International Journal for Innovation Education and Research

ONLINE ISSN: 2411-2933 PRINT - ISSN: 2411-3123

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Abstract

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Keyword: Hybrid Teaching; TeleMeios; Virtual Environment; Digital Information and Communication Technologies;

Published Date: 11/30/2019 **Page.1330-1340** **Vol 7 No 11 2019**

DOI: https://doi.org/10.31686/ijier.Vol7.Iss11.2007

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1. Introduction

This scientific article is the result of research done at the Federal University of Ceará (UFC), focusing on digital technologies and teaching. The study involving this article corresponds to the construction and development of collaborative digital tools to support distance teaching, dating back to the 2000s. At this time, the Multimeios Research Laboratory, linked to the Faculty of Education (FACED) of UFC, located In the city of Fortaleza, he began his experiments aimed at structuring digital support tools that could be adapted and used in virtual and presential educational contexts.

Some experiments took place in person and others online through the *TeleMeios* Virtual Teaching Environment (VTE)[1] to support the investigations developed by Jucá (2011) and Andrade (2011). Since the 2000s, investigative actions involving teaching / research had already taken place in a hybrid format, considering this as teaching actions that mitigate face-to-face and online activities, but there was no study and understanding by the researchers of the concept meaning of hybrid teaching. The expression "hybrid teaching" was not clearly evident in the analysis of these studies, as it was not used in this formative space at that time. Nevertheless, the hybrid perspective was already implicitly present in these research contexts, especially in the development of didactic-pedagogical actions in *TeleMeios*.

Through its researchers, the Multimeios Research Laboratory develops hybrid teaching actions in undergraduate and postgraduate courses, which contributes to the advancement, knowledge and dissemination of the theme in this academic space. The subject "Educational Informatics", for example, has been offered in this format since 2015 in the Pedagogy course, dealing with issues related to the training of future teachers who will work with technological apparatus in computer labs of educational institutions, in addition to the use of educational software in a pedagogical perspective, more recently connected to the questions related to the languages present in the cyberculture context. The subject "Virtual Teaching" is

[1] Nomenclature established by the multimedia research laboratory that characterizes a Virtual Teaching Environment as a training space with formative and pedagogical intent, promoting reflection from the figure of a mediator trainer. Its characterization contrasts with the concept of Virtual Learning Environment, since its epistemic essence supposes the learning process without, technically, the need for a consolidated pedagogical proposal (SOARES, 2017).

also offered in a hybrid way, since the first semester of 2018 to students of Master and Doctorate of the college, with the purpose of giving rise to discussions about teaching and learning in the virtual environment, as well as providing analytical experiences of courses and materials developed for remote environments.

From the end of the twentieth century, it is observed that hybrid teaching is highlighted in government educational policies and programs in the Brazilian context, among which the Open University of Brazil, the Open Technical School of Brazil, the "Profuncionário" Semipresential Courses [2]. The digital technologies used to support online teaching and learning in hybrid teaching contexts, such as the virtual learning environment *Moodle* that is spread around the world, is underused in relation to the resources it offers and the potential it presents in the world, support in the process of digital teaching and learning, as attested by Yunoki (2009) and Lisboa et al (2009). The question then arose: could *TeleMeios* be used as a virtual environment in the context of hybrid teaching? To answer this question, we seek to analyze the experiences of construction and restructuring of *TeleMeios* VTE and its adaptive possibilities in a hybrid context to enable formative actions in which students and teachers can have access to virtual experiences in which they play the role of protagonists.

The text is initially structured with a brief introduction. Following is the description of the methodology used to conduct the research with theoretical basis on hybrid teaching. In the following session, the correlations between the virtual teaching experiences developed by the Multimeios Research Laboratory through the *TeleMeios* environment are sought, understanding them as pedagogical proposals that have already been working in hybrid formats, even before knowledge and use of this nomenclature and classification, thus showing the trajectory of the Multimeios Research Laboratory with regard to scientific and experimental investigations in the field of hybrid teaching. At the end, we present considerations and considerations still needed when dealing with the theme "hybrid teaching" in the Brazilian / Cearense context, linking them to the use of *TeleMeios* and its possibilities in digital educational spaces.

