

# The impact of a digitally enhanced peer learning program on peer teacher students' academic performance

A study developed under Educational Design Research

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*Abstract* — 21<sup>st</sup> century educational systems are expected to provide effective solutions to ever-lasting Education challenges, such as how to facilitate the way learners learn as well as to current issues of an ever-changing world permeated both by technological development and an urge of human attributes stemming from affective and social skills. Under the principles of social constructivism, peer learning seems to be a flexible solution for educational challenges, for encouraging learners' autonomy, engagement and collaboration skills as well as for welcoming the incorporation of innovating strategies and digital technologies. According to literature review, extensive benefits of peer learning have been found under the affective, social, and cognitive dimensions, although more scientific evidence is needed to assess its impact on learners' academic performance. This PhD project tries to provide a valid contribution to the scientific and educational communities, based on finding that the recognized potential of peer learning can be more systematically explored within the realm of teaching and learning practice in basic and secondary education. Under the methodological framework of Educational Design Research, this study aims to develop a digitally enhanced prototype of a peer learning program in the scope of English as a Foreign Language curricula for basic and secondary education and assess the impact of peer teacher students' (PTS) voluntary participation under the cognitive (as for metacognitive skills), affective (regarding motivation), and social dimensions (considering collaborative and communicative skills). Results are expected to find evidence of peer learning positive impact on PTSs' academic performance and facilitate its dissemination.

*Keywords* – *peer learning program; digital technologies; English as a Foreign Language; basic and secondary education.*

## I. INTRODUCTION

Among the numerous challenges Education has faced over time, the way learners are given the chance to learn is a central issue, for its impact on learners' motivation and engagement level, and, above all, on the teaching and learning process efficacy. Authors' opinions like Blaschke & Hase's [1] or Reigeluth's [2] converge in that something revolutionary is expected from educational systems in this field, and that "maximizing learning" [2, p.2] implies the assignment of new roles to teachers and learners, the advent of learner-centered approaches, that are open to incorporating innovative learning strategies and digital technologies, and promote learners' social

interaction, collaborative and communication skills, critical thinking, motivation, and effective academic performance [1, 2, 3, 4, 5]. Rooted in social constructivism principles [6, 7, 8], peer learning is flexible enough to be used as a learning strategy, in class, or as the pedagogical framework of extra-curricular programs, that contribute to giving learners the chance to be co-creators of their own learning process, collaboratively sharing knowledge with their peers, developing critical thinking, creativity, autonomy, sense of responsibility, and (re)capturing learners' pleasure for learning [9, 10, 11, 12].

Although, evidence of peer learning potential to improve soft as well as technical skills is clear, in particular under the cognitive, affective and social dimensions [6, 11, 13, 14, 15, 16], some inconsistencies have been found, according to literature review, that may hinder its effective dissemination, namely, i) little scientific evidence as for its impact on learners' academic performance, due to limitations found in the quasi-experimental methodological design of most studies implemented in the field as well as to the complexity of isolating variables in the teaching and learning area [16, 20]; and ii) the lack of systematic guidelines to support the design of peer learning programs in different contexts from those reported in literature [16]. Based on peer learning potential for educational purposes, and on the current urge imposed to educational systems to provide learners with solutions that prepare them to become not only technically qualified, but also critical, creative, collaborative, and emotionally balanced human beings who can adapt to the 21<sup>st</sup> century society demands [17, 18, 19], relevance was found in focusing the scope of this PhD project on bringing the recognized potential of peer learning to light, also by means of incorporating the support of digital technologies, so that it can be more systematically explored in the teaching and learning practice, and contribute to the improvement of teachers and learners' experience at educational institutions especially in basic and secondary education. These learning cycles comprehend a large diversity of learner profiles, considering students' age, learning preferences, and affective and cognitive development stages, which is not only as flexible and versatile as needed for sample selection, but also representative of compulsory educational reality. This PhD project stems from the area of Educational Sciences and integrates a doctoral program

in Multimedia in Education. The project has been in progress for sixteen months.

