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Digital Collaborative Writing in Primary Education: Implementation and Potencialities

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***Abstract*—This research sought to assess the applicability of m-learning to Primary Education, since we believe that one of the greatest challenges that Education currently faces is to approach the technological and cultural reality of students since childhood. Therefore, we recognize the pedagogical potential of the use of technology in education, namely by their classroom integration in Primary Education, the context of our research. In an action research setting, we developed digital collaborative writing sessions using a web-based text writing platform. The results showed that the use of technological resources for educational purposes presents advantages in terms of motivation, feedback, concentration, productivity, assessment, reading and writing taste, digital literacy, error exposure and assignment sharing. While some technical and/or usability implementation difficulties were recognized, the positive indicators outweighed the negative ones and are an argument in favor of school's mediating role of the use of these technological resources, rather than prohibiting them.**

Keywords— collaborative writing, m-learning, primary education, technology.

I. Introduction

There is a growing massification of digital technologies in today's society, a phenomenon that is recognized by all, but not exploited by all.

Year after year, the technological divide between school and society is accentuated. Families in particular and society in general are increasingly dependent on technologies for carrying out the most diverse tasks. Our understanding is that the school should encourage and mediate the use of digital technologies to build knowledge in the various existing learning environments.

In this regard, Tavares and Barbeiro [1] add that the development of societies is also done by technological contribution, but not all citizens exploit this potential and, therefore, it is up to the School to "mediates the process of transformation of information into knowledge"" [1, p. 7].

Despite several initiatives and a general sensitivity of the educational community to the immanent educational potential in technologies, schools still do not attribute due value to mobile technologies. That is, there is an investment in the acquisition and maintenance of computer resources such as computers, projectors, interactive whiteboards, but the use of smartphones is not allowed in classes, for example.

In this context and with the intention of enhancing immersive and meaningful learning, we carried out an investigation in the field of Mobile Learning seeking to measure the potential of digital collaborative writing in Primary Education. Thus, the research question was the following:

- Can learning collaborative writing in Primary Education be improved using mobile devices?

With greater specificity, we have outlined some research objectives:

- To determine whether students' motivational index is enhanced by the use of mobile devices;
- To check if there is an increase in teacher productivity in his action performed on the platform;
- To find if there is improvement of the classroom climate by the use of mobile devices;
- To check for increased student productivity;
- To find if there are advantages in collaborative writing performed on mobile devices.

II. Context

The target audience is a class of 13 students of the 3rd year of Primary Education, aged between 8 and 9 years, in a public school of Portugal, namely in the Autonomous Region of the Azores (ARA). In addition to the national documents regulating the educational action of teaching, the Integrated Plan for the Promotion of School Success (ProSucesso) is being implemented in the ARA, whose action focuses on three axes:

1) Axis 1: Focus on the quality of students' learning;
2) Axis 2: Promotion of the professional development of teachers;
3) Axis 3: Mobilization of the educational community and social partners.

In short, our investigative intervention focused on the context of mobile learning (m-learning) using the concept of Bring Your Own Device (BYOD) with specific intervention in the curricular area of Portuguese (in the field of writing) seeking to measure advantages that may arise from the use of mobile devices.

III. Mobile Learning

According to Traxler [2], there has been a gradual interest in m-learning visible in the growing number of workshops, conferences and seminars held in several countries such as England, Italy, Sweden, Taiwan, among others.

What is meant by Mobile *Learning*? Without pretending to exhaust the subject, we may add that several authors, as Certal and Carvalho; Laouris and Eteokleous; Sharples, Taylor and Vavoula; and Traxler [2]–[5] have presented several definitions about the concept of m-learning depending on the variable they emphasize most. In an attempt at systematization, Certal and Carvalho [3] present four definitions according to different perspectives on m-learning: (1) from the technological perspective, m-learning is characterized by being a learning supported by mobile devices; (2) in another perspective, it is considered as an extension of eLearning via mobile devices; (3) in formal education, m-learning is compared to traditional forms of teaching, not limited to the classroom and finally (4) from the student and mobility perspectives, m-learning happens whenever there is student learning taking advantage of mobile devices or not space dependent.

