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Dynamics of intersubjectivity: web-forum collaboration at a Brazilian secondary education

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ABSTRACT

This research discusses a theme receiving a growing attention: the dynamic of student-to-student intersubjectivity in problem-solving tasks and meaning-construction in hybrid settings – face-to-face and digital devices – within secondary education. The features of the dynamics of intersubjectivity in this study are defined by cognitive interdependence, the use of communicative language, the co-ordination of actions on the chronotope, and the production of collaborative meaning. We draw on Cultural Psychology and development with dialogic emphasis, based on the supposition that all discursive activity is intentional, evaluated, and goal-seeking. Recognising that all mediation action implies transformation of the environment, of the object of attention, and of the psychological activity. Participants were eight students, three girls and five boys, from the 3rd-year of secondary education, between 17 and 18 years old, freely organized into four dyads. A teacher of Philosophy and an ICT technician were briefed and were primed to support the activities. Data was collected from a state school in Brasília, where the Moodle platform had been in use since 2006. Data gathering drew on both qualitative and quantitative methodology, with an approach based on Grounded Theory, using an emic perspective. The data collection stage included field observation, individual interviews, two empirical studies, episodic interviews, and report of sources. Every stage of data collection was video recorded with the informed consent of the participants and their supervisors. Two problem-solving group tasks were set within the empirical study, the first involving two reports illustrating the use of digital technology in the classroom. The second centered on a view of how schools would be in twenty years' time. The data obtained are presented and discussed in two stages: Study 1 a) interviews with two teachers and 1b) observations of the interaction between students-students in a context mediated by digital technologies. Study 2 a) presentation of the codebook elaborated from the discourses produced by the dyads in the tasks, composed of five categories and 21 subcategories, and submitted to log-linear analysis; 2b) horizontal and vertical reading of the discourses produced, that were submitted to the dialogical Thematic Analysis, and 2c) presentation of the Semantic Maps. All of the data were analysed and discussed. The results indicated that the dynamics of intersubjectivity stimulate interlocutors to take different perspectives on the same object and this reflects in the responsiveness and the alternation of positions of self, the other, the context, and the object. We observed that the interaction is the founding principle when interlocutors initiate the communication, because they seek a point of equilibrium in the intersubjective space. Negotiation of meanings and conventionalization of semiotic and symbolic elements are essential for constructing authorial and original ideas. The meta-analytic function suggests that dyads can interpret their own productions when they reintegrate and reinsert the knowledge and the meanings constructed in between. The activities mediated by forums indicated that intersubjectivity generates and it is generated by distributed cognition, when the production of knowledge moves from a dynamics of information accumulation towards the reflection of what is being produced. Our study indicated practical implications, thus, we suggest that teachers should better know the intersubjective phenomenon, since it is a key factor in collaborative learning.

Keywords: culture psychology, dynamics of intersubjectivity, dialogism, problem-solving, meaning construction, digital technology, secondary education.

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INTRODUCTION

Currently, many Brazilian schools are in transition from face-to-face practices to hybrid learning processes and we are interest in know how digital devices or the use of hybrid resources can lead to more democratic styles of teaching and learning. Thus, in this work we studied the dynamics of intersubjectivity in dyads of students on 3rd-year secondary education in collaborative activities mediated by face-to-face interaction and web-forum. The theme chosen is related to the use of digital technologies in class from the students' perspective, attempt on their opinions and their employment in collaboration. We were open to learn with them, to observe how they use different digital devices in collaboration, and to look closely at their ideas and views on our subject.

Political strategies to include Information Communication Technologies (ICT) at Brazilian schools play a decisive role in the curricular grade as well put a challenge for teachers in the everyday practices. The inclusion also happens by non-formal activities, when students and teachers are using their own cell phones, tablets, digital cameras, laptops, iPhones, apps, computers etc., in the learning domain. It stands new ways to deal with such devices because along the time they are appropriated as epistemic instruments in learning and instruction (Ritella & Hakkarainen, 2012). In the last decade, we also have paid attention to the enabling of educators on platforms which involve 'learning by doing' within digital environments. Despite the challenges and difficulties, we believe that digital devices doing the bridge of the gap in knowledge-levels from one generation to another.

At a macro-level of contextualization, a continued incentive for the integration of ICT has been made by the Government, various Secretaries of Education, universities, public and private institutions, local communities, and councils. Among many important projects, we list some in Brazil that have influenced the transition. The project *Banda Larga nas Escolas* (Broadband in Schools), for example, aims to connect urban schools to the global network (Portal Ministério da Educação, 2008). The project *Um Computador por Aluno* (UCA – One Laptop per Child) initiated by Secretaria de Educação a Distância do Ministério da Educação (Seed/MEC) (Portal Ministério da Educação, 2010) focused on schools' digital inclusion. The recent *Programa Nacional de Formação Continuada em Tecnologia Educacional* (ProInfo Integrado) aimed teachers' enabling in tablet use. The project *Um tablet por Aluno* (UTA – One Tablet per Student) is a partnership between Fundo Nacional de Desenvolvimento da Educação (FNDE – Nacional Fund for Development and Education)

and the Ministry of Education (Portal Ministério da Educação, 2012). Recently, the Federal Government adopted Linux Educational software in Brazilian schools, and version 5.0 was developed by the Center for Scientific Computing and Free Software (C3SL) at the Federal University of Paraná (UFPR) (<http://linuxeducacional.c3sl.ufpr>).

There are other initiatives sponsored by the Federal Government, such as the Portal do Professor (<http://portaldoprofessor.mec.gov.br/>) a platform that offers content, information, media and lesson plans for teachers. In addition, TV Escola (<http://tvescola.mec.gov.br/>) is a public television channel where the Ministry of Education offers abundant content and suggestions for teachers and educators (Portal Brasil, 2010).

Equally important are the experimental projects created by teachers, experts and researchers which also contribute to developing new alternatives in the integration of ICT in teaching and learning practices in Brazilian schools. We should highlight the project *Educomunicação pelas Ondas do Rádio* created by the Center for Communication and Education of the University of São Paulo (NCE-USP) (Gall, 2005). This initiative enables, teachers and students use radio within for teaching and learning. Similarly, the project *Tecnologias e Mídias Interativas na Escola* (TIME) (Viegas D'Abreu et al., 2010), created by researchers at the University of Campinas (Unicamp) is worth our attention. The project *Mídias e Tecnologias Educacionais Livres*, coordinated by the Secretary of Education of Bahia, is an example of authorial project where teachers and students share their own productions with the community. The audiovisual project *Programa Intervalo* is broadcast on TV *Educativa* da Bahia (TVE/Chanel 2) where students lead on of several contemporary themes (<www.educacao.ba.gov.br/intervalo>). Most of these experimental projects arose from an internal community demand in line with material and human resources available in the context. This revels that making is a situated sociocultural practice that involves conventionalization of cultural resources among the interlocutors and other semiotic means. Sometimes the best technology for innovation and creativity is already in the students' backpacks (Beraldo, 2017).

Digital inclusion programs also have an important role in driving educational change. Many students who are starting out in the Brazilian labour market have double-journeys: they work and participate in inclusion programmes where they engage in a wide variety of activities that involve the use of digital technologies, software, programs, platforms, three-dimensional environments, creation of digital objects and so on. For

example, Telecentros.BR, Projeto Casa Brasil, Acessa São Paulo, EducaRede, Futuratec, Rede Cyberela, Juventude Incluída, Centros de Inclusão e Alfabetização Digital (CIAD), Oca Digital, Comunidade Segura (RJ), Instituto Aliança, The Digital School, and among other projects that decentralize the school's role. In other words, inclusion programmes are putting education at the forefront, leading to affirmative action and entrepreneurship. In addition, these initiatives digitally educate young people and adults, promote action in civil society to improve the quality of life.

Some of these projects above obtained great notable results while others are being re-dimensioned. The point here is that digital technologies are central to the daily life of Brazilian students and this requires changes in education, new teaching methods, and re-thinking the curricular base. Besides, we would like to point that basic education in Brazil is centered on the teacher knowledge, as discussed by the models Initiation-Response-Follow-up (IRF) (Sinclair & Coulthard, 1975) and Initiation-Response-Evaluation (IRE) (Mehan, 1979). Emphasis is given to the transmission, memorization of content such as formulas, keywords, schemes, and answers to pre-existing questions that do not instigate curiosity, a critical sense, creativity, argumentative capacity, social intelligence, self-confidence and so on. Abilities which are vital to contemporary life. Furthermore, curricular endpoints endorsement conventional methodologies and standardized test as discussed by Renshaw (2012) and Matusov (2015) in this work. At present, some scholars are searching for more participatory forms of dialogues in class such as collaborative learning and positioning (Barbato & Caixeta, 2014), analysis of the discursive interaction in class (Mameli, 2013), and positions in interaction sequences in science classroom (Rees & Roth, 2017).

Alongside the many important examples above, young people are accessing different platforms during leisure and formal or non-formal learning, such as Crash Courses <thecrashcourse.com>. Also, YouTube or Vimeo channels experts present free content using animation and infographics on topics such as ecology, chemistry, physics, history, astronomy, economics, mythology, and so on. Similarly, web-platforms with collaborative contents/repositories, objects and images (Open Educational Resources – REA), electronic newspapers, wikis, MOOCS (Massive Open Online Course) allow youngsters to collaborate in a participatory and sharing manner, consuming and producing together with their networks. This may also be considered an important factor to rethinking the role of the school and how we may create more collaborative teaching strategies contextualized within the student's universe.

Equally important are the studies in collaborative environments. Several researchers have focused on different activities, such as discussion and argumentation in web-forum (Cesareni, Ligorio & Pontecorvo, 2001); discursive dynamics and explorative practices in constructing new knowledge in computer-support for collaborative learning CSCL (Hakkarainen & Sintonen, 2002); group cognition in the virtual environment (Stahl, 2006); intergroup collaboration across gaming space and practices of teleporting (Fields & Kafai 2009), and Augmented Reality (AR) in a narrative spaces-play (Enyedy, Danish & DeLiema, 2015). Should also contribute to the studies with apps and digital interfaces on the cellular screens (Hulme-Kukulska, 2008), games and avatars in online gaming consoles (Przyblski, Rigby & Ruan, 2010), and avatars in three-dimensional environments (Ligorio & Van Veen, 2006; Çakir, Zemel & Stahl, 2009; Ligorio, Cesareni & Schwartz, 2010).

In addition, the role of media globalization in youth culture reconfigured the way that young people use, produce and communicate by digital media. Presently, Brazil leads Latin America in mobile applications usage and in the free social networking website, Facebook. This general panorama illustrates that the current wave of media globalization is firmly rooted in Brazilian culture and the effects of media globalization are shown in the personality style, mannerisms, fashion trends etc. In this sense, Brazilian usage and preferences helped us to draw a conceptual framework of the influence of media globalization and also reflect the aspects related to the challenges, opportunities and constraints for education and the use of Internet, networks, and so on.

According to many scholars, youngsters are opening creative spaces of interaction and communication that go beyond the mainstream media controls (Barzilai-Nahon & Neumann, 2005; Barzilai-Nahon, 2006; Ippolita, 2013, 2015; Pariser, 2011). Cortéz (2000), for example, says that youth culture is "rebuilding and recreating new societal models, new values and solidarities, and constructing new subjectivities" (p. 82). It can be seen as a positive opportunity for agency, legitimacy, authorial discourse, creativity and originality (Matusov, 2015). The constraints can be seen in the effect on the economy of technological dependence, media communication control, consumerism of global brands, the entertainment industry, global cosmetic industry, fast-food advertising, selfie-addicts, digital divide and so on, that drive changes in habits and customs on local culture, principally, in Latin America (Arnett, 2000, 2005; Arnett, Arnett & McKenzie; 2011; Martín-Barbero, 1996, 2012). In terms of scale and speed we never experienced such behavioral trends in culture and it may provoke instability and confusion because it implies continuous or even intensified

heterogeneity that stresses cultural differences as well oppositions (Hermans & Dimaggio, 2007). Instability increases the desire for stability and evokes localization and its counterforce as a counter-reaction. And it may "motivates individuals and groups to maintain, defend, and even expand their local values and practices to establish a niche for the formation of a stable identity" (Hermans & Dimaggio, 2007, p. 36). In light of this, we can mention, young indigenous leaders in Brazil who use digital resources and networks to drive projects to reaffirming their culture, identity, and language in defense of human rights such as [1]Kayapó group. In Campinas, São Paulo, youngsters are using the Rede Articula Juventude (REAJU) to encourage the construction of public policy for youth in Brazil (<juventudecampinas.wordpress.com/>). As well young volunteers on Politize! are using a website and various platforms to offer free educational contents of politics for Brazilian people (<http://www.politize.com.br/>). There are many examples in the whole territory that show the appropriation of media for young people to promote participation in various spheres of society. Lévy (2011) calls it curatorial work in the sense that authors/creators, readers/viewers, critics/curators, and documentarists/organizers can exchange roles using web-spaces to interchange/mix their production.

Cortéz (2000) and Feixa and Fernández-Planells (2014) call the attention for the new display on networks, such as alternative culture movements, cyber-activism, art network culture, gamers culture, geek culture, curatorial networkers etc., since young people are more exposed to multifarious channels of communication. Also, Arnett (2002, 2005) gives emphasis for the development of bi-cultural identity, when youngsters assume their local identity and global identity in its values, beliefs and practices. Equally important is the pervasive effect of cultural connections leading to hybridization, that is, local traditions mixed with global practices and thus creating a new one (Hermans & Kemper, 1998). A positive contribution to civic engagement with global issues and social intelligence on networks (Arnett, Arnett & McKenzie, 2011), for instance, is accessible in communities such as Global Voices (or Rising Voices), where young writers, analysts, online media experts, and translators of many countries (including Brazilian volunteers) produce content about marginalized and misrepresented communities around the world (<https://globalvoices.org/>).

[1] The Associação Floresta Protegida (AFP) is a non-profit organization that currently represents 17 communities of the Mẽbêngôkre/Kayapó in the southern state of Pará, Brazil < http://florestaprotegida.org.br/>.

The opposite also happens, and as we mentioned before, confusion between local and global identity (tradition culture vs. new culture) can bring instability, insecurity, risks for psychological healthy and vulnerability (Arnett, 2002). Ruptures with the local culture can be perceived as a form of tension or anxiety. Thus, some people do not tolerate uncertainty, for others it is the trigger for change in their lives in order to not generate more ruptures, uncertainties and oscillations (Zittoun, 2006). Feixa (2000, 2003) defends the idea that young people are expressing and re-signifying symbolic manifestations in a set of material and immaterial elements that are representative for their identity as a group. A similar view is shown by Win and Vrakking (2009), who points out that new generations (homo zappiens) are learning to develop new skills and exhibiting new forms of behavior that may show us how future society will be shaped and how it will deal with the digital world. In the same way, Cortéz (2000) emphasizes that there is an obsession of the adult world with the forms of expression of youth culture in the contemporary, as well as an erroneous interpretation of disobedience, disorder, rebellion or apathy. It may indicate that these categories have more levels, dimensions, and nuances that we thought possible.

Feixa (2000, 2003) complements these ideas by saying that temporal construction of time by Generation@ must be observed by the evolution of three types of chronological systems, called: a) sand clock, which are based on a natural and cyclic conception of time (Pre-industrial society); b) analogical clock, by a linear perception of time (Industrial Society), and c) digital clock, in a plural and ubiquitous understanding of time (Post-industrial society). For this author, time is denationalized and becomes increasingly global by synchronized services, that is, we have the impression that everyone lives at the same time (real time media). It is driven by transmissions, telepresence systems, videoconferences, simultaneity in the transmission, etc. He proposes four tendencies to intervene in this process: local space vs. global space, real time vs. virtual time, sedentarism vs. nomadism, urban tribes vs. networks tribes (Feixa, 2000, 2003). In recent work, Feixa and Fernández-Planells (2014) introduced a new chronological framework – the transition from the digital era to the hyper-reality era – that is, the evolution from Generation@ to Generation# (hashtag). The intensive use of metadata has generated fast shortcuts delimiting the information space to connect users/information in time. According to the authors, the new phase of the network society is "characterized by the emergence of the social web, whose central axis is the indexing (numerical and thematic classification) of the subjects according to social, ideological or cultural affinities" (Feixa & Fernández-Planells, 2014, p. 42). This new trend is

defined as: global space vs. glocal, virtual time vs. viral time, nomadism vs. translocalism, network vs. rhizome. Similar, DiMaggio, Hargittai, Neuman, and Robison (2001) discussed that there was not functional-equivalence of time displacement effects of television and radio interaction and media activities on Internet because time online and offline disappeared.

On the question of time, Kennedy and Kohan (2008) consider the ontology of learning in a differentiated way. For them, questioning and responding have a specific dialectical temporality. Based on the concept of time for the Greeks, the authors highlight three temporalities: Aión (Αἰών) designates intensity, power, duration. Time is not marked, it is the time of the experience, to make sense, to be immersed in a context where the learning is motivated by personal interests. Chrono (Χρόνος) is the time marked by the continuity of the successive time, moves according to numbers, it is the chronological time. Adolescence in Western cultures, for example, is marked by the construction of identity in adulthood, entry into the labour market and the start of academic life, and also by processes of identity linked to morality and virtues in the social world (Rosa & González, 2012). Thus, temporality interferes in the forms of subjectivation as a form of regulation in the social world. However, Kairos (καιρός) is the time that means measure and proportion, indicates critical time, particular circumstance, opportunity. Kennedy and Kohan (2008) explain Kairos opens the world to a transactional space of aesthetic experience, where there are times of chronological fissures, in which the dialectic inside-outside, interiority-exteriority, self-world and self-others cause estrangement, that is, the borders become fluid and re-constructible. The authors emphasize "from this we will discover how chronological cause and effect are limited" (Kennedy & Kohan, 2008, p. 8). For the moment, we suggest that focus can be given to new ways of interpreting the chronotope where youngsters are performing and transforming the social and cultural environment through new practices.

Participatory culture is also created in networks as a practice for building together, working together in a formal or non-formal way, and engaging in creative collaborative processes (Jenkins, 2009). Participatory culture is a movement initially created by corporate media and alternative media – community radio, alternative journalism, etc., – which grew up when the content dramatically multiplied and the young public took the control of the media, in the sense of acting and co-producing content (Jenkins, 2009). In this way, more attention to media literacy is needed. Jenkins, Purushotma, Clinton and Robinson (2009) suggest that the challenge of education in this century is to understand how young people have used the media to think and how it can be used in education. For them, is necessary to develop a set of

cultural and social skills, both intellectual and discursive for working in collaboration. They recognize that participatory culture opens possibilities for civic engagement, artistic expression, support for creation and sharing in collective spaces where the more experienced support the novices and everyone can express themselves through original creations (Jenkins et al., 2009).

For instance, we may say that new generations continuously develop new skills through multiple technological resources that allow them to control the flow of information and work with continuous and discontinuous information according to their needs. Wim and Vrakking (2009) noted that this generation (homo zappiens) prioritized certain competencies that give them an advantage, for example, maintaining safe sources, collaborating and sharing relevant information, informing others about their knowledge, and being available to online communities. Thus, negotiation and communication are key concepts for building a good reputation on networks, and it reflects on the quality of information, the reduction of risks and the maintenance of valid and reliable sources. This is the world that most Brazilian students live daily, where they consume and produce content, teach and learn, express their feelings, participate in virtual communities, maintain a group of followers (fans), experience new cultures in a global interconnectivity. As it was indicated in the interviews with our participants, they are immersed in this universe, thus we opted for Grounded Theory to invert the way of collecting the data. We moved from empirical observation to the definition of categories of analysis (Glaser & Strauss, 1967; Corbin & Strauss, 1990, 1998).

Considering the above propositions, our purpose, in this study, is to learn how the student uses hybrid technologies for collaborative problem-solving, and to understand what they think about the use of digital devices in class. This is a mixed method research designed within a dialogical and emic perspective (Pike, 1993) using the precepts of Grounded Theory (Corbin & Strauss, 1990, 1998). Ericsson's protocol of verbalization of thinking (2006) was included in order to analyse meanings negotiation in dialogues. Basically, we were oriented by the theme, as well the research question. Data was generated into the chronotope and further information came from documents, information on platform, questions to the coordinator of school etc.

In this sense, our aim was to analyse the dynamics of intersubjectivity within four dyads of secondary-level students and then describe the processes involved in problem-solving tasks, and meaning-production context, mediated by face-to-face and web-forum. Thus, we formulated the research question that guided us and which shapes the methodology:

- Which processes involve collaboration in the dynamics of intersubjectivity between student-student and how these affect problem-solving tasks in a context mediated by face-to-face interaction and web-forum?

After assessing the first data collected, we alighted on two specific objectives, as presented in the method. Two theoretical lines supported us in this research: Cultural-Historical Activity Theory (CHAT) and the dialogical approach, which have been widely discussed and interconnected in recent research (Roth, 2013). They integrate psychological and sociological dimensions in human interaction and focus on change and development. The first one is centered on the concept of activity mediated by tools and this looms large in this study, since activities of computer-based learning supported impacts on the notion of space-time on the chronotope. And influence the performance of the interlocutors, the representation among the participants, and ways of knowledge-construction along the way.

The dialogic perspective is related to voices (polyphony), positions and representations of self and other. When interlocutors are verbalizing thought through words, they mark the speech indicating different ways of saying to others who they are (Bakhtin, 1929/2010b; Volosinov, 1929/1973), as well indicating forms of feelings, attitudes, and perspectives (Rosa & Blanco, 2007). In this sense, the web-forum – as a didactic tool – has been used in many studies to understand speech activities in teaching and learning situations (Barbato & Caixeta, 2014; Carlucci, Beraldo & Forcione, 2014; Cesareni, Ligorio & Pontecorvo, 2001). We use authentic content, which has a connection with the daily life of graduate degree and teachers' training to stimulate collective discussion. The results suggest strong engagement in the activity, critical thought, authorship, responsiveness and non-indifference among participants. In this way, we focused on the concept of intersubjectivity, since it is better understood by differentiation and contrast. Thus, we created problem-solve situations in which the interlocutors could engage with their own awareness and, at the same time, with the voices of the social other in the chronotope, where they produced meanings in collaboration.

This thesis is organized as it follows. In order to clarify the theoretical path and our methodological choices, we have organized the following chapters and sections: in the **Introduction**, we report a brief contextualization of the research to seek an articulation with the performance of youth culture on networks. Whilst there are many challenges for education in the contemporary world, school practices remain unchanged or just with

superficial changes not involving teaching/learning methods. To have profound changes, practical applications should be included such as: a) the usability of the resource chosen by the teacher, for example, collaborative tools, locative media, wiki, platform etc., b) the Internet information sources (the levels of the access such as collection, portals, sites, virtual museums, database etc.), and c) focus on scientific thinking. In **Chapter 1**, we present the theoretical bases of the mediation by cultural artifacts on the self-regulation and regulation in social activities, as well epistemic mediated artifacts to transform the environment. We also present a study of the intersubjectivity phenomenon to define the concept of dynamics of intersubjectivity, followed by two sections in which we explore the elements of dialogic theory about intersubjectivity, interaction, cognition and communicative discourse. It will also be discussed the principles of mediated action and the transformation of tools into mediator-artifacts able to define chronotopes.

In **Chapter 2**, we raise questions related to semiotic mediation in the processes of negotiation and production of meanings, since we are interested in the interactions between the dyads of students and the meanings they produce. The concept of chronotope gains relevance, considering that collaborative activities supported by computer imply a differentiated time-space of actuation and new forms of mediation. We interrelate the content discussed in these sections to the positions of the interlocutors in the dynamics of intersubjectivity.

Chapter 3 provides the contextualization of the study and the presentation of the method adopted for data collection, based on a qualitative approach and Grounded Theory. In this chapter, we contextualize the school, the participants, the instruments and the procedures for collecting and processing the data. With our entry into the field, and considering the first data collected, new theorizations continued being formulated, which made the context more sensitive to the theme. Thus, an emic position was kept for understanding the participants' choices and opinions (Pike, 1993), according to their perceptions and positions.

Chapter 4 begins with Study 1 – we present the results of the two individual interviews with two teachers in the approximation of the field. We wanted to know how they perceive and signify our theme – the use of ICT in the classroom – and how they comprehend the transition in this school. We also present the results of 18 hours of observation of the interaction between students-students at the Virtual Scenarios Project. This is an interdisciplinary project elaborated by the teachers from different areas of knowledge, where students work in collaboration using their own devices to rewrite Brazilian plays, poetry, and

music. We were attempted to learn about the context of study because this kind of method is based on evidences, theorization, and cycles of revisions. Thus, the information gathered here helped us to choose new strategies for the next steps. The results are presented and discussed. In the sequence, we present Study 2 – Result and discussion of the empirical study, in which we show a codebook comprising five categories and 21 subcategories. The categories were identified from the discourses produced by the dyads, referring to our research theme. In this section, examples of each category are shown, as well as the results being analysed qualitatively and quantitatively. Additionally, we present Semantic Maps comprising meanings produced by each dyad, which have their own trajectory and discursive texture. The maps were submitted to the dialogical Thematic Analysis. The discourse produced was overlaid horizontally as a single text, and vertically gave rise to new discursive formations of meanings as a result of negotiations and conventions between each dyad.

The thesis concludes with a section devoted to **Discussion** and **Conclusion**.

CHAPTER 1 – THEORETICAL PERSPECTIVES

Our literature review focuses on the following assumptions: (a) the principles of Activity Theory, which is centered on tool-mediated actions and their effects such as contradiction that drives forces of change and development into the system of activity; (b) the concept of intersubjectivity, and constituents in the dialogic theory about intersubjectivity, and (c) interaction, cognition, and discourse. These concepts support the construction of the theoretical reference to this research and, in this chapter, we present the studies that we encountered to explore the intersubjective phenomenon.

1.1 Principles of Activity Theory mediated by tools

The concept of artifact-mediated action formulated by Vygotsky (1960, 1978) was essential for sociocultural studies, since it introduced a new way of understanding and analyzing the interaction between subjects in tool-mediated contexts, mainly in teaching-learning contexts, in a dialectic relation between mind and culture. These ideas were based on dialectical materialism, in which the collective man-made artifacts have an important role in linking of the social and the cultural aspects. And this allows individuals transit in a symbolic and semiotic world into the psychological system (Vygotsky, 1986, 1978).

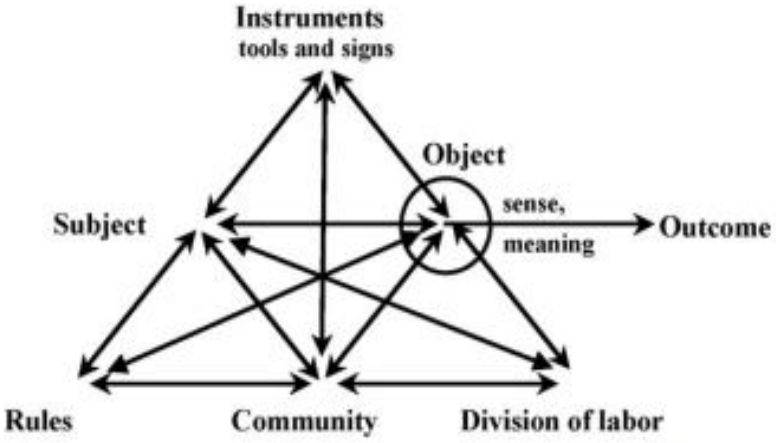
Vygotsky related the following concepts – instrumental, historical and cultural – in order to show that the relation between individuals and the material environment is always mediated by a tripartite structure: subject, mediational means (tool or sign) and object (motive). With these elements, he tried to explain the formation of mental processes and conscious human behaviour to discover the sources that organize them. Vygotsky (1978) concluded that the ontological aspect is understood from the collective (social body), considering that human actions are based on the mediating function by the use of signs and tools in activities oriented by goals. Human conduct itself is also considered as an instrument to change inner activity by the process of internalization and externalization. This implies personal changes, involving a synthesis between human development and the sociogenesis of psychical processes (Vygotsky, 1978).

Based on the proposition of tool-mediated action, Leontiev (1997/2009) delved into deeper consciousness and activity. His argument is that activities are distinguished by their motives, which are material, such as basic survival functions as well as ideals, which are culturally mediated. In general, the activity has a collective meaning, the main presupposition

being the irreducible tension of active agents, mediational means (material and semiotic conditions), and goals, which generate internal transformation into the activity. Leontiev (1997/2009) points out that action and activity are distinct. The first is finite, has beginning, middle and end, refers to everyday actions. In other words, it refers to the beginning of activity. The second is not an additive process, but a sequence of actions which includes an object (motive) in a dynamic system that begins in external activity though social practices. What differentiates one activity from another is its object, which appears in the activity in two ways: first, the object itself; second, "as a mental image, that is, as a subjective product of activity, which registers, stabilizes and carries within itself the objective content of the activity" (Leontiev, 1997/2009, p. 4).

Leontiev (1997/2009, p. 13) emphasizes "the psychological characteristics of individual consciousness can only be understood through their connections with the social relations to which the individual is involved". That is, outside human relations the activity does not exist. For this assertion, Wertsch (1993, p. 18) argues "the basic aim of the sociocultural approach to the mind is to create a description of the human mental process that recognizes the essential relationship between processes and the cultural, historical and institutional context". The thesis of this statement is that the mental process takes the form of the general external structure – of generalization of the object in culture – which involves external objects that are transformed, exchanged, and re-internalized (historical element). In short, types of reasoning are determined by activity. At Figure 1 below, Engeström (1987) elaborates the system of activity from the propositions of A. N. Leontiev, as we can observe, psychological perception is inseparable from the moments that caused it. Thus, the construction of the reality is symbolically mediate, it turns out that the mechanism of new activities lies in the internal contradiction between the prior motive and the development of it though the activity. The development of the activity is defined by Engeström (1999) as an expansion of the object as presented into the activity system.

Figure 1. General model of the activity system

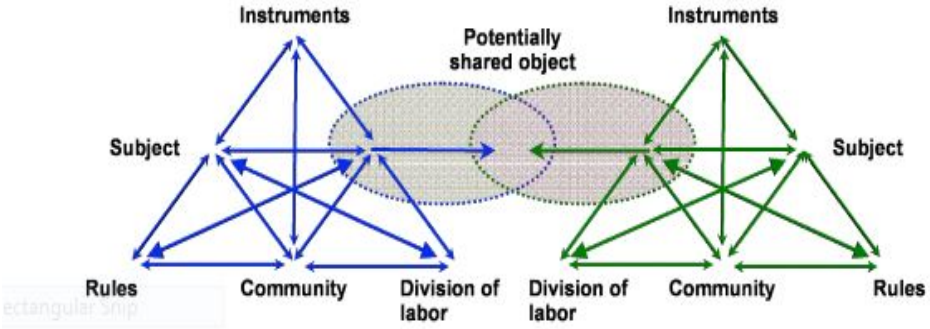


From "The evolution of activity" by Y. Engeström, 1987, *Learning by expanding the evolution of activity-theoretical approach to developmental research*, p. 78.

