Self-regulated learning and gamification in higher education: a proposal for an analysis model

Aprendizaje autorregulado y gamificación en educación superior: propuesta de un modelo de análisis

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Abstract:

The aim of this paper is to propose a conceptual model that links the influence of a gamified context to aspects relating to self-regulation in learning. Although extensive literature has been written on the subject of *self-regulated learning*, there has been little exploration of the environment and works that consider gamification as an effective tool for creating a favourable teaching-learning context to stimulate self-regulation are non-existent. The combination of these two lines, which until now have been studied in isolation, might encourage the teaching community to direct its efforts towards the design of gamified systems within the classroom to instruct and encourage self-regulation. The proposed model presents the key variables to consider, along with a solid theoretical justification for the proposals made.

Keywords: self-regulated learning, gamification, educational environment, learning method.

Resumen:

El objetivo del presente trabajo es proponer un modelo conceptual que relacione la influencia de un contexto gamificado sobre los aspectos relacionados con la autorregulación en el aprendizaje. Si bien la literatura sobre el tópico *aprendizaje autorregulado* es extensa, el entorno ha sido poco explorado e inexistentes los trabajos que consideren la

gamificación como herramienta eficaz para generar un contexto de enseñanza-aprendizaje favorable para estimular la autorregulación. La unión de las dos líneas de investigación estudiadas hasta el momento de forma aislada puede incentivar a la comunidad docente a orientar sus esfuerzos hacia el diseño de sistemas gamificados dentro del aula para instruir y fomentar la autorregulación. El modelo propuesto presenta las variables clave que considerar, con una justificación teórica sólida para las proposiciones planteadas.

Descriptores: aprendizaje autorregulado, gamificación, ambiente educacional, método de aprendizaje.

1. Introduction

In recent years academic literature has reflected teachers' interest in adapting their work to the requirements of the European Higher Education Area by implementing active educational methodologies that make it possible to involve students and ultimately guide them towards self-regulated learning (Rosário et al., 2007; Martín-Peña et al., 2011; Fernández et al., 2013).

In higher education self-regulated learning has inspired particular interest. This is fundamentally because students who learn to regulate their learning also develop the capacity to plan processes and are capable of detecting anomalies in performance, correcting them, self-assessing their results (Daniela et al., 2017), and applying their knowledge to new contexts (Díaz Mujica et al., 2017).

Zimmerman and Schunk (1989), who are regarded as pioneers in the concept of self-regulated learning, state that it is an active process in which students set the objectives that guide their learning. Their contribution focuses on dispositional, cognitive, and metacognitive aspects (Zambrano & Villalobos, 2013). More recent studies support the idea of integrating motivational variables with traditional cognitive ones to provide a full overview of the learning process, arguing that cognitive processes tend to start with motivated students (Pintrich & García, 1993; Torrano & González, 2004). Hence the importance the motivational component has acquired in relation to self-regulated learning.

More recent studies in this field note the importance of considering context as a component in addition to cognitive and motivational ones to explain self-regulated learning processes (Pintrich, 2000), arguing in this case that context influences students' active engagement (Montero & de Dios, 2004) and their motivation (Pintrich, 2000). Accordingly, they share the argument advocated by García Bacete and Doménech Betoret (1997, p. 33) that "students' motivation depends on how the learning situation is presented."

There has been an increase in academic literature considering self-regulation

in higher education, in particular works focussing on studying the processes involved in this phenomenon, the relationship between these processes, and their effect on academic performance (Torrano et al., 2017). However, there has been little exploration of the influence of context on self-regulated learning, despite the gap experts have identified in regards to works that highlight teaching/learning contexts that are effective in orientating students towards constructing their own knowledge (Valle Arias et al., 2010).

Consequently, gamification — the use of game elements in non-game contexts (Deterding et al., 2011) — might be an effective teaching strategy for achieving the required active, positive, and participatory context, thanks to its impact on the motivational (Oliva, 2016), cognitive (Domínguez et al., 2013), and behavioural areas (Werbach & Hunter, 2012).