2. Making the research

The research methodology was the qualitative bibliographic research. The bibliographic search for Lakatos and Marconi (2002), consists of reporting everything that has to be written about the chosen theme. Moreira and Caleffe (2006, p. 74) say that bibliographic research is “developed from the material already elaborated, built mainly from books and scientific articles”. In the construction of the study we use textbooks, scientific articles, reviews, and others. The choice for bibliographic research was because of the need to know “the paths” already followed by teachers / researchers of the Multimeios Research Laboratory of the Faculty of Education of UFC, highlighting its theoretical and empirical effort.

We have appropriated the concept of hybrid education (BACICH; TANZI NETO; TREVISANI, 2015) and its use in Brazil. From this knowledge, we analyzed the experiences of the Multimeios Research Laboratory at the Faculty of Education of UFC, in which *TeleMeios* was used as Virtual Teaching Environment (VTE),

[2] The Open University of Brazil, Open Technical School of Brazil and "Profuncionário" programs were large-scale, semi-presential governmental actions that emerged in the middle of the first decade of the 21st century in Brazil, with the aim of offer, respectively, teacher training courses through undergraduate, technical and technical courses aimed at non-teaching staff of public schools, making use of Digital Information and Communication Technologies. For further details of each of them, you can access the Ministry of Education page at: http://portal.mec.gov.br/.

to understand the possibilities of using this environment in hybrid teaching contexts.

The study consisted of a survey of the scientific production developed by the Multimeios Research Laboratory on the use of the *TeleMeios* virtual environment as a possibility that links their experiences to the hybrid perspectives of teaching. It was important to carry out bibliographical research on the theme that deals with hybrid teaching in Brazil to deepen the theme.

The study seeks to contribute to the systematization of knowledge related to the experiences of the *TeleMeios* and its link to the hybrid teaching that is already under development at the Multimeios Research Laboratory, focusing on teaching, learning and research practices with hybridism, enabled by *TeleMeios* environment architecture, reinforcing its importance to the didactic-pedagogical mediation processes in virtual environments.

2. Theoretical framework

In this section we present an overview of what we discussed about hybrid teaching, taking the "magnifying glass" of Bacich's contributions; Tanzi Neto; Trevisani (2015); Moran (2015); Horn; Staker (2015), and others. The objective is to discuss about "the hard core" of the concept of hybrid teaching, from the one already studied, to subsidize the ongoing investigations in the Multimeios Research Laboratory.

2.1 Hybrid Teaching: initial ideas

For Moran (2015), hybrid education has existed for a long time, illustrated by the example of the teacher who passes an activity or reading for the student to do at home, then work in class. The author argues that hybrid teaching develops in a diverse society, is not limited to what is planned, materializes through various types of methodologies employed and contemplates a different audience in the sense of its formation and origin, thus characterizing its complexity.

Hybrid teaching is configured as the possibility of bringing together the best of classroom education and online education. It is therefore believed that the integration of the two teaching modalities can offer better learning outcomes. But what can be considered hybrid teaching? For Bacich; Tanzi Neto; Trevisani (2015, p.52),

> hybrid teaching is a formal education program in which the student learns, at least in part, through online teaching, with some element of student control over the time, place, mode and / or pace of study, and by least in part in a supervised physical location outside his home (our translation).

With the hybrid teaching creates the possibility of a more personalized teaching for the student, being a methodology with the focus on the student. According to Moran (2015), there are some models of hybrid teaching, designed with such purpose, namely: "flex", "a la carte", "enriched virtual" and "rotation".

