graphically.

3. Results

Then, the general design and construction of the project is described, which by means of a mobile application allows the collection of the heart frequency data obtained during training and the nutritional plan that the student user has adopted, while by means of the web information system, the teacher user is able to carry out the complete monitoring of the records and activities performed by his students, in addition there is the possibility of structuring the physical conditioning and nutritional plans, adapted to their own needs or objectives. Moreover, through the application ranking, the teacher can rate the (3) best students based on their performance in the physical efficiency tests and grade extra marks as a motivation generator.

3.1. Planning and structuring of the exercise routines

In this stage, the information gathered was analyzed in terms of physical conditioning and the creation of routines adapted to each subject's characteristics, as well as corresponding to their physical conditions, lifestyle and, most importantly, considering each person's state of cardiovascular health. Three levels of physical condition were established for each student: beginner, intermediate and advanced, which are defined at the time of registration in the mobile application.

The fitness plans are structured through the application's web platform. It is at this point where the teacher has all the information about the students, facilitating the programming of the conditioning plans using the modules for the creation, visualization and assignment of the routines offered by the web platform.

3.2. Developing and structuring nutritional plans

The structuring of the nutritional plans was implemented in the web and mobile applications. The web application allows the teacher to create and update the recommended nutritional plans for the different meals of the day (breakfast, mid-morning, lunch, mid-afternoon, night), taking into account that the foods added to these plans have a category according to the target characteristics for the consumption of these foods. Likewise, it allows the teacher to visualize the daily caloric consumption of the students, thus leading to a more efficient monitoring of their eating habits.

In the mobile application, a module to manage the student's daily nutritional plan was implemented, and therefore, thanks to the data collected throughout the research concerning nutritional issues, we sought the best way to integrate the different concepts and formulas for the daily calorie estimate that a person should consume based on the individual's physiological characteristics and level of physical condition.

Figure 1
Nutritional plan

Source: Authors

On this basis, the data provided by the system on the students was analysed and the decision was made to use Harris Benedict's equation, which makes it possible to obtain an estimate of the energy expenditure at rest based on the person's age, weight and height. To obtain a more precise calculation of the caloric consumption, the Harris Benedict equation was implemented together with a method for estimating the daily energy requirement, called the Double Marked Water technique, with which the value of the energy expenditure is adjusted according to the person's level of physical activity. In addition, another module was implemented which allows the students to visualize the proposed plans for each meal of the day, managing to personalize their diet with the foods they wish to consume, encouraging them to adapt their eating habits based on the caloric amounts they must consume daily according to their objectives or needs.

3.3. Cardiovascular frequency collection, for the monitoring and follow-up of physical activities

Based on the evaluation carried out on the different heart rate sensors that are available on the market, the Polar h7 sensor was chosen, as its features are highly compatible with mobile devices, it is a well known brand in the sports field and it guarantees a quality product.

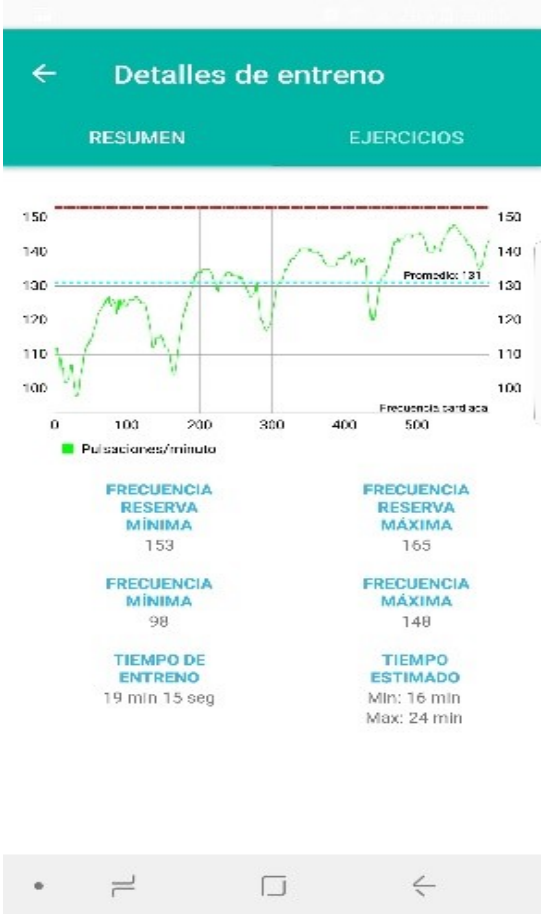
Figure 2
Heart frequency reading

Source: Authors

Once the correct communication and reading of the heart frequency data emitted by the sensor was achieved, the data was converted into relevant information for users and of easy interpretation. Therefore, linear graphs were built to visualize the behavior of the heart frequency obtained during the user's physical activity. Subsequently, in order to allow teachers to monitor and follow up the activities performed by their students a series of methods were implemented. This was done by displaying a calendar, so that the training records of the students could be presented in a general and more orderly way for the follow-up and management of the conditioning plans proposed to them. Information on the daily calories required and the calories consumed by the students was also included in order to have greater control over the nutritional aspect of the students.