Roth (2004) highlights four types of contradictions within the activity system elaborated by Engeström (1978), stating that "primary contradictions exist within each constituent component of an activity system; secondary contradictions are found between the constituents; tertiary contradictions juxtapose the object of the dominant form of activity with the object of a culturally more advanced activity; and quaternary contradictions exist between each entity of the dominant activity and the entity-producing neighbouring activity" (Roth, 2004, p. 5-6). That is, the internal contradiction within the system globalises the dialectical coexistence of the general and particular.

The evolution of this triangular model is re-elaborated by Engeström (1987, 2008), who included, at least, two systems of activity. The author emphasizes that the study of artifacts in the activity are integrated and inseparable from the other elements of the system. According to this view, the object shared gains new status throughout the development of the activity. For Engeström (2008) the instrument (object-oriented) should not be confused with artifact, since this refers to what exists in the material world. The artifact becomes an instrument only through activity (meaning-instrument). Besides that, the Theory of Activity is an object-oriented theory based on Marxist precepts of labour's production (Engeström, 2008). The comparison between systems of activity can be interesting when we need to compare different systems in a more comprehensive way, for example, the public policies for insertion of ICT indicated by the Ministry of Education (MEC), in contrast to the teachers' viewpoints or students' perspectives.

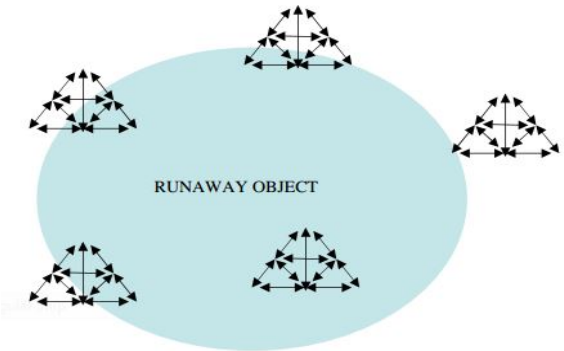
Figure 2. Two or more activity systems



From "The future of activity theory: a rough draft" by Y. Engeström (2008, September), Paper presented at the ISCAR Conference in San Diego, California, p. 4.

Engeström (2008) also emphasizes that objects in movement are runaway objects, because they are contested objects, which generate oppositions and controversies. According to this view, they can be emancipatory objects when they are radically opened to new possibilities to development new systems. The internal contradiction, positions inherent in community activity, rules, division of labor etc., create a field of signification. The author argues that one system can encompass infinite systems that share (or partially share) the same object, as shown in the following figure, which could be in turn composed by similar or completely different systems. Divergence, convergence, and commonalities emerge in each system and within systems, in a simultaneous movement into micro, meso and macro dimensions (inner conflict and internal contradiction). According to this view, researchers understand how individuals deliberate and transform the objects of their attention, such as content, practice, product, subject, in a new way.

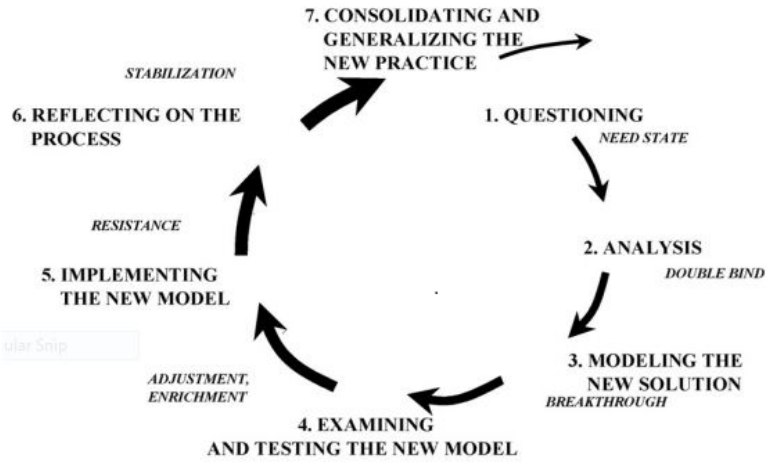
Figure 3. Runaway-objects in a broad-system of activity



From "The future of activity theory: a rough draft" by Y. Engeström (2008, September), Paper presented at the ISCAR Conference in San Diego, California, p. 5.

Engeström (1987) recognizes that it must be understood as a distributed system within the community, and should also contribute to understanding the concept of expansive learning. In this sense, it could be a way of distributing the responsibility among the group, considering the different experiences and expertise that are shared and negotiated. Based on this logic, the transformation of learning occurs through expansive cycles involving internal contradictions (nodes) by diverse viewpoints, and provoking changes. As a result, in the successive phases, primary events are abandoned and a new product "something that was not present is created" (Engeström & Sannino, 2010, p. 2), that is, expansive cycle goes in a spiral movement organized in phases (Figure 4). As we can see, in each cycle are generated internal contradictions, which promote new transformations of the shared object. The consolidation phase is generated a new learning, practice or product.

Figure 4. Expansive cycles of learning



From "Studies of expansive learning: foundations, findings and future challenges" by Y. Engeström and A. Sannino, 2010, *Educational Research Review*, 5, p. 8.

A dialogic approach allows a complementary perspective in the sense that the learning or practice generated in co-regulation is understood as an inter-related process between self-other-object (Ego-Alter-Object, see Markovà, 2013, 2016), or a perceptual, communicative and cognitive exploration of the environment material and semiotic environment. Based on the concept of enunciation (Bakhtin, 1992/2003, 1929/2010a, 1929/2010b), the dialogic perspective maintains that latest events can change prior ideas of the community, the experience is not taken for granted because the chronotope has circumscribed each moment. Thus, when interlocutors achieved the goal, they will have a whole sense of the activity. Grounded Theory is an example of an appropriate method to

study taking into consideration those perspectives; it is a nonlinear method the content is constructed within the chronotope. Apart from some divergences between the perspectives, we can achieve wide comprehension when we join interaction, communication, and the action mediated by tools – where people can transform the shared object in a new form and create a sense of the situationality.

Using the commonalities of the concepts, we applied them on the description of mediated actions by objects and on the configuration of the symbolic space by the dyads. For example, when they shared objects, divided space, defined spatial location, applied instruments (commands, tracks, codes), anchored in didactic material etc. For instance, the present studies and concepts supported us in delimiting the concept of intersubjectivity, and at the same time, articulating the dialectical view defended by Vygotsky and dialogism by Bakhtin. Consider that both theorized from concepts in psychology and culture, in which cognition, thought, language and the social other are central to the understanding of the human phenomena (Wertsch, 1993, 1998). In short, we consider the elements related to the discourse and action mediated by tools are instruments for a better contextualization of our study. In addition, the use of mixed methods allows the collection of different data that are added throughout this research.

1.2 The concept of intersubjectivity: a review

In this section, we intend to conceptualize the dynamics of intersubjectivity, and, by assembling aspects of situated discourse and interaction through mediated activity, to understand such dimensions shaping intersubjective phenomena. This literature review focused on the concept of intersubjectivity in contexts of formal and non-formal learning, including studies in cultural, historical-cultural, sociocultural and dialogic perspectives.

We carried out an in-depth literature consultation of intersubjective phenomena in areas relevant to cultural and developmental psychology. Subsequently, we sought empirical studies of school contexts, centering on problem-solving tasks in student-student or teacher-student collaboration. We prioritized the elements related to interaction and negotiation in the intersubjective process. Most of these publications are peer-reviewed articles available in databases such as ERIC, Capes Periódicos, Google Scholar, or on platforms such as the International Journal of Computer-Supported Collaborative Learning (ijCSCL) and ResearchGate. Thus, we present first a general view of intersubjective phenomena, followed

by an examination of twenty-five studies dealing with the concept in collaborative problem-solving in primary and secondary education settings.

Our first inquiry indicated that, when the concept was studied from varying points of view, intersubjective phenomena is related to development and learning. Naturalistic or experimental studies, for example, focused on examples of interaction between mothers and babies to examine intersubjectivity in the early stages of language. Through imitation and auditory-visual perception, actions were shared by patterns, mannerisms and gestures. The regularities showed a specific communication that involves memory of events, intermodal coordination and pre-verbal cognition, and this has a profound implication for language capacity and emotion (Meltzoff & Brooks, 2007). Trevarthen (2004) observes that intersubjectivity in childhood encompasses primary regulation, composed of turn-taking in vocalization, expressive movements, rhythmic patterns, proto-conversations and gestures that correspond to emotional codes between infants and their caregivers, which in turn are forms of learning. According to the author, infants negotiate interest and pleasure in social activities, and the rhythm of sounds regulates the turns of vocalization. In addition, movements with the eyes, head or face are forms of shared signs. Secondary intersubjectivity includes a higher level of awareness, cooperation and intentionality between person-person and objects, as an involvement of a dialectical game. Consequently, the temporal and prosodic aspects of the interaction in early vocalization are fundamental for socio-emotional development as well as for the development of communicative language (Trevarthen & Aitken, 2001).

Rodriguez (2009), for example, mentions that recognition of the social other is essential for the formation of self-awareness and perception of the world. Accordingly, the first systematized repetitions provoke circular reactions, and as a consequence, habits are the result of intersubjective encounters. Like agreements between babies and people who surround them, in a movement that goes from the gesture to the symbolic plane. In this sense, it is posited that the multimodality of language has great semiotic potential in contemporary approaches to communication, since all signs are potentially capable of signifying (Kress, 2010). Consequently, intersubjective communicative processes require negotiation and conventionalization of signs and meanings among interlocutors in a specific context. Communicative acts are multimodal, currently assuming greater importance because technological innovations have brought new textualities and forms of interaction with digital interfaces. When a digital technology is created the multimodality of language is extended. In

the contemporary world technologies are understood as extensions of human capacity, as instruments that modify our actions, our exchanges with the environment, and the way that we communicate with others. The multimodality of human language in different contexts mediated by digital devices is a subject that can be better explored in future research. However, in this work, we will refer to it in a general way. Our focus is on the conceptualization of the intersubjective phenomenon in contexts mediated by hybrid technologies and relation to learning in educational settings.

Intersubjectivity can also be understood as a process of co-participation and coordination, intrinsically integrated with daily social activities with others. Rogoff (2003), for example, argues that people are immersed in their cultural context where they share knowledge and transform their culture by the continuous and guided participation of immediate cultural practices, and this modulates the psychological processes between adults and children. Thus, collective practices take place in a variety of chronotopes, in a historical, social and cultural context, which implies production of specific types of reasoning and variety of discursive genres (Bakthin, 2010b; Morson & Emerson, 2008).

Vygotsky (1978) and Cole (1985), for example, show that the Zone of Proximal Development (ZPD) is the point of intersection in which the intersubjective process emerges, from the encounter between culture and cognition, as a dialectical tension that triggers the construction of new meanings, concepts and knowledge. In this sense, the intersubjective dimension takes place at different levels of interlocution and reciprocity and can be linked to the success of learning outcomes (Bruner, 1986). Intersubjectivity is also related to the intrinsic motivation and improvement of the efficacy of the learning community (Ligorio, Talamo & Pontecorvo, 2005; Ligorio, Cesareni & Schwartz, 2008) or activation of personal resources and knowledge of previous experiences (Pontecorvo & Orsolini, 1992; Wells, 1993; Wells & Arauz, 2005, 2006). The latter shows that intersubjectivity goes beyond the negotiation of meanings, as coordination and joint attention engagement (Barron, 2000), as well as discursive strategies and other processes that can permeate the quality of relationships as shared values (Rosa & González, 2012), identification, and identity in learning (Ligorio, 2010). It depends on how the activity is configured in the chronotope and alternation between interlocutors on turns and position to construct meanings on intersubjective exchanges (Beraldo, Barbato & Ligorio, 2017). Also, Barron (2000) emphasized that "coordination is fundamental for the establishment of what has been called mutual knowledge or common ground" (p. 404), in the sense of interpersonal peer relationship and mutuality in interaction.

Hutchins (2000, 2010), for example, opted to study with navigational practitioners, such as professionals in cockpits or airplane pilots, to show that situationality in the material world – tools and environment – is transformed into cognitive artifacts to amplify human abilities. He found that artifacts and the environment impact intersubjective processes and communication, since the information is distributed within the group as a flow system coordinated by shared practices and techniques.

Studies based on problem-solving tasks in an educational context have also shown that distributed cognition activates internal processes, such as memory, attention, inference, decision, reasoning and representation between the interlocutors (Ford, 2012; Nathan, Eilam & Kim, 2006; Papadopoulos & Iatridou, 2010, Stahl, 2006). Scardamalia and Bereiter (1991, 2006), have developed the concept of a knowledge community from the notion of distributed cognition and educational practices, which is oriented towards collaborative learning in Computer-Supported Intentional Learning Environments – CSILE). The model includes intentional learning with a focus on knowledge construction in a decentralized and open way, that is, all students collaborate using different sources of information in depth to solve the problem and advance in knowledge. This proposal seeks to replace the formality of structured activities and controlled patterns of discourse in the class, as a dynamic model of communication systems. Any product created in the here-and-now by the participants can be retrieved and archived as extensions of work developed at different times by the group (Ligorio & Ritella, 2013). Technology, in this case, is understood as a means of instituting intersubjective processes and also a vehicle to make increasingly complex the intersubjective dimension (Ligorio et al., 2005; Ligorio et al., 2008). In both cases, new functionalities and aspects put into the scenario – such as the space-time dimension – acquire relevance, which is not yet considered in the studies that we found in the database (Beraldo, Ligorio & Barbato, 2017).

Regarding learning-related issues, Engeström (1987) argues that expansive learning can be understood as a distributed system where individuals intentionally deliberate and transform the objects of their attention – content, practice, product, subject – into a new form. Engeström (1987) postulates that in intersubjective space, people create a common sense about the same object, which happens through changes and internal contradictions to the activity; in other words, by negotiation and meaning construction of a wide possibilities to signify the object. These movements create collective zones of proximal development, which

generate expansive cycles of learning in the activity-system, and as a consequence, the innovations are created.

On the other hand, it has been proved that the intersubjective space generates micro-temporalities in itself. As a result, breaks and misunderstandings in communication occur, as well as dissonances, indicating that intersubjectivity in communication is a temporary phenomenon, by constant negotiation of meanings and generation of new meanings, as a flux, not as a fixed means. It points to the individuality of the mind in interaction (Linell, 2009). In other words, discourse from the discourse of the other (Rommetveit, 1992), without negotiation of meanings (Matusov, Smith, Candela & Lilu, 2007), can provoke disinterest in participation and make sense with the others (Pontecorvo, Ajello & Zucchermaglio, 2005). The normative discourse of the teacher, for example, can be internalized by the students as an abstract speech, which can impede the transition of one thought to another in the learning process (Mortimer & Wertsch, 2003). As Bartlett (1995) writes, intersubjectivity opens possibilities in the construction of meanings, such as the conventionalization of signs and practices. This reflects the positions of active and evaluative communication of the interlocutors, and also the aspects of personal history or the history of the group. This creates a sense of the other depending on circumstances in and around them, awareness involves reflecting on oneself from the other, and this depends on an experience of alterity (Linell, 2003, 2007). A similar perspective is presented by Molinari (2010), which argues that alterity does not mean adversity, the difference is that the diversities activate dialectical dynamics and creating an important learning opportunity.

Similarly, sociocognitive dimensions as a communicative process interconnected with language and thought contribute to our understanding of intersubjectivity and the role that it plays in human relationships. This idea associated with Mercer's proposition (2000, 2004, 2008) suggests that people use language to interthink, and this is important to recognize types of conversation related to aspects of intersubjectivity, specifically when we consider the quality of information, critical and authorial thinking, identification of dissonances, positioning between the interlocutors, and alternation in discursive activities (Beraldo & Ligorio, 2016; Beraldo, 2017, Matusov, 2001, 2004, 2015; Wegerif & Mercer, 1997; Wegerif, 2001, 2007, 2011).

Barnes and Todd (1997) consider intersubjectivity as a tool for collective argumentation, while Brown, Hirst and Renshaw (2005) focuses on conversation as collective thinking. Several studies focus on intersubjectivity in teaching and daily life practices as a

kind of bridge for students to apply scientific knowledge in their own social contexts. The study by Kumpulainen, Karttunen, Juurola and Mikkola (2014), for example, consist of a visit to the museum to encourage and involve student groups in the use of multimodal devices and in creative engagement with an emphasis on the construction of inter-displinarity with focus on imagination and play. In addition, this promotes a personal and collective involvement do that groups can enjoy shared and collaborative knowledge and re-create experience through different materials and conceptual resources. Morgan, Hardgreaves and Joiner (2000) relates intersubjective processes to creative and collaborative song-writing. The written production of a collaborative work was proposed to a group of students; first they were asked to choose an instrument for musical composition. After that, they were required to join parts to produce their composition. These studies show that touching, observing, listening, manipulating objects, and managing co-productions influence intersubjective processes through metacognitive skills and critical observations that interlocutors make of themselves, of each other, and of the learning situation. In particular, when teacher and students are completely immersed in a learning task, the intersubjective space is expanded, enabling productive, innovative and personal development. In this way, collaborative learning is a privileged situation to examine in depth intersubjectivity as an experience between interlocutors, composed by harmonics and dissonances in communication, as beings responsive to the joint resolution of a problem or situation (Beraldo, Ligorio & Barbato, 2017).

We also highlight the studies based on the progressive investigation in computer-mediated activities (CSILE), in which various resources are used during the collaborative work (Hakkarainen, 2002; Hakkarainen & Sintonen, 2002). The survey Interrogative Model of Inquiry (I-Model) is used in CSILE is based on the close relationship between learning and discovery processes. The starting point is a general question that students must answer from their own knowledge, and this opens up what is unpredictable and the possibility of extending the space for intersubjective exchanges. The fact is that the collaborative practices supported by CSILE have a new function in communication and interaction. The students are, at the same time, creating and storing their co-productions. The tools in the environment became objects-to-think-with, which creates new ways of interacting with machines (Evans, Feenstra, Ryon & McNeill, 2011).

Based on this background, we seek a specific understanding of how intersubjectivity is built in primary and secondary education. Furthermore, since intersubjectivity has been

studied in many fields and with many types of tasks, to avoid dispersion we will delimit our focus to one specific type of task: collaborative problem-solving.

1.3 Literature research on Database: problem-solving tasks in collaboration

The initial indications were that intersubjectivity is related to doing together, to the use of language in the co-production of meanings, and self-regulation and autoregulation of the activity among people in a social and cultural situation mediated by material resources.

As such, our literature review focused on twofold objectives: (a) identifying how researches characterize intersubjectivity and (b) understanding the role of technology in the process of building intersubjectivity. To achieve these aims, we follow these steps:

(1) To search for empirical studies focusing on collaborative activities in primary and secondary school.

(2) To select studies that consider the construction of intersubjectivity between students-students or teacher-students.

(3) To compare studies where no digital technology was considered and inquiry into which kind of digital technology was included.

Furthermore, we describe all phases of selection of the articles and comment on the results of the selected studies.

In our search, we considered some of the most relevant databases for psychology, education and social sciences, such as the Educational Resources Information Centre (ERIC), Capes Periódicos (Brazilian database), and Google Scholar, and of course, we included relevant peer-reviewed journals in the field. We noticed that when using solely the keyword "intersubjectivity" a wide range of topics was found showing that intersubjectivity is studied in many fields, such as medical or legal issues, scientific politics, engineering games, design interfaces, publicity, communication etc. With this first search, 2.943 articles were found. This high number of publications reflects the wide and multi-disciplinary interest stimulated by the theme of intersubjectivity. Secondly, we limited our research to the areas of education, psychology, cognitive science, and collaborative learning, which are relevant to our goals. In addition to the main keyword, five criteria were used to select relevant literature: meaning making, meaning construction, problem solving, argumentation, and reasoning. Thirdly, the criterion was to limit our goal in empirical studies carried out in educational contexts. Subsequently, languages were considered. We search for articles written in Portuguese and English, however, none of the 173 articles in Portuguese fit in our descriptors. Finally, we

decided to focus on studies in elementary and secondary education that perceived intersubjectivity as a dynamic process, considering the imminence of human interaction and reciprocal action or attitudes when people exchange information. We have found that such studies have adopted more qualitative methods rather than quantitative.

In the following table, we illustrate the resource, types of search engineer tools and how filters were applied (see Table 1).

Table 1. Resources and filter used

Resource	Search engineer tools	Results	*f* 25
Educational Resources Information Centre (ERIC)	• Publication date (last 10 years) • Descriptors • Source (Journal) • Author • Publication type • Educational level • Audience	With the keyword intersubjectivity, the database indicated 107 articles. Applying additional keywords and criteria for inclusion, we found 32 articles, and we selected six	n=6
Brazilian Database Capes Periódicos This platform uses indexing Journals, as American Psychological Association (APA), Cambridge Journals Online, *Emerald*, *Citus Latinoamericanas en Ciencias Sociales y Humanidades*, *Academic Search Premier*, *Annual Reviews*, *Cell Press Journal*, *Computers & Applied Science, World Scientific Publishing* etc.	• Topics • Author • Collection • Since year (timescale) • Resource (only article) • Language • Periodic Report • Suggestion for research • Expand information	With the keyword intersubjectivity, the database indicated 1.501 articles. Applying additional keywords and criteria for inclusion, we found 31 articles, and we selected six For 'intersubjectivity' and/or 'sense making', we found seven articles published from 2005 to 2013, but none of them fit in our options With 'intersubjectivity' and/or 'meaning construction', we found two articles published from 2005 to 2012, and we selected one. With 'intersubjectivity' and/or 'problem solving', we found six articles published from 2005 to 2014, and we selected three With 'intersubjectivity' and/or 'argumentation', we found five articles published from 2005 to 2014, but none of them fit in our options	n= 6

		With ‘intersubjectivity’ and/or ‘reasoning’, we found eleven articles published from 2005 to 2013, and we selected one	
Google Scholar	• Search only at web • Search English pages • Collection of articles (include patents) • Related articles • Since year (timescale 2005 to 2015) • Option ‘don’t show any citation import links’ • Option ‘in the title of the article’	This search tool offers few possibilities to applied filters, consequently, a great number of articles were indicated. For example, the term ‘intersubjectivity’ in the content of the text totalized 24.600 articles, and in the title, 1.320 articles. Therefore, we delimitated our search adding, for example, keyword + addition keywords. In this case, we used more categories based in the areas of our interest as education, psychology, cognition, collaborative learning for expand our possibilities. We found 79 articles (from 2005 to 2015), and selected eight.	n= 8
International Journal of Computer-Supported Collaborative Learning (ijCSCL)	• Collection from 2006 to 2015, without search tool.	We create a folder on desktop and download all articles from 2006 to 2015; we applied our criteria terms using desktop’ search tool. We found 15 articles and selected four.	n=4
ResearchGate	• Collection from 2008 (founded in) to 2015.	It is a platform for academic purposes that researchers share scientific papers in collaboration with university students, faculty members, and research institutes. We download one article.	n= 1

1.3.1 The selected papers

The search illustrated in the previous paragraph generated 157 articles. We looked closely with the aim of selecting studies that detailed the construction and maintenance of the process of intersubjectivity-building in reference to the task, focusing on primary and secondary education. Finally, we selected 25 articles, which were analysed qualitatively by the three researchers involved in this research.

Also, we are interested in contrasting studies where the scholars use only face-to-face versus digital technology. Thus, two clusters were composed: one comprising studies

where conventional technology was used (see Table 2); the second studies where digital technology played a relevant role and we named this cluster ‘digital resource’ (see Table 3).

We summarized the articles into two tables, reporting the following information: (a) Author/s and year of publication, (b) The main purpose of the article, (c) The topic concerning the task and, when it could be retrieved in the paper, the subjects involved, (d) The country where the research is placed, (e) The grade level, (f) The number of students and teachers involved, (g) The research designed, (h) The tools used, (i) The main results in relation to the concept of intersubjectivity (see Tables 2 and 3).

Also, five dimensions were analysed: (1) the role of the teacher, (2) the cultural and / or intercultural dimension, (3) the cognitive aspects, (4) the social dimension, and (5) space-time.

Table 2. Studies based on face-to-face interaction (n = 10)

Author Year	Purpose	Topic	Country	Grade level	Number	Research design	Tools used	Major findings
Haan and Elbers (2005)	Examine the construction of mathematical meaning of the words by students during collaborative activities in a multi-ethnic classroom of mathematics lessons	Construction of meaning by peers minority and non-minority in a collaborative learning practice Subject: Mathematics	The Netherlands	Seven-grade on Primary school	22 pupils and 1 teacher (five groups)	Case-study Videotape and audio recording Observation	Textbook of four Mathematics lessons Words and expressions in Dutch language	Students can create a variety of symbolic meanings, gestures, and material tools (sketches) for establish a place for intersubjectivity (common understanding of words and expressions)
Brown, Hirst, and Renshaw (2005)	Examine interactions between students in solving a novel problem about bullying using Collective Argumentation (CA), away from the direct supervision of classroom teacher	Collaborative pedagogical activity and collective argumentation Subject: Social Sciences	Australia	Primary School	4 pupils	Case-study Audio and video recording Observation	Problem solving-task around of the concept of bulling. Technique of Collaborative Argumentation (CA)	Share responsibility to learn opens a particular space for intersubjectivity where students can manipulate ideas, information, opinions, and regulate mental functions by themselves as a mediated agency

Enyedy (2005)	Examine how ethnic students reinvent topographical lines using Technique of "Bird'-eyes perspective" (BEV) to represent height in a map within the affordances and constraints of the context. Overhead the perspective of the role of social interaction in the process of knowledge production	Solve collective problems, reasoning, and share goals Subject: Sciences and in particular the desert environment	USA	Second and third grade on Primary School	22 pupils and 1 teacher	Case-study Video recording Observation	Wooden blocks Maps Technique BEV (Bird'-eyes perspective)	Intersubjectivity is a semiotic ecology space that participants use talk, gestures, intonations, overlapping, discursive position, and representation materials to share spatial information and establish cultural conventions
Wertsch and Kazak (2005)	Examine teacher-student interaction exploring semiotic means for creating intersubjectivity, with an emphasis on how it is possible for students to participate in classroom discourse without understanding the full meaning of what they are saying and doing	Intersubjectivity, interaction and semiotic mediation. Subject: Sciences	USA	-	2 groups and 1 teacher	Case-study Video recording	Graph papers to plot statistical data from a biology project	Intersubjectivity involves a form of distributed cognition and agency to use semiotic means that emerged in a sociocultural situated setting

Edwards (2005)	Examine occurrence of exploratory talk amongst peers in collaborative small groups in mathematics reasoning, based on sociocultural activities of learning and emancipatory pedagogical practices	Collaborative groups, reasoning, working together, and intersubjectivity. Subject: Mathematics	UK	Secondary School	Five classes of inner-city school for girls	Case-study Audio and video recorder Observation	Problem solving of mathematics based on logarithmic scale (seven lessons for each class) Technique of Exploratory Talk	Intersubjectivity is an interthink act and requires talk aloud, shared images, create hypothesis, explain and justify. These experiences generate a higher level of reasoning and awareness
Reigosa and Aleixandre (2006)	Examine the process of meaning construction of knowledge in activities of scaffolder problem-solving task in the Physics and Chemistry laboratory. Focus on the transference of responsibility to the teacher for the students in laboratory setting	Problem solving, situated cognition, and meaning making Subject: Physics and Chemistry	Spain	Secondary School	18 students (five groups), and one teacher	Case-study with the same participants for two consecutive years Audio and video recording Observation	Equipment in the Physics and Chemistry laboratory Problem solving task (based on HC1 solution at the school laboratory setting) Handouts	Stereotypes school cultures about the use of the laboratory, and stereotypes of performance deriving from the images related to the procedural exposition of the problem in solving. There are various levels of intersubjectivity, its will be influenced by the way that teacher and students manage resources, practices, and genuine answers and responses
Nathan, Eilam,	Examine interactions by conversation	Intersubjectivity, problem-	EUA and Israel	Six grade on	20 pupils,	Case-study	One Maths Task Pie	Agreement, disagreement and

and Kim (2006)	analysis in a collaborative problem-solving to understand how the discourse of issues of intersubjectivity structures (IS), and how IS perpetuates discourses in a mathematics classroom	solving, and intellectual interactions Subject: Mathematics		Secondary School	and 1 teacher	Video recording (transcription using Transana) Observation	Problem.	misunderstanding are sustained and this creates new engagement on the phenomenon of intersubjectivity. It is a path for minimal effort operating in dyads
Belland, Glazewski, and Ertmer (2009)	Examine how small groups of students interact with and reinforced each other as they engaged in a Problem-Based Leaning (PBL) unit in a K-12 setting (International Society of Technology in Education)	Small groups supported engaged in solving problem based in science class. Subject: Sciences (Genes, Dreams, and Reality: The Human Genome Project)	USA	Seventh grade science on Primary School	Twenty classes and two teachers	Ethnomethodology approach Videotaped Case-study	Technique of Problem-Based Leaning (PBL) unit	Intersubjectivity in mainstreamed groups have potential to increase the motivation and social confidence of students with especial needs, as types of scaffolds leading to a deep learning of content with PBL

Papadopoulos and Iatridou (2010)	Examine the way of a cope solving a non-standard generalization problem by elementary concepts of Diophantine equations on the geometrical context of rectangle's area	Problem solving based on student's past experience Subject: Mathematics	Greece	Tenth grade Secondary School	2 pupils	Case-study Observation	Problem-solving task using Diophantine linear question	Spaces of intersubjectivity generate a rich context where students applied generalization, and the same time elementary concepts, by planning, implementing, looking back and forward, as a refinement of cognitive and metacognitive component
Ford (2012)	Identifies aspects of argumentation in scientific practice as a key for scientific sense making and articulates how engagement in these aspects happens both inter-mentally (between people) and intra-mentally (an individual's reasoning)	Sense making, argumentation, reasoning, and interplay between construction and critique Subject: Science	USA	Secondary School	38 students, one teacher and the author (denoted as 'Instructor 1' and 'Instructor 2')	Case-study Questionnaire Interview Video recording Observation	Ramp motion in an experiment in science (10 hours of instruction) Wooden boards Golf balls Unit height boxes Stopwatches Whiteboards and markers Tasks experiments	Reasoning is a dual process, is shaped by 'sense-making socially' where individuals play two roles – constructors and critics of knowledge –, and 'sense-make individually' by a critic's voice. Intersubjectivity involves an interplay between construct and critique

Table 3. Studies with the use of digital resources (*n* = 15)

Author Year	Purpose	Topic	Country	Grade level	Number	Research design	Tools used	Major findings
Ligorio, Talamo, and Pontecorvo (2005)	*Examine intersubjectivity in writing fairy-tale inspired by philosophically issues using virtual environment where Italian and Greek students made a plan, discuss, and negotiated the creation of two stories that include moral dimension*	Intersubjectivity, cooperative, and collaborative learning Subject: Philosophy for Children (P4C) Italian children studied the fairy-tale *The ugly duckling* by Andersen. Greek students studied *The squirrels save the forest*.	Italy and Greece	Two 5th grades on Primary school in Italy and Greece	31 students, and one instructor	Case-study Video recording Observation	Web-based Collaborative Learning Environment called Synergeia. Collaborative draft from Italians the fairy-tale: *The ugly duckling* by Andersen. Collaborative draft from Greek: *The squirrels save the forest*.	Intersubjectivity is a space for dialogue, partner's representation, reasoning accomplished by tasks in a collaborative way, tuning of reflective and metacognitive skills, and interdependency to create a sense

Stahl (2006)	Identifies a pattern of exchange of postings in chat environment that it terms math proposal adjacent pair, and describes its characteristics	Group cognition and intersubjective meaning making Subject: Mathematics	USA	Second ary School	Three pupils	Problem solving in algebra and geometry Video recording Chat room history	Virtual Math Teams (VMT) research project.	Adjacency pairs are common sequences of utterances by mutual greetings or questions, answers interchanges, which form a meaningful speech act spanning multiple utterances that cannot, attributed to an individual. These elements form a sense of meaning making inside the intersubjective foundation of group cognition.

