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# ICT COLLECTIVE APPROPRIATION ON CHILDHOOD AND ITS IMPACT ON THE COMMUNITY

Mónica Da Silva<sup>1</sup>,  
Adriana Ornellas<sup>2</sup>

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<sup>1</sup> Universidad de la República  
Oriental del Uruguay  
dasilvamon@gmail.com  
<sup>2</sup> eLearn Center. Universitat  
Oberta de Catalunya.  
aornellas@uoc.edu

## ICT collective appropriation on childhood and its impact on the community: the 5D educational model potentials and limits

### ABSTRACT

Uruguay became the first - and so far the only - country in the world to provide a laptop to each public school student and teacher since 2007. Six years after the beginning of the plan, several studies and assessment reports have highlighted the breakdown of the pattern of inequality of access to computers and the Internet thanks to the Plan. Despite this, other studies find that the community impact of the plan is almost zero in social and neighborhood organizations. This article presents the theoretical and methodological framework for research that aims to analyze how the impact of the Ceibal Plan<sup>1</sup>

can be improved by fostering the emergence of communities of practice through the introduction of the Fifth Dimension Educational Model (5D)<sup>2</sup> in a context of social vulnerability in Uruguay. The methodological approach adopted to implement the research is Participatory Action Research, which focuses on a recursive process of reflection and action and is carried out *with* local people rather than *on* them. In addition, the time factor becomes a key element for understanding the processes of negotiation and rearrangement that are required in constructing Participatory Action Research.

### KEYWORDS

Ceibal Plan; Fifth Dimension Educational Model; Participatory Action Research, Time factor.

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- 1. The Ceibal Plan (acronym for Basic Educational Connectivity for Online Learning) is a socially inclusive plan that has delivered one laptop to each child attending public schools at national level. It is inspired in the OLPC (One Laptop per Child) program, whose purpose is to provide each child with a low-cost and connected laptop.
- 2. 5D is an educational activity model based on cooperation between universities and communities, which promotes collaborative learning mediated by ICT.

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## INTRODUCTION: THE IMPACT OF THE 1X1 PROJECT IN URUGUAY

The mass integration of computers into the Uruguayan educational system is part of an overall strategy to transform and modernize education. Since 2007, the Ceibal Plan has sought to influence the reduction of the digital divide in Uruguay through universal access to computers and the Internet in education. Since its implementation, several studies and much research have been carried out on aspects related to the results and impacts of the Plan (Behrendt, 2010; Machado, Perazzo & Vernengo, 2010; Rivoir & Pittaluga, 2010). Some of these studies carried out by the University of the Republic and the Monitoring and Evaluation Area of the Ceibal Plan report a reduction in the digital gap and reveal some impacts of ICT in education, children, families, schools, and communities.

In relation to connectivity coverage for schools, at the end of 2010, 95% of public schools had been reached, although some rural schools that presented difficulties due to the lack of electric power still did not have coverage. Emphasis was given to the placement of antennas in squares and similar spaces in neighborhoods that were considered to be a priority, such as housing developments, complexes, etc. (Pérez Burger *et al.*, 2009; Pérez Burger *et al.*, 2011).

Rivoir and Pittaluga's study (2010) noted the reduction of the digital divide between students who attend public schools and students in private schools due to the use of and access to the XO<sup>3</sup> and Internet computers among the country's poorest population. However, the authors also emphasize that the community impact of the Plan is almost nil, as the application and use of computers by

social and neighborhood organizations have not been identified. Nevertheless, the overall assessment made by respondents is very positive, specifically in relation to equal access for disadvantaged neighborhoods and in small towns.

From an educational perspective, the research of Machado Perazzo and Vernengo I. (2010) suggests an incremental effect on the performance of the students in public schools in the areas of language and mathematics beginning with the arrival of the Ceibal Plan in their schools. This impact is analyzed from the performance of a sample of students in two learning assessments taken in the years 2006 and 2009. However, the author in the study stresses that "... both the characteristics and behaviors of students and their families, as well as the teachers and the authorities of the school, in addition to the policies and specific programs implemented, can affect children's learning" (Machado *et al.*, 2010: 29).