In this research we adopted the position of Dias e Victor [6] on mobile learning, which in essence defines it as all learning carried out through mobile devices at any time and place, and therefore we can talk about ubiquitous learning in the 21st century.

In fact, we consider that m-learning is especially directed to the current generation of students whose attention in the classroom, according to Carvalho [7], is more difficult to keep. This generation dominates apps, games, social networks through their mobile devices and it is in this context that m-learning can intervene to foster the "involvement, responsibility and creativity of students" [7, p. 2], enabling, in particular, an educational practice more focused on, and close to, the student. Moreover, according to Laouris and Eteokleous [4], in m-learning, access and type of information differ, because the type of content tends to be more graphic, visual and animated. Communication tends to be more synchronous, spontaneous, fast, since the mobile device is always connected with Internet access and available in the individual's pocket. The tests, presentations, exams, and tasks are more flexible, instantaneous, collaborative, in short, closer, and tailored, to the student.

Attewell [8] systematizes a set of advantages associated with mobile learning*:* (1) it improves the skills of literacy, and calculus and allows the student to recognize their skills; (2) it fosters learning experiences, both individual and collaborative; (3) it enables the identification of areas where the student needs help and support; (4) it contributes to digital literacy thus fighting e-exclusion; (5) it helps to reduce the formality of the classroom and to integrate unenthusiastic students; (6)it enables longer attention span times; (7) it increases self-esteem.

It is undeniable that m-learning entails a set of advantages that greatly favor the learning and involvement of the student in the construction of their knowledge.

IV. Methodology

What is Action Research? It is a research methodology that was born in the first half of the 20th century whose founder was Kurt Lewin. Action Research presupposes a "new way of making" knowledge by the association of theory to practice[9].

Melo, Filho and Chaves [10] assume that Lewin proposed Action Research as a methodology not only for *in locus* research, but for participating in the problem.

Thus, opting for this methodology means that teachers "study students' learning by relating them to their own teaching and, in this sense, it is a process that allows them to learn about their practices in order to improve students' learning" [11, p. 132].

It should be noted that the choice for this research methodology was the subject of deep reflection and originated in 3 fundamental premises:

1) Problem: Gaps were identified in the school path of the students obtained from the results of the Summative Tests of the previous school year;

2) Researcher: One of the researchers is the teacher of the class chosen as a target audience;

3) Pragmatic nature: There was a pragmatic nature in the intervention in order to improve teaching practice.

To maintain the anonymity of the target audience and the confidentiality of the information provided in the context of this investigation, we chose to proceed with the codification (Table I).

We adopted a simple coding based on the initials of the participants in order to transcribe some of the observations, speeches and records of the results themselves throughout the analysis of the results. The cardinals from 1 to 13 were added to facilitate understanding for readers.

TABLE I. Codification of Actors

Typology	Encoding	Date of data collection	Applied instruments
Students	A	October 2019	Observation Log

V. The writing

In relation to writing, Barbeiro and Pereira state that "Primary Education constitutes a privileged context to proceed to knowledge integration" [12, p. 11] due to the teaching assigned to only one teacher. In this specific context "information and communication technologies, through the Internet, provide new means and extend the possibilities of participation" [12, p. 7] allowing the desired openness. That is, usually, most of the work done by the students remains closed. Closed in the backpack, the notebook, the file folder... The Internet is the door that opens it. There students can research, write, rewrite, format, produce, disseminate, share, interact and collaborate and when they do it, they are learning and training in, and for, the society of their time.

It is unavoidable to reference, albeit brief, on the Writing Media at the level of writing didactics. This area has not been object of many studies or research. Aleixo [13] even considers that the subject of writing media has been little problematized, since the important thing is the final production performed by the students and that this view blurs the need to account for writing media.