Trausan-Matu, Stahl, and Sarmiento (2008)	Examine how learners inter animate in collaborative chats in context of problem solving based on polyphony phenomena, and where different voices jointly or established dissonances in discursive practices	Collaborative learning, inter-animation and polyphony. Subject: Mathematics	Romaine and USA	Two classes on Secondary School	1° case K-12 students using message environment. 2° case Computer-supported learning using Concert Chart environment	Case-study Videotaped Observation	Virtual Math Teams (VMT) using chat Math Problem-solving ConcertChat Whiteboard	Intersubjectivity promote jointly either, harmonies or dissonances to structure dialogues and polyphony phenomena. This generate centripetal and centrifugal forces that create dispute or negotiation by different discursive positions to solve a problem task
Ligorio, Cesareni, and Schwartz (2008)	Examine the construction of Euroland world (virtual land) by students during collaborative activities in a multicultural project to analyse the process and the architecture of intersubjectivity	Intersubjectivity and distributed cognition. Subject: Multidisciplinary (English as Second Language, Geography, History, Music, Art and	Italy and The Netherlands	Secondary School	40 pupils and 7 teachers	Case-study Video recording Observation	Euroland Project to create a 3D World Problem solving: Construct the virtual Dutch house of art.	The architecture of intersubjectivity is established through the situated joint activity between students and teacher mediated by

		Literature)						tools (information, goals, rules, ideas, objects' affordance, gestures etc.) and individual and collective awareness about the whole process and development of the activity.
Rojas-Drummond, Albarrán, and Littleton (2008)	Explore how primary school children learn to collaborate and collaborate to learn on creative writing projects by using diverse cultural artefacts, including orality, literacy, and ICT	Collaboration, co-construction, and knowledge construction Subject: Literature and Language	Mexico and UK	Primary School	Fifty-six 4th grade students from two classrooms in Mexico	Micro-analytical level and macro-analytical level. Videotaped Case-study Observation	Programme Learning Together, were children's planning, writing, and revising their stories, as well as those used for transforming their texts into multimedia narratives	Intersubjectivity in oral and written texts emerges in a contextualized discourse within situated interactions where members can participate actively using the supports that they have to produce jointly, originally, coherently,

								and creatively in their perspective
Radinsky, Goldman, and Singer (2008)	Analyse of spoken and gestural interactions in the argumentation practices between students conducting an earth science inquiry project using Internet-data resources and visualisations tools	Sense making, argumentation and authoritative positioning Subject: Geography	USA	6th and 7th grade on Secondary School	Small groups	Case-study Video recording Observation	Earth Structures & Process unit GIS Paper maps Visual data	Spoken argumentation provides a specific context of intersubjectivity where students can establish negotiation, evaluation, examination of viewpoints, reasoning and coordination of evidences by explanations. Representational gestural in communication can provides a particular explanation in argumentation with incomplete conceptual vocabulary or

								authoritative positioning
Çakir, Zemel, and Stahl (2009)	Analyses foregrounds the sequentially of action and the implicit referent of meaning making. Observes the progressive construction of shared drawings and deictic references in the achievement of intersubjectivity among group members' understanding	Joint organization of interaction, problem solving activity, and meaning making Subject: Mathematics	USA	Second ary School	Teams of three pupil, and one facilitat ors' task	Ethnometh odologycal approach Video recording Case-study	Math problem-solving activities mediated by a synchronous multimodal online environment. VMT (chat window, whiteboard, tool-tip messages, wiki)	Joint problem space has a third dimension – time or sequence –, this constitute a shared temporality – intersubjectivit y –, which provides a framework of sequential orderings, within which temporal deictic references can be solve
Fields and Kafai (2009)	Describe and analyse how insider gaming practice spread across a group of tween player's students on local classroom communities and engaged in collaboration in a project based learning.	Intergroup collaboration, knowledge sharing, and diffusion across gaming space (practice of teleporting)	USA	Fourth to sixth grades on Primary School	21 pupils	Connectiv e ethnograph y Video recording Tracking data	Unit Science Class (viruses and epidemics). Virtual world Whyvittle.net	Diffusion and sharing in less structured places (online platform across multiple spaces) are made by marker that

		Subject: not retrieved	Interviews	traced players' trajectories, they use a number of resources, practices, strategies and commands (i.e. siblings, instant messaging, and phone calls). Intersubjectivity in a wide virtual space is shared and distributed through codes, marks, signs, tags, tracks, anchors.

Davidsen and Georgsen (2010)	Examine actions and interactions in two classrooms and how teacher engage themselves in the process of talking interactive touch-screens. The study focused at three interrelated themes: learning process, intersubjectivity and learning partner-ships	Collaboration and self-directed learning Subject: not retrieved	Denmark	Second grade on Primary School	2 classes, and 1 teacher	Ethnography study Ethnomethodology Interviews and informal conversation	Project Move and Learn at Western State School (WSS) using interactive whiteboard	Collaborative and communicative skills require careful pre-teaching planning and classroom-observations by the teachers in charge. The role and actions of the teacher are decisive factors in the successful employment of the level of intersubjectivity between student-student

Evans, Feenstra, Ryon, and McNeill (2011)	Aim to identify children's communicative strategies when faced with the task of solving a geometric puzzle in CSCL contexts, and investigate a trace in distributed cognition in problem-solving interactions based on discursive cohesion to objects, participants, discursive content, and geometric concepts	Collaborative learning, distributed cognition and reasoning Subject: Geometry	USA	Four grade Primary School	2 groups of pupils	Micro ethnographic case study	Tagram puzzles manipulatives in physical and virtual desktop settings	A collaborative nature of problem-solving shares points co-references, periods of focus, and the formation of coalitions in CSCL contexts. The term 'objects-to-think-with' is understood as specify triadic mediation settings of intersubjectivity
Sullivan (2011)	Examines the development of a creative solution arrived at by students working collaboratively to solve a robotics problem in in a K-12 setting (International Society of Technology in Education)	Collaborative problem solving and creativity Subject: Robotics	USA	Sixth-grade on Secondary School	A group of Latino pupils of science classroom and 1 teacher	Micro-genetic analysis Observation and notes	Problem solve of a light-sensor-enabled robotics focused on computer science, physics (light and heat	Intersubjective process allows learners to engage in the reasoning processes that lead to creative solutions, scaffolds,

							energy), and science literacy concepts	open-ended, goal-oriented task, modelling inquiry techniques that include play, seriousness, shared understanding, and bricolage
Pifarré and Staarman (2011)	Explores how wikis maybe used to support primary education students' collaborative interaction and how such interaction process of working together can be characterized	Collaboration, collective thinking and intersubjectivity Subject: Sciences Think Together Project	Spain and UK	Primary School	Two groups of six students work in pairs	Case-study Video recording Registers from wiki	Wiki science project Web-based inquiry about Mars (Webquest)	Intersubjectivity in a specific characteristic of wikis are joined by students create and share dialogic space in which they open to one-another's ideas and solve task together, providing reasons and justifications

Davidsen and Christiansen (2013)	Apply the Embodiment Interaction Analysis to examine constrains that single-touch screens offer to support task-oriented activities	Intersubjective meaning making using multi-touch technologies Subject: not retrieved	Denmark	Two grade on Primary School	42 pupils and 3 teachers	Case-study Video recording Classroom observation Registers from touch-screen	Multi-touch screen tables Design program Snapshot Pre-teaching planning Topics	Intersubjective meaning making is a combination of language, body, and materials in human-computer interaction
Kazak, Wegerif, and Fujita (2014)	Examine the relationship between students talk and the development of reasoning about uncertain outcomes	Reasoning, dialogic talk and intuitive strategies Technique of Dialogue Talk to open and expand the space of dialogue (Stats Talk Project) Subject: not retrieved	UK	Seven-grade Secondary School	Five students	Case-study Video recording Observation	Software TinkerPlots 2.0 Sequence of tasks	Emerge a social norm or ground rule when students making mistakes need to clarify misunderstanding, question or show ways of manage each game. Its open a sphere of intersubjective which required explanation, reasons, similar

								reasoning that suggest probabilistic understanding
Enyedy, Danish, and DeLiema (2015)	Examine how students predict with their bodies the effects of force and friction and then compare their prediction with the visual Newtonian simulation of a ball experiencing that same amount of force and friction using Augmented Reality (AR)	Collaborative argument and embodied experience were symbols become integrated in the modelling activity Subject: Physics	USA	Second grade on Primary School	One class with 43 students (one lesson)	Case-study Cognitive ethnography Video recording	Software that translate the motion into physics engine and generates a visual display. Physics concepts of Newtonian theory. Narrative space of playing game on the carpet.	Intersubjectivity in an open interaction mediated by open tools is a space where students have access to each other's actions and representations, as well the opportunities to observe their peers creating, modifying, using, and negotiating semiotics signs.

1.4 The role of the teacher

In both clusters (with and without technology), the role of teachers in the construction of intersubjectivity is analysed and different levels of relevance were recognized. When no digital technology was involved, the role of teachers was mainly noted by the support in the interaction between students.

Looking at the studies about face-to-face interactions, we found a wide variety of techniques used by the teacher to support collaborative work, such as the Bird'-eyes Perspective (BEV) (Enyedy, 2005), Problem-Based Learning (PBL) (Belland, Glazewski & Ertmer, 2009), Exploratory Talk (Edwards, 2005; Rojas-Drummond, Albarrán & Littleton, 2008), and Scientific Argumentation and Reasoning (Ford, 2012). In all the cases, the research seems to aim at uncovering the teachers' position and attitude or to trigger teacher change, subsequently the introduction of technology, in terms of teaching strategies. This affected the teacher-students' intersubjectivity in understanding the task.

Other studies focused on teacher's responsibility for learning. For instance, in a physics and chemistry laboratory, Reigosa and Aleixandre (2006) observed how stereotypes about the use of the Lab influence students' performance. The authors identified culture based on beliefs impaired that procedural exposition of the contents inhibited students from formulating genuine questions, since they cannot transit from one concept to another. In this specific study, the teacher was considered responsible for learning, and intersubjectivity seems to be influenced by the context, or by the general assumption about what is expected to do or not to do in the Lab. On the other hand, Brown, Hirst and Renshaw (2005) presents a study in which a group of four students used the technique called Collective Argumentation (CA). CA is applied to encourage students to construct their own theorizations, and create a corpus of more elaborate conceptualizations. The teacher explained the technique to the students and then they used it without his direct intervention. The authors note that sharing responsibility for learning can build trust, and the group become able to manage cultural tools in the collective process of intersubjectivity.

Ligorio et al. (2008) analysed a situation where the collaborative activities were performed on a web-platform. In this case, the mediation of technology strongly influenced the architecture of intersubjectivity, redefining strategies and participation rules for teachers and students. Davidsen and Georgsen (2010) have shown that teachers have played a significant role in maintaining the level of intersubjectivity when using interactive whiteboard. Enyedy (2005) shares the same perspective, that is, teacher coordination is

essential in the process of transforming individual creations into sociocultural conventions, such as in meta-representational competence related to the ability to abstraction and generalization of scientific representations. We also note that when a type of digital technology is introduced, the centrality of the teacher is highlighted. A twofold responsibility is accorded to the teachers: (a) in sustaining the intersubjective understanding of the tasks; (b) in enduring the process of appropriation of technology in the activity.

The studies that focused on issues related to students' daily life indicated the activation of previous experiences and knowledge, a method which works as a mechanism to development subsequent stages of intersubjectivity construction (Brown et al., 2005; Enyedy, 2005; Ligorio et al., 2005; Ligorio et al., 2008; Rojas-Drummond et al., 2008). We noted this type of research methodology has expanded the possibilities of transition from one knowledge-field to another, because students can share their own experiences, involving narratives, emotion, affectivity, explication etc.

1.5 The cultural and / or intercultural dimension

This dimension is considered in both studies (face-to-face and digital). For example, Hann and Elbers (2005), in their study focused on the different perceptions of mathematical concepts among students of ethnic minority groups. The results showed that multiple understandings generate a new intersubjective space of negotiation and conventionalization of meanings.

Interaction between students from different localities mediated by a virtual platform occurred in a few studies (Ligorio et al., 2005; Ligorio, et al., 2008). The authors observed that students – when working at a distance with the aim of popularizing a digital space – create a space that reflects the task and also the reciprocal production, the representation of who the interlocutors are and what is expected to be known or understood. Similarly, the division of responsibility, intentions and emotional aspects are related to reciprocal positioning, in which all these elements enter into the construction of intersubjectivity at a distance. Thus, collaborative strategies turn more complex as long as the students develop a semiotic system by meta-conceptual awareness of what they are creating. Although the cultural and intercultural dimension was only considered in a few studies, we were able to analyse how this dimension affects intersubjectivity. In both cases – face-to-face and digital – cultural diversity induces an expansion of intersubjective space. When students are at a distance, this space becomes richer, as long as reciprocal representation is included. In this

way, intersubjective space is established when others begin to contribute, so decisions taken together form links as a rhizome during the development of the activity.

1.6 The cognitive aspects

Cognitive aspects are examined in almost all papers, both face-to-face and digital; even though this dimension seems to be more richly considered in the former.

Studies based on face-to-face interaction look at intersubjectivity in relation to cognitive processes such as understanding (Haan & Elbers, 2005), reasoning and discursive capacity (Edwards, 2005; Ford, 2015), and the ability to represent, explain, compare, justify and validate ideas (Brown et al., 2005). Some authors have focused on the intersubjectivity incorporated within the domain of discourse, and as a result, the structure of intersubjectivity is more than a point of convergence of a common idea or solution between interlocutors. Argumentation and divergence become instruments for sustaining intersubjectivity, and this influences the capacity of representation (Enyedy, 2005; Nathan, Eilam & Kim, 2006). Other authors have considered intersubjectivity in relation to motivation and cooperative learning in increasing social trust of students with special needs (Belland et al., 2009). Papadopoulos and Iatridou (2010) look at different approaches and forms of reasoning in solving mathematical problems that helps students progress through the transition of representational thinking as generalization and abstraction.

Rojas-Drummond et al. (2006), for example, proposed creative activities mediated by digital technologies using oral and written texts to create original productions. The authors focused on the intersubjectivity characteristics expressed during face-to-face discourse and, in this case, the multimodality of language, such as gestures were also considered. The study by Radinsky, Goldman and Singer (2008) with the use of different types of representational and visual data by the Geographic Information Systems (GIS) indicate that gestures can be considered in the identification of new forms of communication and interaction. This also influence the establishment of conceptual vocabulary and competent positioning among interlocutors.

Another study, using chat, showed that discursive inter-animation patterns, along longitudinal and transverse dimensions, are similar to the polyphonic musical counterpoint of harmonics and dissonances (Trausan-Matu, Stahl & Sarmiento, 2008) as a polyphonic texture (Beraldo, 2017). Equally important is the concept Group Cognition, named by Stahl (2006) to describe how students manage information to solve mathematical problems through the use

of chat, considering the short time of the solution and the brevity of the messages. Chats are linear writing tools and do not allow the deletion of the messages, influencing how intersubjective space is built. In this case, people use symbols, emoticons, figures, abbreviations, hashtags, links, images, gifts, audios etc., to adapt their own codes. Among these important observations, this is an evolution of language, by new forms of signs that create new forms of communication through multiple layers of information. On the other hand, virtual environments as platforms for inquiry-based learning offer more time and possibility for planning, negotiation, elaboration, implementation, discussion and reorganization of information (Ligorio et al., 2005; Ligorio et al., 2008). Chats are present in platforms, but people can use other resources as forum, web-conference, recording audios, wiki etc. Another interesting point of the analysis shows how technologies modify cognitive aspects, something to be concerned about when we reflect that digital technologies are programmed to think with and are capable of sustaining high levels of reasoning (Evans, Feenstra, Ryon & McNeill, 2011), for example, the CSCL or CSILE models.

In summary, we posit that the various elements related to the cognitive aspects that enter into the intersubjective process – in both studies, face-to-face and digital –, indeed act: (a) as a support for the resolution of the task; (B) maintenance and development of interaction with others; (C) as capable of producing complex levels of reasoning, reflexivity, reciprocity, and performance in the situated problem-solving task.

1.7 The social dimension

This dimension is widely considered in both face-to-face and digital studies. Face-to-face studies refer to distributed cognition (Wertsch & Kazak, 2005) or group cognition (Stahl, 2006) as a theoretical framework able to understand intersubjectivity at a social level. The social dimension is strongly connected to collaborative learning, with or without technology. Interesting is also the connection highlighted by Ford (2012) between inter-mentally (between different individuals) and intra-mentally (at the individual level) reasoning. According to him, this interplay is feeding a special sense-making process, specific for scientific concepts. According to this author, the practice of simulating scientific discourse between authors and reviewers to support authorial production generates a close relationship between learning processes and self-regulation in the activity. Similarly, Enyedy (2005) demonstrated that social dimension is related to the meta-representational competence of the community as an ecological system of signs and meanings produced by them.

As to the digital studies, particularly relevant is the focus on students' engagement (Belland, Clazewski & Ertmer, 2009; Nathan, Eilam & Kim, 2006) considered as a venue for social and educational inclusion. In these particular cases, the social dimension is understood as cross-group interaction. Taking into account also the points of view of students with special needs impacts on cultural practices, promoting new possibilities of producing intersubjective dynamics. The connection between using technology and the cross-group intersubjectivity in education is analysed in connection to learning outcomes.

One specific aspect is connected to the use of avatar, which may promote new relations within students into the digital world (Fields & Kafai, 2009) as well as embodied experiences by prediction of body movement and by modelling motion in a virtual space (Enyedy, Danish & DeLiema, 2015). Thus, social dimension is extended beyond the context of the class and affects the processes through which intersubjectivity is built.

1.8 The space-time

Studies that involved digital resources (Çakir et al., 2009; Fields & Kafai, 2009) examined the asynchronous space-time dimension by introducing the idea of virtual spaces and multimodal communication in an online environment. Space and time are inevitably perceived in a new way, because there is an expansion of time. The interlocutors can refine their ideas and products by the coordination among the group. Space-time effects are not confined to virtual environments, but they change the way that people perceive them. Similarly, space-time may have a specific chronotope, depending on the tool used, such as chat conversation through instant messages (Stahl, 2006; Trausan-Matu et al., 2008), and this influences the way that the intersubjective process is constructed.

In experiments where both face-to-face and digital devices are combined, a hybrid space is created, in which the interaction is mediated by a mix of tools that can index all collective production and also stores all information in the database. Thus, the group can access each other's actions and writings. As a result, digital space becomes an additional layer, including and impacting on the physical space. The study proposed by Enyedy et al. (2015) was composed by material and Augmented Reality (AR), a carpet where the friction of objects and the movements of the bodies mapped by simulation into the virtual narrative space. Students are able to model their movements, for example, the movement on the ice versus mud. Thus, this turned the narrative more complex, students learned by their own kinesthetic experiences. We also highlight the use of single-touch screens and tabletops to

open equal possibilities as a combination of language, body and materials (Davidsen & Christiansen, 2013); Computer-Supported Collaborative Learning (CSCL) (Evans et al., 2011; Stahl, 2006); web platforms, such as Synergeia (Ligorio et al., 2005); and the interactions within three-dimensional space (Fields & Kafai, 2009). All of these studies favoured intersubjective dynamics.

The introduction of digital technology made intersubjective space more complex, it was understood as both a means to extend the space of intersubjectivity as well to advance understanding among interlocutors. In both cases, new features and multimodal aspects of language entered onto the scene. In particular, the space-time dimension acquired relevance, which was not recognized in studies with analogical resources (Beraldo, Ligorio & Barbato, 2017). The multimodality of language has changed the procedures for producing meaning through the empowerment of students and teachers on the digital spaces. With the analysis of the selected articles, intersubjectivity was explained in connection with a constellation of diverse concepts and ideas discussed above.

The five dimensions were extrapolated in our revision: the role of the teacher; the cultural and/or intercultural dimension; the cognitive aspects; the social dimension; space-time. These can be treated as indicators of the dynamics produced into the chronotope and these elements can be used at educational practices. Specific spaces could be created to incorporate other voices and different points of view on the same topic or object. Such spaces could also be digital, researchers should take into account that the mediation of digital technology affects the perception of space-time, in particular, the configuration of the different tempos, named by Ligorio and Ritella (2013) Adagio, Andante and Allegretto[2]. These authors used the musical metaphor to described different rhythms of the actions and learning in the collaborative activity.

The review presented allowed a broad reflection on the complexity of the concept of intersubjectivity. The selected authors were based on cognitive, sociocultural and dialogical perspectives. These approaches share the view that intersubjectivity is crucial to learning,

[2] The study counted with the participation of 10 teachers in training that used an online platform, focusing on collaborative work and the role of technology. *Adagio* refers to actions of slower flow, when the group is learning to deal with new resources activities are perceived as complex and there is a need to explore semiotic resources. *Andante* refers to the more flexible configuration among participants, familiar semiotic features, accelerating the flow of action, concentration on some conceptual and contextual elements. *Allegretto* refers to activities perceived as simple, expertise, efficient participation, knowledge of semiotic resources, rapid flow of action, effective and rapid solution etc.

considering it as a dynamic process in which the interlocutors alternate their position into the speech activity. This provokes tension and distension into the dialogue space (Wegerif, 2007, 2008, 2013). Mainly, with regard to the use of verbalized language, when others' voices are appropriated by the interlocutors, as a recursive tool that encapsulates rules, values, ideas, authority, influence, authorial voice etc. (Beraldo, 2017). This can also establish a relation of communicative, cognitive and interpersonal interdependence with another chronotope, principally, in time, when digital windows are open by the use of web-video or online communities (including social voices in the past). Conversational models, such as used by the Exploratory Talk[3] technique (Rojas-Drummond et al., 2008; Littleton & Mercer, 2013), emphasize language as a tool to generate inter-animation of voices in the co-production of oral and written texts. In this turn, the collaborative work is reviewed and re-written by the interlocutors, which drives the discursive and intersubjective processes.

Material artifacts also play a relevant role in intersubjective space, because they give a certain frame to the chronotope – constraints and affordances – of its historical, situated, and cultural instant, conditioning space-time and the possibilities of interaction and communication (Renshaw & Brown, 2006, 2007). This indicates that technology can play a relevant role in the activity and understanding of the dynamics of intersubjective processes. In fact, we believe this is an interesting clue for future research. Furthermore, dialectic opposition produces tension between the interlocutors, and many elements contribute to defining the quality of the socio-communicative situation, such as thematic changes, use of different types of discursive genres, strategies in collaboration, discursive breaks or misunderstandings in the production of meanings, through a continuum between formality and informality produced in situ. Despite the diversity in definitions, we found some common elements. Intersubjectivity is considered as a space for negotiation of meanings and for intellectual development, for expressing and sharing emotion, through guided activities supported by teachers mediated by communication tools (Haan & Elbers, 2005; Nathan et al., 2006; Ligorio et al., 2005; 2008; Davidsen & Georgsen, 2010; Sullivan, 2011, Davidsen & Christiansen, 2013).

[3] Exploratory Talk is a technique created at the program Think Together, it provides a dialogue-based approach to the development of thinking and communication skills for knowledge building. The project is led by Prof. Dr. Neil Mercer and Prof. Dr. Rupert Wegerif, with participation of a group of researchers from several countries. The project is allocated in the Department of Education of the University of Cambridge, UK: <https://thinkingtogether.educ.cam.ac.uk/about/>.

Intersubjectivity in studies that use only analogical resources (2005-2012) is defined as an ecological space of interthinking, interplay, semiosis, regulation and agency, in which information, procedures and cognition are shared. Intersubjective experiences can generate new procedures, innovation in problem solving, more complex levels of reasoning and awareness, cognitive and metacognitive processes, and cultural conventions.

The results obtained from the review of the studies that use digital resources (2005-2015) understand intersubjectivity as dialogism, polyphony, joint space, interdependence and collaborative actions. Dialogic interactions have been shown to increase students' motivation, social trust and inclusion through different types of scaffolding, since digital resources supported the discourses produced and also the stages of collective production. This generated a body of information that can be consulted and reorganized at different phases of the activity.

Collaboration, joint attention, and mutuality in dynamics can be a pathway to identify a general orientation within interlocutors. Of equal importance are the shared object (product, subject, theme etc.) and its transformation. Emergent ideas built through negotiation and construction of meanings can shift when interlocutors stand a semiotic space, multiple levels of information are achieved, the intersubjective space became more permeable. Consequently, it involves production of new levels of evaluation that may lead to innovation. Studies that use digital resources, for example, placed emphasis on the different positions of the interlocutors in a shared temporality as well as the conditions of socialization that creates new possibilities of innovation in the course of the activity. These studies showed that digital technologies guided joint activity through different and complex tools that include multiple semiosis, strategies and procedures, such as interface design, game programming, 3D modeling, HTML language, virtual immersion, etc. As a result, this wide range of tools can transform the conditions of problem-solving task in situated and oriented activity. As Linell (2009, p. 12) emphasized "sense-making is strongly interactive and contextual".

This review allowed a wide reflection upon the complexity of intersubjectivity. The studies selected were characterized from a cognitive, sociocultural and dialogical perspective. In general, these approaches consider intersubjectivity as crucial for learning and stress that it as a dynamic process. A fine understanding on how intersubjectivity built during collaborative activities leads to improvement of learning environments.

1.9 Elements of the dialogic approach on intersubjectivity

In this paragraph, we point out some aspects of dialogical perspectives from Bakhtin (1981) and Volosinov (1929/1973) of social and cultural minds, and the role of the other/others on communication and cognitive processes. Many scholars had assumed this perspective – interdependence in interaction, communication and cognition (Linell, 2009); sociocultural approach of the mind (Wertsch, 1993, 1998); dialogical Self (Hermans, 2001; Hermans & Hermans-Konopka, 2010); positioning (Harrè & van Langenhove, 1991); discursive voices in the classroom (Renshaw & Brown, 1998); dialogic learning (Wells, 2007, 2015); dialogical mind (Markovà, 2013, 2016); dialogical pedagogy (Matusov, 2001, 2004); dialogical space (Wegerif, 2011, 2013); dynamics of intersubjectivity (Beraldo, 2017) among others.

According to Wegerif (2010, p. 25) the terminology "dia" comes from a Greek word meaning "through or across" and "logic" from a Greek word meaning speech, but it is also used to refer to reason, thus, dialogic means literally reason across difference. In the light of this concept, Linell (2009) claims that dialogicality is a characteristic of the human mind, because the presence of the other is inevitable, he says "cognition precedes communication" (p. 37), even without exchanging words, people will make suppositions about who is the person by their side. Linell (2009) emphasizes that communicative act-activity happens into the dialogue because "communication and cognition are dialogically interconnected through relational interdependencies" (p. 15). Dialogue is understood as an experience of alterity that entails conflicts, tensions, agreements, disagreements, suppositions, negotiations, suppressions, vagueness, ambiguity etc. (Matusov, 1996, 2001). Discursive acts are always intentional and addressed to others, which involves potential response (anticipation) and orientation. Thus, "intersubjectivity can be seen as defining the properties of communication" (Linell, 2009, p. 81).

In a dialogic perspective, meaning emerges from the inter-actions between two or more people, and this involves intersubjectivity in a semiotic and social field (Rommetveit, 1990). Interlocutors need to situate themselves to share information. In addition, intersubjective processes are segmented at various episodes within discursive dynamics, on a provisional or partially shared basis. In this way meanings gain various nuances and textures (Rommetveit, 1990, 1992; Linell, 2009). As a possible space of interchange and reciprocity within others' voices (Bakhtin, 1992/2003, 1929/2010a, 1929/2010b) is in a specific chronotope (Bakthin, 1965/2014, Morson & Emerson, 1990/2008). Then, utterances refer to

situated inter-acts, conscious and intentional, and the referent (the sign) is not fixed a priori or corresponding to a syntactic unit or grammatical phenomenon. The sign gains signification into the discourse, as a unit of communication that 'incites response' and requires an active position among interlocutors (Bakthin, 1992/2003, 287). Besides, it is full of emotion, intonation, judgment and value. The chronotope encompasses the space-time of the discourse, where breaks occur in communication at different levels of alternation within interlocutors. As a result, new positions are generated in the social dimension of speech and new forms of thinking are developed by the logic of the discourse. As Bakhtin (1929/2010b) states, consciousness is essentially sociological and the forms of the sign are conditioned by the specificities of social organization and circumstance in which communicative processes occur. More hierarchical contexts, for example, tend to monologism and finished forms of the discourse, that restrict the possibilities of materialization of the utterance. In this case, the monological discourse remains on a linguistic level 'on the surface' where language has an abstract nature.

In addition, issues related to school representation and social imaginary (Renshaw, 2013, Matusov, 2015), as well as beliefs about teaching and learning, authoritarian models of teaching (Mortimer, 2005), practices adopting interactive patterns and prescriptive discourses (Mortimer & Scott, 2002) are mediators characterised by power, dominance, normalisation and prescription. We have discussed tripartite structures: Initiation-Response-Follow-up (IRF) (Sinclair & Coulthard, 1975) and Initiation-Response-Evaluation (IRE) (Mehan, 1979), which tend towards authoritarian models, where the teacher's speech prevails. For these authors, the scope of communication where creative and innovative elements remain completely absent.