Therefore, we believe that gamification can guide students towards self-regulation of their learning, taking into consideration the fact that one of the characteristics of this type of learning is that students are able to accomplish a set of adaptative attitudes and beliefs that lead them to become engaged in and persevere with academic tasks (Valle Arias et al., 2010).

Although there is extensive literature on gamification in teaching, we have not found any works that suggest this tool as a methodology that is capable of generating the necessary motivating context so that students can develop the charac-teristics typical of self-regulation. This raises the following question: can implementing a gamified system create a teaching-learning context that is favourable for incentivising this type of learning? Answering this question is part of the aim of this study.

Accordingly, the aim of this work is to suggest a conceptual analysis model that tests how appropriate it is to consider gamification as a contextual variable for incentivising the process of academic self-regulation. It offers a proposal that shows the synergies offered by combining two lines of research that until now have been studied in isolation and it also considers variables that affect self-regulation (cognitive, motivational, and behavioural) as being dependent on the context variable.

In addition, the approach developed in this work can help the teaching community consider the task of creating gamified environments in the classroom as an effective option for encouraging self-regulation. Therefore, it presents teachers with the challenge of creating an active, positive, and participative environment (Boekaerts & Cascallar, 2006; Martín, 2012) that enables students to find the best way of learning, in line with the idea shared with García Bacete and Doménech Betoret (1997, p. 34): "It is not a matter of motivating students but of creating the appropriate context to inspire their motivation."

This work is structured as follows: firstly, the theoretical foundations that

establish the importance of the contextual component in self-regulation and the potential of gamification as a tool to take into account in instruction methods are set out. Based on a literature review, we propose a conceptual analytic model that displays the relationship between a gamified context and the cognitive, motivational, and behavioural areas involved in the self-regulation process. It ends with conclusions and suggested future lines of research.

2. Self-regulated learning: the importance of the contextual component

Self-regulation is an active process in which students define their learning objectives and attempt to discover, control, and regulate their cognition, motivations, and behaviour to achieve these objectives (Valle Arias et al., 2010; Rosário et al., 2012).

In this sense, we can state in general terms that learners combine the basic characteristics of self-regulation when: they participate actively in their learning process (Núñez Pérez et al., 2006a); they are able to control it (Núñez Pérez et al., 2006b); they are motivated to do so (Pintrich, 2004) and display adaptive attitudes and beliefs that lead them to engage in and persist with academic tasks (Valle Arias et al., 2010).

This involves students becoming key actors in their learning processes (Cabero, 2013) and to do this, it is vital that they understand how to do this, are able to do

it, and want to do it. Knowing how to do it is conditioned by instruction; being able to do it is shaped by the capacities, knowledge, strategies, and skills necessary for achieving objectives, in other words, the cognitive component; and wanting to do it relates to the motivational component, in other words, having sufficient disposition, intention, and motivation (Valle Arias et al., 1997).

Cognitive researchers' interest in studying academic motivation marks an important change in conceptions of self-regulated learning and thought (Zulma Lanz, 2006). The characteristics of a task, the structure of work in class, teaching methods, the teacher's behaviour, and the type of interactions established between teachers and students (Montero & de Dios, 2004) play a crucial role in this type of learning, as does the context in which the activity takes place.

It is therefore apparent that even though the cognitive component has been the most studied variable in self-regulated learning processes (Suárez & Fernández, 2011), the current focus tends to show the importance of considering not only cognitive aspects but also motivational (Lamas Rojas, 2008) and contextual components (Pintrich, 2004).

Over the last two decades, various theories and models have been proposed that have set out to identify and describe the processes involved in self-regulation of learning, with the contributions of Pintrich and Zimmerman being recognised as the most influential (Torrano et al., 2017).

In particular, the conceptual model proposed by Pintrich (2000) is still the foundation on which much of the subsequent theoretical edifice is built as it was first to consider the contextual component as an area involved in self-regulation (Torrano & González, 2004).

Pintrich (2000) identifies four phases learners pass through in the development of self-regulation (planning, self-observation, control/regulation, and evaluation) identifying which actions the learner performs in each of them depending on the component or area involved in self-regulated learning, that is to say, in the cognitive, motivational, behavioural, and contextual areas.