However, the same author considers that we should avoid the idea of writing media neutrality and that several authors have been corroborating the idea that "research on the production of texts using the word processor developed in recent decades has been giving greater visibility to aspects related to writing media" [13, p. 117].

The same author presents the importance of the writing notebook as an instrument for the development of learning to write emerging "the clear understanding that they should

constitute something like a workbench [...] that is, what students write is always available either to be reformulated or to be integrated into an individual writing project" [13, pp. 210, 211]. This strategy has been followed within the scope of the ProSucesso project and we believe that it can be promoted by the use of mobile devices as a writing, starting to be called a digital writing notebook.

Textual production (Fig. 1) implies the mobilization of knowledge and processes. This activity involves tasks related to three components: planning, textualization and revision [12], [14], and the introduction is part of the initial situation; the development includes the problem, the difficulty arising from the problem and help to overcome the difficulty: and finally, the conclusion includes the final situation and may have or not a happy outcome.

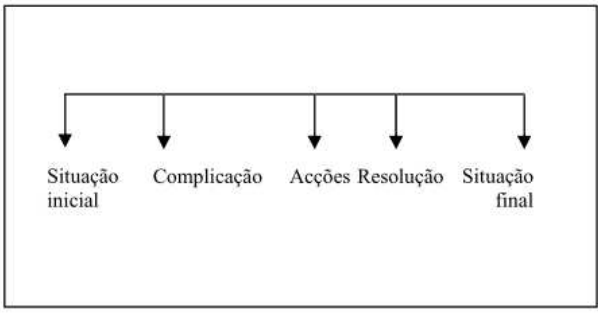


Fig. 1. Sequence of narrative text [13, p. 135]

Students, even if the already know the narrative structure, need to develop an appropriate profile and congruent with the skills necessary for writing, to become skillful writers.

Cassany, Luna and Sanz [15] present some premises that characterize the profile of a skillful writer.

- Skillful writers are skillful readers and the acquisition of writing code results from readings performed;
- They are aware of their readers, so they spend time thinking about what they will write and how they will do it to meet the expectations of the target audience;
- They plan and structure their writing according to a mental construction of the text they have already idealized;
- They often reread the parts of the text that they produce to assess whether it is in accordance with what they mean and whether it has the necessary consistency;
- They review the text to modify and/or improve it;
- They present a recursive writing process that translates into a flexible writing that can be reformulated from its starting point - planning;
- They have resources that support to information retrieval or doubt clarification.

This ideal of writer is not an utopy, it is achievable. Can mobile devices trigger higher motivational indexes in students and provide moments of such an immersion that contributes to the development of writing skills?

VI. Results

Our intervention focused on the curricular area of Portuguese, in the field of writing, with the preparation of classroom scripts aimed at collaborative writing carried out on the *web-based Etherpad* platform. Please be informed that this platform was discontinued in 2020, however there are other similar alternatives, even graphically similar, such as *Riseup Pad* and *MeetingWords.*

We chose to limit our intervention to the narrative text type, since the students were more familiar with this type of text because it was elected to the initiation to the learning of writing in the previous school year. It should be stressed that we aimed to gauge differences and/or advantages of digital collaborative writing performed on mobile devices compared to traditional media.

Therefore, the class was split into groups of 3 to 4 students, without changing the layout of the classroom, because each student had their own mobile device. Each element of the group was assigned specific tasks for the writing of the collaborative text. That was an essential organizational stage for the development of the activity, because the students in this age group still have not enough autonomy development to organize themselves without help.

During this phase, the students expressed themselves orally evidencing some anxiety about the beginning of the activity fact we interpreted by as an indicator of motivation. "Teacher, may we begin?" (A 4); "I can start writing planning?" (A 2); "Teacher, a A8 has already begun writing; may I, too? (A 5)". These and other similar expressions were verbalized by the students during this initial period of organization.

Contributing to this situation were two platform affordances that caused some distraction: color user identification and chat. *Etherpad allows* user identification by the name and by association of a color to that user. It was necessary to direct the students' attention to the work to be done and not waist useful class time.