At this point, we underline that, in the recent study of tripartite structures, Rees and Roth (2007) investigated patterns of talk in the classroom, observing that patterns of speech depend on the situation where they grounded. These authors noticed that discourse patterns can be cultural features that participants recognize, orient towards, and reproduce as social and cultural phenomena. This framework suggests that we need to look more closely at the social dimension of speech (communication), and to include contributions from other areas, such as anthropology, sociology, and linguistics.

Similarly, polyphony in the intersubjective processes is the main property of discourse, relevant since it is regulated by recursiveness, inconclusiveness and inter-discourse, which opens space for voicing, addressivity and responsiveness in turn-talks

(Bakhtin 1981, 1986; Volosinov, 1929/1973). For that matter, in this study we give much attention to observing how interlocutors appropriate others' voices and how these voices influence them, as multiple textures/layers of discourse.

In the light of this, discursive activities in pairs or groups play an important role in educational practices, especially when the teacher can use language techniques and strategies to make references, remissions, identifications, and pauses to support student use of the language as a tool (Mercer, 2000, 2004, 2008; Littleton & Mercer, 2013). Equally important, time is an element that must be observed, sometimes students need more time to establish coherence to speech discontinuities, semantic relations, and the various dimension of the speech to develop discursive competence and creativity. As emphasized by Volosinov (1929/1973), dialogical space is an arena of voices where people agree, disagree, refute, and generating centripetal and centrifugal forces of continuity and change. The tension of multivocality and the discursive flow steer the interlocutors towards different world-views of the shared-object at various levels of understanding.

Within this perspective, Pontecorvo, Ajello and Zucchemaglio (2005) recognize that it is through our own insights, in a close relationship between learning and discovery processes, that exploratory knowledge or discursive-thinking develops. Through the utterances of the other, complements, opinions, propositions, exposition of ideas, lead interlocutors beyond the merely factual knowledge. For these authors, the dimension that best characterizes the discussion is given by the role of the opposition, putting the discourse-reasoning in advance and grounding new ideas by meta-discourse skills. In the same way, Roth (2013, p. 43) underlines "speech has two related moments, an inner semantic movement, and outer grammatical movement, that we can understand not only the development of thinking in situation, but also the development of thinking in the child and society".

In short, thinking together requires the prior knowledge of a cultural domain – linguistic code, notions of frames and communication schemes, historicity in the use of objects, logical-conceptual thinking, self-reference, previous experiences, addressivity to other discourses etc. It also involves the ability to distribute the cognitive dimension of cultural and social activities, and requires simultaneous coordination which involve memory, decision, reasoning, inference, expertise, semiotic ground, management of time, comprehension of the object shared etc. (Hutchins, 2000).

Such are some of the reflections that we have introduced about dialogue and intersubjectivity and which are widely discussed throughout this work. Following, in the next section we discuss the action mediated by tools and emphasize how this concept expands our understanding of the dynamics of intersubjectivity.

CHAPTER 2 – THE DYNAMICS OF INTERSUBJECTIVITY AND MEANING PRODUCTION

2.1 Thought and language in building intersubjectivity

The issue of thought and language in the production of meanings has been studied from different theoretical perspectives and the common base that we found in the literature consulted is that language is a conventionalizated system by interlocutors in their historical, social, and cultural materiality. Thus, in this section, we are searching for a more comprehensive understanding of the meaning production in the dynamics of intersubjectivity.

Vygotsky (1962, 1978, 1986) and Luria (1987) were very concerned with the interrelationship between thought and speech in the different moments of ontogenetic development of children in interaction with adults or a more proficient peer. The authors devoted part of their studies to understand the roots of thought and word in the internalization-externalization process in socialization, where individuals produce and transform their culture, language, and creations. According to them, the psychological structure of language in the child occurs thought the categorical thinking, that is, the concepts are formed by process of generalization and abstraction of the object. They set that the meaning cannot signify in isolation of its historical and social domain, thus language should study in the light of the subject. Vygotsky made a relevant contribution to the study of thought and word for the formation of internal dialogue because he focuses on the semiotic potential of human language by its degree of contextualization with the world (Wertsch, 1993) and his ideas launch many questions of how people think to produce meanings together (Littleton & Mercer, 2013).

In the semiotic perspective, Volosinov (1929/1973) stated that meaning has a unitary significance that belongs to the utterance as a whole and its significance anchored in a shared-object (theme). He pointed "the theme of an utterance itself is individual and unreproducible, just as the utterance itself is individual and unreproducible. The theme is the expression of the concrete, historical situation that engendered the utterance" (p. 99). The theme and its signification are at the level of the social, historical and concrete plane of the interaction, pushing this process to tensions in the intersubjective plane. Thought and language are not only internal process inside of the brain, they are embodied at the intersubjective instance (Barbato, Mieto & Rosa, 2016).

The examination of production of meanings in interaction and learning was also studied by Halliday (1993), he states that meaning is always the product of two speakers or

more and “the ontogenesis of language is at the same time the ontogenesis of learning” (p. 93). The author pointed that “children are predisposed, from birth, (a) to address others, and be addressed by them (i.e. to interact communicatively); and (b) to construct their experience (i. e., interpret experience by organizing it into meanings)” (Halliday, 1993, p. 94-95). Halliday and Mathhiessen (2003, p. 24) bring to our attention the fact that “language is a complex semiotic system, having various levels, or strata”. They expanding this idea on two axes: lexicogrammar and semantic, considering five dimensions to study the use of language: a) structure (i.e., syntagmatic order by word, morpheme, syllable, letter etc.); b) system (i.e., paradigmatic order by syntax, patterns, regularities, system of polarity etc.); c) stratification (i.e., sound system, writing system, and wording system); d) instantiation (situationality of speech as potential meaning-making), and e) metafunction (i.e., make sense of our experience, communicative process, intersubjective stances etc.). Also, some scholars shed light upon the idea that language is a tool that interlocutors use to express their thought. For example, that language is a sociocultural tool (Matusov, 2015), that language is the most prominent dialogical artefact (Markovà, 2013), that language lives only in/and through the mouths of real people, and as a “person’s signature” (Linell, 2009), that language functions as an interthinking tool (Littleton & Mercer, 2013), that spoken language is a tool for thinking collectively (Wegerif, 2008), and that language is the prime instrument of thought and social action (Davies & Harrè, 1999). From dialogical perspective, Linell (2009) adds another dimension on this theorization addressing the internal dialogue in dependence with prior experiences as an interpersonal dialogue connected to the plurivocality of the discourse. That is, the “utterances are strongly other-orientated” (Linell, 2009, p. 240) as potentialities to make-sense trough semiotic elements that ground in the intersubjective sphere. Also, the contextual resources, anticipation in action, and circumstance are semiotic frames that have effects in our perception, representation, and comprehension.

In this sense, Rosa (2007) explains that the qualities of any object are the result of feelings and senses which emerge from our consciousness, but they must be imagined for meaning. He justifies, “Meaning is not something given; it is always on the making. Meaning is a result of sense once the goal has been achieved. If a behaviour does not achieve its expected outcomes, it becomes meaningless” (Rosa, 2007, p. 207). Within this perspective, we agreed with the observation made by Jewitt, Kress, Ogborn and Tsatsarelis (2012, p. 268) “signs as the product of a process of sign-making which arises out of (and are motivated by) the cultural, social and psychological history of the sign-maker, focused by the specific

context in which the sign is produced". In the same direction, Valsiner (2012) emphasizes that a generalized sign indexes a fact that can be referenced to infinite signs, through the process of semiogenesis, being "the temporal flow that guarantees the constantly active novelty of semiotic processes" (p. 42). Additionally, Valsiner (2016, p. 6) states that "the temporal looks at the phenomena implies no reification of any form of distribution, but observation of accruing of the phenomena as they emerge in their novel forms". In this case, a forward-oriented semiosis involves an oppositional structure of the irreversible time between PAST<>FUTURE, that is, the present is understood as an actualization of potentials meanings. Also, Josephs, Valsiner and Surgan (1999) posit that the process of meaning-making and meaning-acting involves two functions: a) the creation of conventionalized signs, which are instruments to regulate our intervention with the environment, and b) the use of these signs, in the processes of regulation and self-regulation within people and their environment. That is, the sign is characterized by a tension in the construction of immediate reality at here-and-now for the future context, since generalized signs are conceptualized in their opposition. In such cases, this orientation is related to the dynamics of hierarchical organization of meanings, ambivalence, and potentiality of the semantic field. Directionality refers to the engagement of the interlocutors in a cognitive, communicative and intentional activity, where they qualify and concretize meanings in a specific chronotope (Bakthin, 1965/2014; Morson & Emerson, 2008). As Bakhtin (1981) stressed, "every utterance participates in the 'unitary language' (in its centripetal forces and tendencies) and, at the same time partakes of social and historical heteroglossia (the centrifugal forces, stratifying forces)" (p. 272, quotation marks by the author).

Among many other important observations, Valsiner (2016) points that all meaning integrates elements of previous experience and projection which can never be totally determined on the threshold. Integration of past elements to new elements, either are complete or partial. If these elements did not develop, they are maintaining in a null condition. That is, if no tension between certainty and uncertainty occurs, relative stability is maintained or blocked (Valsiner, 2012). In this aspect, the present is understood as an infinitely small frontier that must be transposed to become a new present moment, and thus successively in the establishment of sign fields that promote certain sense of order in the regulation of future actions. According to Valsiner (2016, p. 8) the structure of *Gegenstand* "is an object that is involved in the act of objecting. The simplest structural depiction can be given as the *Gegenstand* that includes the directed orientation (→)together with an oppositional barrier ([])". That is, one meaning is in opposition to another, because they are

mutually inclusive and belong to the same semantic field. Interlocutors qualify them by hierarchy at different levels of meaning (Abbey & Valsiner, 2005; Valsiner, 2004).

Halliday and Mathhiessen (2003, p. 22) emphasized "Positive and negative are contrasting features of the clause, which could be made manifest in many different ways. They represent an aspect of the meaning potential of the language, and they are mutually defining: 'not positive' means the same thing as 'negative' and 'not negative' means the same thing as 'positive'" (authors' quotation marks). They call it system of polarity organized into systemic patterns of choice. For example, in our study, we observed that a distance from the object (Theme) allows the dyads go beyond to the first comprehension of the meaning. As we found at the Category 5 – Voicing and Positioning. The distance of the shared-object created a space for re-contextualization of the meanings (Rheme). Abbey and Valsiner (2005) called this phenomenon projective contextualization, which is the process of reinsertion of the meaning into the process of the emergence of the personal sense under new circumstances. In which there is a constant process of updating the meaning, the person begins to understand the properties of the object placed in different possibilities. That is, the interlocutors actualized the meaning in many ways into the speech activity. For Abbey (2007), it is a meaning-as-motion, which operates to give completeness to the meaning, for example, when there is a state of near-certainty and near-uncertainty, as ambivalent acts in decision-making. The authors (2005) suggest two forms of projective contextualization: personal and social. Personal projective contextualization prioritizes the perspective of the individual over those of the social, such as moral values, social rules, beliefs, and so on. Social projective contextualization is the opposite, emphasizing collective beliefs and social values of individual ideas.

Thus, language in the dynamics of intersubjectivity is primordial to establishing a discursive environment, in which new ideas can be built. The novelty in here is the possibility to explore the recursiveness of the platform to produce new textualities, access many layers of information (horizontally and vertically on the web), access simultaneously personal and collective ideas, propositions, and perspectives etc. As a result, this modality of interaction and communication influences the way that the intersubjective process is constructed and maintained, and this has implications for the way that we think and share information. Language – in its whole forms of expression – is a fundamental tool within the chronotope of the dynamics of intersubjectivity. At this time, we include the concept of chronotope to solve the methodological problem related to online and offline, since this boundary is not considered by new generations. We have argued that language possesses many layers and

nuances with the inclusion of digital technologies and it implies pedagogical changes in learning, as concluded by Walsh (2006).

> […] pedagogy is no longer sufficient for the literacy practices needed in our society where much essential information is communicated through images, electronic and digital communication, we are a long way from knowing how to develop classroom learning experiences that will assist students to manage multiple literacy and learning practices (p. 48).

In light of this, we should consider, for example, changes not only in communication but also in the new capacities that such devices provoke, as a kind of mixed language that include a fixed system (codes) and natural language. Turkle (1984) says "Technology catalyses changes not only in what we do but in how we think. It changes people's awareness of themselves, of one another, of their relationship with the world" (p. 18-19). In this same direction, Fehér (2012) argues that new media become more complex when platforms and contents were remixed in diverse channels on networks, beyond the terms convergence and divergence she included the concept of transvergence in communication. In addition, Lévy (1996, 1999) maintains that we cannot plan learning in advance, considering that information develops continuously on the web and its flow impairs collective intelligence.

Considering the above, the philosophical concept of rhizome is useful here to explain the multiplicity of meanings and signifiers of the complex interconnected systems (Deleuze & Guatarri, 1995). The rhizome is a mechanism used to explain new forms of writing that does not contain lines of organizational solidity. It is an arborecent model that includes principles of connection and heterogeneity. Deleuze and Guatarri (1995, p. 8) posit "the rhizome is constituted by plateaus (zones of continuous intensity) to the vectors that cross them and which constitute many territories and degrees of deterritorialization", that is, we are living in a new space of communication with many positive potentialities to signify. Lévy (2011, p. 8) applied the concept of rhizome to the hypertext, he says "as a textual machine that could profoundly change writing, and therefore thought". The author argues that symmetrical links can form a rhizome as a complementarity of concepts, on the other hand, the nodes of the rhizome – problems of semantic, incompatibilities, opacity, fragmentation, pragmatics, culture differences etc., – can be solved by a system for encoding meaning that he named Information Economy Meta Language (IEML). That is, IEML is a kind of semantic sphere that works as a "'bridge language', and addressing system for concepts that is capable of linking different systems for classifying and organizing data that would otherwise be incompatible" (Lévy, 2011, p. 2). He states that such system would be a general model to join

human collective intelligence and computer language into a “bulb” and its “capillaries” (idem, p. 31). In terms of clarifying and sharing information and data it looks useful. From the ontological perspective of thinking and natural language, such mechanism could close the diversity of ideas, innovations, new conceptions, culture novelty etc. We can see this as a crux in two ways: a) as a desire of equality, if everybody has good intention and b) as a tool of control/filter information by gatekeepers (Barzilai-Nahon & Neumann, 2005; Barzilai-Nahon, 2006, 2009; Ippolita, 2013, 2015; Pariser, 2011). As mentioned, the new generation assimilated these new assemblies more quickly, thus it can be an opportunity to approximate one generation towards another. In our position, as researchers, we should look for it in an inverted way to collect data with youngsters using digital resources, perhaps learning with them and verifying how these new sociabilities are being constituted.

2.2 The chronotope in the dynamics of intersubjectivity

Bakthin (1965/2014) elaborated the concept of chronotope to analyse how events and actions develop in literary genres. He found that thematic content determines the compositional field. Genres and the multiplicity of genera are determined by the chronotope. In Greek romances, for example, he noted that there was not an historical location of time; temporal contiguity was realized by types of links. In the biographical novel, he found that time operates over long periods, events occur in a time-line, space, however, remains the same, the world remains unchanged. In the realist novel, Bakthin (1924/2010a; 1965/2014) observed that human relationships are indissolubly linked to historical and social circumstance. Space is no longer seen as a static background, but a whole in formation by the relationships between people and their world. Following this idea, Bakthin (1929/2010b, p. 45) concluded “the forms of the signs are conditioned by the social organization of such individuals as by the conditions in which the interactions take place”. In other words, signs belong to a system of communication that is inseparable from its own circumstance. In this sense, the configuration of the chronotope sets the enunciation between interlocutors at variously fused time and space (Morson & Emerson, 2008). In addition, is important to say that the rhythm and organization of chronotopes differ in each culture or micro-culture.

The concept of chronotope has been used in studies in psychology and education to comprehend the temporal and spatial dimension of formal and non-formal learning. Matusov (2001, 2015), for example, draws attention to the configuration of two types of chronotope in the classroom: a) in the interpersonal relations between teacher and students, when there is

dominance of the teacher's speech, without any possibility of alternation of voices, and b) in the disposition of materials in the physical space, uniforms, classroom layout, furniture, schedules, timelines, etc., which may limit or facilitate interactions. Thus, intersubjective space can be influenced by this configuration. In our study, for example, we observed that the layout of the computers in the Lab is identical to the classroom, the students are lined up, the tables are turned to the teacher, and the laboratory coordinator stands in the back to monitor the activities. Possibly, this configuration restricts the space of interaction and communication. We argue here that dialogical pedagogy values the ontological aspects of the chronotope to the detriment of prescription in the curricular grade and conventional classes. As Matusov (2015, p. 69) proposes the notion of "A-chronotope" can be applied to the pedagogical and educational elements. A-chronotopes are elements that reflect monological classes where communication and mutual relationships are almost absent. Otherwise, dialogic pedagogy should focus on actions for agency, on the legitimacy of students' knowledge and on their creativity and originality. It is why we believe that authentic materials linked with students' daily life can generate engagement and motivation, and can be an alternative to transcend predefined curricular objectives based on memorization of formulas, keywords, schemes, and answers to pre-existing questions.

For this reason, Matusov (2015) considers that students should be ontologically engaged in the activity, questions should be original to reach a high critical level and to cover each other's contribution. For this author, a better use of the discourse generated together produces new questions that, in turn, direct the interlocutors to principles of reciprocity and transformations of the quality of the reflections. This occurs, for example, when the previous actions contribute to converge the analysis of the task itself for a meta-analysis, moving from discussions focused on didactic material and questions organized by the teacher.

The chronotope can be also understood in a different way. As proposed by Renshaw (2013), historical, economic and social moment influences the educational politics that are reproduced in the curriculum. As evidenced by Bakthin (1965/2014, 1924/2010a) the background of the chronotope is not passive, that is, ideologies will act in the production of discourse as well as the configuration of the elements that will compose them. In Chapter 1, we suggested the comparison between systems of activity (Engeström, 2008) in a more comprehensive way, for example, observing the chronotope of public politics for insertion of ICT in contrast to the chronotopes of the Secretaries of Education and the schools' viewpoint.

Renshaw (2013) argues that the beginning of the twentieth century was characterized by an inflexibility of space and hierarchy in the relations in teacher/student

relations, in the segmentation of time and delimitation of chronological class activities. Post-1960, this came to be reconsidered from a constructivist standpoint in which "guided activities predominated and where teachers became observers and facilitators of classroom activities" (Renshaw, 2013, p. 60). In this case, the chronotope had become more negotiable, flexible, conversational, and less formal. In the following decades, there was an increase in competitiveness, market opening, privatization, neoliberalism, bureaucracies in the world, and this outlined a new framework for changes in education. According to Renshaw (2013), flexibility and efficiency in the use of time have taken place in the economic life of society. As a result, a system of measures and monitoring has been established, which reflects upon the application of tests, memorization of content, ranking, etc., strongly present in the contemporary world. The author argues that is necessary to take into account that learning spaces refer to the way that individuals create relations of closeness and distance, formality and informality, intimacy and indifference, authority and consideration. This requires new repertoires, transference of responsibility and new practices, as well as learning resources that can be applied in other social instances (formal and non-formal) (Beraldo, 2017). The chronotope could emerge as a hybrid time-space, this would involve public policy discourse, curriculum discussions, understanding the perspective of teachers, and insights of student needs at school (and in their communities). The arguments show that chronotope does not relate to a physical place, but rather to the space-time of the existing event, of acts as activity (Bakthin, 2010a).

On the *Toward a Philosophy of the Act*, Bakhtin (2010a) defines that concrete acts are unique and irreplaceable and this implies a situated and intentional action between interlocutors. Consequently, it becomes procedural when people engage conscious and intentional to achieve a goal.

Among many important observations, the chronotope within the dynamics of intersubjectivity in online environments expands the space-time of interaction and communication. Besides that, students and teachers can access the space anytime, anywhere, and by several internet-connected resources. In such case, the notion of chronotope gains new meaning, where expertise can be placed and shared in an expanded and democratic dimension. Forums, for example, are resources that allow the collective production of contents, in which participants can access in real time or asynchronously. It impacts on the performance and the way that intersubjectivity is built (Ligorio et al. 2005; Ligorio et al. 2008). In these interactions, in activities with common goals, intersubjectivity generates and is generated by distributed cognition. Participants move from a dynamic that accumulate

information to a dynamic that creates possibilities to formulate ideas and producing meanings that are re-contextualized as activities in progress (Beraldo, Ligorio & Barbato, 2017).

Collaborative activity involves discussing a problem or event relaying on previous experiences that can raise new questions about what happened and what people say about it. Possibly, this triggers the search for a solution and towards a joint contribution within the participants. In addition, the configuration of the chronotope in the dynamics of intersubjectivity provides methodologies to support conditions for socialization, where people can learn and practice together to find a solution or combinations of diverse forms of knowledge to promote debate and critiques. For example, when communication fails among interlocutors and they need to negotiate meanings, it provides a new orientation within the group, and this can be a great step towards intellectual autonomy and authorship. This may happen also, through the possibility of trying different discursive genres, such as informal conversation, types of written texts, different levels of argumentation, present many ways to expose ideas, etc.

2.3 Positions of the self in the dynamics of intersubjectivity

At paragraph 2.2, we attempted to define the concept of chronotope in the dynamics of intersubjectivity, and this leads us to reflect upon the position of the self and how the subjects are constituted by the culture into the chronotope. Hermans (2001) proposes the mutual inclusion between self and culture, in order to avoid the subject being seen in an individualized and self-sufficient light, or that culture is understood as an abstract concept. Thus, self and culture complement each other as a space in which dialogic relationships can develop and in which subjects can assume multiple positions. In agreement, Zittoun and Grossen (2013) argue that we should look for this concept in two ways: a) at micro-temporalities of daily life, and b) at transitions throughout life. The authors say that in the space of self and culture the person becomes aware of oneself and others, thus material artefacts also contribute to the construction of the sense of continuity and integrity of the self. In others words, self and culture allow individuals to represent themselves within the social and cultural groups, in a given historical materiality that is interpreted and symbolized by processes of identification (Rosa & Blanco, 2007) and/or identity (Ligorio, 2010).

Hermans (2001) called individualized-self the combination of the social aspects that evolve through internal dialogue and sense of continuity of the self, that is, the person constructs a stable identity as a cohesive whole that shapes actions, representations, and

experiences (Rosa & Blanco, 2007). Production of narrative as a tool to situate meanings locally, implies actions, values, beliefs, desires, and intentional states (Bruner, 2002). Narrative is a way of thinking by which individuals organize their experience in a socially constructed activity, its entails a plot, a causal and temporal thematic arrangement, in which the subject can tell what happened and how he/she understood the reality (Bruner, 2002). Equally important, is the concept of dialogical self that includes more complex forms of narrative, since other discursive voices and other temporalities are present and influence the flow of events. The dialogical self is based on the concept of polyphonic construction in terms of multiplicity of relatively autonomous positions, with tendency to discontinuity, it also has been uses widely in psychology (Davies & Harré, 1990; Hermans, 2001; Valsiner, 2012).

Rosa, González and Barbato (2009) define two types of narratives of the self: those of the primary genre, which maintain a close relationship with the event, in this case, the narrator makes explicit references to people and uses interventions in the plot. The second type refers to the secondary genre, in which the narrator establishes a more complex discursive domain. The person narrates more removed from the fact, he/she can presents causal explanations, makes revisits to justify something, exposes motifs to interconnect the plot in the unfolding events. Also, Polkinghorne (1991) states that we seek reasons to create narratives for ourselves and about our own past actions in order to make sense of what and who we are.

Rosa and Blanco (2007) argue that the sense of identity of the I and Me is guaranteed by the acts of identification as a connection and intentional schemes in which dialogue is structured as "coherent signs with the use of other signs in the same language game of language" (idem, p. 6). For these authors, "actions and actualizations are the first mediational means to identify regularities and differences in order to understand and make sense about the world, as well as to influence the behaviour of others" (idem, p. 7). Actions and actuations are explained in a contextualized way and situated in the discourse, the Self (I, Me, Mine) or we are deitic in that can indicate discursive actuations that contribute to the identify agency, personal identity, self-concept, etc. In this sense, the self can take positions relatively autonomous in an imaginary space that is interconnected to physical space, where individuals can move from one position to another and can be positioned in turn. That is, creating fields of negotiation with the other, considering that dynamics between individuals always involve moral context and intentional actions (Hermans, Kemper & van Loon, 1992; Harré & van Langenhove, 1999).

The concept of positioning proposed by Davies and Harré (1990) is useful to understand the interrelation between the positioning of the self in relation to other subjects in the discourse. Observing that, illocutionary acts carry in themselves a proposition, an intentionality to orient the other and/or anticipate possible response or action from the other. Davies and Harré (1990) note that dominance by the interlocutor in the conversation may force the other to take a position that might not do it voluntarily. This may be related to a moral issue or to the establishment of polarities as power/lack of power, dominance/submission, vulnerability/victims etc. However, the positioned person can reposition him/herself by refuting or rejecting such position, and this generates the dynamic character of the positioning and the possibility of agency (Davies & Harré, 1990; Harré & van Langenhove, 1999). In the case of a positioning coalition, a change in the personal repertoire may occur (Hermans & Hermans-Konopka, 2010), this leads to new categories of thinking that generate personal, beneficial or negative change. In this dialectic between interlocutors, words move through alternation of voices, that can empower the intersubjective space where people signify, representing the experience and build the reality (Bruner, 1986, 1990).

In the recent literature, Fehér (2017) studied footprints that users leave in their timelines on the Internet. She entitled them "digitalizated-mediatizated self" (p. 122) to explain online self-representation.

> Social media platforms, search engine hits, blog posts, selfies, transactions and further footprints are the digital versions of the early idea of mass media, and a product of automatized systems. Users have audiences and are targeted via the platforms/applications of the new media and analysed via big data services. The digitalized-mediatized self locates itself and is also localized by user/system activities at different levels of transparency (Fehér, 2017, p. 113).

The example above shows that the study of dynamics of intersubjectivity evolves an intricate relation between self/selves into a micro-culture at a chronotope connected with a huge mass of information, data, codes and other voices (users) on the web. For a while, we are interested to understand the positions of the self into the dynamics of intersubjectivity and hopefully we will expand this concept in future research. Given that it could be argued that the positions of the self in the dynamics of intersubjectivity involve proximity and distance between interlocutors, alternation of speech turn-taking, and transference of power (or not) to produce a varied layers and voices tessitura on the chronotope. More precisely, in our fifth

category of analysis we have focused on: a) exotopic position, b) appropriation of other voices, c) reciprocal appropriation of position, and d) discursive position (see Table 15).

In the next chapter, we make a contextualization of the school where we delivered this study. Our focus was on the processes that involve collaboration in the dynamics of intersubjectivity between student-student to verify the conditions of socialization from the students' perspective, that is, we were open to learning with them and to knowing how they interpret those changes, how they perceive themselves and other people in this transition.

CHAPTER 3 – THE RESEARCH

3.1 Contextualization of the study

This research was carried out in the same school where we conducted the master's study (Beraldo, 2013). Thus, we had in advance some information about the use of the platform and how the teachers were managing this resource in learning. Most of the teachers were prepared to manage different tools technically and they were trying by themselves to adapt traditional classes to the online environment. We were careful not to create pre-assumptions, since three years had passed. For this reason, an emic and ethic position (Pike, 1993) was central. In addition, as we have been arguing, the new generations over the last 10 years are interacting more and more with codes, digital interfaces, and virtual environments. Thus, new practices and new forms of communication may be observed from their perspective. Based on this background, we adhered to the precepts of Grounded Theory to enter into our participants' communal dialogue to learn with them. This method helped us in designing our methodology and ensuring a continuous interaction between data, analysis, comparison, and theorization (Corbin & Strauss, 1990, 1998; Glaser & Strauss, 1967, Charmaz, 2006), as well as turning the data more meaningful within each phase. Thus, we explored the relationships from the psychosocial standpoint, together with the contextual factors which introduced the intersubjective phenomenon into the dynamics. Given these linkages with the previously discussed topics, our goal was to examine:

- Which processes involve collaboration in the dynamics of student-student intersubjectivity and how do they affect problem-solving tasks in a context mediated by face-to-face interaction and web-forum?

Also, two specific objectives were included here that emerged from the data:

- to identify turn-taking and alternation of position in the dynamics of intersubjectivity.
- to identify how the dyads of students produce meanings in collaboration in a web-forum, and how they presented themselves in the situations requested on the two problem-solving tasks.

3.2 Method

We used mixed methodology with qualitative and quantitative analysis, namely, application of questionnaire, field observation, individual interviews, two empirical studies, episodic interviews and documental analysis (Charmaz, 2006; Denscombre, 1998; Flick,

2009). As we mentioned earlier, we followed Corbin and Strauss (1990, 1998) indications to collect the data. The method consisted of comparative analysis drawn from evidence, frequency, and hypotheses. As the conceptual formulation did not refer to priori suppositions, we began with the observation and approximation of the field of the study. The development of the methodology is procedural, in accordance with the theorizations and decisions taken by us (Corbin & Strauss, 1990, 1998; Glaser & Strauss, 1967). This choice allowed us to generate different types of data, which were presented in each phase, stimulating the production of information.

In addition, we decided by the use of mixed instruments such as individual interview, episodic interview, problem-solve tasks, and observation to turn the context more sensitive to the theme. In this process, we could generate multifaceted data by internal triangulation, triggering spontaneous and authoritative discourses (Barbato, Mieto & Rosa, 2016, Beraldo & Ligorio, 2016; Fereday & Muir-Cochrane, 2006; Rich, 2012). Still, the questions we elaborated in the collection phase were constructed from a recurring theme in the Brazilian students' life – the use of ICT in classroom –, creating the necessary conditions for the production of meanings and trust building between researcher and participants. This option provided more flexibility, generating a continuous flow between theoretical basis, research question, method and our focus, namely the dynamics of intersubjectivity between dyads of students.

Two important points served as guides on the collection: a) change – since the process to generate the data is built on a theoretical basis that emerges from the context, feeds and produces cycles that generate new questions; b) sources diversification – such as the use of mixed methods to generate data that complement each other and give consistency to the episodes that we analysed (Corbin & Strauss, 1990, 1998; Glaser & Strauss, 1967; Rich, 2012). According to Charmaz (2006) and Gibbs (2007), we can identify meanings in different instances: a) literal – words, type of dialogue, actions in the collection setting, conversational patterns etc.; b) interpretation – implicit norms, rules, conventions, values, transitions (breaks), acts (brief events) and long-term activities involving negotiations; and c) reflective – which is the process of the researcher herself from his/her observations. For these authors, the researcher should him/herself ask open questions to generate new questions. For example, what is happening? What they are doing? What are they saying? What are the actions and speeches showing? Also, to re-watch the videos is essential in order to observe something important that had not been earlier perceived. Returning to the data was a constant feature.