Accordingly, in the cognitive area, the processes involved are goal setting, metacognitive knowledge, self-observation of cognition, and the development of cognitive and metacognitive strategies; the motivational area covers the concept of self-efficacy, value of the task, personal interest, emotions, and self-observation of motivation; the behavioural area comprises activities relating to planning of time and effort and self-observation of it; and the contextual component comprises the student's perception with regards to the task, context, evaluation and process of self-observation.

Ultimately, this model offers an analysis framework in which it is possible to study the different processes involved in self-regulation (Torrano & González, 2004), explain the relationships established between these components, and link them directly with learning (Torrano et al., 2017).

Considering the contextual component, learning context is one of the elements that specialist literature regards as fundamental in knowledge creation (Peñalosa Castro & Castañeda Figueiras, 2008), especially when students' behaviour and decision making are based on their surroundings (Winne, 2004). Therefore, although this component was not considered in the first approaches to self-regulation, there is a consensus surrounding its importance in the self-regulation.

Over the last decade, work has been done studying the influence of context on some of the aspects relating to self-regulation, such as autonomy, perceived competence, and attitude towards a subject (Gascón et al., 2010), on how the blended setting influences motivation and the use of self-regulated learning strategies (González-Gascón & Palacios, 2011), and on how the learning context a group of teachers creates influences motivation, strategies, and promotion of personalisation (Daura, 2013).

Regarding Daura's work (2013), the results of her research are interesting as she concludes that most of the actions teachers put into practice spontaneously implemented certain strategies and in no case did so intentionally, underlining the importance of the self-regulation process being a deliberate act that requires manipulation of the surroundings, adapting them to the needs of this type of learning.

On similar lines, Ley and Young (2001, p. 94) suggest a series of principles teachers can use as a reference for fostering self-regulated learning through instruction, such as:

1. Guiding students in preparing and structuring effective learning environments.

2. Organising instruction and activities to facilitate the use of cognitive and metacognitive strategies.

3. Setting learning goals and generating feedback to offer students opportunities in their cognitive development.

4. Providing students with continuous evaluation information and giving them the opportunity to self-evaluate their own learning.

These authors' recommendations represent a challenge for the educational community in its search for methodologies that make it possible to move learners closer to regulation of their own learning, while at the same time offering particularly interesting pointers for anyone interested in pursuing this line of research in greater depth.

Nonetheless, given the present study's focus, we feel it is advisable to consider the first principle relating to the learning environment while trying to establish what characteristics a learning setting should have if it is to be favourable for ensuring that students regulate their learning.

Taking as a reference point what Bransford et al. (2000) establish when they suggest four perspectives for designing effective learning settings is of interest:

- *Student centred*: They must help students make the appropriate connections between their prior knowledge and their current academic tasks.

- *Knowledge centred*: It is not enough to teach general problem-solving and thinking skills; the capacity to think and solve problems requires well-organised knowledge and this is only accessible in appropriate contexts.

- *Assessment centred*: It is necessary to provide students with assessments that reflect the learning and achievement of objectives defined in the different environments.

- *Community centred*: this involves the degree to which a sense of community is promoted. This is a matter of promoting interaction between students and between student and teacher.

In addition, it is interesting to note the generalised consensus in academic literature that self-regulation is not an innate competence in students (Zambrano & Villalobos, 2013) and so can be taught and fostered at any level.

At the start of the century, Pintrich (2000) already insisted on the need to teach students to self-regulate. This is why interest in knowing how the capacity for self-regulation can be boosted through

instruction has developed (Zambrano & Villalobos, 2013).

Following the classification provided by Torrano et al. (2017), the teaching methods used in recent decades to incentivise self-regulation have undergone the same evolution as the concept itself. They have changed from a form of education focussing on the strictly cognitive with direct teaching of learning and modelling strategies, and now also consider motivational and contextual aspects with guided and autonomous practice, self-observation, and self-reflexive practice, with these last two aspects being regarded as the current teaching methods.

However, these methods all require deliberate intervention in the learning context. Therefore, we believe that gamification can provide a methodologically attractive and effective option for affecting cognitive, motivational, and behavioural processes, as it creates a context focussed on the student, knowledge, assessment, and sense of community, as Bransford et al. noted (2000).