The "flex" model is characterized by educational actions with emphasis on online teaching, in which students make a list of activities that should be considered in their study routine. The "a la carte" model enables personalized learning, in a place and time considered most convenient, in which the student organizes his routine according to the proposed objectives, and structured with the help of an educator. The

"virtual enriched" model adopted by an educational institution in which its subjects will be online and in-person, allowing students to attend school only once a week. The "a la carte" and "virtual enriched" models are not common hybrid teaching experiences in Brazil.

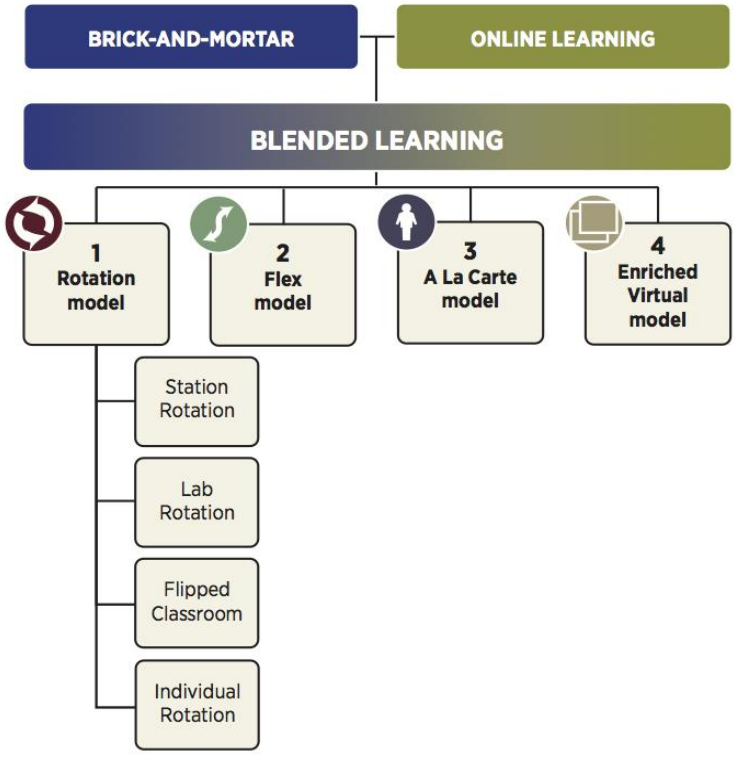
The rotation model is characterized by the execution of activities alternately by a group of students with a set time or guided by a teacher who may or may not be present. These activities may be read or written, but there must be at least one online activity in the curriculum. This model proposes four proposals: rotation per season; rotational laboratory; inverted classroom and individual rotation. (BACICH; TANZI NETO; TREVISANI, 2015).

In the proposed rotation by stations groups are organized, in which each performs a task, according to the orientations proposed by the teacher, and one of the groups will be developing their actions online, valuing the moments of collaborative and individual production. Students will switch groups according to the proposed time for each activity, with a rotation taking place until all students have participated in all groups. The activities are independent but work in an integrated manner as everyone will have access to the same content.

The proposed inverted classroom, more widespread in Brazil, is characterized by the theoretical part of the content being studied outside of school, through online teaching, and the practical part being debated in school, in the classroom. In the proposed individual rotation, there is a path to be followed by the student, which must be part of their study routine in order to achieve the studies outlined by the teacher.

The rotation model, rotational laboratory, is the most similar to the hybrid proposal presented and investigated in this work. It is characterized by classroom and laboratory use. Students will be divided into groups, where one part will be with the teacher in the classroom and the other part will be in the teaching lab making use of computers, individually and independently, with activities proposed by a teacher.

Figure 1. Hybrid Teaching Proposals.



Source: available at <https://www.christenseninstitute.org/blended-learning-definitions-and-models/>.