The organization, summarization and codification of the data helped us in the process of understanding, generalization and control of the methodological design (Charmaz, 2006; Corbin & Strauss, 1990, 1998). The data-based theory also contributed to the ordering of the more abstract concepts that were being named and the formation of the categories and subcategories that made up the codebook (Table 15).

As previously mentioned, mixed methods are important to gain a cultural perspective, since it is useful in gauging the field and entering the communal space of dialogue to appreciate the intersubjective phenomenon. Also, to facilitate the study through mutual understanding (rapports) that guide the researcher to perceive the human factor, both for conducting interviews and for collaboration in the dynamics of student-student intersubjectivity. Sensitivity is vital to understand the knowledge produced by the individual process and intersubjective process in collaboration.

Novelties in cultural practices require an approach as Grounded Theory to maintain the openness on the research field. As well mixed methods and qualitative and quantitative analysis followed by cycles of revisions to diversify the data. In this way, the data collection took place in a coordinated mode, since we needed to study the first results to start a new phase. It also helps us to explore more alternatives, make adaptation or methodological reformulation.

The following table concentrates the information of each methodological phase and anticipates what will be presented in the two studies on Chapter 4.

Table 4. Methodological phases

Contextualization	Participants	Instruments	Organization	Study 1	Study 2
• Documental source – Political Pedagogical Project (PPP) of school • Information from the questionnaire (Instrument 1) students' profile on the 1st, 2nd and 3rd year on secondary education • Information collected by open interviews with the two teachers • Information of the students' profile on the individual interview (Instrument 2) with eight students on 3rd-year on secondary education • Observation of students-students' interactions using their own digital devices at the Lecture Hall Re-reading the data collected in the master (Beraldo, 2013)	• Eight students on the 3rd-year of secondary education • Two teachers (the philosophy teacher and the coordinator of the ICT Lab)	• Instrument 1 – questionnaire for surveying students on the 1st, 2nd and 3rd year of secondary education • Instrument 2 – semi-structured script of individual interviews to draw the profile (only for the eight students) • Instrument 3 – construction of Task 1 and selection of two online papers on web-news • Instrument 4 – construction of Task 2 • Instrument 5 – construction of semi-structured script for episodic interview	• Production of three documents: Term of Responsibility for Interview, Term of Image and Voice, and Term of Responsibility (for students under 18 years old) • Results of the questionnaire (Instrument 1) • Transcription of the teachers' interviews • Transcription of individual interview with eight students • Transcription of the Task 1 (four dyads) • Transcription of the Task 2 (four dyads) • Description of interactions and mediation by objects for each dyad • Construction of the categories and subcategories of the codebook	• Results of the data obtained from the interviews with the philosophy teacher and the ICT Lab coordinator. • Results of data observation – interaction among students- students using their own digital devices at the Lecture Hall. Discussion and contextualization • Discussion	• Results of four episodic interviews, one per dyad • Results of codebook frequencies by the log-linear analyses. Discussion • Presentation of Semantic Maps. Discussion based on the dialogical Thematic Analysis • Results and discussion

- Refinement of codebook categories and subcategories
- Application of codebook frequencies
- Elaboration of tables in Excel with frequencies for each forum
- Submission of frequencies to log-linear analyses
- Transcription of the episodic interviews
- Organization of the discourses produced by the dyads using A3 paper, in the horizontal order
- Organization of the discourses produced by the dyads using A3 paper, in the vertical order
- Selection of the extracts more significant for discussion
- Construction of Semantic Map for each dyad

3.2.1 The field of study: the school

We gathered the data in a state secondary school in the Federal District, Brazil. It is a long-standing school, founded in 1961, which played an active role in the fight for democracy and quality in state education. In 2014, a sociocultural questionnaire was carried out, used it to delineate the school reality from the results of this survey. Approximately 40% of the students are residents of the satellite cities Samambaia, Ceilândia, Riacho Fundo, Recanto das Emas and surrounding cities such as Santo Antônio do Descoberto and Águas Lindas de Goiás. 60% are residents in Taguatinga.

In total, 100% of students and teachers use mobiles phones, computers and/or other digital devices. 52% of the teachers use the [4]Moodle platform to share content, links, materials, videos, and for forum activities (very few forum were found on the system). In 2006, the ICT Lab co-ordinator, Luis (fictitious name) devised a pilot project in collaboration with three other teachers. Accordingly, the school participated on the Programa Banda Larga nas Escolas (PBLE) (Broadband in Schools, MEC, 2008) to obtain wireless connection. At this time, some teachers started using Blogger, Orkut, Picasa, and personal email, thus some problems arose such as security, institutional support, competing groups, improper use of image etc. The found platform was the solution for a safe environment. They also produce video, construct of virtual scenarios, read collectively using digital tools etc. Each year the teachers define a theme to be worked through the different disciplines such as Racial Equality, Basic Human Rights, Senior Citizenships etc. This project occupies a small parcel of the curriculum, the main focus is given on the subjects of the [5]Vestibular and [6]ENEM.

According to the Political Pedagogical Project (PPP), this school makes a joint effort for the integral formation of students, prioritizing diversity, citizenship and human rights, bearing in mind that the school is centrally located in a residential neighbourhood with high levels of violence. Robberies and drug trafficking are commonplace in the vicinity, the surrounding walls are high and there are two entrance monitoring systems into the school yard. Intense traffic noise around the school requires teachers to talk at high volume in the

[4] Moodle (Modular Object-Oriented Distance Learning) a free and open source learning software.

[5] Vestibular is a selection process for the admission to Brazilian state universities and private educational institutions. The universities and institutions are free to devise the exam.

[6] The National Exam for Secondary Education (Exame Nacional do Ensino Médio) evaluates Brazilian students within the 1st, 2nd, and 3rd grade. The top scores are separated into three categories: public quotas for Public Schools, universal system and quota for black people <http:enem.inep.gov.br/>.

classroom, as well in the ICT Lab. The institution attends to the needs of 1st, 2nd and 3rd year students in secondary education over three sessions. In the evening, the school also teaches young adults (Educação de Jovens Adultos – EJA) whose ages range from 20 to 26 years. It is not uncommon in Brazil for young people to drop out of school to work or to combine work and study.

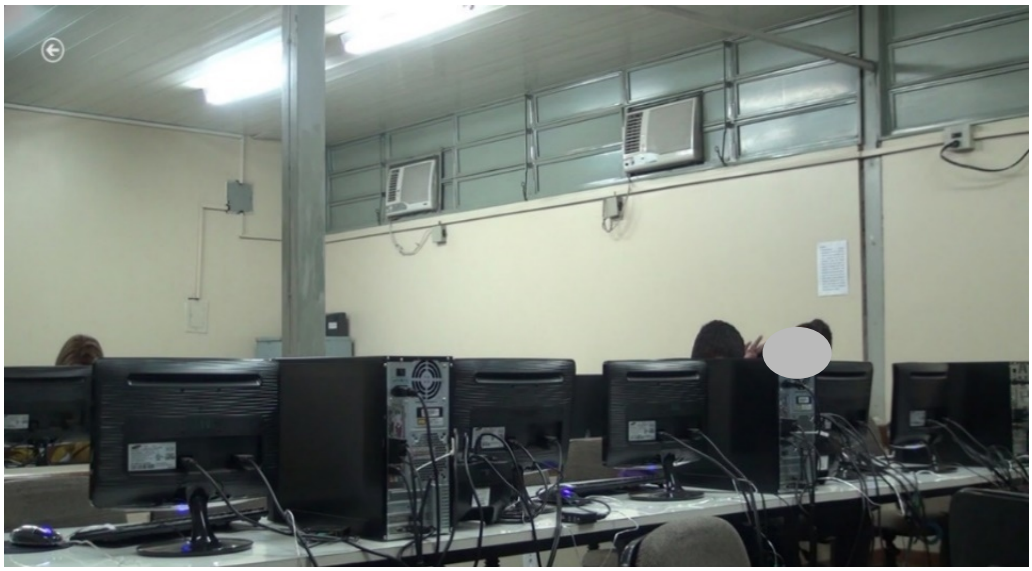
The school has approximately 3,100 students and 185 teachers on the roll. Each teacher teaches on average of 14 to 16 classes, of approximately 35 to 40 students per class. All teachers remain in the classroom, and students change rooms, with 15-minute intervals in each class period. According to teacher Mariana, the excessive number of students is one of the factors that prevent interactive class activities with few opportunities for students to work in dyads. Classrooms are very small and all have safety grills on the windows, an indication of the school's concern for protecting people and space. There is no seating near the classrooms, so students fill the inner hall during the breaks.

The school has 28 classrooms equipped with audio-visual features (49-inch LCD TV, VCR, data show, but no internet connection). There are also four laboratories – physics, chemistry, biology and ICT Lab. There is an amphitheater, a multifunctional resource room, a resource room for the visually impaired and rooms for management, coordination and teachers, plus a covered sports court. Additionally, the ICT Lab is used for the application of tests, exercises and other activities, and there are 34 computers available, 55% being in good condition. There are two digital charts provided by the Projeto Proinfo Integrado (Ministry of Education – MEC), but the resource was never used by the teachers.

The ICT Lab is organized on the same layout of the traditional classroom, the teacher stays in front of the students, the school desks are arranged in rows, the coordinator stays in the back monitoring all computers. Mobile phones and other digital devices are prohibited in the Lab. The flow of students is intense, the room is open during three sessions, and in the case of test application, the teacher is available in two shifts. Some students wait outside the Lab until a computer is available (see Figure 1 below). The connection is slow as the platform is allocated on a shared server (many websites and platforms are connected in a unique server). Thus, 30% to 35% of the tools and resources of platform capacity is used.

Currently, the school has adopted the browser Linux Educational[7] software, indicated by the Federal Government, being the version 5.0.

Image 1. ICT Lab



The school participated in various Government programs for ICT inclusion at schools such as Student Monitor (Microsoft), Mídias Integradas na Educação (MEC), Banda Larga nas Escolas (MEC), TV Escola (MEC) and Programa Nacional de Tecnologia Educacional (Proinfo Integrado, MEC) and, also adopted the RIVED Project (learning objects created for Education Seed/MEC). Besides, more than 90 teachers were trained in the online course Build your own class in Moodle (Pulino, 2009) at the University of Brasília (a free course managed by volunteers). Futhermore, they have problems with the messenger system, since the students are registered on a single e-mail, thus they cannot exchange messages with the teacher and among themselves. It is why a small number of fulfill questionnaires returned (Instrument 1).

3.2.2 Participants

For the selection of participants, we developed a questionnaire with open questions (Instrument 1), considering the following criteria: a) navigation practice on networks, b) use of various tools on networks, c) knowledge of different digital devices, and d) participation in

[7] Linux is a free and open source software to run programs on any operating system, there is no dependency on a single vendor for higher performance, since the source code allows a technician to solve any faults. There is no licensing cost.

one or more communities on network. This questionnaire was validated by four students from the same school from [8]PIBIC-EM scholarship and 22 undergraduate students from the Psychology Institute at the University of Brasília. The questionnaire was posted on the homepage of the school website for all secondary students, in the morning session. From the population of 1200 students, ninety-four filled questionnaires were returned: 17 (1st year), 40 (2nd year) and 37 (3rd year). This low number of respondents was insufficient for our goals, as we wanted to find among 10 to 12 participants from the same class. Thus, teacher Mariana indicated five classes for possible selection of the students. Finally, we had eight students, three girls and five boys, from the 3rd-year of secondary level between 17 and 18 years old, voluntarily organized into four dyads. Mariana and an ICT technician were also present when we video-recorded the two tasks.

Individual interviews were scheduled with the students in the following week. For this purpose, we used the semi-structured individual interview (Instrument 2 – presented in section 3.2.4). A schedule for participation in the forum and in the episodic interview was also arranged. All the individual interviews were recorded on video in the ICT Lab or the multimedia room. The individual interviews totalized ninety-six minutes, all of them transcribed, we outline the profiles as following.

Table 5. Students' profile

Pseudonym	Age	Profile
Agnes	18	She started using the Internet at age of 9. She uses software' design to draw. Currently, she uses WhatsApp, Facebook, Google, Google Maps, You Tube, Instagram, and Tumbrl. She accesses 'Save me', 'Polymers', and 'Turn Easy' to take video classes. She thinks teachers should publish their video classes instead of showing PowerPoint to the class. Agnes believes the Government should use resources on the Internet to save money in education.
Deca	17	She used the Internet since she was 10. She said it is unthinkable to live without mobile phone or Internet. She affirmed that students cannot learn by using the internet because there are too many things online that would distract young people. Nevertheless, she believes in a few years students will have virtual classes.

[8]PIBIC-EM is an Institutional Program of Scientific Initiation Scholarships for Students on Secondary Education (CNPq / University of Brasília).

Bella	18	She started to surf the Internet at 10 years old, publishing her photos and making friends in online communities. Currently, she uses Facebook, Twitter, Blogger, Google and WhatsApp. Her parents died, thus she found online stories similar to hers that helped her moving on. She is planning to create a blog to help adolescents to overcome their difficulties. However, she predicts that the 'WhatsApp Era' would destroy face-to-face interaction because people are continuously connected online.
Tottein	17	He started on the Internet by himself when he was 8. He plays games online and teaches tracks and codes' game on the web. He uses Blogger to publish poetry, monologues, and tales. He uses many channels to research political news, and he believes that online information is less manipulated than off line information. He uses an informal platform called 'Teacher Jubilu' and You Tube to study Biology and History. He believes that paper and pen will be vanish, thus everything will be virtual. Students will use iPad and teachers will teach via web channels.
Bakufun	18	He started to play games online at the age of 15 and he learnt to surf the Internet by himself. He collaborates with a community where he has a 'role' (group mission). Together with his friends, he joins 'Dunia', 'Fantasy', and RPG. He said gaming develops his memory, thinking, and creativity because by playing he understands the codes. He dreams of developing his own storyline' game. He uses Youtube, Whatsapp, Facebook, and Blogger. He predicts ICT will be used in school through mobiles phones.
Snorlax	18	He familiarized with the Internet at 11 years old by playing RPG (role-playing game). He uses forum to teach and learn codes in games' communities. He is a musician and he posts his videos on Internet, with 600 visualizations each video. He thinks Japan is an advanced country because Japanese students already use laptops and teacher uses digital chart.
Rick	17	He got his first computer at the age of 13 and he learnt to surf the Internet by himself. He uses WhatsApp to participate in a community supporting students that want to apply to college. He claims that schools should use ICT to make classes more dynamics and interesting. Rick expresses some preoccupation for the expansion of the technological market, because people will lose personal contacts.

Geo	17	Geo started surfing on Internet when he was 10 years old. He regularly Facebook to publish his own personal reflections and to help others "open their minds". He reports having had some difficulties in expressing his feelings face to face. Thus, Facebook, Twitter, and WhatsApp help him to make friends. He created a community online to sell and trade parts of skates. He is member of 'Green Life', a community where he and his friends raise money from donation or by selling recycled material. They use the money to buy trees' seeds to plant around the city. Geo claims that school should use computers instead of books or notebooks.

The formation of the dyads 1, 2 and 4 was decided by the students. The dyad 3, composed by Bella and Tottein, was formed by the remaining students, as following.

Table 6. Formation of the dyads

Dyad 1	Agnes	Deca
Dyad 2	Bella	Tottein
Dyad 3	Snorlax	Bakufun
Dyad 4	Rick	Geo

Next, we present the profile of the philosophy teacher and the ICT co-ordinator. Fictional names were chosen instead of the proper name: Mariana for the philosophy teacher and Ana for the ICT Lab coordinator (see Table 12).

Table 7. Teachers' profile

Pseudonym	Age	Profile
Teacher Mariana	51	She graduated in social studies in Uberlândia and moved to Brasília. In 1998, he completed a degree in Philosophy. She began working in this school in 2003, teaching students on the 3rd-year of Secondary School. In 2009, he specialized in pedagogical coordination at the Education Faculty, at the University of Brasília. She worked in the public school for about 25 years and she retired the year after she was interviewed. She began using ICT in the program Aluno Monitor course and was trained in the online course Build your own class in Moodle in 2006. She used the platform for application of tests, posts materials, videos and forum. At the time of the interview, she taught for 14 different classes in the

		school, with approximately 40 students each, in the morning. She was a reserved person, used a low tone of voice and she was careful in her responses. She reported that she enjoyed teaching, but that it was difficult to develop more dynamic lessons because the high number of students she had in her classes totalizing, on average, 600 per year. She had competencies to use the platform and other digital tools. Her online class was organized by topics, the questionnaires were configured to randomize questions, videos and reading materials were separated by subject, the environment is inviting. When we collected the data, Mariana had the collaboration of seven PIBIC scholarship holders who supported the activities carried out by 14 online classrooms.
Teacher Ana	60	She is graduated in Portuguese Language and began teaching in Goiânia. She had a graduate degree in Education and also an undergraduation in Economy. When ICT was included at school, she became a specialist in educational computing. She was involved in the implementation of PAS, and attended the TV Escola Desafios de Hoje, a program delivered by the Ministry of Education (MEC). She got a course in computers' configuration and microinformatics. Also, she was trained in the online course Build your own class in Moodle in 2006 and 2008. She uses technologies since television and videos entered in the classroom. She worked as a teacher for almost 30 years, and was readapted for voice problems, in 2007. It is why she began working as coordinator of the ICT Lab. In this school, she created the course of microinformatics and edition of videos in collaboration with students. She maintains two active rooms on the platform to assist students for the ENEM (National Exam on Secondary Education), Vestibular, and public contest. Currently, she is responsible for training other teachers in Moodle and for the maintenance of the system and computers.

3.2.3 Ethical procedures

The study was approved through an addendum on the master's research (CEP/IH 11-06/2012), shaving been carried out at the same site. Confidentiality was respected, and pseudonyms voluntarily selected. We prepared three permission documents for data

collection: a) Term of Responsibility for Interview, b) Term of Image and Voice, and c) Term of Responsibility (for students under 18 years old) (see Appendices 3, 4 and 5).

3.2.4 Instruments

We use the following instruments:

a) Instrument 1 – Open online questionnaire to draw the web profile

b) Instrument 2 – Semi-structured individual interview

c) Instrument 3 – Statement for Task 1

d) Instrument 4 – Statement for Task 2

e) Instrument 5 – Semi-structured episodic interview. Each script was devised based on the results of the interactions and speeches produced by each dyad in Forums 1 and 2.

Following are the instruments constructed. For each question, we inserted a box-editor.

Table 8. Instrument 1 – Open online questionnaire

Dear student,

My name is Rossana, I'm a teacher and researcher at University of Brasília, and I would invite you to participate in this questionnaire about the use of ICT and the Internet. Please, answer all the questions and send it by clicking on the button.

For answer the questions, click on the on the editor and drop it in, so it will open a chart-text for you put your reply. Your opinion is very important to us, and we expect that you will write a lot about your profile.

1. What kind of ICT do you use daily? What for?
2. What kind of Apps do you use in your mobile or computer? How they help you in your daily activities?
3. Could you say which *pros* and *con* of the use of Internet, in your view?
4. What do you search for on the Web (e.g. – information, music, video, games, film etc.)? How do you store it?
5. Which social networks do you participate in? What do you post/share/reblog?
6. Do you know how to edit images/photos/videos? How do you do it?
7. What do you know about intellectual property, images, videos and plagiarism of contents on Internet? Could you give an example of something that happened to you or that somebody told to you?

8. What do you do to protect your ID on Internet?
9. How do you feel about using an Avatar in games? What is possible with an Avatar?
10. How do you think your life would be without the internet, and why?

Next, we present Instrument 2 applied to interview the students selected.

Table 9. Instrument 2 – Semi-structured individual interview

Introduction

1. First, I'll say thank you for your interest in this study. I'm going to ask some questions about your profile. I would like to know how do you use digital devices and your preferences.
2. What's your name? Could you suggest another name that we can use in this study?
3. Do you remember the first time that you used the Internet? Who taught you and what did you feel?
4. At present, what do you do on the web?
5. Which are the *pros* and *cons* of the use of Internet?
6. Which kind of social networks are you linked with?
7. What kind of content do you usually post/share/reblog in your page(s)?
8. Have you ever had a problem using social networks? [if so…] Can you describe it?
9. Do your teachers use technologies in class? What kind of technologies?
10. What do think about the future of school? How do you imagine the school in twenty years?

Thanks for your collaboration!

Instrument 3 was used in the application of Task 1 – Forum 1, constructed from a recurring theme in the life of young people – the use of mobiles in the classroom. For that, we selected two short papers from *O Globo Online*, a Brazilian web-newspaper, in which the people interviewed presented divergent opinions, some against the use of such devices and others in favour. From these, we produced three more questions, from the perspective of the interviewees in the articles (Instrument 3). With this kind of task, we had focused on the opinions and positions of the students on the theme.

Table 10. Instrument 3 - Statement for Task 1

Dear Student,

The aim of this forum is to ask your opinion on twofold articles:

- ✓ Article 1 – Park School allows students to use mobile phones but only in optional classes (*O Globo Online*, May-2011).
- ✓ Article 2 – Expert in new technologies supports the use of mobiles and tablets in the classroom (*O Globo Online*, June-2011).

Base your activity as follows:

1. The reporter Joanna Dale, after speaking with a number of teachers and students on the use of mobiles and notebooks at school, obtained a variety of opinion. **What do you think about the students' views?**
2. What answer would you give **if you were in the place of the teachers, coordinator and the Head of School?**
3. The expert Oge Marques comes to the defence of mobiles and tables in class. **What's your opinion about that?**

You can use your experiences, information at web or ideas from your Philosophy classes in your post comments. Before you post your comment, you can read your colleagues' posts of and add your own comments.

* Work with your peer and comment on your colleagues' posts if you want!

With the results obtained in Task 1, we elaborate Instrument 4, presented below. We have built prospective task, oriented towards creativity, imagination and exploratory knowledge.

Table 11. Instrument 4 - Statement for Task 2

Dear Students,

The aim of this forum is to ask your opinion. Imagine the school of the future in 20 years.

Choose one or more of the listed roles as a possible person with whom work for this task: the president, the Minister of Education, the Governor, the Head teacher, a teacher, a student, or another person at your choice.

Once you have selected a person, describe in detail how the school would be. You may use pictures, videos, illustrations, music, blogs, and information on the web-sites – anything you like from the Internet to build your ideas, and then post them here. Later you should explain what would you need to change learning and teaching.

* Comment on your colleagues' posts and keep in the same pairs.

Instrument 5 – Semi-structured episodic interview was based on the results of the discourses produced by each dyad in Task 1 and Task 2. We analysed the transcripts and

selected excerpts that could generate new information, explanation, reiteration or new arguments. As showed in the following two examples.

Table 12. Instrument 5 – Semi-structured episodic interview

Dyad	Questions
Agnes & Deca	Agnes and Deca, could we try to recall what you said? Let's see if you remember. You said that the students are too immature to use their mobile in class, and, at the moment, the school shouldn't allow it. Could you explain why?
Geo & Rick	Geo and Rick, you said that in high-level schools the technologies as tablets are already being used in favor of students and this makes the class more creative. Could you explain what these schools do?

Materials

- Two reports selected from web-newspaper (see Annexes 1 and 2).
- Four video cameras.
- Four tripods.
- Four digital audio recorders.
- Two notebooks.
- Two HD.
- Diary of field observation.
- Memory cards.
- Audacity application
- Moodle platform of the school.

3.2.5 Data collection

We adopted a mixed methodology – qualitative and quantitative – in an approach to the field that reflected Grounded Theory (Strauss & Corbin, 1990, 1998). We established a general theme – the use of ICT in classroom –, and we seek to maintain an emic[9] and ethic position (Pike, 1993) as an active listener. The research was developed in several stages, between procedures, collection, analysis and revisions to generate sufficient and

[9] According to Pike (1993) the emic and ethical terms were used when he established the difference between a phonemic and a phonetic analysis, to distinguish perspectives with focus on the use, in a description of a system within a specific cultural system. From the perspective of phonetic analysis, this method privileges universals of language, in a description of outside of a specific system.

representative data that could indicate regularities, permanence and connections. In particular, discrete events, incidents, sudden changes, and additional information were considered.

Thus, the ICT Lab coordinator invited all teachers using the platform to participate, seven teachers on the 1st and 3rd-year were willing. Thus, we invited the philosophy teacher who had shown interest having had eight years of experience on that platform. We met teacher Mariana in the Lab to present our study and, at the time, asked her to give us an interview, at the convenient time for her.

We conducted an open, audio-taped interview with teacher Marina lasting seventy-four minutes in total, at a place chosen by her, near the school. We also recorded an open audio-taped interview with the ICT coordinator teacher Ana lasting eighty-two minutes total. The results were used to approximate the field of study and to know their perspectives about the schools current transition. The information obtained is also used to devise more effective strategies in the subsequent steps of the data collection. In this opportunity, Mariana invited us to attend the rehearsals in the Lecture Hall were students of the 3rd-year were elaborating virtual sceneries to re-write Brazilian masterpieces (project Cenários Virtuais das Obras do PAS)[10]. Thus, we conducted six sessions of observations of five student groups from the third year of secondary education, totalized 18 hours. On that occasion, the use of their own digital devices was allowed, such as video cameras, tablets, mobile phones, walk-talks, audio-visual equipment etc., as well the resources available at the school. This action was not anticipated. Thus, we emphasize the importance of the researcher being ready to cope with such situations.

This first observation in the field was fundamental to verify student performance in activity mediated by hybrid resources and to observe the social dimension in the interaction and communication to better understand general aspects of intersubjective exchanges. Mariana indicated one of these five classes for the empirical study, opening the beginning of one class for personal presentation and for explanation of the study. In this first meeting, eleven students demonstrated interest and fitted in our criteria, however, only eight participated in all phases of the collection. We counted on the effective participation of eight

[10] The project Virtual Scenarios is indicated by the Serial Evaluation Program (Programa de Avaliação Seriada – PAS) at the University of Brasília. Participation in PAS is made through the registration of public schools in the program, it is a process evaluation carried out in three stages, during high school, in which the student scores points for admission to the University of Brasília <http://www.cespe.unb.br/pas/>

students of the 3rd-year, being three girls and five boys, who formed four volunteer dyads. Only the dyad 3 was composed by Mariana. The data collected with the other three students (group of three girls) will be used on another occasion, as one member did not appear in the episodic interview.

To establish when students could participate in our research, Mariana agreed to allow students and offered two slots of time to apply two different problem-solving tasks, she scheduled the activity in the ICT Lab. She also provided handouts with instructions and with recommendations for students to talk aloud (Ericsson 2006) during the performance. The researcher prepared the cameras and stayed outside the Lab while the dyads were working. Twenty-eight students participated in the first task and four dyads were recorded. In the second task, twenty-three students participated, and only the same four dyads were recorded. In this activity, the teacher also read the instructions and handed the rules of participation (see Table 11). Task 2 presents a forward-looking question in which the dyads should choose one or more responsible person – president, minister, governor, Head teacher, teacher, students, or other person – to create The School of the Future in 20 years. We applied the same procedures. The recordings of the two forum totalizing 191 minutes. The emphasis was in the prospective ideas and imaginative scenarios. We expected new understandings from multiple perspectives on the same object. We focused on alternations of voices between the interlocutors, focusing on building their own convictions, arguments and understandings, rather than purely factual knowledge. This type of task presupposes, for example, the exotopic positioning, which allowed the interlocutors get a certain distance from the task, as an observer who is outside the discourse and at the same time is part of it (Bakthin, 1986, 2010a, 2010c). This extrapolates the position of the discursive self. It is expected that interlocutors include new voices in the discursive structure, in a quadrilateral relationship between I (self/Ego), the other (Alter), the socio-cultural dimension (We, other voices) and the object (or Otherness) (Linell, 2009).

In the last phase of the collection, we applied the episodic interview with each dyad. The questions were formulated from the discourses produced on Task 1 and Task 2. The episodic interviews totalized seventy-six minutes. In addition to each phase, there was a systematic work of synthesis, codification, theorization and re-elaboration of the instruments, in order to fine-tune the context. We obtained the following data, available in the sequence in which they were collected.

Table 13. The data

Data	Time
Individual interview with the teachers	156 minutes
Observations at the Lecture Hall	18 hours
Individual interview with the students	96 minutes
Forum 1 – Task 1	141 minutes
Forum 2 – Task 2	48 minutes
Episodic interview with each dyad	76 minutes

3.2.6 Data analysis

The data collected through the Open questionnaire (Instrument 1) was used to draw up the profiles that were analysed manually. We have selected the most fully representative answers to observe the preferences, uses and knowledge on networks. This first procedure helped us in the construction of Instrument 2 – Semi-structured individual interview.

The second procedure is related to the interviews with the teachers. Their narratives were transcribed and reviewed by the researcher, and the most representative excerpts were selected and used to contextualize the field of study, as well as to delineate the teachers' profiles and their perception of the school's progress in up-to-date methodologies This information established new thinking for strategies in the subsequent steps of the data collection. For example, we opted for the non-interference of the teacher during the task solution, further detail is presented in Study 1. The third procedure consisted of the summarizing of six sessions of free observation, registered in a diary by the researcher, between two and three hours each session, which were used in the contextualization of the study. The result is presented in Study 1. The fourth procedure consisted of the individual interviews with eight students through Instrument 2. The student's information was used to know better our participants and their preferences. The fifth procedure comprised of the transcription of the discourses produced by each dyad on Task 1 and Task 2. The complete corpus consists of the manual transcription of eight sessions recorded in video and audio among the interaction of four dyads of students who worked on two different problems solving tasks, totalized 141 minutes in Task 1, and 48 minutes in Task 2. In the sequence, we organize tables for each dyad, composed of five columns: a) pseudonym, to control the speech shift; b) time, in minutes of each shift; c) division of discourses produced by episodes; d) description of the interactions between students and mediation by objects; and e)

application of frequencies. In addition, we captured images from the video to illustrate the descriptions of instrumental mediation, such as sharing the keyboard, displaying on the computer screen, meaningful gestures, etc., as shown in the following table.