Similarly, in the web application, a linear graph was implemented for the visualization of heart rate data and detailed information of each routine, and this information can be accessed through the records shown in the calendar. Fig. 3

Figure 3
Training details



Source: Authors

3.4. Incorporation of a Gamification system for performance management and individual user progress

The Gamification system for the individual progress of the users is based on several criteria that was very well detailed, in such a way that the acquired progress is evidenced embedded in the physical conditioning plans imposed by the teachers. The criteria taken into account will be presented as follows:

3.4.1. Adaptation times to the physical conditioning program

To plan the exercise routines, the levels of physical activity (novice, intermediate and advanced) are taken into account to determine what type of training should be assigned to the users. Therefore, certain adaptation times were defined for students to comply with in the conditioning program, in order to be able to increase the training intensity according to their performance and progress times. These times in accordance with the levels of activity are defined as: a) a user of novice and intermediate level, must be committed to the process of physical conditioning for 6 months to access the next higher level, b) when a user is registered as an intermediate or advanced level, a process of adaptation to the conditioning programs must be carried out. This adaptation process is considered to be within a period of 2 months, during which time the system will identify the user in the next level down.

3.4.2. Performance management

For the Gamification system it is of great importance to evaluate a progressive performance of each user. In this case the performance is evaluated according to the fulfillment of the weekly sessions determined by the planning and structuring of the exercise routines, that is to say, the performance will increase if, being a novice or intermediate user, the user fulfills 3 or 4 weekly sessions, and in the case of being an advanced user the user must comply with 4 to 6 weekly sessions.Fig. 4 This performance criterion will determine how fast and continuous a user's progress is, both in their actual physical condition and in the level the system considers them to be.

Figure 4
Physical tracking

Source: Authors

Each student who joins the conditioning program will be assigned a value of 100% initial performance. If the weekly routines are followed correctly, the performance will be increased by 1%. If the routines are not followed correctly, the performance will be then reduced by 1%. It should be noted that when a student increases fitness levels, performance will be reset to 100% again.

3.4.3. Obtaining progress points according to adaptation times

For this criterion, a base of 100 points was initially defined to be assigned to the user for each training session carried out. At the end of a routine, the system evaluates the results to estimate the total points awarded to the user Fig. 5.

Figure 5
Classification of participants Source: Authors

These results are evaluated as follows:

Basic points: 100

Time points: the time spent in training and the times estimated by the system for its duration are collected. Having this data, a percentage is calculated according to the time differences and from there the product is made between the base points and the calculated percentage value, giving as a result the time points.

Total points: The total points are calculated with the product between the time points and the value of the performance that the user has at that time.

From these points, a detailed analysis was made so that the Gamification system takes into account the total points obtained in 6 months so that the user can access the next level.

Table 1
Allocation of points according to performance criteria analysis

Standard	Month						Total points
	1	2	3	4	5	6	
Performance	104%	108%	112%	116%	120%	124%	-
Base points	1.600	1.600	1.600	1.600	1.600	1.600	9.600
Base points * Performance (That applies to each training session * performance in the week)	1.624	1.688	1.752	1.832	1.896	2.372	11.164

Source: Authors

Analyzing these data, Table 1 we obtain that the execution of the conditioning programs, only with the base points, would grant 9,600 points in the 6 months corresponding to each level of physical activity. But when taking into account the points obtained with the application of the performance, 11.164 points would be granted in the same 6 months of training, having a difference of 1.564 points, which is finally equivalent to 3 weeks of training with 4 sessions per week in the novice and intermediate level; likewise equivalent to 2 weeks of training with 4 to 6 sessions per week for the advanced level.

These calculations were designed with the aim of creating a system that provides evidence of the progress of each user in their conditioning programs, but also that it encourages improvement, which ultimately leads to generate a motivation to obtain better results. In this case the motivation is oriented to the fulfillment of the weekly sessions and the correct accomplishment of each training, observing as well the times to rest in each exercise, which will allow the user to fulfill the program of conditioning according to the level in a shorter period of time, while creating a habit of continuity in the trainings.