A monitoring and assessment report from the Assessment Area of the Ceibal Plan (Sectoral Department of Education Planning) reveals that 50% of the teachers planned activities in the classroom with computers at least once a week, and 21% did so almost on a daily basis. The general assessment of the impact on the children points out that 77% liked working with a laptop in class more than without a computer (Pérez Burger *et al.*, 2009). On the other hand, a later version of the same report highlights the growing difficulty in the maintenance of the XO, which becomes a problem for the students and the school institutions in their daily planning (Pérez Burger *et al.*, 2011).

In addition, the master's degree dissertation of one of the authors of this article about the Ceibal Plan (Da Silva, 2012) sought to learn

3. The XO are laptops developed by OLPC (One Laptop per Child), with free and open software. The operating system used is Sugar. These machines were distributed in Uruguay by the Ceibal Plan to all students in the public educational system.



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more about the collaborative interactions and collective productions between children stemming from the use of the XO. The findings of the study emphasize that the predominant use of the XO is through video games. Much of the digital knowledge children have is left on the fringes of school life and is not capitalized on, nor is it integrated as knowledge that can be related to the curriculum. When knowledge is not made use of as such, a gap is created between the culture of the school and the culture that permeates life outside of it. The study also reflects difficulties in relation to the implementation of new strategies for teaching and learning since the introduction of the XO into school life.

The research summarized here thus far shows how the Ceibal Plan has guaranteed digital access at a national level. However, its impact on education, new strategies of ICT-mediated learning, and in the community is incipient or almost zero. This highlights the importance of initiating deeper changes in education and community contexts which would require the development of research and interventions to promote the appropriation of digital resources, generating changes in educational processes, starting with the availability of technological resources.

This article presents a research proposal that aims to contribute to necessary changes in the community space and education through the integration of ICT. To achieve this, the construction of a learning community based on the “Fifth Dimension” model is taken as reference. This is a model of educational activity based on collaborative learning mediated by ICT that has been developed by a network of teams from universities in the United States, Mexico, Brazil, Australia and some European countries, including Spain, (Cole & Distributed Literacy Consortium, 2006; Nilson & Nococon, 2005).

Through the creative use of ICT, the “Fifth Dimension” (5D) model seeks to construct a context of activity that allows the development of the skills necessary for the inclusion of the children participating in the proposal. This model is developed inside and outside the school, creating an environment of collaboration, where meanings, goals and tools are shared.

## BACKGROUND RESEARCH

The joint construction of meanings, interlocution, inter-subjective processes, action, connection, possibilities for participation and significant knowledge constitutes an essential element in the generation of collaborative environments. It is from this participation that affiliation and membership is generated, promoting reciprocity through a shared experience. A collaborative activity is defined depending on the levels of participation, and the way the different participants find possibilities of creating opportunities for themselves and others (Gros, 2005). The environment is understood as the set of interrelated elements that make up a favorable system for interaction and learning. It is what constitutes and allows the interweaving that promotes the social production of knowledge through mediators.

According to Gros (2005), research in the field of collaborative learning mediated through technology is heterogeneous and complex, as there are many ramifications of lines of study such as: group behavior, commitment, and the tasks and mediators used, among others. Based on contributions from Reeves, Herringston and Oliver (2004), the author states that some of the initial research on the introduction of ICT in education shows a prevalence that highlights the benefits and effectiveness of mediated and collaborative learning, which is generally quite instrumental and superficial. The results are

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mostly statistical, concerning the number of interactions, and do not delve deeply into the interactions themselves and the consequences for the learning process.

The author proposes other different research groups focusing their studies on conditions that promote collaborative learning and the design of the environments that enable them. This is highlighted in the studies of Dillenbourg (1999), in Switzerland; Baker, Hansen, Joiner and Traum (1999), in France, and Wasson and Mørch (2000) in Norway. All used socio-cultural orientation towards learning, which assumes continuity from the works of Piagetians and Vygotskians on collaborative work and negotiation, including the analysis of the interactions based on the use of technology. Within the principal findings, the need arises to generate changes in curriculum management and school organization, to stress the importance of generating learning communities, to focus on and analyze the quality of the interactions between teachers and students, whether they be in person or virtual, and to ensure the authenticity of the tasks.