In all these discussions one cannot miss a central element, which are online activities, understood as those "[...] that stimulate, at the same time, the autonomy and interaction between the participants of courses offered semi-presently or completely at a distance" (GUERREIRO, 2015, p. 34-35). The pedagogical design of these activities must be intentionally prepared to achieve the intended pedagogical objectives and, at the same time, enable learning routes that meet different learning styles within the scope of hybrid teaching.

Hybrid teaching is sometimes considered synonymous with blended learning. It is characterized by the pedagogically combined use of face-to-face and distance activities, aiming that the subject learns effectively in these two teaching modalities, and should be considered the models previously presented, as well as others not discussed here. In the next section, it will deal with how it has been leveraged in *TeleMeios* VTE.

2.2 TeleMeios: the Virtual Teaching Environment

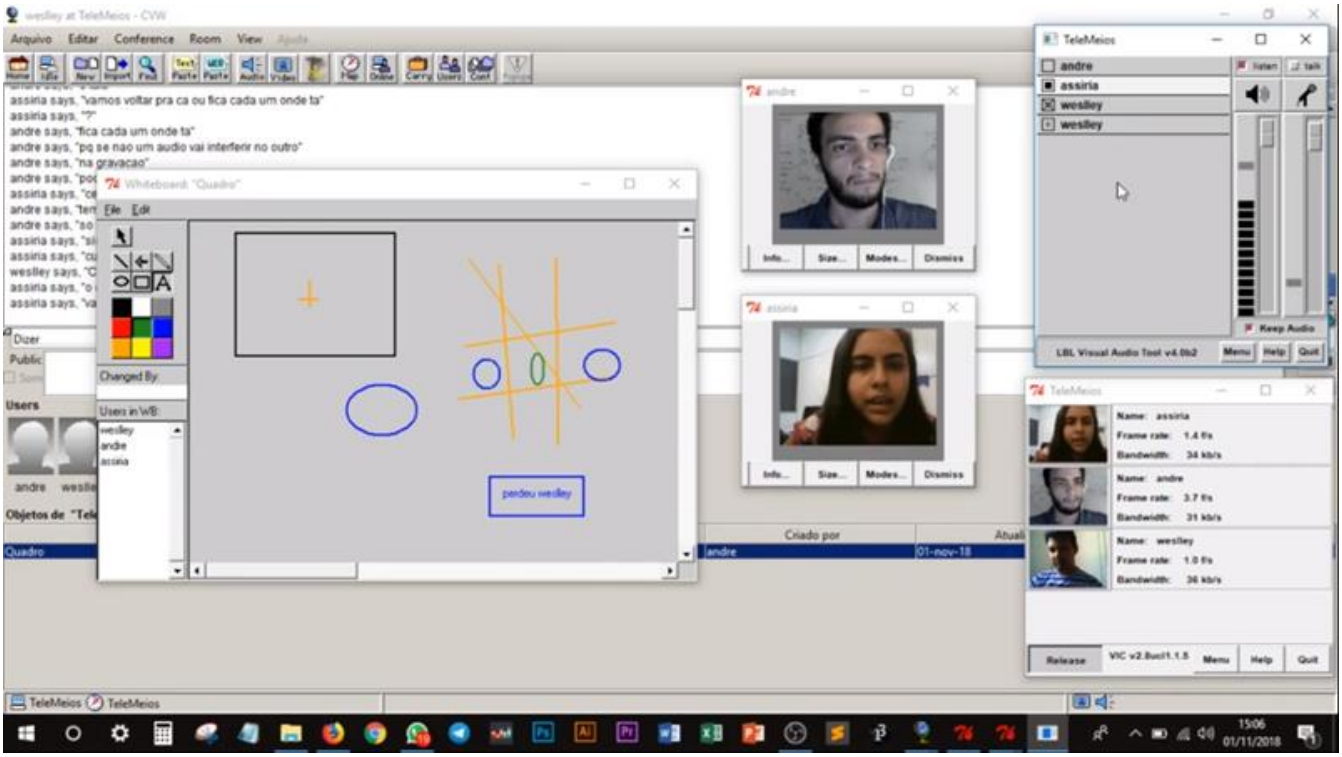
The structuring of *TeleMeios* VTE was based on a scientific research carried out by the *TeleMeios* Group[3] in 2006 in the context of the Multimeios Research Laboratory, at the UFC Faculty of Education. Santos (2010) defines *TeleMeios* as a telematics environment that integrates text, sound, image, mail and specific software sharing resources, with the purpose of providing teaching.