Table 14. Data description

Pseudonym	Time	Conversation	Micro-Context	Category
Deca/girl (17) Agnes/girl (18)	10:47	So, I thought, when we read for the first time, the students are bit immature by taking pictures from the teacher using mobiles phone only for joking. This kind of things, did you understand?	Now, they focus at the forum task. Agnes looks to Deca and explains what she thinks about the content of the paper task for the first time. Deca was listening and shaking her head affirmatively.  Right after there is an "opening" of the conceptual space → This kind of things, did you understand?	**Episode 2 Agnes & Deca** Category 1: Definition of space or chronotope analysis 1.a, 1.a, 1.a, 1.a, 1.a, 1.a, 1.a, 1.a, 1.a, 1.a, 1.a, 1.a = 13 1.b, 1.b, 1.b, 1.b = 4 1.c, 1.c, 1.c, 1.c, 1.c, 1.c, 1.c, 1.c, 1.c, 1.c, 1.c = 11 Category 2: Level of interaction 2.b, 2.b, 2.b, 2.b = 4 2.c, 2.c, 2.c = 3 2.d, 2.d, 2.d, 2.d, 2.d, 2.d, 2.d, 2.d, 2.d, 2.d, 2.d, 2.d, 2.d, 2.d, 2.d, 2.d, 2.d, 2.d= 20 2.e = 1 Category 3: Definition of the activity 3.b, 3.b = 2 3.c, 3.c, 3.c= 3 3.d, 3.d, 3.d, 3.d = 4 Category 4: Tools/object 4.b, 4.b, 4.b = 3 4.c, 4.c = 2 4.d, 4.d, 4.d, 4.d = 4 Category 5: Voicing and positioning 5.c, 5.c, 5.c = 3 5.d, 5.d, 5.d, 5.d = 4
Agnes				
Deca	11:04	They don't know how to use it for study, did they?	Deca askes to Agnes to confirm the argument, and shakes her head affirmatively. Agnes and Deca don't includes themselves (("they" refers to students on the paper 1, so "they" are different of us)). Right after there is an "opening" of the conceptual space → They don't know how to use it for study, did they?	
Agnes	11:05	They don't know how to use it on the right time moment, and with finality, no? Such as mobile, apps, and so one. I felt they are a bit immature.	Agnes opens your ideas using examples, while she argues keeps looking firmly to the camera. The video camera is a new element that they interact and delegate a role into the activity ((objects-to-think-with"))*. While speaking, Agnes moved her hands while talking. "They" are different of us ((students' voice on the paper 1)).	
Deca	11:16	Um. Apps are not necessary, are not necessary.	Deca rests her face on her right hand, and affirms two times "Apps are not necessary" (I) Position. Agnes looked to Deca and agreed. Deca avoided look directly to Agnes' face.	
Agnes	11:22	Um, um.		

The sixth procedure consisted of joining the information obtained up to this stage of data and the articulation between theorizations and reflections on the information collected for the construction of the codebook. In this way, we chose the longest transcript, of the dyad that participated most in the tasks to identify particular instances in the dynamics, which were minimally organized and codified. For this, several readings and revisions were made to build a first version of the codebook, which was submitted for the appraisal of five researchers. The final codebook is composed of five macro categories and 21 subcategories, described and exemplified with excerpts of the dyad 1. A more detailed description is presented in Study 2. We emphasize that the five categories are at a higher level of hierarchy and are more abstract than concepts that represent them.

The seventh procedure comprised of applying the frequencies of the categories and subcategories in the discursive episodes. Thus, we divided two tables in Excel, namely Task 1 and Task 2. Later, the results of each dyad were submitted to log-linear analysis, focusing

on: (a) how the nature of the task can influence the construction of intersubjectivity; (b) how each dyad established a specific pattern of interaction in which we could identify the positions taken in each task. The macro categories and subcategories took into account the precepts of the theoretical perspectives adopted and, at the same time, the discursive productions generated by the students. The materials posted in the forum, such as posts, responses to other posts, images and links, were considered as supplementary information of the transcribed data.

The eighth procedure focused on the Thematic Analysis, so we organized the discourses produced by the dyads in Task 1, in a paper A3, into two columns, for example: one for Deca, the other for Agnes, following the chronological order by the approximation of the speeches. Then, the horizontal reading was applied in order to describe the discursive triggering, retakes, repetitions, communicative breaks, negotiation, change of position, appreciations etc., which made possible to understand the personal and shared meanings. In the same way, we followed the same procedures with the transcripts of Task 2 and then, with the episodic interviews. At the end, we performed a vertical reading, placing Tasks 1 and 2 and the episodic interviews side by side to check the intertextuality of the discourses. In this step, we selected the most representative features for analysis, which are discussed in the Results.

The last procedure of the data is composed of Semantic Maps, taken from the junction of the meanings produced by each dyad, which are presented, analysed and discussed in the Results.

CHAPTER 4 – RESULTS AND DISCUSSION

4.1 Study 1 – Approximation of the field

In study one, we present the results of the individual interviews with the two teachers and the results of the observations at the Virtual Scenarios Project. The data collected were used to guide us in the formulation of the two empirical studies, as well to provoke new reflections. In the section 4.1.1, we present the results and the discussion of individual interviews with the teachers – Mariana and Ana (the ICT Lab technician). Their discourses are additional layers not only to understand better the context of the study, but to know how these innovations have modified the school environment in practice. As well their opinion about the theme of interest of this study. Representative excerpts have been selected from their narratives to illustrate the chronotope, it was important for us to know how their voices and the students'voices are intertwined. This information is important in the sense that compound ground of the study since we wanted to know how these innovations are perceived and expressed by them. At the Virtual Scenarios Project we observed the social dimension of collaboration as well mediation by tools and aspects related to intersubjectivity phenomenon in collaborative activities. We also focused on the space of socialization among the groups of students to identify the effect of the introduction of their personal resources, such as video cameras, mobile phones, walkie-talkies, and the virtual scenarios created by them.

4.1.1 An extensive comprehension of the field: how the two teachers perceive and signify our theme

4.1.1.1 The narrative of Mariana

We started an open interview focusing on her professional experience to know better how she perceives the transition of the use of face-to-face interactions to context mediated by digital technologies. In a second moment, we asked her to talk about her future expectations for the use of gadgets in school education. For the analyses, we considered the most representative extracts of the transcription. About her experience, reflections, prospect ideas by the use of digital technologies in the classroom, and considered our literature review. The interview was recorder in a place chosen by her near the school, totaled seventy-four minutes. At the beginning of the session, we asked her to talk about her professional experience to compose the profile and so on. We listened to her attentively without interfering with the flow of the narrative, sometimes indicating that we were following (e.g., How was it? /

What's happen after? / Okay) and minded not to issue opinions that would interfere (Gaskell, 2002). We then asked about the experience with the platform. She said: "Ah, I was illiterate. I didn't know how to use the Word program. The only thing that I knew was typing. I was afraid to use the computer. I didn't know how to save a file, anything". In 2003, she learned on the course Student Monitor offered by Microsoft how to use Word and to cut texts and insert images in Powerpoint. In this respect, we identified in the narrative several extracts where Mariana explains the milestones along the way.

We selected the followed extract as an example. She said "When I took up the position of pedagogical coordinator, I really learned it. In fact, I was forced to learn by myself. I had to learn how to manage the internet, to open and close e-mails". This experience seems to have had a positive impact, thus she decided to specialize, with the aim of teaching/learning coordination using Moodle. "It was a joy. I was facing the computer. I was searching for things on the internet and I was able to put images and videos on the platform. So, I learned the term mediated reading. I'd never heard it. I found it fantastic. So, I deeply encourage the use of technology in class".

According to Ritella and Hakkarainen (2012), the integration of technologies as an instrument of learning/instruction is a process that requires effort over a long period. Technology passes through an instrumental genesis and it demands the development of a system of cognitive-cultural activity. Around this, the interdependence of distributing knowledge in the cultural system between teachers and teachers-students is established. The new ways of doing and thinking together, depend on: a) the conventionalization of a symbolic and semiotic field, in which the interlocutors can act in these contexts mediated by ICT devices; b) generalization of the object in school culture such as functions, techniques, practices, and types of reasoning determined by the type of activity they are doing. Also, Ligorio and Ritella (2013) call attention to the various rhythms involved in learning with ICT, that is, time to transform traditional practices into a new instrument of mediation. Thus, technology becomes functional and this involves the integration of epistemic artifacts that give stability as a double mediation by cognitive processes to subsequent activities, creating an evolutionary body of knowledge about the artifact (Hakkarainen & Ritella, 2011; Ritella & Hakkarainen, 2012).

In the meantime, the teacher seemed to reflect on other potentialities and to change her position. As long as the narrative was carried out, she positioned herself in favour of

expositive classes. She said: “I defend expositive classes because it is possible to give entertaining classes to secure the attention of the students. It is only for those teachers who can do it. In all modesty, I can do that”. She continues:

> But, if I give a good lesson with chalk and talk. I can teach a lesson by accessing videos on YouTube. Maybe I can use TV or explain the lesson using Powerpoint, right? Yeah, I had never thought about it. I can replace the textbook. I think it is possible. I can replace it, yes, for something::: How do you call that? It’s not virtual. It is virtual, right? I think it can be replaced. Yes, in the future. Then, I go back to ecology, right? In the matter of paper economy. The book is there, maybe in another format.

As observed, her position indicated the idea of the centrality of the teacher in the learning process, as she expressed “expositive classes using TV, videos, powerpoint” and “paper economy and ecology” and it does not refer to innovation. According to Rosa, González and Barbato (2009), when the narrator explains he/she takes into account his/her know-how, beliefs, proficiency, and prospections, in this case, metalanguage works as a mediator. The person is describing he/she analyses herself in such a situation. In a semiotic perspective, the person moves across symbolic and semiotic planes (Volosinov, 1973) between past experiences, present (here-and-now), and future expectation, consequently, the narrative shapes the experience through time (Valsiner, 2012; Zittoun, et al., 2013). As discussed previously, a forward-oriented semiosis implies an oppositional structure of the irreversible time, the present is understood as an actualization of potential meanings (Abbey & Valsiner, 2005; Valsiner, 2012, 2016).

Based on the experience as pedagogical coordinator, Mariana created 14 online classrooms on the platform and she had the assistance of graduated degree students to organize the forum, materials, files, and links. She commented “it was terribly exhausting, because it generated a great volume of posts, as well plagiarisms among the students”. She explained:

> The number of students 600 students per year was excessive. If I post a message on the forum and each student speaks once, I will correct 600 answers. If I make more comments, then the other goes and comments come, then, we already have 1,200. If I put a third comment, this becomes terribly exhausting. For this reason, I gave up using the forum. Then I canceled out, I gave up the forum. Today, Moodle for me works more like a repository.

For her, in the last two years, the platform converted into a kind of “file storage”. It indicates that she did not know the software’ functionalities to take maximum advantage of the tools and resources in the online environment. As previously discussed, the type of technology chosen by the teacher influence the formation of the chronotope, also the construction and maintenance of the intersubjective space. In the literature review on the database (Table 3), we identified that digital artefacts play a relevant role when the methodological design explores mixed tools and the capacity to different sources of information (Davidsen & Christiansen, 2013; Enyedy et al., 2015); Pifarré & Staarman, 2011); Ligorio et al., 2008; Rojas-Drummond et. al., 2008). In addition, we verified that when any kind of digital resource is introduced, the centrality of the teacher is highlighted: (a) in sustaining intersubjective understanding of tasks; and (b) in the support for the appropriation of the use of the technologies in oriented tasks. Thus, our argument is that practices are changing and teachers and students can divide the responsibility of learning, invent new forms of application of digital devices as well to re-signify the new subjectivities and socialization in class.

As for future expectations, we asked what she would do if her forty students logged on to the internet simultaneously. She commented:

> I would have a well-made plan. I’ve never done this, but in time, I would tell them you will look at me now, you will research now, then you will close the tablets and discuss the matter. I already did this once. Because I have a good command at the class. Yes, I can. I’m well in charge here. Maybe the excessive number of students becomes a problem, because how will the teacher control them? The subject should be very interesting, it has to be very engaging much as possible. So, it would be like that, now you will read, now you will discuss while I visit each group and I read with them a fragment and such things. And then, I’ll open a discussion. So, I'd have a break. They would not have the tablet, notebook, computer available all the time. It would be only a tool, an instrument because they already use it.

Mariana took different positions in her narrative arguing continuously “I cannot visualize the students understanding if the teacher does not present some ideas. I cannot think how the most part of my students will understand the concepts without me if I did not facilitate this understanding before”. As Matusov and Hayes (2000) argue, adults have an adult-centered view of learning, which is strongly related to the constructivist legacy. Brown, Hirst and Renshaw (2005) also stresses that teachers are reluctant to implement collaborative activities in which students are responsible for theorizing, because they believe that students

are not able to manage a wide corpus of information by themselves, yet that students should be supervised, monitored and controlled in learning to achieve great proficiency. In this sense, we should consider the position of the teachers by the prescribed curricular grade, norms, and rules that they need to achieve such as “to keep the class in silence”, “to keep the class in order”, “to dominate the class”. The fact is that different voices were intertwined in her narrative, to which Mariana discusses, argues and responds. Thus, the resistance to a new artifact is natural; the interpretation and perception of new possibilities of such use is a result of the meeting of different representational systems, acknowledging the constraints and effects of the historical, cultural, social, and institutional context.

For instance, we verified that the transition of the teacher to new practice is a process that requires a canonical disruption, on a new trajectory that does not always occur in a linear way. It passes through recognition, contestation, self-reflexivity of positive or negative experiences. Also, forces may impact the implementation and consolidation of a new practice.

The results indicated that the transition of this participant was shaped by moments of technical learning, the discovery of technological novelty, comparisons between the use of analogical and digital resources, experience and application of technology with students. In this transition, she perceives the potential of the ICT and, sometimes, she denials this potential and return to the known base. It is observed that the difficulty of technological management has been overcome, however, the two teachers still need to deal with the complexity of the internet, informational volume turns of voice and position in the teacher-student relationship. Besides, the students’ knowledge of the networks changes what we think about ZPD (zone of proximal development), so a new perception of this concept is needed. The impact on teacher perception moves between the known and attempts to understand the new. A factor is that it involves processes of regulation and self-regulation that go through the imbalance and equilibration, uncertainties, expectations, and experimentation, in a trajectory that increases by the actualization of experiences and the future expectations in the narrative. The methodology adopted allowed us to learn with this participant, to know how she interprets these changes, and know how she perceives herself and the others in this transition.

4.1.2.2 The narrative of Ana

For the interview with the coordinator of the ICT Lab, we used the same methodology, in one session, of eighty-two minutes. Ana defends the use of new tools, and said "technological advances can improve the quality of teaching and learning", but she is against the use of msn (messenger) because "msn does not deal with educational contents, as well the use of social network tools such as Facebook, Blogger, Instagram". She monitors the history of all navigation on the computers to find inappropriate contents. She believes that

> Facebook captures the students' attention and entertains the eyes and ears. Students find things on the web that are not good for their learning. There are bad contents that can contaminate the boys' education. There are good things and bad things on the web, and you cannot check everyone's use. We don't know what they are doing there, it's an open system.

For Ana, it is necessary to "monitor, control and check the contents" in the school space. Intuitively, she realizes that this space is 100% connected to the Internet and the need for changes is concrete. Probably, negative experiences and/or personal beliefs orient her in this transition. She expressed:

> You know, it took us years to learn how to use the platform, it was with the mistakes and adjustments, and it has been a long journey, because the resources that have been used in the past have become obsolete quickly, both for the student and for the teacher. Internet attracts the attention of the student because many things enter in their eyes and ears, they live in a universe of novelties, so we teachers have to be jugglers, clowns.

The dissemination of ICT goes forward quickly, a great volume of technologies enters in the market daily. The level of sophistication is increasingly complex making it impossible for the teacher to follow this evolution, which can be identified as disenchantment, frustration, and resistance to change. Conversely to this idea, we found in our review that the presence of the teacher in the classroom and his/her role in the teaching-learning process are necessary. However, an emphasis has been placed on technologies by themselves, as tools capable of "attracting attention" and "entertaining the eyes and ears". Results indicate that the transition of this participant was shaped by moments of technical and technological learning, experiences and frustrations, recognition of students' knowledge about networks, beliefs of traditional methods of control and monitoring.

Considering the results, we argue that transition does not lie in the idea of using more advanced or sophisticated technology, but in assigning new positions, new repertoires, transfer of responsibility, and more effective practices and learning resources that are related to the milieu of the youngsters. Technological innovations triggered new types of physical interaction, communicative capacities, new forms of managing information and constructing knowledge. It is about a profound cultural change and new representations, roles, and positions between teachers and students. This will possibly lead to more democratic and open school practices for contributions and, at the same time, the approximation of different forms of knowledge from one generation to another.

When we asked about her future expectations "What would it be if 40 students connected their tablets simultaneously in the classroom?". She said:

> Yeah, the boy has a tablet to use at home. Also, to research when he cannot attend school. In the classroom, it may work if the teacher controls it. If the teacher wants to use it he needs to request and book it in the Lab. Also, the teacher needs a purpose and skills in its use. Even when the teacher supervises the students will pick up things on sites, pages that are prohibited. In this case, it is better to walk around the room helping, showing, observing computer to computer to know what the student is accessing. If the student is not working on the topic discussed we ask to him to change and pay attention. If he insists, the teacher must make a stand. Tablets can disrupt the class.

Although in the arguments put forward during the interview may be based on beliefs and values that orient meanings such as "tablets can disturb the class", Ana also is driven by other senses that indicate that is in favour of ICT. As we can see, both teachers give relevance to the idea that the teacher is the centre of the teaching-learning process, but Mariana indicates to be more receptive to innovations. On the other hand, Ana is more oriented by personal beliefs that reflect her resistance and a strong concern with network security.

The voices of these teachers provided: a) more information about the context, b) insights to conduct the empirical study, and c) new understandings of the transition in this school. From these results, we decided that the dyads would solve Tasks 1 and Task 2 without the direct intervention of the researcher or the teacher. The openness was necessary to maintain the conditions of socialization that could emerge among relationship, learning processes and discovery. Mariana was receptive to the idea and supported us in every task.

In Study 1, we took a close look at the social dimension and contextual factors that involved the intersubjective phenomenon by observing the groups' collaboration in the Virtual Scenarios Project. The interviews with the two teachers supported theorizations and decisions taken during the empirical part of the study.

4.1.2 Intersubjectivity and students-students collaboration at the Lecture Hall

The observations occurred in the main Lecture Hall, during rehearsals for the Virtual Scenarios Project where five groups of 3rd-year students were using their own ICT devices to re-write Brazilian masterpieces (poetry, art, music, plays, performance etc.). We carried out 18 hours of observation, in six sessions, lasting between two and three hours each. Initially, we focused on the general aspects of intersubjective exchanges among students such as gestures of reciprocity, cooperation, work synchronicity, scaffoldings, management of the material environment, interaction with interfaces, the dimension of time and space of each rehearsal.

The observation began at the final stage of the project, during the rehearsals and adjustments of the virtual scenarios. This interdisciplinary project is held once a year, divided into stages, culminating in the presentation of the re-writing of plays, music, art or performance. The groups are evaluated from the following parameters: organization, punctuality, posture, creativity, and domain of content. The adaptation of the works aimed to identify sociological, historical, linguistic, scientific and technological aspects of the masterpiece in its cultural event. That is, on its transversal axis to stimulate reflection on citizenship, human rights, and sustainability. The learning objective were to provide an experience of collective work as an affirmative policy to promote autonomy and cooperation in school projects.

From our observations, we verified that the communicative space among students was fluid, allowing the speech exchanges, constructed, most of the time by visual form, gestures as referential language (such as indicating, showing, controlling the time, holding the floor), and chatting messages. That is, the common ground depending on the circumstances of the affordances and constraints of the materiality and conditions posed by the teachers. At the stage, the students' attention was required, as well as the activation of personal resources such as space-time orientation, multimodal coordination, memorization, social group coordination, decision, reasoning, improvisation, and so on. Mainly, the event

depended upon the synchronicity of the physical materials comprising several layers of images and scenes (animations, 3D figures, mixed sounds etc.). That is, the coordination of simultaneous actions among the participants and the synchronization of voices and movements at this stage. The social dimension is related to the meta-representational competence of the group and the ecological system meanings established in social interaction (Enyedy, 2005).

Image 2 shows a group of students performing the poem *The Rose of the People* using their own digital devices, that is, hybrid practices are emerging. According to the evaluators (teachers of different knowledge areas), the students should have a domain of the content as illustrated in this fragment.

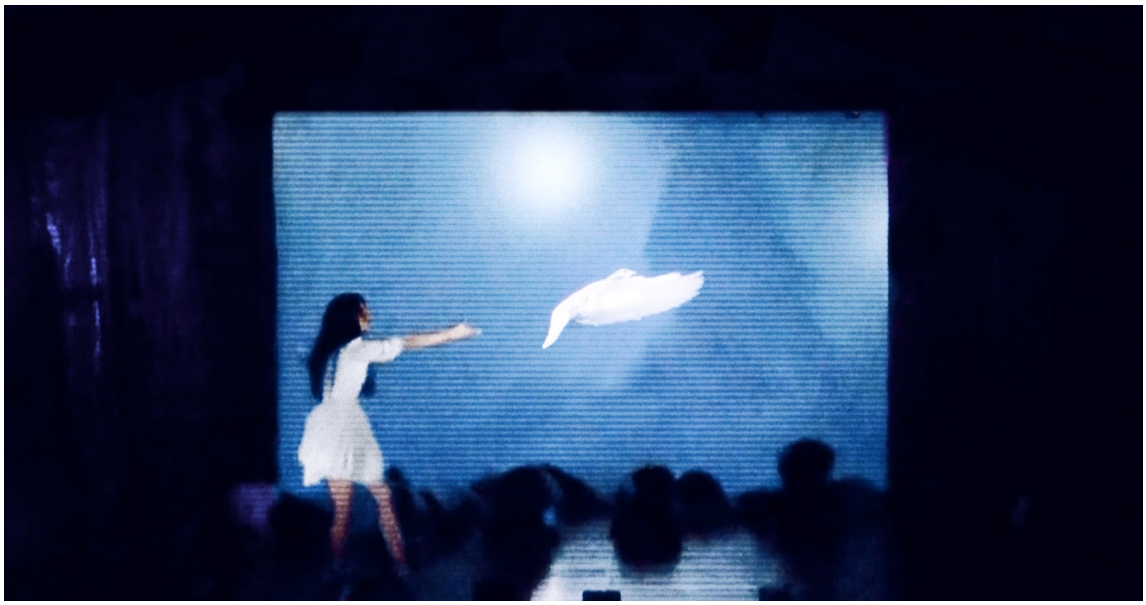
- First part – Oral test

[The student memorized the text] The poem Vision of 1944, was written by the Brazilian poet Carlos Drummond de Andrade and it is part of a modernist book The Rose of the People. The poem consists of 25 stanzas, 25 quartets, each verse is formed by an isometric white decasyllable. The poet does not make rhymes, alliterations or onomatopoeias. The poet begins each verse saying: my eyes are small to see. The poet wants to emphasize how the man is small in relation to post-war events. The poet uses comparison in the verse "countries mutilated like trunks"; metaphors in the verse "the coconut trees ripped and tumbled" and prosopopoeial in the verse "in each image that each one revives" [it continues for 03:58 minutes].

- Second part – The performance of the poem

The scene starts with a sequence of images on the Second World War (they mixed sounds and images of warplanes, Hiroshima bomb, destruction), the boys were wearing a military uniform to represent the violence committed by the soldiers. In this specific scene, some girls are lying on the stage, one to another gets up and pronounce one stanza of the poem. After that, the lights are turned out and the stage managers (students) project the white dove flying while the ballet dancer reproduces the same movements accompanied by a soft music. [total of 09:58 minutes].

Image 2. Scene at the Virtual Scenarios Project



In this context, collective activity is a tool to trigger the intersubjective process. That is, the student performance is assessed as part of a group and opens a space for cross-referencing, addressivity and responsiveness among the interlocutors (Bakhtin, 1981, 1986; Volosinov, 1929/1973). Besides that, they need to be cooperative to detect and correct errors and redefine strategies on the stage, which are important actions in the processes of regulation and self-regulation to achieve the aim. Thus, the structure of intersubjectivity incorporated into the ground of communication is more than a point of convergence. We can still consider the ability to observe-elaborate, when some idea is suggested for action, possibly activity-guided when a student gives instructions to his/her colleagues. The effects of collaborative solution can also be considered in relation to representations, such as peer interaction, scaffoldings and similar interests (Messer & Pine, 2000). In the same way, when the students' voices are mixed with the voice of the writer/poet, these processes became even more complex, that is, the students were able to "embody" the characters. In this sense, mixed voices, sounds from other decade, photographs, images are a kind of anchor that bring aspects of polyphony in a new type of textuality. As posited by Riva and Galimberti (2003, p. 13) "artifacts, in fact, connect us closely and organically with the physical environment that surrounds us and help to develop knowledge and the functions of knowledge".

Also, we noted that digital technology influenced the configuration of the collective effort, either by coordinating the actions of the protagonists with those providing technical support by the use of walkie-talkies and mobiles. As discussed by Ligorio et al. (2008) mediation by technology creates a space that reflects the activity and also the reciprocal production, in the sense of the expectation of what is necessary to know in the collaborative situation. It suggests that hybrid spaces for negotiation are being created in the transition of this school. The result allows us to sustain that the common sense of the same object – the theme of the play or poetry – gives them the framework to mediate the symbolic and material elements in that chronotope. As Kennedy and Kohan (2008) emphasized Aión designates intensity, power, duration. It is the time of the experience, making, immersion in a school context, where learning is motivated by personal and collective interests. Kairos is the time that opens the world to a transactional space of aesthetic experience.

This first phase of exploration indicated that there are several dimensions to study intersubjectivity considering the polyphonic texture/layers that are woven into the chronotope, also suggesting the division of responsibility, agenciality, and interdependency (Brown et al., 2005; Ligorio et al., 2005; Sullivan, 2011). For instance, we highlight the central categories that interest us in this study: intersubjectivity, distributed cognition, mediation by digital resources, production of knowledge, polyphonic dynamics and collaborative dynamics.

4.2 Study 2 – Results and discussion of the empirical study

In Study 2, we present the results and discussion of the data collected in the two collaborative activities – Task 1 and Task 2 –, eight sessions, two for each dyad. Also, episodic interviews, four sessions, one for each dyad. All sessions were recorded in audio and video and transcribed manually. We opted for the use of mixed methods and the approach of Grounded Theory from cultural psychology and dialogical perspective. With this focus, we were able to generate multifaceted data and subordinate the conditions of communication into the chronotope in which the corpora developed. In the first moment of the analysis, we used a qualitative-quantitative methodology to examined the data on Task 1 and Task 2. And from the longer transcript of the dyad that participated most in the tasks, we elaborated the codebook. We identified the categories and subcategories to construct the codebook. Which have been minimally organized, coded, exemplified and applied to log-linear analysis. In the

second stage, we apply the dialogical Thematic Analysis, which aims at all discursive productions as a single text, including the episodic interview, as a result of negotiations and convention of a field of meanings. The most recurrent meanings were used to construct a semantic map for each dyad. Thus, each map has its own trajectory and texture.

4.2.1 The qualitative-quantitative analysis

The longest excerpt of transcription was used to produce the codebook. Three different researchers, all of them fully aware of the research aims, examined the transcriptions through several cycles of reading, always searching for dynamics of intersubjectivity. This first version of the codebook was discussed with two other researchers. Therefore, a total of five researchers discussed the final version. The version emerging from this step was discussed among the researcher group and a 100% of agreement was reached in the assignment of the categories to the data, the final version of the codebook was comprised of five categories and 21 subcategories. A good balance between grounding them into the analysed data and considering the theoretical background discussed. Indeed, the categories take into account concepts and ideas emerging from the theoretical perspective adopted in the study and, at the same time, they are able to classify all the interactions we analysed. Materials posted in the web-forum, answers to other posts, images, and links were considered as supplementary data used to clarify face-to-face discussions. In the following table, we present the codebook with contextual references and excerpts taken from the transcripts.

Table 15. The Codebook

Category	Sub category	Examples
Category 1: Definition of space and/or time	1.a Physical Share objects; define the space (joint, avoid, support)	Students look at the same material Delimit the working space by visual contact
	1.b Digital Re-definition of digital space (to point on the laptop screen to define a location on platform: here, this, that, there, first, after, underneath etc.)	Agnes: *I think we put it here, on the topic, right?*
	1.c Semiotic References to tools not concretely there, semantically evoked	Agnes: Agnes: *Um, um. For example, if you need a laptop in class. You should use it just for visit sites and you can write your observations, notes such things.* Deca: *Like a course that:::* Agnes: *Besides this, access e-books, for example, so you don't need to bring books every day.*
Category 2: Levels of interaction	2.a Individual work	Silent individual reading
	2.b Synchronicity within the dyad. Convergence of individual work/thinking. Engage or open a conversation through which the individual thinking is disclosed to the partner and assumed as similar	Deca: *Yeah, we can limit the internet connection. Where I take a class course the access to the internet is limited, they block all sites, these things.* Agnes: *Um, um. It could be done. Yeah, we can block it. They will use technologies only in a specific situation.*
	2.c Interstice Turn-taking seems to complete each other thinking. It seems like thinking is formed within the space of dialogue	Agnes: *Because they cannot resist…* Deca: *The seduction of social networks and other things.*
	2.d Work in pairs One invites the other to start the activity. For instance, one dictates, and the other types. One reads while the other listens.	Deca: *There is a mistake here. Take it and put this: it makes the student lose contact with the teacher.*
	2.e Community synchronicity Attempt to synchronize with the larger group online	Deca: *Oh, everybody posted. So, we can answer. Maybe one? One or two?*

Category 3: Definition of the activity	3.a The value of the task Reasoning around how much valuable what they are doing is	Agnes: *Well, we do not need grades in Philosophy. Do you need them?* Deca: *No.* Agnes: *Because, if we miss a lesson…*
	3.b Interpretation of the tasks Negotiation of meaning about the task. Here the interpretation is at a tentative level	Agnes: *Yes, but she asked what we think about his position. Did you understand? About the use of devices, tablets and mobile phones in class.*
	3.c Definition of what to do Here the task is definitively interpreted and they take action	Deca: *Now, we write our opinion. We consider the expert is right in this moment.*
	3.d Anchoring to the material Clear reference to the material or the instruction given for the task	Agnes: *I thought, when we read for the first time, the students are bit immature by taking pictures of the teacher using mobiles only for joking. This kind of things, did you understand?*
	3.e Future perspective Projecting the outcomes for their activity in the future	Agnes: *Something like that:: in the future students can work and use technologies in a specific area or use in their profession. It will develop the country.*
Category 4: Tools/objects	4.a Instrumental use The focus is on understanding how the tool/object works	Agnes: *Yeah, is Ctrl? Command Crtl+C. Paste it using Command.*
	4.b "To think about" The focus is on what can be done with the tool/object	Deca: *You should open a new window on Moodle.*
	4.c "To think with" The action is relegated to the tool	Deca: *Do we really need to do this? What we said is already filmed; we don't need to do it again.*
	4.d Boundary between tool and thinking Actions where the technical focus is not distinguishable to the semiotic one	Agnes: *Immature. Can I write that?* Deca: *Yes. But before, put a dot.* Agnes: *A dot?* Deca: *A dot or a comma? Wait, we have to think how to continue this sentence.*

Category 5: Voicing and positioning	5.a Exotopic position Visualize the problem in a 'Third positon' (as viewer). For instance, they refer to Brazilian students as if they were not such	Agnes: *Yeah, Brazilian students are not prepared to use it. They don't know how to use it:: to allow it. They didn't have discipline in Brazil to use mobiles, tablets.* Deca: *Yeah, they need discipline.*
	5.b Appropriation of voices Bring the voice of the parents, teachers, other students, politicians etc., in the discourse.	Deca: *Yeah. We should decide what the teachers would say. Teacher can accept technologies in class, but too limited.* Agnes: *Okay, we accept it. Like this?* Deca: *Um, um.* Agnes: *We? (laughs) Oh, it's sound weird.*
	5.c Reciprocal appropriation of the position	Agnes: *He lives in United States, right (the American specialist cited). There, he uses this kind of thing. But, is a question of discipline. Because, they use it for the right thing, the right goal, isn't it?* Deca: *Yeah, they know how to use it.*
	5.d Discursive position The position take about the problem is built discursively and it results as a combination of various points of view	Deca: *Students and teachers can suggest some propositions, and send them to the Minister of Education, and he should take it to the President. If the President accepts the proposal, he will give directions to the Minister and he will apply them. Don't you think?*

We consider the construction of this codebook as the first result of our investigation. The categories we defined reveal the process of building intersubjectivity during the two types of problem-solving tasks we designed. Once the dimensions of intersubjectivity were defined, we applied the codebook to each dyad and each session with a twofold aim: a) understanding how these dimensions differ in the two tasks. To this aim, the frequencies of these categories at each task will be compared; b) understanding whether the performance is participants-dependent, in other words, whether dyads develop specific paths of interaction that are independent to the task. In sum, we are interested in understanding to what extent the dynamics of building intersubjectivity are sensitive to the task and/or to the dyads paths.