On the other hand, Crook (1994) carries out his investigations in relation to collaborative learning and the use of computers, focusing his studies on the task. He proposes that ICT are not qualitatively different from other resources as when confronted with collaborative work, but do have a few requirements that enhance their use. He explains that collaboration occurs in a specific problem-solving context involving emotional and cognitive reciprocity.

Lévy (1992) proposes thinking of technology and its interface as a cognitive network of interactions. In the words of the author:

*“... on connecting the subjects, and intervening with them, the communication and representation techniques structure the collective cognitive network and contribute*

*to determining their properties. Intellectual technologies are also present in the subjects through imagination and learning” (1992:186).*

The means of understanding the multifaceted character of technology refers us to the notion of mediation, understood as the way our action is connected and our activity is transformed. (Crook, 1994). In the cultural life of a community, technological devices form a part of the mediating resources of the culture. Children appropriate resources which feature in their community and these same resources allow them to participate in social life. As Crook puts it: “Our task is to participate in the action, and, thus, appropriate from the mediating instruments that which can help us to carry out exchanges between ourselves and others.” (1998: 55).

Crook (1994) also states that inter-subjectivity is the human capacity that is deployed as an explicit way of obtaining help and guidance in areas of joint activity, involving mutually recognized, shared knowledge. Following Rommetveit (1979, cited by Crook, 1994) the concept of inter-subjectivity refers to a state of mutual understanding, developed in everyday communication, related to the task of creating common references. Inter-subjectivity involves understanding and reciprocity sustained by the interaction that is based on the shared experience. The notion of inter-subjectivity allows us to capture social meanings and the reality built from shared meanings.

The construction of meanings has several dimensions – it occurs in the person, but also in relation to others and in the socio-historical context produced. At the same time it is singular, because each person has a unique way of experiencing and perceiving the world, which can be shared by means of communication. (Bleichmar, 2007) Meanings are negotiated and shared, which refers us to the social process of



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the construction of knowledge, where dialogue and participation are important.

Technologies, conceived as mediating artifacts in the process of knowledge construction, become integrated as a part of the context and culture in which they are immersed. In the Vygotskian sense, technologies are mediators in the learning process; we learn with them, like cognitive tools that are part of the process of the construction of knowledge. (Vygotsky, 1988).

Leontiev, (1975) in a departure from Piaget's contemplations about the active construction of knowledge by children in relation with their environment, replaces the concept of assimilation with that of appropriation, giving a fundamental weight to socio-historical aspects where, immersed in cultural activities, the child makes the instruments and the signs of each society its own. The idea of appropriation of knowledge is conceived as a process through which teachers and students, adults and children participate together and give their own meaning to the contents and the use of ICT-mediated activities (Crook, 1994).

Therefore, based on these theoretical references, the research we present proposes a study in which the center of interest is learning as social participation mediated by ICT (Wenger, 1998). The implementation of the 5D model is the favored setting to discuss collaborative interactions oriented towards ICT-mediated learning. The interest of the analysis is the activity and the processes and collaborative interactions generated that are mediated through the use of technological objects<sup>4</sup>, with a focus on learning and its characteristics. The research will also include a transversal exploration of how the time factor impacts on the processes of collaborative learning

in relation to the contexts where 5D will be developed. According to Leontiev (1975), the unit of analysis is the activity, that is to say the relationships between the subjects, as well as its goals and the tools used to achieve them.

## THE 5D EDUCATIONAL MODEL

The educational model called the "Fifth Dimension" (5D) aims to build a context of activity where technologies are used in creative ways, enabling the development of skills for inclusive education and the digitized world. With 5D, a space is created which is under permanent construction beginning from the different contributions of the participants. A meaningful learning process is constructed, based on negotiation and cooperation, starting with the different contributions of the participants and following the objectives of the proposal.