For Jucá (2011), the diversity of resources offered by *TeleMeios* can strengthen the didactic-pedagogical relationship between teacher and student so that both can interact in real-time synchronous moments and asynchronous moments with space and time difference, providing also greater student autonomy and also emphasizing the need for teacher mediation. Araújo et al (2019) increases that *TeleMeios* software can be used by the teacher to assist him with teaching purposes.

TeleMeios interface allows users to easily communicate, since it has a structure that is easy to read and understand, as shown in Figure 2.

Figure 2. *TeleMeios* Environment Interface in 2019.

[3] Group linked to the Multimeios Research Laboratory (FACED / UFC) formed by teachers, researchers and undergraduate and graduate students.



Source: printscreen (2019). Available at < https://www.youtube.com/watch?v=7NK5ffY30Zk>.

Jucá (2011) and Andrade (2011) highlight the interaction between users made possible by the synchronicity present in the chat, audio conferencing and videoconferencing features, as well as the use of whiteboard and application sharing tools, which shows a differentiated pedagogical design of the environment.

It is important to consider that the *TeleMeios* environment brings with it a simplicity and "cleanliness" of design, besides being ergonomic, focusing on the learning to be developed, reason why it is necessary to investigate how it can be used in hybrid teaching actions. In the next section, we will deal with this, based on the results and discussions compiled from research already undertaken.

3. Results and discussion

We highlight the experiences of using the environment *TeleMeios*, described in the work of Jucá (2011) and Andrade (2011), in order to find possible approximations with theorists dealing with hybrid teaching and the pedagogical proposal of the environment under study.

Aspects related to the pedagogical mediation involved in the teaching of mathematics using Digital Information and Communication Technologies (TDIC) were observed by Jucá (2011) when preparing and teaching a Course of Geometric Constructions at *TeleMeios* VTE. This author aimed, in his thesis, to observe the use of digital information and communication technologies in education, especially when dealing with pedagogical mediation in mathematical education in virtual environments, taking as transversal pedagogical support for its conduct the Fedathi Sequence[4].

The course taught by Jucá (2011), divided into a pilot meeting and five classes lasting two hours each, took place in the virtual format in its entirety, in which there was total interaction between the subjects, teacher

[4] The Fedathi Sequence is a teaching proposal created by researchers from the Fedathi Group that seeks to modify the teacher's attitude towards their actions, which leads the student into a learning situation (MENEZES, 2018).

and students, through the resources made available by *TeleMeios* and run on networked computers. The subjects, who during the meetings were physically present in the computer labs LI 40, LI 41 and LI 42 (two students in LI 40, two other students in LI 41, the teacher in LI 42 and one mote student moving around the classrooms to support) at the College September 7 (FA7), communicated in real time via text chat, voice and image using audio conferencing and videoconferencing and, in an innovative way, through application sharing used during the meetings.

The experiences of Jucá (2011), in his study, materialized in synchronous e-learning[5] activities, as formative actions were designed, connecting students and trainer via the internet, aiming at the development of elementary geometric constructions through *GeoGebra* software, where everyone shared their experiences through problem solving. The study proved to be effective, showing that *TeleMeios*, being conceived in an e-learning proposal, provided horizontal and collaborative learning, however it was not evidenced as a hybrid use proposal, considered as teaching experiences that permeate online and face-to-face, neither 100% online nor 100% face-to-face.