3. Gamification a contextual variable: justification and suitability

Gamification in education is "a process to engage people, motivate action, promote learning, and solve problems" (Kapp, 2012, p. 219). It is presented as a pedagogical innovation that can increase engagement, motivation, and learning (Prieto, 2020) through the use of strategies typical of games (Oliva, 2016), taking advantage of the motivating context games offer to appeal to students and ensure they actively engage in the learning process (González Gascony & Mora Carreño, 2015; Rubio, 2014).

Although the phenomenon of gamification did not originate in the field of education, it is in education that it has inspired the most interest (Seaborn & Fels, 2015; Silva et al., 2019) thanks to its impact on learning (Li et al., 2012; Burkey et al., 2013; Dicheva et al., 2015; Seaborn & Fels, 2015), behaviour (Werbach & Hunter, 2012), and motivation (Oliva, 2016; Díaz, 2017; Navarro, 2017; Melo-Solarte & Díaz, 2018; Suelves et al., 2018; Zatarain, 2018, among others).

In the specific case of higher education, there has been a notable increase in academic works that demonstrate the development and application of gamification techniques inside and outside the classroom (Cortizo Pérez et al., 2011; Domínguez et al., 2013; Caponetto et al., 2014; Moreira & González, 2015; Ocampo, 2016; Oliva, 2016; Baldeón et al., 2017; Fernández-Zamora & Arias-Aranda, 2017; Rodríguez, 2018). These works are fundamentally interested in studying its impact on academic performance and motivation.

However, few works propose gamification as an effective tool for boosting self-regulation, despite its recognised impact on cognitive (Baldeón et al., 2017), motivational (Oliva, 2016), and behavioural elements (Werbach & Hunter, 2012).

It is known that gamification when correctly implemented results in changes in users' behaviour (Werbach & Hunter, 2012), thanks to the implicit benefits of the games.

Games offer the possibility for students to develop their cognitive skills (Navarro, 2017), improve their problem-solving ability (Higgins et al., 2003), foster learning in the motivational and social domain (Baldeón et al., 2017; Domínguez et al., 2013), and increase concentration, effort, comprehension, analysis, planning, and obtaining set learning outcomes (Arnold, 2014; López, 2014).

Nevertheless, although the essence of gamified systems lies in the use of elements characteristic of games, they are not games and their aims should not be entertainment (Seaborn & Fels, 2015).

Listing all of the steps to follow when developing a gamified system goes beyond the scope of this study. However, we believe it is important to underline that the creation process involves a detailed, rigorous, and perfectly cohesive analysis of each and every one of the stages that comprise it (García et al., 2019).

Gamification uses rules, challenges, points, or rewards, among other aspects. These take advantage of the innate desire of all individuals for status and achievement, thus promoting active participation, while fostering positive behavioural change (Prieto, 2020).

In this way, according to Oliva (2016), the advantages gamification offers students can be summarised as follows:

– It seeks to recognise academic effort (through rewards).

– It helps students identify their improvements and progress easily (thanks to the leaderboard).

– It helps students improve their performance (through challenges).

– It orientates them in comprehension of more complex content (thanks to continuous feedback).

Ultimately, it is a matter of internalising the fact that for students to feel motivated to learn, they must perceive the utility of learning, something closely linked with the learning environment (García Bacete & Domènech Betoret, 1997).

4. Analysis model proposal

Based on the above, the intention of the analysis model proposed in this work revolves around the relationship and impact of a gamified setting on cognitive, motivational, and behavioural aspects, and ultimately on self-regulated learning.

The variables associated with the gamified context and self-regulated learning have been defined on the basis of existing theoretical foundations, with the objective of contrasting the proposed model for the

benefit of the teaching community in future research.

Accordingly, we have identified three variables for the "gamified context" construct:

1. *Characteristics of the task*. We have followed the approach defined by Vermunt (1996) in regards to the types of learning activities. In the case of the present study, we have decided to consider only two: cognitive processing activities and affective processing activities.

2. *Elements*. The most influential elements in gamified systems, based on what is established in the literature review carried out by Seaborn and Fels (2015), include points, rewards, feedback, and leaderboards.

