Design-Based Research in e-learning: self-regulation competence in tutor training

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***Abstract*— The redesign of learning models in the digital society asks out teachers to experiment with pedagogical approaches called emergent or digital, among which are gamification, flipped classroom, mobile learning or e-portfolio. For this research we have followed the methodology named Design-Based Research, DBR, incorporating several transformative elements in the Virtual Learning Environment, VLE, for the training of online tutors. In this paper we present a study developed within the framework of the training of Spanish teachers as a second language through the Instituto Cervantes VLE. The evidence has been obtained through the triangulation of quantitative and qualitative methods recommended for researchers on self-regulation competence. From the analysis of the data obtained with the implementation of thirteen badges and a personal blog or e-portfolio, it can be concluded that they positively influence the motivation of trainee teachers, metacognitive development and learning planning, bounded by a context of discovery and interactive asynchronous learning. The challenge is twofold: on the one hand, to transfer this experience to the professional practice of online teaching and, by extension, to the scheduling of face-to-face classes; and on the other hand, to create a construct that describes how the role of the teacher and the student is redesigned in these active methodologies.**

Keywords*— *Design-Based Research, self-regulation, tutor training, gamification, e-portfolio, e-learning

I. INTRODUCTION: SELF-REGULATION AND DEFINITION OF THE RESEARCH PROBLEM

In contrast to children and adolescents, the training of adults, in general, and of teachers, in particular, is based on the assumption that they hold the cognitive strategies, knowledge and skills that allow them to reflect on and improve their own learning process in a responsible and autonomous way. However, today's R-ICT (Relationship, Information and Communication Technologies) society is causing all citizens to face the challenge of responding to unknown problems generated by the transition from the industrial society to the liquid society of digital time, and to the evolution of the concept of e-learning [1], [2]. In this context, teachers in training who access the e-learning modality have a dual role: they are both protagonists and observers of immersive learning experiences [3]. In this study, we have identified the competence of self-regulation as the basis of our research, sponsored by European frameworks such as DigCompEdu [4] where self-regulation is integrated as one of the four competences in the area of "Teaching and learning". According to J. Blas García "to speak of self-regulation is to speak of that capacity we have as people to constantly plan and adapt our thoughts, our emotions and our actions to direct them to achieve the goals we set ourselves" [5]. With what elements integrated in the online teaching-learning ecosystem can be activated this competence and what improvements do they bring in the student's process?

In this study we have planned an action trying to deploy strategies that influence self-regulation, focusing on three factors: improving the retention rate in online courses by emphasizing the need to follow the course schedule (which favors collaborative learning, since if students do not keep the same pace, interventions in forums, blogs and wikis are isolated and do not lead to linked responses), the promotion of reflection on the learning process (which allows adjustments to be made throughout the course) and the ability to awaken self-motivation (if the student actively participates in the course through asynchronous tools, the group itself is an incentive for him/her).

II. RESEARCH CONTEXT

The research was conducted in two online AVE Global tutor training courses, which were held respectively from October to December 2019 and 2020. AVE Global are the Instituto Cervantes online Spanish courses [6], [7] that cover a curriculum from level A1.1. to level C1.4 of the *Common European Framework of Reference for Languages* [8]. Both teachers at the Instituto Cervantes and educational institutions that wish to incorporate these courses into their academic offer must be "accredited" in order to have access to the AVE platform, a proprietary development of the Instituto Cervantes (http://ave.cervantes.es), for which they must take the training. Regarding the participants, in the 2019 course, sixteen teachers in training are consigned for the purposes of this research, with a total of eighteen enrolled, and thirty-six in the 2020 course. In total, the participants number for this research are fifty-two.

III. DESIGN-BASED RESEARCH

In the search for a suitable methodology for the scenario described, Design-Based Research (DBR) provided us with the ideal framework. It is inspiring much of the research related to e-learning and virtual learning environments. Its beginnings are documented around 1990, detecting that studies on the design of instruments to be implemented in education are very scarce because research is not oriented to this end [9], [10].

In DBR the emphasis is on problem solving and knowledge construction aimed at the design, development and evaluation of the educational process [10]. The result will be a concrete product [11]. One of its main characteristics consists, therefore, in the introduction of transformative elements in authentic educational contexts. The development of solutions requires a consistent theoretical foundation (phase 2 of the IBD process according to De Benito [12], following Reeves).

In our case, after having detected the research problem, the challenge was to design what type of intervention could be carried out. The study of the NMC Horizon Reports, published since 2002 [13], [14] and European frameworks such as DigCompOrg [15] led us to identify thin-layer gamification and e-portfolios as the appropriate emerging approaches within which to design the actions and elements that guided the search for solutions to our research problem.

IV. Transformative elements in the VLE and emerging pedagogies

The gamified approach can be "deep" or "thin-layer", the elements of thin-layer gamification are points, badges and leaderboards. Following recent research published [16], trainee teachers mainly opted for the deployment of points and leaderboards in their final projects. This gap in the use of badges, having a less competitive connotation, made us identify this element as a focus of our DBR to promote self-regulation competence.