Andrade (2011) sought to answer questions about how teacher mediation took place by using *TeleMeios* VTE and the Sequence Fedathi teaching methodology in teaching the determination of the equation of a straight line, and how this environment could favor the approach of subjects of the school Flat Analytical Geometry in his study.

In this sense, the researcher conducted experiments that involved the planning and execution of a teaching sequence, which was divided into six moments, lasting two and a half hours each, where the first and the last were conducted through face-to-face meetings, while the other four occurred virtually, using *TeleMeios* supported by *GeoGebra* software and a text editor.

The research environment was composed of two physical rooms, located in the building Research and Regional Studies Center (NUPER). In the presential moments, the subjects were in one of the classrooms, while in the virtual moments, the researcher, in the role of teacher, was placed in room 1 and the students, which totaled 4, in room 2. It was observed that the arrangement of the two classrooms made impossible any kind of eye contact between the researcher and the students, which characterized, during the virtual sessions, a pedagogical mediation without the presence of the teacher in the same physical space of the students.

The first didactic session, in face-to-face format, aimed to lead students to develop skills regarding the resources (text communication, voice, video and application sharing) provided by *TeleMeios*, so that they could, in the next sessions, perform the proposed activities in the environment more autonomously. The second didactic session took place in virtual format through *TeleMeios*, when the researcher teacher shared the *GeoGebra* software with the students, so that everyone could know and use their geometric construction tools. The study of the determination of the equation of a straight line was performed during the didactic sessions three, four and five, virtually, through *GeoGebra* shared by *TeleMeios*.

In the last session, the students underwent a written assessment in the traditional format, all being physically present in the same environment using paper and pen, which aimed to verify the learning in relation to the content addressed. Andrade (2011) also clarifies that didactic sheets were elaborated with the purpose of presenting, during the didactic sessions, orientations, problem situations, exercises and guides to the

[5] "Etymologically, the term e-learning corresponds to distance learning mediated by digital technologies" (MOREIRA; MONTEIRO, 2018).

students through the sharing of a text editor in *TeleMeios*, with the objective of highlight the learning pathway developed.

Andrade (2011) concludes that *TeleMeios* enables broad communication between users, teachers and students through the chat, audio conferencing, videoconferencing and application sharing features offered by the environment, which favor the performance of group activities. The researcher also emphasizes that the methodology of use of the environment is of fundamental importance in order to explore its potential, enabling a pedagogical mediation through the Fedathi Sequence, as appropriate, thus allowing a collaborative and horizontal approach to a given content.

It is observed that the research analyzed was articulating face-to-face moments in the conventional classroom and virtual moments (composed by synchronous and asynchronous activities) through *TeleMeios*, thus configuring a hybrid teaching perspective. From this experience, *TeleMeios* can then be verified as an environment that can be adapted and used in hybrid teaching contexts, either in person or at a distance, using virtuality.

4. Final considerations

It can be concluded that *TeleMeios* as a hybrid virtual environment, which can favor peer and / or individual learning, in a teaching and learning proposal from a collective and collaborative perspective.

With the results evidenced in the studies by Andrade (2011), it is possible to notice that hybridity is much more characterized within the research, using mixed moments (presential and virtual) in its pedagogical actions. The studies conducted by Jucá (2011) have approximations with the perspective of e-learning insofar as they do not have presential intervention moments.

It is worth mentioning that this study is at an early stage, which requires teachers / researchers to plan and develop this environment in different formative contexts, which can use hybrid teaching with courses focused on corporate education, vocational education, higher education, high school, youth and adult education and others, to reapply concepts of pedagogical design under the parameters of hybrid teaching, aimed at the formation of different audiences with diversified formative purposes.

The research indicates that the *TeleMeios* environment has a formative potential to be explored and investigated, focusing on the structural and pedagogical designer of virtual environments that surpass the concept of content repository and the idea of students as receptacles of knowledge and teachers as holders knowledge, enabling several virtual and face-to-face paths to be followed, with a view to learning that is effective and especially meaningful.

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