4.2.2 Statistical analysis: frequency tables and log-linear analysis

In other to exploit our aim, we first coded all the transcripts. The following tables report the frequencies linked to each task and compare the four dyads. Time to solve the task was unlimited.

Table 16. Frequencies for Task 1

	Dyad 1	Dyad 2	Dyad 3	Dyad 4
Category 1: Definition of space and/or time				
1a. Physical	67	36	27	29
2.b Digital	101	28	31	25
3.b Semiotic	54	1	12	26
Category 2: Levels of interaction				
2.a Individual work	11	25	7	0
2.b Synchronicity within the dyad	41	4	21	9
2.c Interstice	53	3	11	27
2.d Work in pairs	107	3	20	37
2.e Community synchronicity	49	8	8	28
Category 3: Definition of the activity				
3.a Value of the task	3	0	2	2
3.b Interpretation of the tasks	18	2	7	23
3.c Definition of what to do	26	10	8	7
3.d Anchoring to the material	17	5	7	4
3.e Future perspective	7	0	6	0
Category 4: Tools / object				
4.a Instrumental use	16	3	3	8
4.b “To think about”	22	7	2	4
4.c “To think with”	9	0	1	2
4.d Boundary between tool and object	38	0	11	15
Category 5: Voicing and positioning				

5.a Exotopic position	8	0	2	0
5.b Appropriation of others' positions/voice	8	0	0	4
5.c Reciprocal appropriation of the position	25	0	5	15
5.d Discursive position	62	0	9	32

Table 17. Frequencies for Task 2

	Dyad 1	Dyad 2	Dyad 3	Dyad 4
Category 1: Definition of space and/or time				
1a. Physical	20	23	36	3
2.b Digital	25	14	27	5
3.b Semiotic	26	1	19	1
Category 2: Levels of interaction				
2.a Individual work	5	9	2	4
2.b Synchronicity within the dyad	13	8	27	4
2.c Interstice	21	0	18	0
2.d Work in pairs	31	12	28	5
2.e Community synchronicity	1	1	2	0
Category 3: Definition of the activity				
3.a Value of the task	5	1	0	0
3.b Interpretation of the tasks	1	2	5	1
3.c Definition of what to do	6	8	9	0
3.d Anchoring to the material	3	1	6	1
3.e Future perspective	8	0	3	0
Category 4: Tools / object				
4.a Instrumental use	3	3	6	3
4.b "To think about"	5	7	2	1
4.c "To think with"	10	1	4	2
4.d Boundary between tool and object	11	0	9	1
Category 5: Voicing and positioning				

5.a Exotopic position	0	0	0	0
5.b Appropriation of others' positions/voice	0	0	0	0
5.c Reciprocal appropriation of the position	2	0	4	3
5.d Discursive position	15	2	18	4

One basic method to analyse this tables is via cross tabulation. The recorded frequencies could be summarized in a multi-way frequency table, that is, a cross-tabulation table with two or more factors. Subsequently, we applied a log-linear analysis that generalized Chi-square principles. The term log-linear implies that, through logarithmic transformations, multi-way frequency tables can be treated as in a classical Analysis of Variance. Moreover, this type of analysis can be used to evaluate how data fit specific models, reflecting different explanation hypotheses. According to explorative approach and Grounded Theory precepts, the present study verified independent, interaction and mixed models. The significance of the analysis was approached through Pearson Chi-square statistic, and the maximum likelihood ratio Chi-square statistic (Fisher 1922; Neyman & Pearson 1931). Both tests evaluate whether the expected frequencies under the intended model are significantly different from those observed. Another advantage of this approach is that the significance values of hierarchical models can be directly compared in order to select the one fitting better to the data (two models are hierarchically associated with each other if one can be obtained from the other by adding/deleting variables). The aim of our analysis is to determine the most parsimonious model (i.e. with the least number of effects/interactions) to satisfactorily explain the data collected.

4.2.2.1 Results

Three independent variables were considered: Dyad (4 levels) x Task (2 levels) x Category (3-5 levels depending on the considered category). Since we have five Categories, the log-linear analysis was repeated five times. First, we analysed the general models according to the kind of effect included: only principal effects, only two-way interactions and three-way interaction (see Table 18).

Table 18. Degree of Freedom (Df), Maximum Likelihood (M-L) Chi^2 and the related p for each category and type of statistical effect. Pearson Chi^2 values were omitted since they were largely overlapped to those of M-L Chi Square.

	Df	M-L Chi2	p
Category 1			
Principal Effects	6	275.1	<0.001
Two-way interactions	11	117.4	<0.001
Three-way interactions	6	5.2	n.s.
Category 2			
Principal Effects	8	454.6	<0.001
Two-way interactions	19	225.2	<0.001
Three-way interactions	12	42.7	<0.001
Category 3			
Principal Effects	6	73.8	<0.001
Two-way interactions	11	50.1	<0.001
Three-way interactions	6	3.7	n.s.
Category 4			
Principal Effects	6	110.1	<0.001
Two-way interactions	11	49.8	<0.001
Three-way interactions	6	2.9	n.s.
Category 5			
Principal Effects	5	213.3	<0.001
Two-way interactions	7	36.5	<0.001
Three-way interactions	3	2.3	n.s.

Table 18 suggests that in all the categories, with the only exception of Category 2, the three-way interaction was not significant. Consequently, a more parsimonious model than the saturated one can be explored in four out of five categories (saturated model has the maximum number of parameters; therefore, it is the least parsimonious at all). According to the hierarchical analysis of log-linear models (see Table 19) better explaining models (i.e. not

significant with respect to the saturated one) were the so-called conditional independence for Category 1, 3, and 4.

Table 19. Degree of Freedom (Df), Maximum Likelihood (M-L) Chi^2 and the related p for each best (more parsimonious) model in each analysis.

	Df	M-L Chi^2	P
Category 1			
12, 13	8	9.3	n.s.
Category 2			
123	Saturated model		
Category 3			
12, 13	8	5.1	n.s.
Category 4			
12, 13	8	3.6	n.s.
Category 5			
12, 3	5	3.2	n.s.

The significance is obtained comparing the intended models with the saturated one. Pearson Chi^2 values were omitted since they were largely overlapped to those of M-L Chi^2. 1: couple, 2: task, 3: subcategory; how to decode numbers: e.g. the meaning of "12" is "interaction between couple and task", that of "3" is "principal effect of subcategory". In other words, dyads interacted both with tasks and categories; however, the latter ones were independent. The best model for Category 5 was independence of one factor. Indeed, dyads interacted with the task but this category was independent. Finally, Category 2 cannot be reduced and the best model remained the saturated one. The interpretation of standardized residuals was the last step of the statistical analysis. Tables 20 and 21 reported, respectively, standardized residuals for the interactions dyads and tasks, and dyads and categories.

Table 20. Standardized residuals for the interaction Dyad and Task, for each category. Significant values (in bold) to be interpreted are those positive, higher than 2. Values for Category 5 were omitted because the interaction was not significant.

	Dyads			
Category 1: Definition of space or Chronotope analysis	1	2	3	4
Task 1	1,5	-0,7	-3,4	**2,4**
Task 2	-2,2	1	**5**	-3,6
Category 2: Level of interaction				
Task 1	1,6	-1,2	-3,5	**2,2**
Task 2	-2,5	2	**5,5**	-3,5
Category 3: Definition of the activity				
Task 1	0,4	-0,8	-1,3	1,7
Task 2	-0,7	1,4	**2,1**	-2,7
Category 4: Tools / object				
Task 1	0,9	-1,1	-1,7	1
Task 2	-1,3	1,6	**2,5**	-1,4
Category 5: Voicing and positioning				
Task 1	-	-	-	-
Task 2	-	-	-	-

Table 21. Standardized residuals for the interaction Couple and Subcategory of each Category. Significant values (in bold) are those positive and higher than 2. Values for several Subcategories were omitted because excluded by the analysis

	Dyads			
Category 1: Definition of space or Chronotope analysis	1	2	3	4
1a. Physical	-2,3	**3,2**	0,7	-0,3
2.b Digital	0,8	0,1	-0,4	-1
3.b Semiotics	**1,9**	-4,3	-0,4	1,7
Category 2: Level of interaction				

2.a Individual work	-2,8	**10,3**	-1,3	-2,1
2.b Synchronicity of individual work, and convergence	-1,2	-0,5	**3,9**	-1,9
2.c Interstice	0,9	-3	0	0,9
2.d Work in pairs	1,5	-2,3	-0,7	0
2.e Synchronicity with other students	0,2	-0,5	-2,4	**2,8**
Category 3: Definition of the activity				
3.a Value of the task	-	-	-	-
3.b Interpretation of the tasks/posts	-1	-1,7	-0,5	**3,5**
3.c Definition of what they should do	0,4	**1,8**	-0,1	-2,1
3.d Anchoring to the educational material	0,6	-0,4	0,8	-1,3
3.e Prospective situation / projection	-	-	-	-
Category 4: Tools / object				
4.a Instrumental use	-1	0,4	0,3	1,1
4.b Tools / object “to think about”	0,1	**3,6**	-1,7	-1,3
4.c Tools / object “to use for think with”	-	-	-	-
4.d Boundary between tool and object	0,6	-3,1	1,1	0,2
Category 5: Voicing and positioning				
5.a Exotopic position	-	-	-	-
5.b Appropriation of voice	-	-	-	-
5.c Reciprocal appropriation of the position	-0,3	-0,7	-0,3	0,8
5.d Discursive Position	0,2	0,5	0,2	-0,5

According to the principle which imposes to interpret as significant standardized residuals positive is significantly higher than 2 in absolute value (e.g. Gnisci & Bakeman 2000), our data suggested that each dyad was characterized by a specific profile of interaction. In particular, dyad 3 showed to the adoption of a large number of events of frequency for each category (5, 5.5, 2.1 and 2.5, respectively), higher in task 2 than in task 1 (-3.4, -3.5, -1.3, -1.7, respectively). On the contrary, dyad 4 used more often Category 1 and 2 in task 1 (2.4, 2.2 respectively) than in task 2 (-3.6, -3.5, respectively). Dyads 1 and 2 did not show any difference in the distribution of categories in task 1 and 2; in other words, they

showed a stable use of categories across task 1 and 2 (see Table 19). Moreover, dyad 2 seemed to be characterized by (a) a larger use of physical references in category 1 (stand. Res. 3.2) than the other subcategories, (b) a very larger amount of individual work in category 2 (stand. Res. 10.3) with respect to the other subcategories, and (c) a larger use of references to tools / objects "to think about" in category 4 with respect to the other subcategories. Dyad 4 was featured by synchronicity with other students of Category 2 (Stand. Res. 2.8) and interpretation of tasks/posts in Category 3 (Stand. Res. 3.5). Dyad 3 was marked by the synchronicity of individual work, and convergence (Stand. Res. 3.9), while dyad 1 did not show any preference for subcategories. Finally, in Category 5 the frequency of discursive position seemed globally more represented than the other subcategory (Reciprocal appropriation of the position). Overall, the dyads' style of interaction depends on both their specific paths and on the type of task.

4.2.2.2 Discussion of the frequencies

Once the dimensions of intersubjectivity were defined, we applied the codebook for each dyad and each session with a double-fold aim: a) understanding how these dimensions differ in the two tasks and b) understanding whether the performance is participants-dependent. In other words, whether dyads develop specific paths of interaction that are independent to the task. In sum, we are interested in understanding to which extend the dynamics of building intersubjectivity are sensitive to the task and/or to the dyads paths.

Our results indicate that both nature of the task and dyads make an impact on the intersubjective processes. Task 1 – strictly related to a real situation that students face every day in the classroom – triggers higher frequencies of all the categories (1.204 in total versus 519 in task 2), with the exception of beside Category 5 (Voicing and positioning). This specific category records a discrete frequency for dyad 1 on task 1, but in general, it is not so frequent. This could be due to the short-term task. A situation where students will be required to discuss for a longer time and they may need to go back to the task several times could better support the dialogical process of voicing positioning.

Similarly, each dyad reacted in a specific way to the tasks. For instance, dyad 1 and 2 showed to approach the tasks reporting similar categories' frequencies; whereas dyad 3 concentrated its intersubjective activity during task 2; dyad 4, instead, concentrated its

activity during task 1. This could be due to many factors hard to predict in advance, such as how much they already were used to work with each other or the type of tuning the two students forming the dyad had.

It may also be inferred that dyads in task 1 tended to concentrate intersubjective activity in the initial phase of the session; whereas in task 2 members of dyad preferred to work independently, once the rules of interaction are defined. In other case, members of dyads tended to show a longer latency in defining intersubjective rules with few shared works in the first task and a clear increase in intersubjective activity after having "broken the ice". In any case, each dyad establishes a specific way of seeking intersubjectivity that features the dyad and, at the same time, it is flexibly adapted to the task.

Results suggest that task 1 is able to trigger richer intersubjective processes and this effect is stronger in dyad 1. Indeed, there is a systematic difference in the trends for each dyad. For instance, dyad 1 (833 frequencies in total versus 226 dyad 2, 387 dyad 3 and 276 dyad 4) is always very productive, with a pick of frequency in task 1 (639) than in task 2 (194). This may suggest that each specific dyad interaction may generate peculiar intersubjective processes.

The design of each task was different, but its core has the same issue – the use of digital technologies at school. The content of Task 1 was connected to the daily lives of the students, this may emerge interest and motivation. Task 2 referred to a prospective question in which each dyad should choose one or more profiles to create the School of the Future in 20 years. This requires producing knowledge from their own personal experience and expectation in collaboration, work with hypothetical situations and future scenarios that require a higher level of abstraction, thus it was more complex.

The results obtained from log-linear analysis contributed to understand the dimensions of the two tasks and to see how specific paths of interaction are sensitive to the task and/or to the dyads paths. In addition, the codebook became a tool for visualizing the elements that express the construction and maintenance of the intersubjectivity and for mapping the chronotope. For example, Category 1 – 1.a Physical space or Category 4 – 1.a Instrumental use, demand actions on a level of significance related to the recognition and organization of collaborative space, the conceptual stability of the semiotic and material resources (frames, contextual situation, representations of the material world etc.). Category 3 – 3.c Definition of what to do and 3.d Anchoring to the material refers to the initial

involvement on the activity, it requires processes of generalization of the object, a kind of conceptual acknowledgement, attempt to situate the theme in the activity. Also, distribution of roles, activation of previous knowledge, establishment of rules and early processes of socialization. All of them are aspects of collaboration that will influence to building intersubjectivity.

Disagreement, oppositions, coalitions or divergent positions in collaborative activities are interpreted as developmental potentials in intersubjective dynamics, since they have enabled the argumentative and critical capacity. Positions work as mediators in the discursive interplay of meaning production, such as exotopic position, appropriation of other voices, reciprocal appropriation of position and discursive position, which allow the awareness of the Self (I), Other (Alter), the socio-cultural dimension (We, other voices), and the object (or Otherness) (Linell, 2009).

In the formation of communicative ground to achieve the goals, the interlocutors may activate internal processes such as memory, decision, making, meta-representation, metalanguage, logical reasoning, hypothesis, creation, spatial-temporal ordering of actions and discourses, which generates high levels of self-awareness. Category 5 – 5.a Exotopic Position, for example, requires more complex levels of abstraction and cognitive efforts go thought from one concept to another. As well as the subjects connect with social and cultural elements in two dimensions: individual and collective. As Stahl (2006) postulates it works on the foundation of the group cognition and coordination of actions in the space-time of communicative activity and also in the maintenance of intersubjectivity. In this way, the subcategories that involving goal-oriented strategies reach more depth intersubjective levels. In addition, the representation between peers and the attunement of reflexive and metacognitive abilities activate the construction of meaning and signification to produce novelty and original knowledge (Enyedy, Danish & DeLiema, 2015; Ligorio et al., 2005; Ligorio et al., 2008; Pifarré & Staarman, 2011; Rojas-Drummond et. al, 2008).

The second phase of Study 2 also involved the application of the dialogical Thematic Analysis in the discourses, thus the semantic maps add more information to the results obtained in the frequencies. We aimed with the maps the specific objectives: a) to identify the expressions or terms generating alternation of positioning among the dyads, and b) identify in the discourses the meanings built in collaboration about the theme – the use of digital technologies in the classroom.

4.3 Dialogical Thematic Analysis

In this section, we analyse the discourse produced by the dyads from the perspective of the dialogical Thematic Analysis, seeking to advance our understanding of the dynamics of intersubjectivity and processes that involve collaboration in problem-solving via face-to-face and web-forum interaction. We focused on the social space of negotiation and meanings construction by each dyad. In this way, we apply to the discourse a methodology that involves "overlapping the voices on the horizontal plane that developed entities by itself. Even when the voices are independent, they touch other voices giving rise to new utterances composed by harmonics and dissonances" (Barbato-Bloch 1997, p. 62). Also, new discursive formations and significations emerge in its juxtaposition, on the vertical plane. Thus, communication as dialogue evolves overlapping singular voices that touch each other while are recognized by the interlocutors and incite harmonic, dissonances, fugues, and stabilizations in the signal space (Barbato-Bloch, 1997). Our findings suggest that the discourse of each dyad has its own trajectory and texture, which were summarized on the semantic maps, as meanings concretized on the chronotope. The results stem from Task 1 and Task 2 totaled eight sessions, and the episodic interviews totaling four sessions (265 minutes of recording).

We drew on the thematic analysis proposed by Ryan and Bernard (2003) and Braun and Clarke (2006), whose methodology is the identification of broader terms, concepts, and themes that are verbally expressed during speech. Sometimes, the dyads did not speak aloud, so we used the results of the forum. The themes grounded on the chronotope of the collection, as ontological processes in a psychosocial interaction. The methodology seeks the level of comprehension with regard to properties of the categories of words, connections, discursive marks and paralinguistic elements in the transcription (Braun & Clarke, 2006). Similarly, we note flexibility in the organization, since the phases of the collection are intrinsically dependent as a cohesive whole concretized by situated meanings. Implicit elements such as personal, temporal, spatial marks, convention, modalisation, evaluative marks, are also important indicators of this type of analysis. In addition, verbalisation is essential when the interlocutors are interacting (Ericsson, 2006). Also, the contextual elements on tools-mediated actions are anchors to observe the transformation of the shared-object along the space-time of the activity. The methodology consisted of several readings of the transcriptions, first, horizontally, following the chronological order of the discourse, which was summarized and interpreted from their thematic significance, in which the

production of meanings results in a cohesive whole (Barbato, Mieto & Rosa, 2016). The same procedure was performed for Task 2 and for the episodic interview. The episodic interview has given us a broader dimension of how the dyads have re-contextualized their production. We point out here that the interview script was constructed from the products of task 1 and task 2. For this discussion, we present semantic maps constructed from the most recurrent terms or phrases that were continually reiterated during the negotiations and which we consider most representative to illustrate this analysis. Data collection and procedures for data processing as described in Chapter 3, were use the same for all dyads.

4.3.1 Result and discussion

In this section, we present the semantic maps generated from the dialogical and pragmatic analyses of the discourse, accompanied by the description and discussion, focusing on how each dyad negotiated and produced meanings, and considering the central categories for this study, being: a) intersubjectivity, b) distributed cognition, c) mediation by web-forum in the production of knowledge, d) polyphonic dynamics, e) dynamics in collaboration.

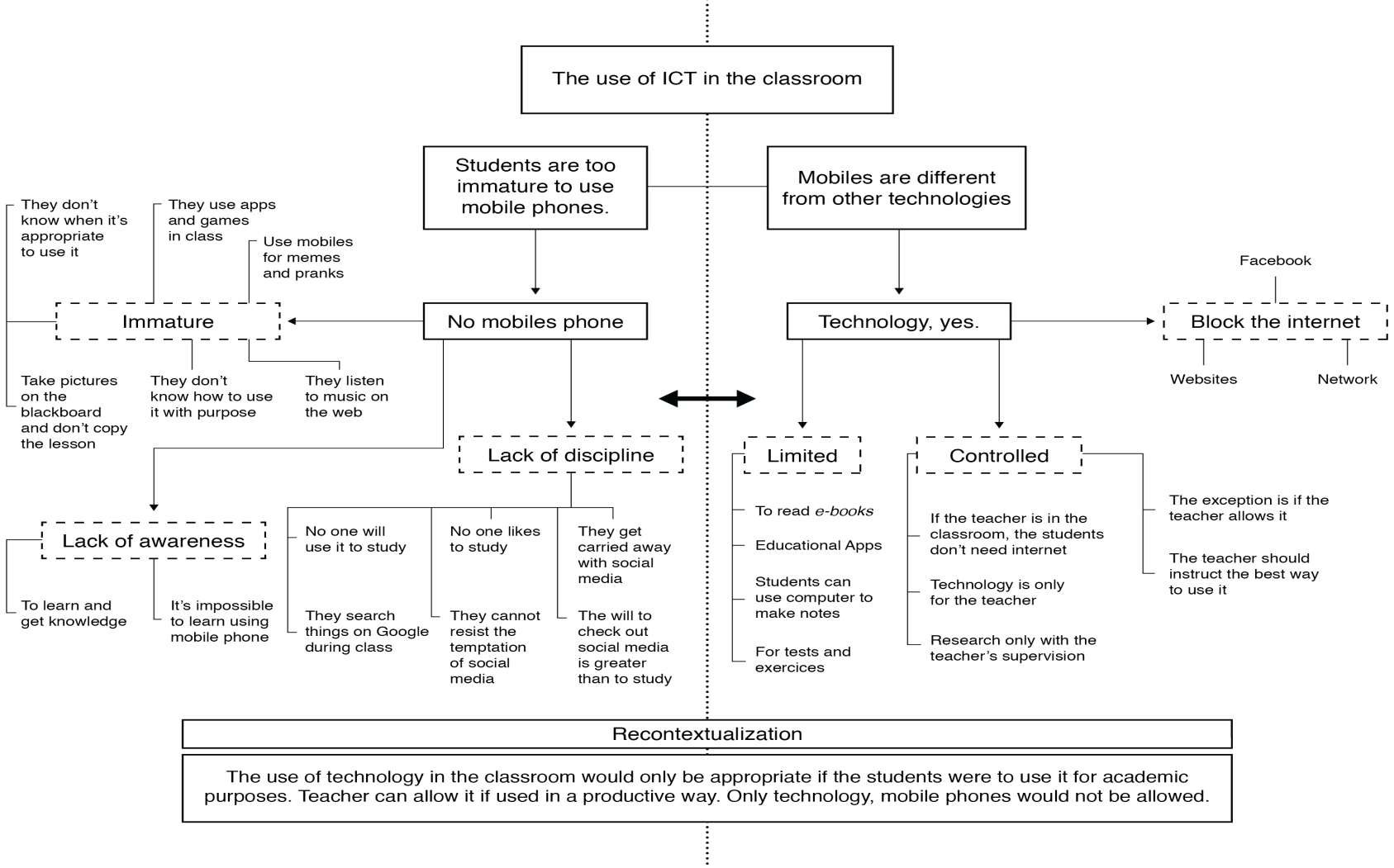
4.3.1.1 Dyad 1 – Agnes and Deca

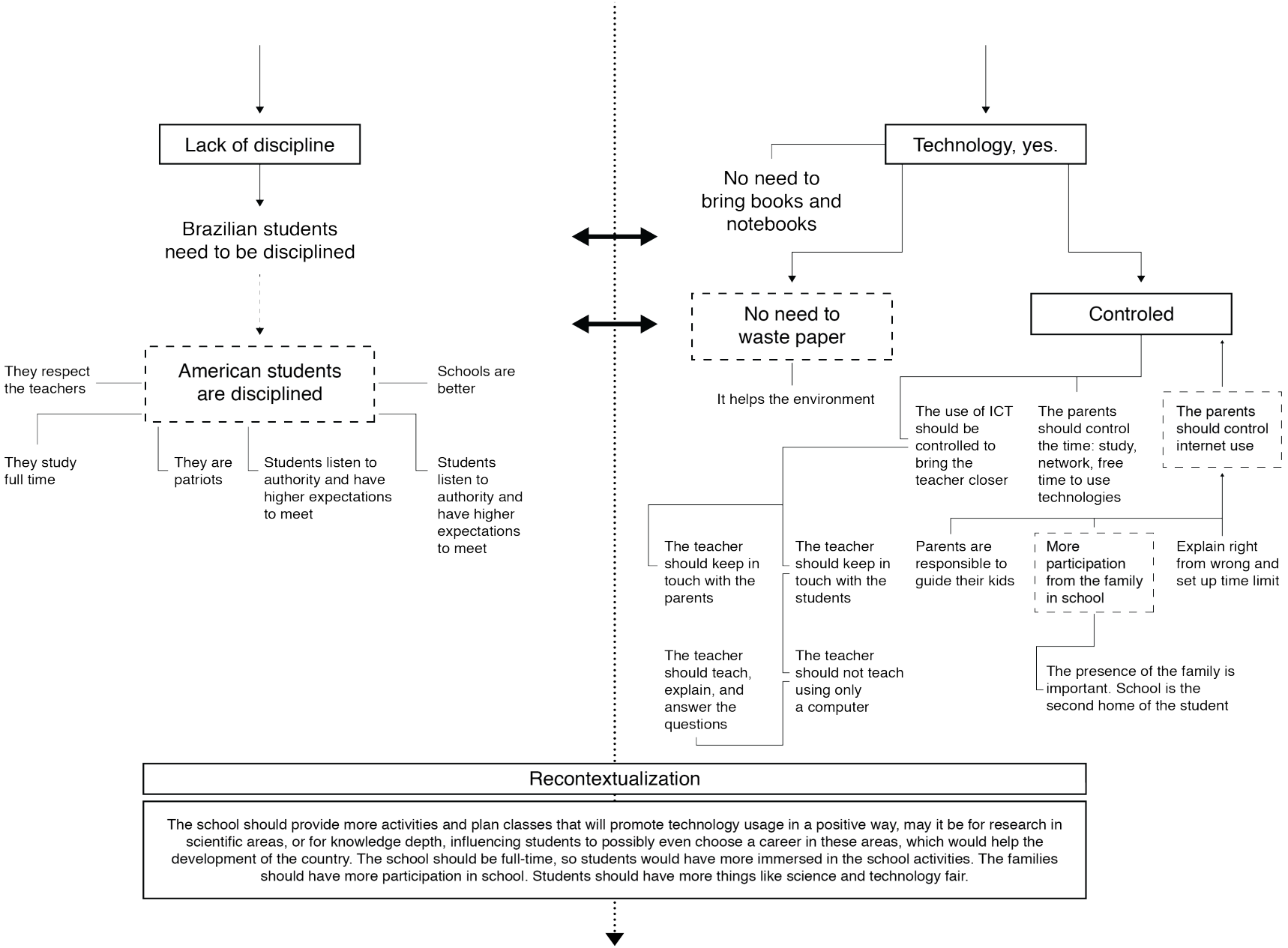
The communication of this dyad was categorised by discursive positioning and reciprocal appropriation of position, indicating that there was a negotiation to reach a consensus. The roles assigned or assumed by this dyad involved alternation of turn-taking and collaborative dynamics. The interlocutors reacted to the unpredictability of the context seeking to establish rules and standards of self-regulation, so the intersubjective dimension moved along on various levels of understanding and reciprocity, as shown in Tables 16 and 17. Their production comprises 579 turns, some in simple agreement, others more elaborate.