The ultimate goals of this PhD project are the following: i) facilitating the dissemination of peer learning in basic and/or secondary education sectors, and contributing to the improvement of teachers and learners' education practice; ii) reinforcing the potential of digital technologies to support both teachers and learners' work in collaborative peer learning projects; iii) contributing to improving teachers' digital literacy; iv) promoting learners' commitment to their own learning process and their appreciation for interacting with their peers while learning; v) fostering reflective practice among the education community on their teaching and learning practice; and, after all, vi) contributing to the efficacy of the teaching and learning process. In order to achieve these goals, should the subsequent specific objectives be accomplished, namely: a) gaining in-depth knowledge of peer learning implementation worldwide, considering an extensive literature review, and nationwide, regarding good practice examples of peer learning projects run in Portuguese educational institutions; b) identifying possible strengths and weaknesses of peer learning implementation in Portugal; c) based on preliminary research stage findings, developing a peer learning program supported by digital technologies and transmedia storytelling techniques within the scope of English as a foreign language (EFL) curricula, to be implemented in Portuguese basic and/or secondary schools; d) assessing the relevance peer learning may have in these educational levels by determining the impact of peer teacher students' (PTS) voluntary participation in the developed prototype of a digitally-enhanced peer learning program on their academic performance, more specifically under the cognitive (regarding metacognitive skills), affective (as for motivation), and social dimensions (regarding collaborative and communication skills); e) based on the findings collected, systematizing conclusions as for procedural, strategic and outcomes of the educational intervention and sharing them with the scientific and education communities as an open source resource; and, finally, f) promoting the dissemination of peer learning and facilitating its implementation in different contexts and subject areas within basic and secondary education. The research questions are the following: *What is the role of digital technologies in designing and implementing a peer learning program for the curricula of middle/secondary education, based on PTSs' voluntary participation?*, and *What is the impact of peer learning experiences on PTSs' academic performance?*.

## II. STATE OF THE ART OF PEER LEARNING PRACTICE

### A. Theoretical principles and related concepts

The potential of learning by means of teaching has been recognized all over history and studied by renowned theorists of Education such as Jean Piaget [21], and Lev Vygotsky [22], and the origins of peer learning seem to be connected to Ancient Greece [20], at a time when Aristotle used to give his best students, called "archons" [23, p.283], leading roles, according to which they used to help the remaining disciples their master's doctrine [20]. Topping [8, p.631-2] distinguishes between the most "archaic perceptions of peer learning", where only the best students were given the chance to transmit their classmates the

knowledge instructed by teachers, and more recent trends, according to which "peer helping interaction is qualitatively different" [8, p.632], PTS being cognitively closer to peer learner (PL) and where both students "feel equally valuable and worthwhile", being "active participants in the learning process" [8, p.643]. Due to its potential, new trends of peer learning have been established, especially over the past decades [8], and various terms are used to name them according to the context, the status, and the role of the actors involved [7]. Peer tutoring and cooperative learning," the longest established forms of peer learning", according to Topping [8], peer teaching, frequently used in same level peer learning programs [7], reciprocal teaching, often associated with reading comprehension and written production training programs [16], peer instruction [24], with strong evidence of effectiveness in Physics and Computer Science university courses [25], and peer assisted learning (PAL), used both in cross and same-level programs [7].

Variables like the age of the participants as well as their motivation and proficiency level, the nature of the tasks involved and the support of their teachers and schools are vital to the success of any peer learning program [26]. When interacting with each other, tasks like peer discussion, reflection as well as the deconstruction and processing of knowledge, especially important in the case of PTS, contribute to the development of students' critical thinking and autonomy [7]. Also relevant is to avoid knowledge telling processes of sharing content, and to stimulate peer learners to access knowledge in a reflective rather than a receptive way [9, 16].

### B. Peer learning educational outcomes and current trends

According to literature review, the benefits of peer learning have particularly been evident under the affective, social and cognitive dimensions [13, 14, 6, 15, 11, 16, 8] in different scientific areas and educational contexts, such as Health [13, 20]; Physics [24, 25]; or Computer Science [12, 27], predominantly in introductory courses and in cross level programs [16]. Recent studies have highlighted the potential deriving from the association of information technology, in particular mobile and social media tools, and peer learning [3, 4, 5], for promoting greater work visibility between learners and these with their teachers, increasing learner engagement and empowerment [4], active participation, collaboration, learners' autonomy [28] and autonomous learning [5, 29, 30] as well as digital fluency [4]. Notwithstanding, a low uptake of mobile learning is reported in literature [5], in particular, in higher education, and logistical as well as ethical issues connected to student interaction are pointed out for being at the core of possible social media usage issues in educational institutions [3, 31].

## III. METHODOLOGY

Educational Design Research (EDR) is the methodological framework under which this PhD project is being developed. Its underlying research problem requires the option for a methodological approach that can be flexible enough to combine the development of usable knowledge, in real contexts, with the design of research-based and practical education solutions [32, 33]. It includes multiple participants and incorporates both qualitative and quantitative data due to its mixed nature [34].

Three distinct phases are associated to studies implemented under EDR [33, 34], namely, i) the preliminary research stage; ii) the development stage; and iii) the assessment stage. TABLE I, provides a detailed description of the major steps predicted for each phase of the project.