Originally, 5D was supposed to cater to the cultural situation of minority groups, oriented towards the strengthening of social identity and the preservation of cultural heritage. This is particularly highlighted in the work of Cole (1996) and Cole and Distributed Literacy Consortium (2006) with Mexican immigrants in the United States and with the Gypsy community in Barcelona (Lalueza, Crespo, Palli & Luque, 1999; Lalueza, Crespo & Luque 2009). Several authors (Lave & Wenger, 1991; Rogoff, 1990; Wertsch, 1985) suggest that a central element for learning processes is the consideration of the place where it is developed, as learning is a localized process.

The projects inspired by the 5D model are based on the theoretical framework of Cultural Psychology (Cole, 1996; Rogoff, 1990), as well as in the contributions of Community Social

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4. Photo-cameras, cell phones, computers, etc.

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Psychology (Krause, 2001; Martín Baró, 1987; Montero, 2004; Sawaia, 2004). The guiding principles of the 5D model are that children, families and teachers are considered partners with the capacity to formulate and follow the objectives, and therefore transform the activity, while being respected both in their own right and as constructors of the approach. The model is therefore based on the participation, collaboration and identity of the participants involved. Thus, the activity has to be linked to the community where it is being developed so that learning is meaningful and connected to their interests, creating flexible, horizontal roles that depend on the activities and the objectives of each stage of the work.

5D is a proposal for educational intervention and research in which negotiation and participation among all social participants are fundamental to the creation of systems of meanings shared and constructed between academic knowledge and local knowledge (Cole, 1996). It requires the use of a complex process of negotiation with the locality where it is implemented. The interaction between the researcher and the population he or she will work with is essential not only for obtaining information, but also for the permanent evaluation of the research design and development.

The social context in which we are carrying out this research and implementing 5D in Uruguay is considered a context in a situation of social vulnerability. Specifically addressed is the Pinar North neighborhood, Canelones, created at the end of the sixties where families from the capital and the interior of the Uruguay settled. The neighborhood has few services and no sidewalks, and the unpaved, dirt streets are often flooded when it rains and there is no sanitation. There are approximately 10,000 inhabitants and the population is mainly young, with an average age of 27. 94% of the population is served by public health services and 70% attend public or State educational

facilities (INE, 2010). Part of the population lives in informal settlements and their homes are precarious constructions, the inhabitants crowded into small rooms.

The 5D proposal has arisen as a response to the problems and needs felt by residents. They valued the importance of having an extra-curricular space for children in the neighborhood where the technological resources distributed by the Ceibal Plan could be used in a significant way. 5D is constructed with neighborhood participation, adapted to the specific characteristics of the context, seeking the integration of groups of children from the neighborhood. The adaptability and the narrative are two cornerstones in the construction of the proposal, i.e. it is adapted to local characteristics and interests, looking for meaning in the facts from the construction of a story.

Research activities began in August 2012; the proposal includes the training of University students from various disciplines. The Pinar North neighborhood Center is the community site where 5D is being developed. This center was opened in the year 2009 and is co-managed between the municipality and a committee of residents from the neighborhood.