The chat was the resource that challenged the most the performance of the tasks. Therefore, instead of banning it, we tried to provide some feedback to students to motivate them to focus their attention on the work to be developed using the chat itself. The reaction was very good! Students felt free to express themselves with *emojis and* interacted among themselves and with the teacher in the chat, at the same time they continued their written productions.

After this initial period marked by some excitement, the students focused themselves on the task and were able to produce quality writing work.

The collaborative writing activity, for the students, was an innovative and enriching experience because it allowed each student to see his colleague writing, having the possibility to intervene in order to correct, add, propose, complete, among other actions.

Facial and body expressions of astonishment spread almost among all students. The attention to the work produced by peers, and, therefore, the commitment and helping each other among the elements of the group were patent. Occasionally, oral verbalizations were heard trying to help their colleagues organize their ideas and in the construction of paragraphs revealing the development of social, literacy and

writing skills. "A4, you can say that the animal was caught in a trap" (A12); "A10, the lion could be called Crystal" (A8).

However, this feature was not always well used by the students, as there were situations in which colleagues inadvertently deleted the written productions of others. "Teacher, I wrote the introduction and A13 erased everything" (A12); "Who's erasing?" (A 9); "People are messing with what I've done" (A 6); "Now I have to do it again" (A8); "A13 did it" (A12); "It was not me, teacher" (A13).

Although these transcripts seem somewhat dramatic, they are easily corrected by the user himself, undoing their latest actions.

Motivation, perhaps, is the variable that was most evidenced. The classes where mobile devices would be used were preceded by great enthusiasm by students who showed great anxiety until they were authorized to use these resources.

In the time frames that mediated the classes where those mobile devices would be used, students often produced vocalizations requesting their use: "are we going to *do Etherpad* today?" (A8); "shall we finish the text now?" (A3); and some dialogues that fueled this hope:

- "Teacher, what are we going to do today?" (A2)

- "Why do you ask that?" (Teacher)

- "We could do a little *Etherpad…"*(A 2)

It should be noted that this interest was not short-lived as the students, on their own initiative, created private pads to write their texts. As this is a personal initiative of a few students, we chose not to include them as a research data in this investigation, but we think it is worth mentioning.

The time involved in textual production on the online platform was roughly the same commonly used in traditional writing media and the possibility of future publication of the works was also advantageous because it was carried out on a digital platform, since the final production was already digital.

The goal of 75 words (Fig. 2) for textual production in the 3rd year was met and even exceeded, with an average of 135 words. It should be noted that this number of words is also above that recommended for the subsequent school year – 4th year (90 words).