3. *Learning Climate*. Depending on the degree of autonomy students achieve, following Matos-Fernández (2009) under the Learning Climate Questionnaire developed by Williams and Deci (1996).

With regards to "self-regulated learning", we have considered three variables: the cognitive component, the motivational component and the behavioural component identified by Pintrich (2000), as these are recognised in the literature as a model to follow to explain the self-regulation process (Torrano et al., 2017).

Nonetheless, to determine the dimensions associated with each of the variables, we have used and adapted the proposal made by Paz (2018) based on the approach developed by Lindner et al. (1996), thanks to its recognised validity for measuring students' degree of self-regulation. Accordingly, it is structured as follows:

1. *Cognitive*. Referring to automatic or habitual processes:

   – Attention.
   – Information storage and retrieval.
   – Task execution.

2. *Motivational*. Comprising beliefs and questions of personal motivation:

   – Attributions.
   – Goal orientation.
   – Value of the task.

3. *Behavioural*. Relating to behavioural aspects:

   – Seeking help.
   – Time management.
   – Task management.

Graph 1 presents the proposed theoretical model that relates a gamified setting to self-regulated learning.

Autonomy is part of one of the basic needs in the Self-Determination Theory developed by Deci and Ryan (2002), focussed on studying "the degree to which people carry out their actions with a sense of autonomy" (Matos-Fernández, 2009, p. 168). It refers to the practice of providing students with a certain degree of freedom and flexibility in learning,
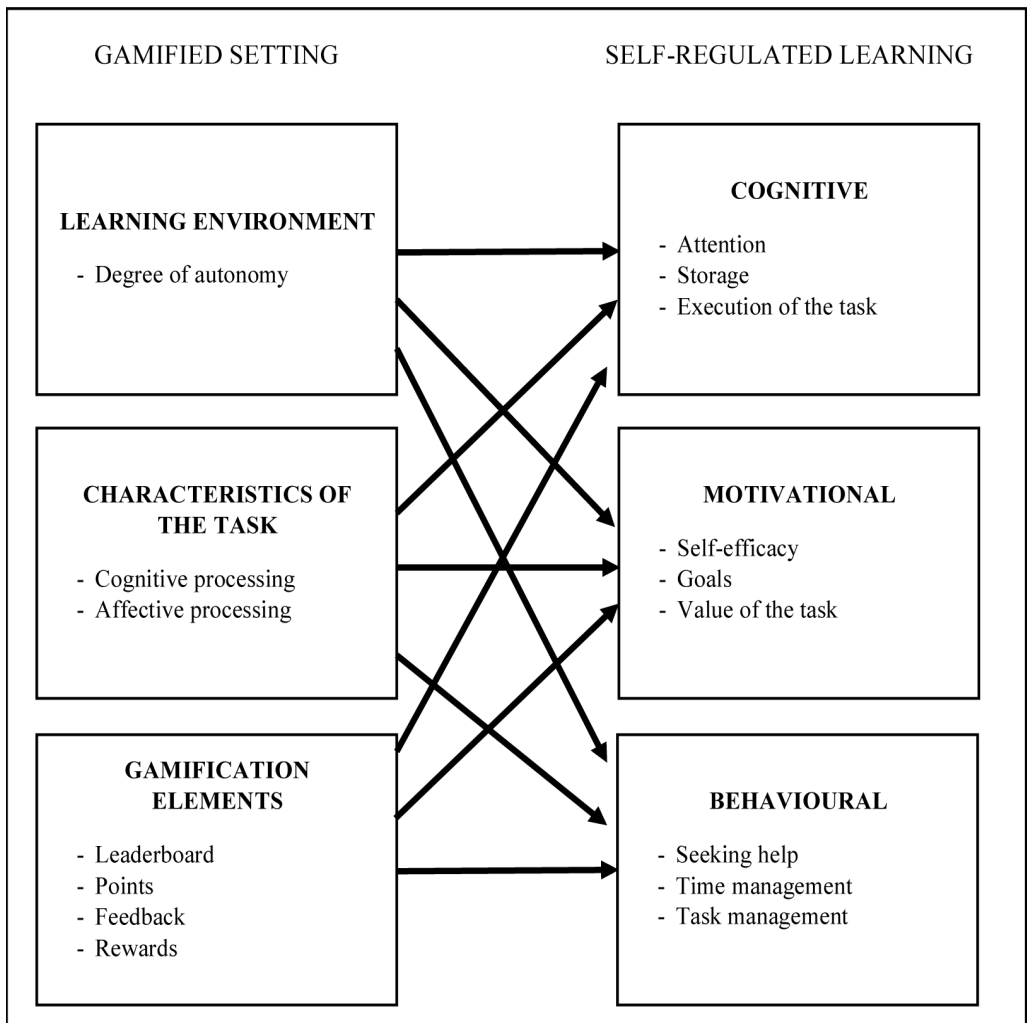
offering them the opportunity to decide how they want to learn (Chaudhuri, 2020).