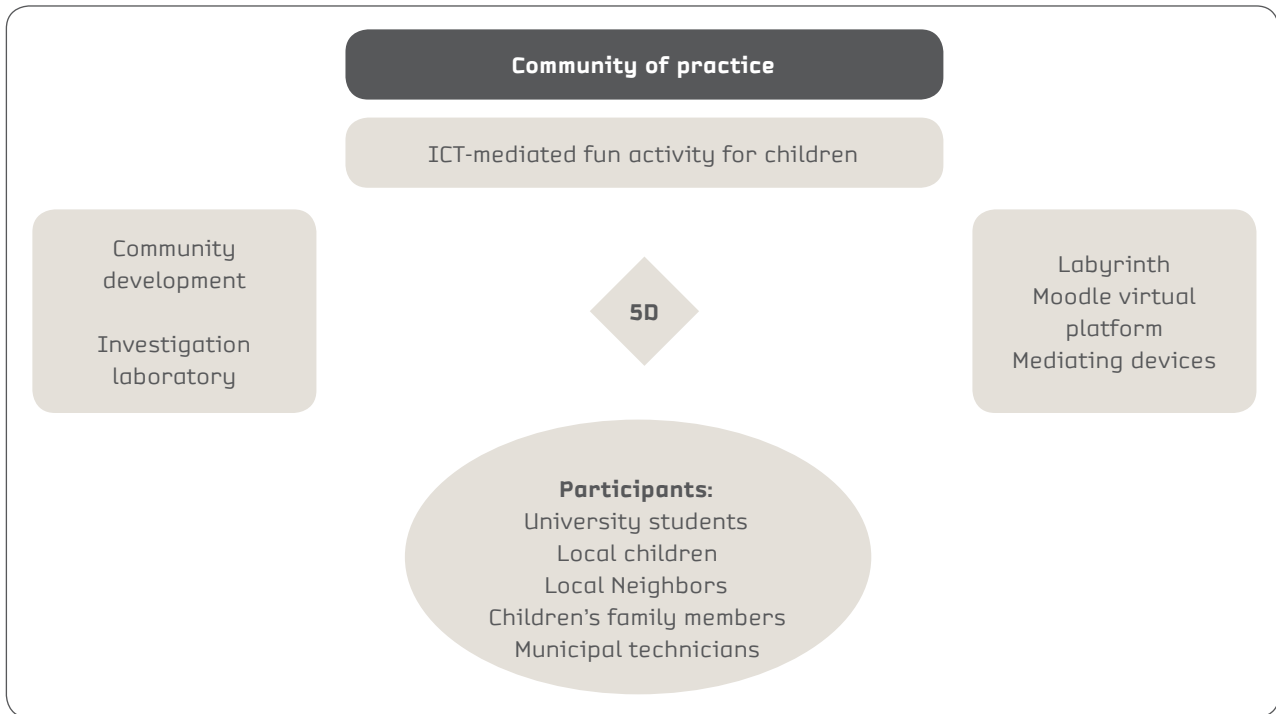
The 5D project involved the production of a context shared by everyone, including resistance, contradictions, participation and permanent negotiation. The creation of the proposal takes into consideration the characteristics, rhythms and particular features of the local area and is also influenced by the academic culture, resulting in the construction of systems of shared meanings between participants, or what Cole (1996) calls a "micro-culture".

Adults accompanying children in the proposal are fundamental; affective and cognitive harmony is needed to be able to generate an



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**Figure 1.** Components of the 5D model.



atmosphere conducive to the activity. College students have the function of accompanying the children along the path as they make their way through the maze (virtual and real game scenario). The child and the college student together create a team in which both must overcome the different challenges to complete the game. Thus an interaction between the participants is achieved, where meanings are shared and the children are able to expand their knowledge and skills in the “zone of proximal development” (Vygotsky, 1977; Vygotsky, 1979).

A scenario of learning in a shared space is built, where the participants seek to attain ownership and knowledge, negotiated and constructed from the tools proposed.

## METHODOLOGICAL DESIGN

The research presented focuses on the analysis of 5D activities and the processes and collaborative interactions generated by

the introduction of technology at community level in a context of social vulnerability. One part of the resulting question is: what are the potentials and limits of the 5D collaborative learning model to generate new forms of interaction and knowledge construction mediated by ICT in the selected context? This raises the need to analyze how the 5D model adapts to the characteristics or needs of the environment where it is implemented and how it constitutes a tool for education and community development, as well as to find out which activities are most attractive for the children and what are the learning processes that are constructed with the same activities.

## OBJECTIVES:

The overall objective of the research is the design, implementation and analysis of the 5D model in social organization in Uruguay.