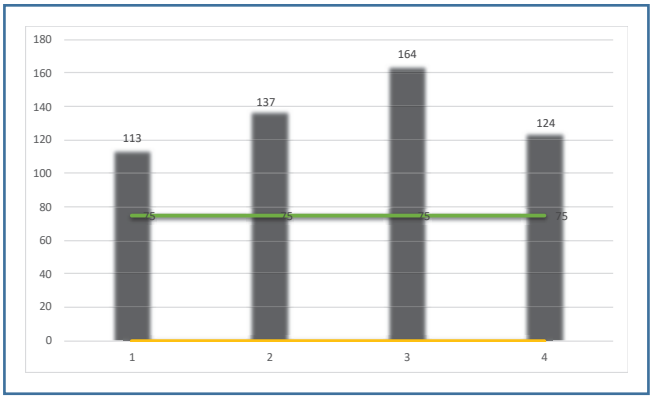


Fig. 2. Number of words from collaborative textual production

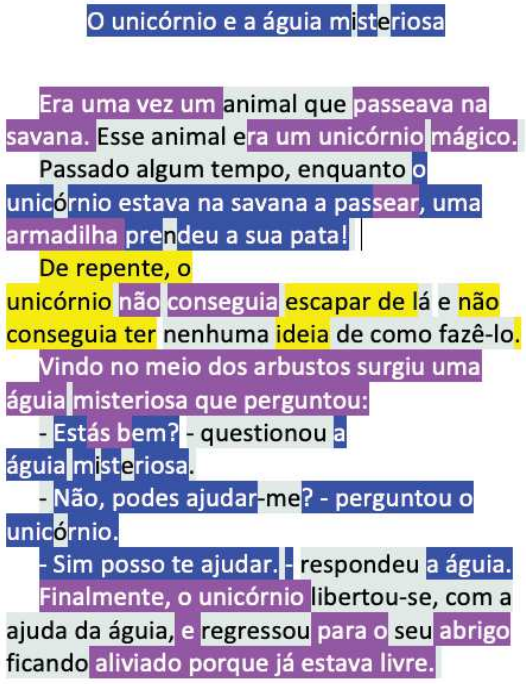
The follow-up by the teacher was also done on the platform, because, as already mentioned, it is possible, in real time, to monitor the progress of the students and watch the production of their texts, at the time they occur, enabling the teacher to act more timely, allowing faster feedback to the student.

This speed in feedback entails some advantages in learning writing, because it allows closer monitoring of the student, it is process and not product focused, avoids the visualization of the error by the student, corrects just in time and assists in the correct development of writing skills avoiding the accumulation of faults that can lead to enduring errors and demotivation for writing.

To the timely feedback we must add the capability of reaching everyone. That is, as the follow-up by the teacher is done on the mobile device, it is possible to have in the Internet browser several tabs corresponding to the work of all groups / students. Thus, viewing and intervening in the written productions of the students is a click away.

Since this is not the focus of this study, we just remark that this would be an area worth exploring, as it enables the production of collaborative interclass, inter-schools, with family work, i.e., an wider collaboration framework, not restricted to the classroom.

The graphic output we get from the action of students in groups and teacher is another advantage to stress. It is always difficult to measure, in the work of groups, which is the contribution of each element for the final product and this platform facilitates this appraisal, because it associates each color with its respective user (students and teacher). For example, in the text "*The unicorn and the mysterious eagle*" (Fig. 3), we can see that the 3 elements of the group contributed homogeneously to the final product (the being the 4th contributor).


O unicórnio e a águia misteriosa

Era uma vez um animal que passeava na savana. Esse animal era um unicórnio mágico.

Passado algum tempo, enquanto o unicórnio estava na savana a passear, uma armadilha prendeu a sua pata!

De repente, o unicórnio não conseguia escapar de lá e não conseguia ter nenhuma ideia de como fazê-lo.

Vindo no meio dos arbustos surgiu uma águia misteriosa que perguntou:

- Estás bem? - questionou a águia misteriosa.

- Não, podes ajudar-me? - perguntou o unicórnio.

- Sim posso te ajudar. - respondeu a águia.

Finalmente, o unicórnio libertou-se, com a ajuda da águia, e regressou para o seu abrigo ficando aliviado porque já estava livre.

Fig. 3. Graphic output of collaborative text on *Etherpad*

From the visualization of the text (Fig. 3) it is possible to perceive more clearly the advantages of digital collaborative writing compared to the writing performed in traditional

media. It should be noted that collaborative writing on traditional media is more passive for students as their contributions are usually oral and only one student writes. In digital collaborative writing there is a greater involvement of all students at all stages contributing to meaningful and immersive learning centered on the process and not on the product.

We should also stress that our goal, in addition to the assessment of the advantages of digital writing, is to enhance and encourage the use of mobile devices in the teaching-learning process from a perspective of complementarity and never the replacement of existing writing media.

From the stages of writing production, it was found that the review stage gains an important emphasis if practiced in a digital platform, because the correction and rewriting do not entail some of the constraints of traditional media such as erasing and starting again, copying again all production, common strikethroughs and teacher corrections. In digital media, it is possible to format, correct, add, remove, and even move, parts of the text and rearrange it without wasting time, duplication of work and constraints for students.