After several months of intense search for solutions, based on the European frameworks and international reports on digital transformation in education, we came to identify the badges as the catalyst elements of this research. We designed two types of badges for each of the modules in which the course was structured, the one called "Contents" and the other "On time!". The result was twelve badges and a final trophy. The “Contents” badge corresponds to the completion of the activities and tasks of each module (it means that all students would potentially obtain them if they reached the end of the course and wanted to get the certificate). In contrast, the “On Time” badge challenged students to follow the pace set for each module and, therefore, would only be earned by those who follow the course schedule. Another noteworthy characteristic, which was a debated topic, was defining the method of assigning the badges. Finally, it was decided that they should not be automatic: the teachers in training would assign to themselves, that is, they had the power to decide that they were worthy of having the “On time!” badges.

To foster self-regulation competence and reflection on learning, we identified a second pedagogical approach, the e-portfolio or personal blog whose function would be as a learning diary [17]. The students would post or "exhibit" their badges and write some notes that stand as evidence of the "reward" or emotional benefit that the badges can bring to student motivation. The group of students were also encouraged to visit the e-portfolios and comment on the contributions of their colleagues. The purpose was that they could learn among them, as a "modus operandi" to promote a constructive learning practice, in which the way of doing could be useful among peers.

V. Results and evidence

Due to the complexity of the self-regulation competence, which includes aspects such as motivation, the monitoring of the learning process itself, the application of strategies to reorient the process or the ability to replan tasks to achieve the objectives, several researchers agree on the need to apply quantitative and qualitative methodologies to explain this competence [18], [19], [20].

In both editions of the course, data from students who had posted the On Time! badge on their personal blog were analyzed (remenber that the Contents badge would be obtained by all those who completed the activities programmed for each module). The results evolved satisfactorily, the last module showed a percentage of 81% of students completing the course on time in the 2019 [21]. In the 2020 course, 89% in the penultimate module met the planned schedule for the course but in the final project they were a little more delayed, with only 69% making it to the schedule. According to our interpretation, this impact could have been related to the fact that in the 2020 edition the course was extended by one week in order to include the formative feedback from the training tutors on the last deliverable of the students, the final project.

These data are complemented by the final questionnaire, which asks about the functions of the badges specifically. The questionnaire was designed with the Google Forms tool and the items were submitted to the review of three experts in different subjects and universities. On the other hand, we used the literals and expressions with which the teachers describe the effect that the badges were causing in their learning experience (they were compiled through different communication tools, such as email, forums, Twitter, wikis and blogs). In the 2019 questionnaire, 43.75% of the total participants responded and in the 2020 questionnaire the percentage rose to 66.66%. Regarding the demographic profile, it should be noted that 80.6% of the sample were women and 19.4% men; regarding the level of studies, 87.09% of the total answered that they have master's degrees, and 6.45% are PhDs. Their extensive experience as teachers of Spanish is also striking, as can be seen in Table I.

TABLE I. PARTICIPANTS TEACHING EXPERIENCE

0 years	3.2%
1 to 5 years	45.1%
6 to 10 years	29.2%
more than 11 years	22.5%

[a.] Own prepared.

About the age of the participants, almost half were under 35 years old, specifically 48.38%; 32.25% were between 36-45 years old and 19.35% were older than 46 years. The international audience is also striking, including Spanish, Argentine, Italian, Mexican, Colombian, Cameroonian, Chilean and Brazilian.

If we pay attention to the results on the functions and uses of the badge, as can be appreciated in the Table II, in both editions the participants recognize that badges influence the self-regulation competence, becoming an extrinsic factor that makes the students set themselves the challenge of keeping up with the pace of course.

The badges are a challenge that they can self-manage and share on their blog, and therefore, an element of motivation.

We are surprised in this contrastive analysis, the fact that in the first course the highest value was given to the badges as they help metacognitive reflection but, on the contrary, in the second course, it is one of the least valued functions.

TABLE II. FUNCTIONS OF SELF-REGULATION

Self-regulation and badges		
Functions and uses	***2019***	***2020***
Influence the competence of self-regulation	71.4%	75%
A challenge to keep up with the pace of the course	71.4%	75%
A goal that I want to achieve	71.4%	75%
They are a motivating element per se	71.4%	70.8%
Help to reflect on the module tasks	85.79%	70.8%

[b.] Own prepared.

If we cross these quantitative data with the qualitative ones, we observe how in the personal blogs constituted as e-portfolios, these functions of the badges are reinforced with texts such as "By the skin of my teeth, but, here are my badges!", "If I organize myself as I want, I would have one or two days left over before finishing the module and then I could dedicate more quality time to the forums. I'll keep trying!", "I guess I can hang up my badges now, but there are so many things going on in my brain, I'm reluctant to say I finished the module, there are still articles I couldn't finish, forty thousand tabs open on my computer" (2020 course edition).

VI. CONCLUSIONS

In this study, we have been pleasantly surprised by the effect that visible and tangible elements can have on trainee teachers' reactions and decision making, taking specific weight in the skills, attitudes and strategies of self-regulation competence. On the one hand, we point out how the simplicity of implementation of the badges and the e-portfolio itself could make it easier for teachers to accept the challenge of transferring them to their learning contexts, in this case it would be important to contrast the results for different ages and different learning modalities. On the other hand, this DBR is based on an authentic scenario in which we develop a learning by discovery and learning by doing methodology, which leads us to wonder what kind of influence the modus operandi and discourse of the training tutors may have, thus pointing to the redesign of roles of teachers and learners in the new emerging approaches [15], [4].

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