Linked to this objective are the following specific objectives:

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- To identify the needs, visions and attitudes of parents and community participants in relation to ICT-mediated collaborative learning.
- To design the 5D model according to the needs and characteristics of the researched context.
- To implement the 5D model together with the participants involved in the heart of the Pinar Norte neighborhood, Canelones, Uruguay.
- To describe the collaboration processes that contribute to the creation of a community of practice mediated through the use of ICT.
- To analyze the time factor involved in the process of the implementation of 5D.
- To analyze the potentials and limits of the 5D model in the selected town.

## PARTICIPATORY ACTION RESEARCH AS A METHOD

The method adopted for the development of this research and the questions and objectives it seeks to respond to are framed within qualitative and participatory methodologies and include two distinct complementary phases.

The first phase is conceptually and methodologically based on the interpretive or constructivist paradigm of educational research and focuses on the understanding and interpretation of the educational reality from the point of view of the meanings and intentions of the subjects involved in the educational setting (Arnal, Rincon & Latorre, 1994). With this aim, a contextual analysis is carried out, collecting information about the needs, expectations, evaluations and beliefs of the families of children and community participants. The favored instruments for collecting the information are open interviews and group discussions.

In the second phase Participatory Action Research (PAR) is carried out, (Greenwood, Whyte, & Harkavy, 1993; Reason & Bradbury, 2007; Whyte, 1991) which seeks to transform the investigated socio-educational reality contributing to the changes in the levels of appropriation and use of ICT by the community. PAR involves a cyclical action, the “reflect, plan and act” model of engaging with the community (Figure 2). The PAR approach of the research works towards closing the gap between researcher and researched and involves a joint process of knowledge-production leading to new insights on the part of all those involved in the research (researcher, parents, children, educators, social workers and college students).

The participants' observations are used with their respective activity log, as well as a table of qualitative indicators to assess various factors such as: the participation of children in the proposal; the collaboration between the children and the college students; the quality of interaction between the children and the college students; motivation with regard to the proposal; children's knowledge of ICT; the autonomy of the children in the completing the tasks and the use of reading and writing as a mediator in the carrying out of the activity.

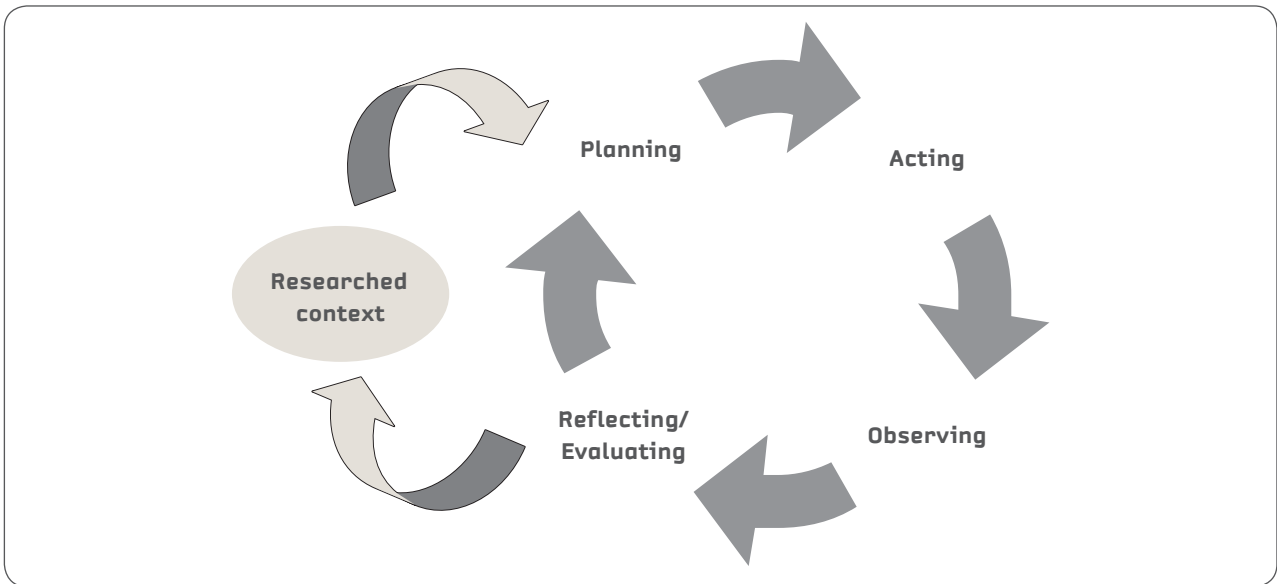
The methodological perspective adopted seeks to create conditions that allow the development of processes of reflection, self-education, planning and equal participation. It means introducing a methodological rigor in which the different interests and points of view of the participants in the approach are integrated. A process of design, progress, testing, analysis of results and a return to the design is developed through a feedback in practice. The participation of stakeholders in the design, implementation and development of 5D is essential. The participatory status of the 5D model involves multiple forms and cycles of knowledge production.