Synchronous monitoring of writing tasks developed in the classroom by the parents and/or other people becomes possible on the *Etherpad platform.* In the days leading up to the class sessions, the parents were informed of this affordance, but despite this information, there were no users beyond the students and teacher. However, this possibility is assumed to be a great advantage over the traditional work that is registered and kept closed in school notebooks, as they tend to remain throughout the school year in school. However, during the following days, the students brought oral accounts that they had shown their parents their work and in particular the conversations held in the chat.

Recalling some of the advantages of m-learning presented by Attewell [8] such as: literacy development and calculus; individual and collaborative learning; identification of student difficulties; increased self-esteem; longer attention periods and the profile of a skillful writer, as Cassany, Luna and Sanz [15] refer that they plan, structure, reformulate and review the writing according to their mental construction to correspond to a target audience, we believe that these writing sessions on the *Etherpad platform* contemplate all the advantages proposed by Attewell [8] and contribute to the development of the profile of a skillful writer presented by Casany, Luna and Sanz [15].

Due to these assumptions, collaborative writing on an online platform, in classroom context, when well planned, contributes to the development of the taste for reading and writing, promotes digital literacy, allows writing and rewriting without constraints, favors the attention focus in the task, promotes a good classroom climate, facilitates the teacher's follow-up, contributes to less error exposure, facilitates the publication or presentation of the works and presents an openness trait. This openness can be exercised to alter texts, review, read them, publish and share them.

On the other hand, the diversity of equipment (laptops, smartphones, and tablets), with different screen sizes, may be a disadvantage in the case of students who are not familiar with the equipment to be used. However, if the student is familiar with the equipment, then should not be understood as a disadvantage.

Another situation that may compromise the task is that students do not have mobile devices. It is recommended that the teacher provide some devices to address this possible situation.

The level of digital literacy of both students and teachers can facilitate or hinder the writing process. Some of the common doubts: demarcation of paragraphs, typing of accents, punctuation marks and general formatting of the text.

As a disadvantage in collaborative writing, it is worth mentioning that we have to deal with some delays as each student contributes to the text in each stage. For example, one cannot write the conclusion without having completed the development stage. Still in this type of writing, there was a more noticeable use of the Chat, and the choice of the online platform for writing should ensure it is as minimalist as possible.

VII. Conclusions

Recalling the starting question, " • Can learning collaborative writing in Primary Education be improved using mobile devices?", we answer it with a categorical "Yes". The use of mobile devices can contribute to the improvement of collaborative writing in childhood. However, it is not enough to deliver or ask students to use mobile devices without any criteria and expect beneficial results. It is necessary to properly plan the activities involving mobile devices with well-designed objectives for the skills to be developed. That's why we structured our intervention in order to get relevant results.

We proposed a set of objectives for this research for which we present some answers:

- To determine whether students' motivational index is enhanced by the use of mobile devices;

This objective was easily attainable. We would even say that it is enough to present the task to be performed using mobile devices, that motivation arises instantly. The motivation index was measurable, throughout the investigation, by the verbalizations of the students requesting the use of mobile devices. The *Etherpad* writing platform has produced high motivational indexes contributing to immersive, meaningful and contextualized learning. We would point out that this interest was not short-lived as students, on their own initiative, created pads to write their texts.

- To check if there is an increase in productivity by the teacher in his action performed on the platform;

The absence of a spelling and grammar checker on the *Etherpad* platform requires that these actions must be performed by the teacher. Since the class was subdivided into groups, there was an effective monitoring by the teacher in providing the necessary feedback to the groups at the distance of a click. We considered that there was an increase in teacher productivity by the monitoring provided on the platform favoring interactivity between peers and textual correction.

- To find if there is improvement of the classroom climate by the use of mobile devices;

After the initial period of getting used to the mobile devices, we found that the tasks favored a greater focus of students, thus contributing to a good classroom climate.

- To check for increased student productivity;

In the class sessions we found that students exceeded the 75-word goal for the 3rd year. However, compared to the records in traditional media, we found that there is a similarity between these different writing media.

- To find if there are advantages in collaborative writing performed on mobile devices.