Self-determination theory holds that the setting affects behaviour. Therefore, in a learning climate that is conducive to encouraging autonomy, students will tend to take their own problem solving decisions (Ossa Cornejo & Aedo Saravia, 2014), thus contributing to the development of aspects relating to cognition.

Taking into consideration that gamification sets constant challenges for students where decision making and problem solving are embedded in the development of the game, we establish the following proposition:

GRAPH 1. Conceptual model.

GAMIFIED SETTING — SELF-REGULATED LEARNING

LEARNING ENVIRONMENT
- Degree of autonomy

CHARACTERISTICS OF THE TASK
- Cognitive processing
- Affective processing

GAMIFICATION ELEMENTS
- Leaderboard
- Points
- Feedback
- Rewards

COGNITIVE
- Attention
- Storage
- Execution of the task

MOTIVATIONAL
- Self-efficacy
- Goals
- Value of the task

BEHAVIOURAL
- Seeking help
- Time management
- Task management

Source: Own elaboration.

P1a: The learning climate gamification creates has a positive influence on the cognitive component.

When teachers create a learning setting through activities that are rewarding for students, present them with challenges to achieve and this is simultaneously offered in a context that supports their autonomy, it will be very likely that a motivational force is developed that results in learning achievements (Maldonado et al., 2017).

Therefore, we have established that:

P1b: The learning climate gamification creates has a positive influence on the motivational component.

The possibility of improving the autonomy with which students operate will enable them to acquire greater responsibility in the construction of the learning, they will find meaning in concepts and procedures, and they will increase their confidence in their own abilities (González & Escudero, 2007). Nonetheless, the figure of the teacher and the predisposition of the students as a group are vital.

A fundamental concept in any game mechanism is the "bi-directionality of the interaction and the relationship", where the process must be an interaction between peers and between peers and their teacher (Parente, 2016). Therefore, one of the fundamental pillars of gamification is constant feedback.

Consequently, under the assumption that a gamified system creates the right environment for students to identify their needs, take the initiative in asking for help, and administer time better in order to continue advancing in the game, we have established that:

P1c: The learning climate gamification creates has a positive influence on the behavioural component.

One of the important elements for guaranteeing the quality of learning is determined by the tasks the students perform (Garello & Rinaudo, 2012).

Cognitive processing activities are those intended for students to process learning content by linking concepts, selecting key points, or seeking practical applications. Affective processing activities, however, are directed at confronting the feelings that arise during learning and inspire a particular emotional state (Garello & Rinaudo, 2012).

We can, therefore, affirm that gamified tasks are cognitive and affective processing activities given that using game strategies in teaching-learning environments facilitates useful comprehension of the content covered in class, as it becomes a more enjoyable and entertaining action (Oliva, 2016), and also the creation of an appropriate motivational context so that students achieve positive emotions.

In relation to this last aspect, Pintrich and García (1991) have already established that when students positively value the tasks they do, they tend to be more engaged in their learning process, thus incentivising more frequent use of cognitive strategies.

The gamified system, therefore, should be approached in such a way that students

can see their progress and setbacks at all times, revealing their strengths and weaknesses to them. In this sense, the presence of continuous feedback is vital, since as the learners supervise the realisation of their tasks, an internal feedback that is inherent to the task of instruction is created (Lamas Rojas, 2008).