3.5. Integration of Gamification strategies within the information system

A structure based on levels was designed in such a way that, according to a certain level, the user is awarded a badge, achieving recognition based on the progress made in carrying out their training. It was estimated that, for the progress of levels, each one is reached in an average range between 2 weeks and 2 and a half weeks, which is equivalent to 9 or 10 training sessions. This estimated time was established so that the student would perceive that achieving each level will not be too easy, nor will it take a long time which may be overwhelming to achieve. Finally, it was defined that each level would consist of 1000 points. Using this scheme, the badges that will represent the level of each user were designed Fig 6. Mainly, the classical gold, silver and bronze badges were chosen, but in addition to that, they were adapted to the progress of the levels throughout the 6 months of conditioning, therefore 3 ranges were implemented for each badge to differentiate the students in higher ranges and not only be novice, intermediate and advanced users.

Figure 6
Types of badges

Source: Authors

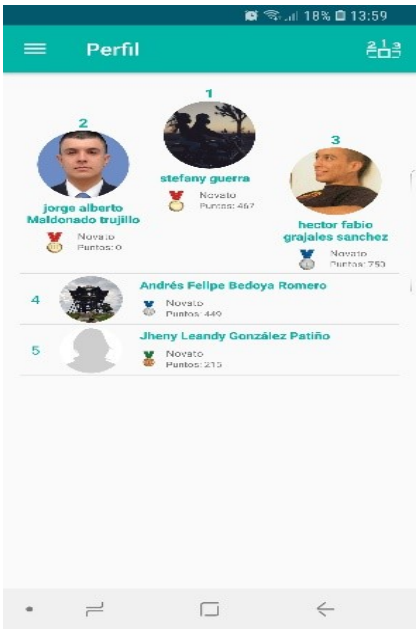
Badges will be awarded as follows:

- When a user registers, the user will start at level zero, which is represented by the base badge that does not determine a rank. This is intended precisely to create that stimulus and motivation to take on the challenge of progressing from the beginning of the conditioning program.

- The badges will be obtained from level 1 to level 27. The ranks of the badges corresponding to each level will be awarded in the order of bronze 3 to bronze 1, following silver 3 to silver 1 and finally gold 3 to gold 1. These ranks apply to the 3 levels of physical activity (beginner, intermediate and advanced), that is, if a beginner and gold 1 rank user goes up a level, he will progress to the intermediate activity level and his badge rank will be bronze 3.

As the main strategy for the Gamification system, a ranking of users was implemented, allowing therefore representing the results, progress and performance obtained in the physical conditioning programs to which they are linked. The ranking is designed to influence both the teacher and the participant, so that the teacher can make a comparison of progress, allowing the visualization of habits, behavior or patterns Fig 7. Among the students, a ranking system influences the generation of an environment of healthy competition, in which each participant has an attitude of improvement and motivation, which indirectly generates a sense of discipline for the correct execution of the physical conditioning program.

Figure 7
Ranking



Source: Authors

4. Conclusions

Heart rate measurement provides a wide range of benefits and general information (regardless of a person's profile, lifestyle or physical condition), which allows the monitoring of cardiovascular health status and the body's responses to a given situation, effort or physical activity. Likewise, the evaluation and interpretation of the heart frequency oriented to the physical activity, allowed to identify states and conditions of training to which people are able to perform, avoiding with this the over-training, the physical stress and the muscular fatigue. On the other hand, the heart frequency is a data that assumes an essential importance for the follow-up and improvement of the quality of the training and the development of more efficient conditioning plans adapted to the needs or objectives of the users.

The method in which the nutritional plans were implemented made possible a structure oriented to the measurement of the calories consumed by the user, with this the system allows us to generate a feeding plan and to distribute the daily caloric amount between the different meals of the day, facilitating in this way to the user to maintain a suitable nutrition adjusted to the consumption of daily calories according to its physiological conditions and lifestyle, which finally permits a general supervision of the daily required calories for each user. Similarly, with the joint work of the components of heart rate, physical conditioning, nutritional plan and the successful incorporation of Gamification strategies for the management of performance and individual progression of users and the allocation of points for the completion of training, they were able to visualize a continuous progress in the results expected by users and improvement of their performance, boosting the levels of motivation and willingness from users to successfully meet the fitness plans that are proposed.

Finally, in the development and implementation of this project, it was of great importance to carry out real field tests, which allowed the evaluation of the system's functionalities based on the different characteristics and physiological states of the users. All the data provided by the system was analyzed, seeking the best way to adapt it and translate it into relevant information to create a more complete system better adapted to the physical conditions, objectives and other variables to be considered corresponding to the users.

4.1. Future Works

As potential future works, it is recommended to extend the functionalities of SIMAFI, allowing to collect more information from users and data provided by heart frequency monitors to generate greater feedback on results. On the other hand, the incorporation of more gamification strategies, adapting elements that contribute to a better interaction between the system and the users, such as events, new scenarios, challenges among participants and accomplishment of challenges, among others, thus creating stimuli boosting motivation and commitment among users.

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