We have seen some advantages in composition writing performed on mobile devices, such as: collaborative writing allowed at a higher level (contributing and seeing contributions from colleagues simultaneously); timely follow-up, by the teacher, to the student, enabling faster feedback; closer monitoring of the student; process-centric evaluation; avoid the student's display of the error; easier evaluation by visualizing the graphic output of the students' written productions (group and individual); increased standing of the review stage and facilitation of future publication of the work, concluding, therefore, that digital writing books are more versatile.

A. Other conclusions

In addition to the objectives initially presented we have ascertained, during the sessions, other situations worth mentioning.

- The time involved in textual production on the online platform was roughly the same commonly used in traditional writing media.
- In addition to the feedback, we should keep in mind the idea of reaching everyone. That is, the monitoring by the teacher on the mobile device, in Portuguese, allows to reach students more quickly by focusing the work of students in several tabs of the same device.
- We verified the possibility, in the writing platform, of openness to the educational community, either synchronously or asynchronously, or both.
- Mobile devices captivate attention and promote students' focus on the tasks to be performed.
- The evaluation of collaborative writing is facilitated through the graphic output of textual production.

REFERENCES

[1] C. F. Tavares and L. F. Barbeiro, The Implications of ICT in Language Teaching, 1st Edition. Lisbon: Ministry of Education - General Directorate of Innovation and Curriculum Development, 2011.

[2] J. Traxler, "Defining Mobile Learning," in IADIS International Conference Mobile Learning,2015, pp. 261–266.

[3] F. M. Certal and A. A. A. Carvalho, "Study On Receptivity to M-Learning in Basic Education," in VII International ICT Conference on Education, 2011.

[4] Y. Laouris and N. Eteokleous, "We need an educationally relevant definition of mobile learning," Cyprus Neurosci. Technol. Institue, pp. 1–13, 2005.

[5] M. Sharples, J. Taylor, and G. Vavoula, "Towards a Mobile Learning Pedagogy," 2005.

[6] L. Dias and A. Victor, "Teaching and Learning with Mobile Devices in the 21st Century Digital World: Benefits and Challenges," Eur. J. Multidiscip. Stud., vol. 2, no. 5, p. 7, 2017.

[7] A. A. Carvalho, "Apps and Digital Games in Educational Context to Promote Involvement, Responsibility and Creativity in Students," in Proceedings of the 21st International Symposium on Computers in Education (SIIE 2019), C. G. Marques, I. Pereira, and D. Pérez, Eds. Tomar: Polytechnic Institute of Tomar, 2019, pp. 1–6.

[8] J. Attewell, Mobile technologies and learning: a technology update and m-learning project summary. London: Learning and Skills Development Agency, 2005.

[9] P. Ferreira, "The Use of The Methodology of Research-Action in Social Intervention: a theoretical reflection," Rev. Interv. Soc., vol. 32, no. 32, pp. 215–236, 2008.

[10] A. S. E. de Melo, O. N. M. Filho, and H. V. Chaves, "Lewin e a pesquisa-ação: genesis, application and purpose," Fractal Rev. Psicol., vol. 28, No. 1, pp. 153–159, 2016.

[11] J. R. Santos, Action research and the development of educational practices and educational leadership conducive to effectiveness in schools. Lisbon: Open University of Portugal, 2017.

[12] L. F. Barbeiro and L. Á. Pereira, O Ensino da Escrita: a dimensão textual, 1st Edition. Lisbon: Ministry of Education - General Directorate of Innovation and Curriculum Development, 2007.

[13] M. da C. F. A. Aleixo, "The Writing notebooks as mediators of the production of texts by students of the 1st CEB," Doctoral Thesis, University of Aveiro, 2010.

[14] C. Reis et al., "Portuguese Basic Education Programs." Ministry of Education - General Directorate of Innovation and Curriculum Development, Lisbon, 2009.

[15] D. Cassany, M. Luna, and G. Sanz, Enseñar lengua. Barcelona: Graó, 1994.