In addition, it is hoped that gamified tasks will help students to persist with doing them, a fundamental skill for achieving self-regulation (Pintrich y García, 1993), which has a direct impact on their cognitive area.

In view of the above, we have established that:

> *P2a: The characteristics of the tasks in a gamified system have a positive influence on the cognitive component.*

In addition, we believe that if the task to be done is gamified and students are encouraged to participate more actively through rewards, this will ensure that the characteristics of the task will have a satisfactory effect on the motivational component.

However, it is important to take into account that the system of rewards must be designed in a way that stimulates students' intrinsic motivation, otherwise, their self-efficacy or the goals or value of the task could be at risk.

Ryan and Deci, who are reference points on the subject of intrinsic and extrinsic motivation, define intrinsic motivation as "the doing of an activity for its in-

herent satisfactions rather than for some separable consequence" (Ryan & Deci, 2000, p. 56), while extrinsic motivation "pertains whenever an activity is done in order to attain some separable outcome" (Ryan & Deci, 2000, p. 60).

Orbegoso (2016) states that intrinsic motivation is the form of motivation that can truly inspire change and real progress in people's behaviour. He notes that "it derives from the underlying incentives in the task itself, its difficulty, the challenge or stimulus undertaking this action and attempting to complete it satisfactorily represents for the individual" (Orbegoso, 2016, p. 77). Ultimately, it is the spontaneous tendency of individuals to explore novel focuses to learn and participate in an activity they perceive to be interesting (Chaudhuri, 2020).

There is no doubt that stimulating students' intrinsic motivation should be the ultimate aim of any teacher (Romo & Montes, 2018, p. 47), and so when designing a gamified practice, the elements selected should respond to this aim, and of course, the system of rewards should too.

Intrinsic rewards must therefore be created that encourage the desire to learn and carry on participating. This means that they must be associated with the development of the game and not an external stimulus as an improvement in the grade for the subject might be. So for example, one intrinsic reward could be obtaining privileged information that helps advance in the game or obtaining extra points that help complete a level.

It is also important to take into account that, when designing gamified activities, it is necessary to provide a balance between the knowledge acquired and the level of difficulty of the tasks, in the same way that low penalties for tasks not successfully completed must be established. Students could be made to feel of failure and defeat, negatively affecting the components of self-regulation, especially the motivational element (Domínguez et al., 2013).

Based on the consideration that gamified tasks increase the value of the task, favour beliefs of self-efficacy, and the system itself encourages the student to set learning goals, we have established that:

P2b: The characteristics of the tasks in a gamified system have a positive influence on the motivational component.

That said, the emotional reaction that taking part in a game causes is also closely related to feedback and the constant interaction that occurs in the process of playing (Simó & Domènech-Casal, 2018).

This is why the presence of the feedback element in gamified activities is so important. When the teaching-learning process is stripped of its punitive character when learners make mistakes, these errors are turned into learning opportunities (Ardila-Muñoz, 2019), and students are guided in the use of tools with which they can manage their time and the task correctly and seek help, it will be closer to having an impact on the behavioural component as well.

Therefore, we have established that:

P2c: The characteristics of the tasks in a gamified system have a positive influence on the behavioural component.

The reasoning behind the design of the games in gamified experiences is perhaps the most important element (Domínguez García & Mora Merchán, 2014). A gamified system should contain challenges, feedback, incentives, points, and leaderboards grouped into what are called dynamics, mechanics, and game elements, which allow users constantly to be aware of how they are doing things.

So, with a system of rewards, there is immediate recognition in the form of points, prizes, etc. for completing a task, in the hope that students will experience an emotional reaction when overcoming the difficulties (Domínguez et al., 2013) and will find incentives to develop cognition and modify behaviour if necessary.

In this way, the system of rewards fosters effort and collaboration while students are rewarded for overcoming challenges (Badilla & Núñez, 2018), with a direct impact on their attention, storage, and execution of the task.

Therefore, we have established that:

P3a: The game elements typical of gamified settings have a positive influence on the cognitive component.