As regards the preliminary research stage, the tasks planned have already been finished. The preliminary empirical data collected result from a multiple case study including five selected peer learning projects, out of which four were run in Portuguese basic and/or secondary institutions and one in a higher education institution. Eight teachers, responsible for those projects, and sixty-three PTS were inquired respectively by means of a semi-structured interview and a survey by questionnaire both created and validated for the purpose of this study. Data were collected from December 2018 to January 2019 in the institutions the projects were held. Interview content was transcribed and analysed under content analysis with the support of content analysis software WebQDA, and the data deriving from the survey by questionnaire were treated with the support of quantitative analysis software SPSS, in the case of closed questions, and content analysis, as for open questions. In order to enforce the applicable law regarding participants' confidentiality and anonymity, teachers and PTS signed a declaration of informed consent, which in the case of students under eighteen was done by their legal representatives. As regards the general quality criteria of educational interventions, emphasis of Stage one is on validating the relevance of research content [35].

Entities like "Direção-Geral de Educação", under Portuguese Ministry of Education, as well as the Deontological and Ethics Commission of the University this PhD project belongs to will be contacted, before tasks planned for Stage 2 are implemented, for authorization request regarding the collection of data in the scope of the school-based intervention. The development stage of the project is expected to be the longest, considering the time span involving authorization request and reply and implementation of the prototype in three distinct schools. Three iterative cycles are planned, namely, a pilot of the prototype, a first, and a second implementation moments, so that the general quality criteria of educational interventions, more specifically, consistency and usability variables [35] can be properly assured. The digitally enhanced prototype of a peer learning program will be conceived as a blended solution, incorporating face to face and distance learning tasks, with the support of ICT tools, particularly used for synchronous and asynchronous communication and data sharing between PTS and PL. Each peer learning session will correspond to a one/two-day-challenge, created with the support of transmedia storytelling tools and techniques. PTS will also be assigned the role of co-creators of the tasks planned for each challenge, under the supervision of their English teachers and the researchers of the project. Learners' immersion while participating in the challenges is expected. Possible critical factors are the selection of schools where the prototype will be implemented and voluntary recruitment of PTS to incorporate the study sample. In order to overcome that, researchers in charge of the project will show their total availability to support all implementation stages and create an impactful marketing campaign of the intervention, grounded on the values of the

project, in particular, the power of solidarity, knowledge sharing, friendship, commitment, and mutual growth.

The scope of Stage three or the assessment stage will be, initially, the validation of the developed and implemented prototype regarding its applicability and effectiveness [35], and finally the systematization of findings and sharing them with the scientific and education community as an open source resource, considering the procedures, strategies and outcomes of the solution developed, and the promotion of peer learning dissemination, so that it can be implemented in as many different contexts and subject areas within basic and secondary education as possible.

TABLE I. RESEARCH PLANNING UNDER EDUCATIONAL DESIGN RESEARCH

Phase	PhD project overall planning	
	Overall task planning per stage	Expected time span
Stage 1	Combination of extensive literature review with preliminary empirical data from five selected case studies of peer learning projects implemented in Portuguese educational institutions; establishment of guidelines for developing the goals determined for stage 2;	From Sept. 2018 to July 2019
Stage 2	Development and implementation of a prototype of a peer learning program supported by digital technologies within the scope of EFL in Portuguese basic and/or secondary schools;	From Sept. 2019 to Dec. 2020
Stage 3	Assessment and implementation of possible adjustments to the prototype designed, systematization and sharing of findings with the scientific and education communities.	From Dec. 2020 to March 2021

Own source

#### IV. EXPECTED RESULTS

Regarding the expected results of this project, finding evidence of peer learning potential and efficacy in improving teaching and learning practice is a major goal, by means, first, of assessing its positive impact on PTSs' metacognitive skills, and thereby contribute to bridging the gap still identified in literature regarding peer learning impact on learners' academic performance, under the cognitive dimension. Besides this, adding findings to the already grounded evidence of peer learning transforming impact on learners' affective, regarding their motivation, and social dimensions, as for their collaborative and communication skills, is expected to be achieved. The dissemination of good and inspiring pedagogical practice examples of peer learning projects implemented in Portuguese educational institutions is also expected to happen.

The developed and implemented prototype of a digitally enhanced peer learning program within the scope of EFL learning is expected to be an innovative solution, in the scope of the pedagogical strategies and resources involved, and have an interventional role, in the sense that it is expected to promote reflective practice among the education community (in particular on teachers and students) and promote a more autonomous, conscious, motivating and effective option for teaching and learning strategies. Based on the digitally enhanced

procedural and strategic features of the prototype developed, more specifically as for how ICT tools may contribute to facilitating learners' interaction with their peers and with their teachers as well as how collaboration and communication between them can be thereby improved, it is also expected that teachers' motivation and digital fluency will be promoted and ICT tools usage when supported by innovative pedagogical strategies can be encouraged, which, after all and in line with literature review [4, 5, 30], is expected to contribute to connecting teachers with 21<sup>st</sup> century learners.

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