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**Figure 2.** Phases of the research process



## THE TIME FACTOR IN PAR

In the process of designing and carrying out the Participatory Action Research the time factor plays an important role. Research takes place in the context of non-formal education and gives priority to community participation in the process of appropriation of ICT by children and the improvement of specific practices of use and integration of ICT in the community.

Temporality is a key characteristic of the core concepts of computer-supported collaborative learning - interaction, communication, learning, knowledge building, technology use - especially in our case, where collaboration and learning processes are studied by people who work together over months (Reimann, 2009).

The phases of the research process, as well as the design and implementation of the 5D model, require a process of collective construction in which all the subjects involved are actively participating in generating the approach. In this sense, the consideration of different phases is fundamental, as the effectiveness

of negotiation and articulation of the various levels of participation are dependent upon it.

In this respect, the research pays special attention to the following aspects related to the time factor: the temporal features of research methodology (McGrath & Kelly, 1986); the time for negotiating the availability of educators and families to engage in the tasks; the time for training volunteer university students; the amount of time children are engaged in collaborative activities; the time needed for the children's learning to take place (Caldwell, Huitt & Graeber, 1982); and, finally, the researcher's time.

The construction of 5D requires collective processes, based on the affiliation of the different participants, respecting the time of the encounter and the construction of stable social relationships. The characteristics of each participant distinguish the time needed to carry out each activity consistently and in depth, requiring a consensus regarding the structuring of the educational space and the uniqueness of each student's stage in the schedule of proposed activities. What is

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paramount is the interaction of the children with the college students, the use of ITC mediators, customization, and finally the personal and emotional involvement of the participants.

resolution as a game or a challenge promotes a feeling of safety for the children themselves. At the same time, it contributes to the acquisition of specific communication and computer tool handling skills.

## CLOSING REMARKS

This research assumes a commitment to science in the service of social transformation, seeking the involvement of community stakeholders for the benefit of the children at the local school. The importance of the participation and commitment of university students, community participants, parents and local residents requires the combination of different phases that come into play when developing the approach. The regard for and articulation of phases generates benefits and reevaluates the link being constructed, while developing the civic capacity of the participants engaged in the research.

The attitudes and beliefs of parents and stakeholders in relation to the use of ICT have changed along with and at the same level as the advance of the research, the levels of involvement, and the development of 5D. The use of ICT in an educational proposal, which includes games, imagination, and narrative, has contributed to improving knowledge among children and parents about the features of the device. Children use new applications, provided by the project, enhancing the range of possibilities of use for communication. The concentration on the task of 5D and its

An important point of the proposed 5D impact is associated with the approach of children and parents new to the Neighborhood Center who had not previously visualized it as a space to be used by them, or as something for them. The use of ICT, internet connectivity and the support of college students become elements attracting many families in the neighborhood.

These early impacts suggest a return to design, planning and execution, an acknowledgement of the findings, the continuation of reflection and self-correction of the approach, a return to practice and retrieval learning from one another. The systematization and energizing effect of the action, the reflection of the actions and the educational process of participation produce changes in everyone involved.

The research is currently at the phase of characterizing the particular features that the 5D model in this community adopts in order to validate it and give an account of reality and its application to the situation in Uruguay – a phase which will allow it to have significant elements for the development of future communities of practice and strengthen the line of research on collaborative learning mediated by ICT.

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