As is shown throughout this work, the use of any element characteristic of games has a direct impact on the

motivational area. So, rewards for points achieved, continuous feedback, the challenge of completing a task, or the presence of a leaderboard where students can always monitor their performance, thus incentivising them to progress and climb the table, are unprecedented motivational elements.

New generations need the recognition and support of their teachers, less formal relationships, and a warm and relaxed learning setting where they feel secure expressing their doubts or feelings (Chaudhuri, 2020). Gamification is an ideal tool for achieving this.

Therefore, we have established that:

P3b: The game elements typical of gamified settings have a positive influence on the motivational component.

It is vital that the elements selected for gamifying foster the development in the user of logical and critical-reflexive thinking skills; analysis and synthesis skills; skills for planning, organising, and controlling the execution of the activity; skills for regulating attention and concentration and skills for reflecting on one's own thought process and its content (Klimenko & Alvares, 2009), ultimately, making users reflect on the need to ask for help and orientate management of time and the task.

Accordingly, given that gamification makes it possible to orientate changes in users' behaviour towards the creator's wishes (Werbach & Hunter, 2012), we have established that:

P3c: The game elements typical of gamified settings have a positive influence on the behavioural component.

5. Conclusions

The implementation of the European higher education system has motivated interest in continued research into self-regulated learning, thanks to the capacity for command, regulation, and control students acquire over their own learning process, and ultimately research on the acquisition of the current learning to learn competence.

Pedagogy has moved from a text and lecture style model to a model based on collaboration between teachers and students (Chaudhuri, 2020), with the learning to learn competence becoming key in the new educational system and in which self-regulated learning is founded on the formulation of this competence (Gargallo López et al., 2020).

Academic literature on self-regulated learning provides evidence of the self-regulatory shortcomings of university students, and experts in the field assert that there is a need to encourage this type of learning through instruction (Zambrano & Villalobos, 2013).

This requires an effective and attractive teaching method that can capture students' attention, actively engage them, and help them understand the associated benefits for their professional development. To this end, didactic efforts should be directed at awakening students' intrinsic motivation, as intrinsically motivated

individuals have been found to accept problems as personal challenges without desiring or hoping for an external reward (Orbegoso, 2016).

In addition, there is unanimous agreement on the influence of motivation, cognition, and behaviour on human performance when these aspects work in unison (Benavidez & Flores, 2019). However, although the emotional area being the cornerstone of cognitive (Treviño, 2020) and behavioural achievement, in order to motivate students, it is vital to generate the appropriate motivational context (García Bacete & Domènch Betoret, 1977).

Therefore, we believe that a gamified setting combines the optimal environmental conditions to favour students' motivation, cognition, and behaviour thanks to the interest that the use of game dynamics in educational settings inspires (Navarro, 2017).

It should be noted that until now there has not been a tool considered by experts for studying self-regulation of learning.

On the other hand, the theoretical foundations surrounding the topic of self-regulation, regard setting as an element involved in the self-regulation process (Pintrich, 2004; Torrano et al., 2017). Nonetheless, the present work maintains that context is independent of this process, giving rise to a proposal for a conceptual analysis model that accounts for the positive influence of a gamified context on academic self-regulation.

The theoretical model proposed is the result of a solid literature review that has made it possible to identify the appropriate variables and the relevant propositions to be able to test it in future research.

The logical reasoning we have followed, based on what was established in the literature review, is as follows: whether cognition and behaviour depend on motivation and motivation depends on the learning context, the starting point for guaranteeing success in self-regulation must lie in considering context as an independent variable. We therefore set out to evaluate whether cognition, motivation, and behaviour are easier to regulate in an environment that is attractive, positive, and creative.

Ultimately, we provide a proposal that impacts various aspects:

- The synergies associated with the combination of two lines of research, until now studied in isolation – gamification and self-regulated learning – are justified.

- The contextual component is emphasised by offering a new perspective on self-regulated learning by considering context as an independent variable and not as an internally engaged model, as has been done until now.

- We propose a valid analytic model that can be adapted to any qualification, subject, or educational level.

- This provides the teaching community with a conceptual model endorsed with theoretical rigour and practically prepared for use as the basis of empirical study.

As a future line of work, we intend to test the model by implementing a gamified system in different subjects.

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