The intersubjective dynamic in this dyad was characterized by cognitive interdependence in the production of original content, mutual influence, cognitive distribution, intermodal coordination and greater convergence of ideas on the shared-object. Also observed were the exchanges of personal experiences and polyphonic dynamics, allowing more activation of personal resources, being constituents of affectivity and/or empathy. Agnes and Deca formed the dyad who most worked collaboratively, they systematically followed the statement in the two tasks, as shown by the results of the

frequencies. The processes of identification were fundamental during the resolution of the tasks, while being responsive to the elaboration of a joint response. To clarify our arguments, we present the semantic map of this dyad, which represents the meanings attributed to the use of digital technologies in the classroom. As we showed in the methodology, the discourses produced by the dyads were set on paper A3, in two columns, for example, one for Deca other for Agnes, following the chronological order of the approximation of the speeches. Then, the horizontal reading was made to describe the discursive triggering, negotiation, repetition, communicative breaks, changes, appreciation, argumentation etc., which enabled the verification of individual and shared meanings. Equally, we followed the same procedures with Task 2 and the episodic interview. At the end, we performed a vertical reading, placing Tasks 1 and 2 and the episodic interview side by side to check the elements of intertextuality. In the rectangles are the initial propositions in which opposing structures are, at the same time, inclusive within the semantic space. Here, propositions are broader and more abstract. For instance, we present the whole scheme to analyse their production. In the rectangular figures are the themes that refer to the most recurrent terms (or similar terms) that remain and/or are emphasized throughout the discourse. It can be observed both in the horizontal reading of the data and in the vertical reading, with a certain sense, that is when the statement is repeated literally or by semantic approximation into the semiotic field. The sub-themes (rheme) were anchored on the themes, and they may develop or not. Thus, when they become a theme we marked them with dots to differentiate. For example, the themes “lack of discipline” and “lack of awareness”, in the beginning of the analysis was a sub-theme, but new meanings were added in this domain as a theme in formation that may expand or retreat (in the dotted rectangles). The meanings anchored in the themes are indicated by connectors and may indicate expansion or not. At the end of each activity, we select a speech fragment of the participant discourse named here as re-contextualization.

Figure 5. Semantic Map – Agnes and Deca




Lack of discipline
Brazilian students need to be disciplined
American students are disciplined
They respect the teachers
They study full time
They are patriots
Students listen to authority and have higher expectations to meet
Schools are better
Students listen to authority and have higher expectations to meet
Technology, yes.
No need to bring books and notebooks
No need to waste paper
It helps the environment
Controled
The use of ICT should be controlled to bring the teacher closer
The parents should control the time: study, network, free time to use technologies
The parents should control internet use
The teacher should keep in touch with the parents
The teacher should keep in touch with the students
Parents are responsible to guide their kids
More participation from the family in school
Explain right from wrong and set up time limit
The teacher should teach, explain, and answer the questions
The teacher should not teach using only a computer
The presence of the family is important. School is the second home of the student
Recontextualization
The school should provide more activities and plan classes that will promote technology usage in a positive way, may it be for research in scientific areas, or for knowledge depth, influencing students to possibly even choose a career in these areas, which would help the development of the country. The school should be full-time, so students would have more immersed in the school activities. The families should have more participation in school. Students should have more things like science and technology fair.

For the analysis we have applied a simple format to the episodes focusing on the development of the turn-taking and the production of the meanings (Baron, 2000; Littleton & Mercer, 2009).

In the first forum, Agnes and Deca read the two reports and answered the questions following each instruction. Agnes presented more discursive positions, and also was open to the contributions and reformulations. Every time, before typing, Agnes asked of her peer, "Can I put it in?", "Do you agree?", "How do we put this?", in an attempt to synchronize and achieve convergence of work. Similarly, Deca was attentive to grammatical revision. She always noted details, saying "Take it and put a dot", "You need to erase it", "You write it without 's'". Also, she showed her colleague many keyboard shortcuts, being an indicator of forms interacting with codes. This outcome shows that dynamics in collaboration produces a diversity of scaffoldings such as the ability to observe-elaborate, to guide activity, in meta-discursive competence, in space-time orientation. The following excerpt illustrates this kind of scaffolding in turns 62, 63, and 64. As we have pointed previously in section 1.2, boundaries between tool, objects, and forms of thinking are also constituents that shape the intersubjective phenomena. Positioning in the dynamics also works as a tool to establish the semantic space into the chronotope as shown in the episode below.

Episode 1

49. Agnes: So, I thought, when we read for the first time, the students are a bit immature by taking pictures of the teacher using mobiles only for joking. This kind of things, did you understand?
50. Deca: They don't know how to use it for study, do they?
51. Agnes: They don't know how to use it at the right time, moment, and finality, no? Such as mobile, apps. I felt they are bit immature.
52. Deca: Ahm. Apps are not necessary, are not necessary.
53. Agnes: Um, um.
54. Deca: We don't need mobiles in class. Only in case of change. Change a laptop for a copybook, for example. However, it's not necessary.
53. Agnes: Um, um. (laughs)
54. Deca: Let's start. Do we write, yeah? Just record?
55. Agnes: Yeah. (laughs)
56. Deca: Is immature the position of the students.
57. Agnes: (whisper while type) Is immature the position of students, "Bro".
58. Deca: (dictates) For the use of technologies.
59. Agnes: We should analyse the use of technologies, right?
60. Deca: Immature. You can write immature.
61. Agnes: Immature. Can I write that?
62. Deca: Yes. But before, put a dot.
63. Agnes: A dot?
64. Deca: A dot or a comma? Wait, we have to think how to continue this sentence.

65. Agnes: Hang on! Because it is in their relationship to the use of such device as mobile. For such device, they are immature.
66. Deca: Okay, so put it.
67. Agnes: Because they need discipline for use it at the right moment, for the right thing. Do you agree?
68. Deca: Yes.
69: Agnes: Because they need to learn, but they don't. They don't know "Bro!"

At the beginning of this sequence, Agnes visualizes the problem in a 'third positon' (as a viewer) an omniscient observer who is outside the discourse and, at the same time, taking part in it (Bakhtin, 1986, 2010c). In turns 49, 57, and 61 she takes a discursive positioning bringing arguments to orient her peer to the appropriation of the reciprocal positioning. While Agnes explains, Deca listens and shakes her head affirmatively. In turns 56 and 60, Deca states that (Brazilian) students are immature, that is, the reinsertion of the first shared-meaning "immature" that opens many possibilities into the process of the emergence of conventionalized signs (Abbey & Valsiner, 2005). As illustrated above, Agnes makes the proposition (theme) (turn 49) and Deca confirms (turn 51) if they are talking about the same thing. Agnes reaffirms and justifies "They don't know how to use it at the right time, moment, and finality" (turn 50), that is, they mark their positions in the intersubjective space. Turn 56, indicates the reciprocal appropriation of position, Deca agrees and emphasizes (turn 60). In turn 67, there is an opening in the conceptual space, Agnes reinforces her position and asks "Do you agree?". Deca shakes her head affirmatively and Agnes justifies "they need to learn how to use it" (in turn 69). The data suggest joint attention and shared-responsibility to solve the problem. The girls also gave examples and opinions to balance the difference between technologies vs. mobiles phones. Mobiles are related to leisure, fun, distraction, games, music, friends, and social media. Technologies are necessary only for the teacher.

Accordingly, Agnes suggests "the use of technologies should be controlled, and an educational app should be created", many possibilities were brought to delimit a field of meaning around the idea that Brazilian students are not prepared to use mobiles because "is missing a lack discipline" or "they don't have discipline", and so on. They tried to find a solution for control, limit, and block the access on the internet. For instance, the focus can be done on polyphonic dynamics in the points of tension by personal and social projective contextualization. It also implies a quadrilateral relationship between the Self (I/Ego), the other (You/Alter), the sociocultural dimension (We/other voices), and the object (the use of digital technology in the classroom). It gives them a sense of order to concretize the

meanings in the chronotope. In the following fragment, the girls discuss what teachers can do as proposed in the statement of the task 1.

Episode 2

110. Agnes: (reading) [If you were on the position of the teachers, co-ordinator, Head-teacher of Park Gávea School, what solution will you do?]. Why? About the use of technology. Oh, Okay. What? The position of the use ahm::: what solution we'll take if we were on the position of the teachers. Well::: the use of technology could be allowed, for example, using educational apps. Something like that.
111. Deca: Um, um.
112. Agnes: It could be:::
113. Deca: Something that helps:::
114. Agnes: Um, um. For example, if you need a laptop in class. You should use it just for visit sites and you can write your observations, notes such things.
115. Deca: Like a course that:::
116. Agnes: Besides this, access e-books, for example, so you don't need to bring books every day.
117. Deca: Yeah, books.
118: Agnes: Such these things. For environmental problem. Because in this case you won't need paper. You need only:::
119: Deca. Um, um. Yeah. We won't need paper, copybook, books, anything.
120: Agnes: For these things. Did you understand? Also, for the school test, right? If we use a laptop, we do not have a test at school. Something like that and it will be allowed in a very controlled manner.
121. Deca: Um, um.
122. Agnes: Something that student would like, right? Something that keeps his attention, that makes he wants do only this. Did you understand?
123. Deca: Um, um.
124. Agnes: Not only for use the internet, only internet. Do you want internet for search what? It's only for:::
125. Deca: Yeah, we can limit the internet connection. Where I take a class course the access to the internet is limited, they block all sites, these things.
126. Agnes: Um, um. It could be done. Yeah, we can block it. They will use technologies only in a specific situation.
127. Deca: I'm sure, they'll use for Facebook. Besides is not necessary make a search in class, at school.
128. Agnes: For sure they'll access Facebook.
129. Deca: Um, um. Even with sources like books.
130. Agnes: It's three, no? How do we write it?
131. Deca: Ahm. We should decide what the teachers can do.
132. Agnes: What? Oh, yes.
133. Deca: Yeah. We should decide what the teachers would say. Teacher can accept technologies in class, but too limited.
134. Agnes: Okay, we accept it. Like this?
135. Deca: Um, um.
136. Agnes: We? (laughs) Oh, it's sound weird.

At this point, the girls are attempting to create a solution for the position of the teacher, students, coordinator or Head-teacher. We expected with this type of question to open possibilities on voicing and positioning. The discursive position is shown in turns 110, 114, 118, 125 and 126. Also in turns 131 and 133, Deca assumes the position of the teacher. For instance, the results indicate complexity in exchanges of reasoning that involves perception, imagination, planning, coherent representation, conceptual thinking. In turn 125, Deca includes a previous experience and some factual information "Where I take a class course the access to internet is limited". It suggests agreement and convergence of ideas, as well a previous experience that may reinforce their choices. For the girls, "technologies can be allowed" such as "an educational app", "to visit sites", "to write notes on laptop", "access e-books", "don't bring books". That is, Agnes and Deca are searching for more descriptive levels to limit, control and block sites, Facebook, networks, and internet. Here, the intersubjective processes are maintained by critical observations in progress through the transition of representational thinking, such as generalization and abstraction (Brown et al., 2005; Edwards, 2005; Ford, 2012; Papadopoulos & Iatridou, 2010). This type of engagement opens the possibility of moving from one position to another and being positioned (Davies & Harré, 1990; Harré & van Langenhove, 1999). The other positions function as mediators in the interplay to produce interwoven meanings by polyphony. These are quite complex, since these involve closeness between the Self (I), We and the other (teachers, Head-teacher, coordinator, specialist) in the appreciation of the problem and being in the place of the others. This type of engagement to think, "What teachers can do" gives them an extra perspective and intuitive explanation on the shared-object. In short, "meaning arises as a consequence of choices" in situ (Jewitt et al., 2012, p. 268) as a social semiotic approach of language. As shown on the map, the principal anchors are "No mobile phones" and "Digital technologies, yes" (computer, tablet, and educational app). The data suggests great convergence, as well the category interstice that here is understood as a maximum level of intersubjectivity process. That is, the interlocutors are completely immersed into the activity, it seems to include each other's thinking. The findings also indicate that subordinate questions include the use of metalanguage for synthesis, and the reintegration of their own production.

Examples of moral context also emerged in this dyad, it was revealed by self-reflection, comparisons, critical comments, interventions (turn 118 and 119). Values and beliefs also emerge on the centered-teacher position, for example, "only the teacher can use technologies in class". The outcomes indicated that mediation by web-forum broadens the

possibilities of reflection on what this dyad was producing in association with their colleagues' production. In the following episode, the girls were approaching their colleagues' post, by discussing what is better for schools: rules or prohibition.

Episode 3

344. Deca: This is the part that we disagree with. It was about the school review its rules. Put a dot. We disagree about the part that school should review its rules. So, put a dot after this. The school doesn't need to allow it now but one day they will. They don't need to allow the use of technology in class now. Not yet. Just mobiles, Okay? They can allow another kind of technology. We have to use it anyway. I'm referring just about mobile in class.
345. Agnes: Um, um. What did you think? The school should review its rules, isn't?
346. Deca: No, no. The school doesn't need to allow mobiles in class. Write mobile. Just it!
347. Agnes: (re-reading the post) [The school must consider the possibility of allowing students to use a mobile phone in class productively]. We fully agree. We agree. Ahm. a comma here.
348. Deca: Just put it. It's enough. We don't need to discuss it.

In the fragment above, the mediation by web-forum strongly influenced the maintenance of intersubjectivity. Turns 334, 345, and 346 illustrate the collaborative efforts to reintegrate and reinsert the meanings built in collaboration, which legitimises their knowledge. In turn 344, Deca disagreed with the response of another dyad, thus it becomes an instrument for sustaining intersubjectivity within the community. Opposite viewpoints, exchanges comments, comparisons, misunderstandings, produce complex levels of reasoning. Also, evaluation and critics may lead to innovation and new categories of thinking. Agnes repeats the central point of the post that they are replaying; "The school should review its rules, shouldn't it?" (turn 345), and Deca seems to orient Agnes that prohibition of mobile phones at school is better than rules in turn 346. Thus, the web-forum had an impact on the production of knowledge, allowing the dyad to confront their production, with attention to: a) the posts as a result of the distributed cognition on the same object, b) the reflectivity of the group cognition by different perspectives on the shared-object, and c) re-signification of the collaborative production in comparison to opposite or similar ideas, either by adding or producing new arguments.

In Task 2, they should decide who will be responsible for creating the School of the Future in 20 years, and describe how this school should be (Table 8). The prospective task enables creative engagement with the focus on imagination, strategic planning, elaboration of hypothetical situation and insightful dimensions of cultural practices, as well as individual

and collective awareness. The studies found in our research on the database also indicate such capacities, such as diffusion across gaming space by practices of teleporting (Fields & Kafai, 2009) and construction of the virtual Dutch house into the three-dimensional world (Ligorio et. al., 2008). The results in these studies confirm that the outcomes of the collaborative work create a space that reflects the task and also the reciprocal production in the platform. And we also observed it in our findings. See the following fragment.

Episode 4
550. Deca: (reading the statement) Who will you choose:::
551. Agnes: Ahm, who will you chose::: a person to create::: Okay, we should create the school of the future and say who will do it.
552. Deca: Umm, the President, maybe the Minister?
553. Agnes: I think the students can do it, don't you think? Students and teachers can do it.
554. Deca: But:: students will be Ministers in the future. The President will create it, but::: You know, there is a student that already do this::
555. Agnes: Oh, I don't know "Bro", maybe the Minister of Education can do it, he has a great background. Let me see:::
556. Deca: Yeah, he can do what he wants (whispers)
557. Agnes: Look here, maybe:::
558. Deca: We can answer ahm.
559: Agnes: Who will we choose?
560: Deca: Who? The President!
561: Agnes: I do not choose the President because he will just:::
562. Deca: No! Students and teachers can suggest some propositions, and send them to the Minister of Education, and he should take it to the President. If the President accepts the proposal, he will give directions to the Minister and he will apply them. Don't you think?
563. Agnes: Um, um.
564. Deca: Let me type, I want to write.

The fragment suggests that negotiation is an arena of voices that generates centripetal and centrifugal forces (Bakhtin 1981, 1986; Volosinov, 1929/1973), it is not an accretion of ideas or information. It is a space where positions are assumed, contrast, and diverge at various levels of knowledge entering into the intersubjective space to produce meanings in collaboration. Thus, in this episode, there was a joint effort in the exchanges of turn-taking, work in collaboration, and mutual support. The dyad described the school of the future in a general way. The school idealized by the girls should be full-time to generate more opportunities such as science and technology workshops. The parents should have more participation at school and more contact with the teachers to supervise scholar performance, grades, necessities. The students posted a single post and did not comment their colleagues' posts. The processes characterized in this intersubjective dynamic are argumentative

strategies, joint decision, application of exploratory knowledge and focus on the construction of their own ideas.

The episodic interview gave an extensive comprehension of their production. The interview script, with brief questions, was elaborated from their own production. The outcomes indicated that metalanguage works as a tool to re-contextualize and re-signify the meanings in a new instance. The meanings remained more organized and interwove, as illustrated in the following example.

Episodic interview – 1

Researcher: Could we try to recall what you said? Let's see if you remember. You said that the students are too immature to use their mobile in class, and, at the moment, the school shouldn't allow it. Could you explain why?

Deca: Because::: for now there is no need to use technology, ahm for the question of mobiles, the personal things of the student. Technology is only for the teacher. Maybe it's necessary, but not for the student. I think they are still immature to use their personal technology, their mobile phone, tablet.

Agnes: Yeah, like that::: in one paper, they were talking about Oge Marques' research. He studied in the United States, in Florida and there they used lots of technologies. They have discipline, you know what I mean? For example, if you say that we can use our mobile in class no one will use it to study.

Deca: Yes, students aren't mature enough.

Agnes: Yeah, they are not mature or disciplined enough to use it for searching. If the teacher is in the classroom you don't have to use internet for anything. Ask for the teacher, you know? I think it's more for that reason that we thought like that.

In the episodic interview, the intersubjective process had a strong bond with their own production. The activation and integration of new information occurred many times in this session that may indicates authorial production, joint interpretation, shared understanding, explanation, and synthesis. Also, polyphonic dynamics emerge, when Agnes and Deca brought in the voices of the teacher, parents, and the expert Oge Marques.

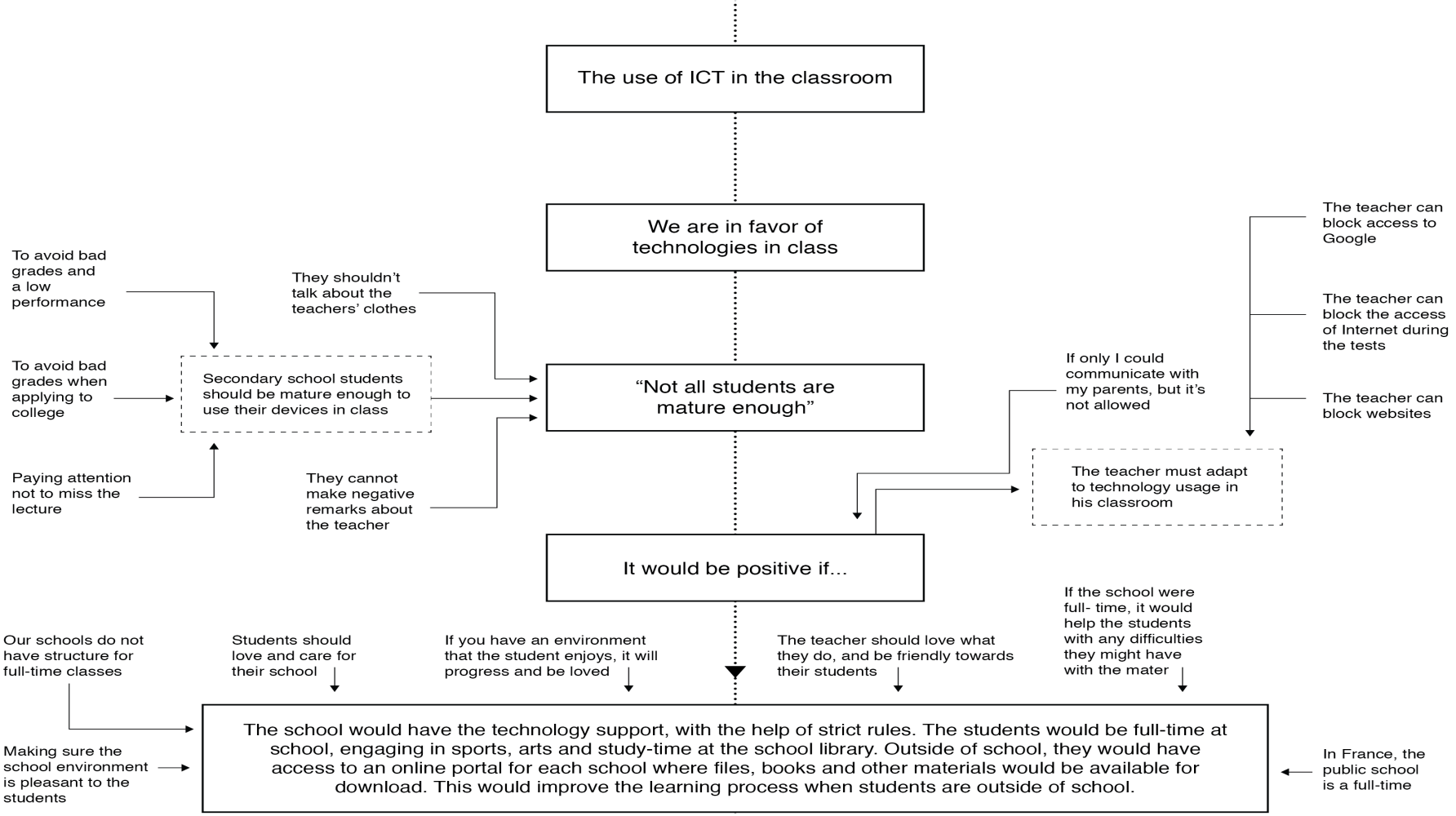
4.3.1.2 Dyad 2 – Bella and Tottein

The interaction between this dyad was for the most part characterized by tool mediation in the processes of regulation and self-regulation within the activity. Physical and digital materiality showed an increased frequency of the use of the deictic. The outcomes suggest a lack of identification between them and it generated imbalance, few communicative

exchanges, and misunderstandings. This may affect the emotional and affective aspects. Their production comprises 116 turns. Tottein's position suggests resistance, he avoided eye contact and was always reporting to his colleagues sitting next to him. Bella used her mobile to regulate herself, she was always reading text messages or chatting. The absence of alternation of power provoked a certain control, considered here as part of the intersubjective process (Matusov, 2001; Matusov et al., 2007). It probably impacted on the representation among them, as well to build the intersubjective space (Mortimer, 2005; Mortimer & Scoot, 2002; Reigosa & Aleixandre, 2006). On the other hand, on the episodic interview, they were more open to each other.

To construct the semantic map, we had taken together their speech exchanges in the forum and the transcriptions on the episodic interview as a single text, since the interaction was marked mostly by non-verbal language. The following map shows the meanings attributed by Tottein with Bella's consent (notion, concord or murmur). In the rectangle, we put the initial proposition "We are in favor of technologies in class". In this dyad, the sub-themes were constructed in a kind of linear progression and central theme is located in the rectangles. The potential themes (not concluded) are in the dotted rectangles. At the end of the activity, we selected a statement made by Tottein to illustrate how the school of the future would be.

Figure 6. Semantic Map – Bella and Tottein



Bella and Tottein were joined by the teacher since the other participants had already chosen their peers. There were few moments of verbalization, thus we also made a descriptive analysis of the interactions. After reviewing the video-data, we verify that Bella seems to be open to working with Tottein. At the two sessions, she arrived first, sat in front of the camera, and waited for Tottein. He arrived, sat down and kept in silence biting his nails or monitoring what their colleagues were doing. Unlike the others dyads, there was no empathy between them at the two tasks. They were physically distant.

At the beginning of Task 1, Tottein asked: "Do we have to access the school website?" (turn 2), Bella remained in silence and pushed the chair for him to type. She said, "You get on the school site that the task appears" (turn 3). Tottein said "Look, I've already accessed the school site". Bella points to the screen and said "Look here! No, no. You'll have to cancel" (turn 5). They read in silence. After solving technical problems, Tottein said: "What we have to do is discuss the use of technologies. What do you think of the use of technology?" (turn 18), Bella replied, "You can answer" (turn 19) and Tottein objected: "I know that I can answer, but I want to see where the three questions are. Where are the questions? You must have it in the text, right?" (turn 20). Bella said "After reading everything you have to answer only the three questions" (turn 21). Thus, Tottein replied "Um, um. Because the others have answered it wrong, they have posted four answers, but it has to be one, two and three" (he pointed to the screen, turn 22). Tottein dominated most of the speech shifts, as well answered the tasks by himself. The most evident characteristic was interaction mediated by instruments, the subcategories that stand out were the activities in the physical and digital environment. According to Linell (2009), we have to consider several dimensions between monological and dialogical discourse, that is, all communicative and cognitive practices are dialogic projects because each act is addressed to the other. People respond each other in some way, being the context and social conditions potentialities or constrains. The discourse produced by this dyad is similar to the types of conversation showed by Littleton and Mercer (2013) to analyse the quality of conversation in peers or groups. The Disputational Talk occurs when there are constant disagreements between interlocutors, some decisions are taken individually, there is little criticism and few communicative resources, the atmosphere is more of competition than cooperation. In this case, our codebook supported us to verify the elements that configured the chronotope. We also re-read the individual interview to understand with more accuracy the profile of these

participants (Table 5). Taking all information together, the following example illustrates this analysis. At Task 1, Tottein wrote a single post using first-person pronoun.

> I don't agree with the attitude taken by the students (cited in the report). I'd look for a way to make students aware of mobiles at school. I wouldn't restrict this use as the school does. I think mobile phones can be adopted. It's better than the students hide it or give the teachers a headache. Students can use it when the content is related to the lessons. Furthermore, they are secondary school students, they already to know that mobiles disturb learning in class.

In Task 2, Bella entered in the Lab, the camera was on, she sat down and waited for Tottein. He came over the time and asked: "Can I use the computer?" (turn 44) Bella gets up handed the chair and pointed to the computer screen. She said "Here, is it!" (turn 45). Tottein asked, "Is it the same? Is it activity two? Calm down, let me see what it is" (turn 46). He starts typing, Bella grabbed her mobile and checked the messages. Then, both looked at the screen and read the instruction in silence, this interaction was characterized by individual work. Bella was not absent, she always looking at the screen paying attention to what Tottein was doing. Sometimes turning her face to see what the other couples were doing, then she returned to the same position. Tottein continued typing the answer by himself. After that, he pointed to the screen and said "I finished! Click here, right?. That's it! I think that's all!" (turn 60). Bella pointed to the screen and replied "Look up here, you have to quote the source" (turn 61) and Tottein argued "But the others did not quote it! Look here. You have to name one or another. You have to choose which social roles we would choose to create the school. I think it's okay" (turn 62). Both looked at the computer and read in silence. Bella tried to give an opinion, saying "I think I had ..." (turn 66), Tottein interrupted saying "I don't think so. I'm sure this is the most serious message of all and it's already written. Here oh, see ahm? Do you have another opinion?" (turn 67). He prevented her from completing her speech. He wrote,

> The school will be supported by technology, being approved by all kinds of rules and laws. The students will be full-time at school, part of the time doing sports, arts, and study at the school library. Outside of school would have an online site for each school where files and other things would be shared that will help to learn when students are outside.

Finally, at the episodic interview, we asked a general question, since we had collected few fragments of dialogue. We asked "Which conclusion did you get on the forum?". Tottein responded first. He described the tasks in details in a discursive positioning.

Episodic interview – 2

> For example, the problem is about the students who talk about the clothes of the teachers. I do not agree. Like::: you can give an opinion, but negative comments of the teacher::: How dare they do such a thing. Stay in class and think about the teacher's clothing and commenting on Twitter! Like::: it also has a detail because such thing happened in the secondary school. Students on the secondary school should know how to use mobiles in the classroom. Whether or not you will disturb the class because if you won't pay attention you will lose the content, you will be left behind, it will harm your grade and also in the future it will affect the Vestibular. So, it's like::: I think, I'm in favor of using my own device in the class, but I also think that it depends on the person, right? If the person knows how to use it, then it has a positive side and also has a negative one.

Then, we asked for Bella her opinion. She agreed with her colleague, indicating the reciprocal appropriation of positioning and she added new ideas.

> I also think the same because often in the class::: even when I need my mobile, mainly in the language classes, Spanish languages. Often, we need a translator and it is not allowed. But I think they (the students cited) aren't mature enough for post these things::: to say bad things.

During this session, the dyad worked collaboratively, possibly because they felt more comfortable at the interview. We asked a suggestion to the use of digital technologies in class, Bella responded: "The networks could be blocked!". This argument was presented first by Agnes and Deca. Tottein agreed immediately indicating the reciprocal appropriation of positioning. He said,

> Yeah. That's it! Block the networks and sites, for example, such as Google. Yes, it could be done because is possible to block Google. For example, when the person is answering a questionnaire and the teacher is explaining the exercise, so you can do a search. But it depends if the teacher makes a questionnaire taking questions from the internet, questions for the Vestibular it doesn't work. If the teacher forms a type of question from the book and asks to search, it's Okay. Sometimes we do a test using our own copy notes or search something on the internet. So, if the teacher forms the question correctly for us to search a content on Wikipedia, for example, the question is not for free, you need to try, to respond it. I learn more doing projects, for example.

From the above, we can note that the arguments presented by Tottein are cohesive. He suggests from his personal experience a way for the teacher qualify the content, that is, he put himself in the teachers' position. Tottein and Bella made significant interventions indicating that the conditions of socialization influence the construction and maintenance of

intersubjectivity dynamics. In this last session, different arguments were presented by this dyad. Alternation of turn-taking and discursive progression occurred, prevailing the discursive positioning and reciprocal appropriation of positioning. The interview was representative in the sense that there was a possibility of working together on the tasks and, for some reason, they did not. We may suppose that, as students remaining in the formation of dyads, they would need more time to know each other and to establish rules and ways of work in collaboration.

About the school of the future, Tottein replied that it should be approved by the three federal authorities and laws. In this way, we asked if they could explain how the authorities would act. He justified,

> For example, the State schools must follow the laws passed in the Congress of representatives, okay? If it is approved, it has to be placed in the Education Constitution, ahm::: you could eh::: for example, students would stay full-time at school, then, there might be some kind of agreement among them to complete the school activities, right? In this sense, it is not only the school itself that will solve it. All schools should be at the same level because it would be like an egalitarian situation. Like::: in the developed countries the public school is better than private school, eh::: if you have an egalitarian education, the student will stay full-time and may have an environment where he feels good at school.

We asked the same to Bella, and she nodded her head in agreement. Tottein responded,

> In my opinion, it should have all sorts of things such as Wi-Fi. There is no reason for the school to prohibit it. Wi-Fi would facilitate. What happens in private schools? The students are relaxing in the intervals. For example, I can communicate with people outside. I can read my messages. I can talk with friends at school. So, we don't have this freedom. In my opinion, students hide their mobiles and don't pay attention in class. If one day, the teacher allows it in class we can send messages. At the end of the class, we must pay attention, so the teacher gives some time. Every teacher gives one and a half hour of class, then he can let the students rest and do whatever they want for some minutes. In my opinion, the student wouldn't feel deprived of anything.

This suggests that Tottein was apprised of what was happening inside the web-forum. Clearly, we can see a discursive position in his arguments. He may have kept a vicarious participation. He was not absented of what his colleagues were discussing in the forum, but was observing, reading, interpreting and he captured the central ideas of the tasks. Conversely, Bella had a legitimate peripheral participation as discussed by Lave and Wenger

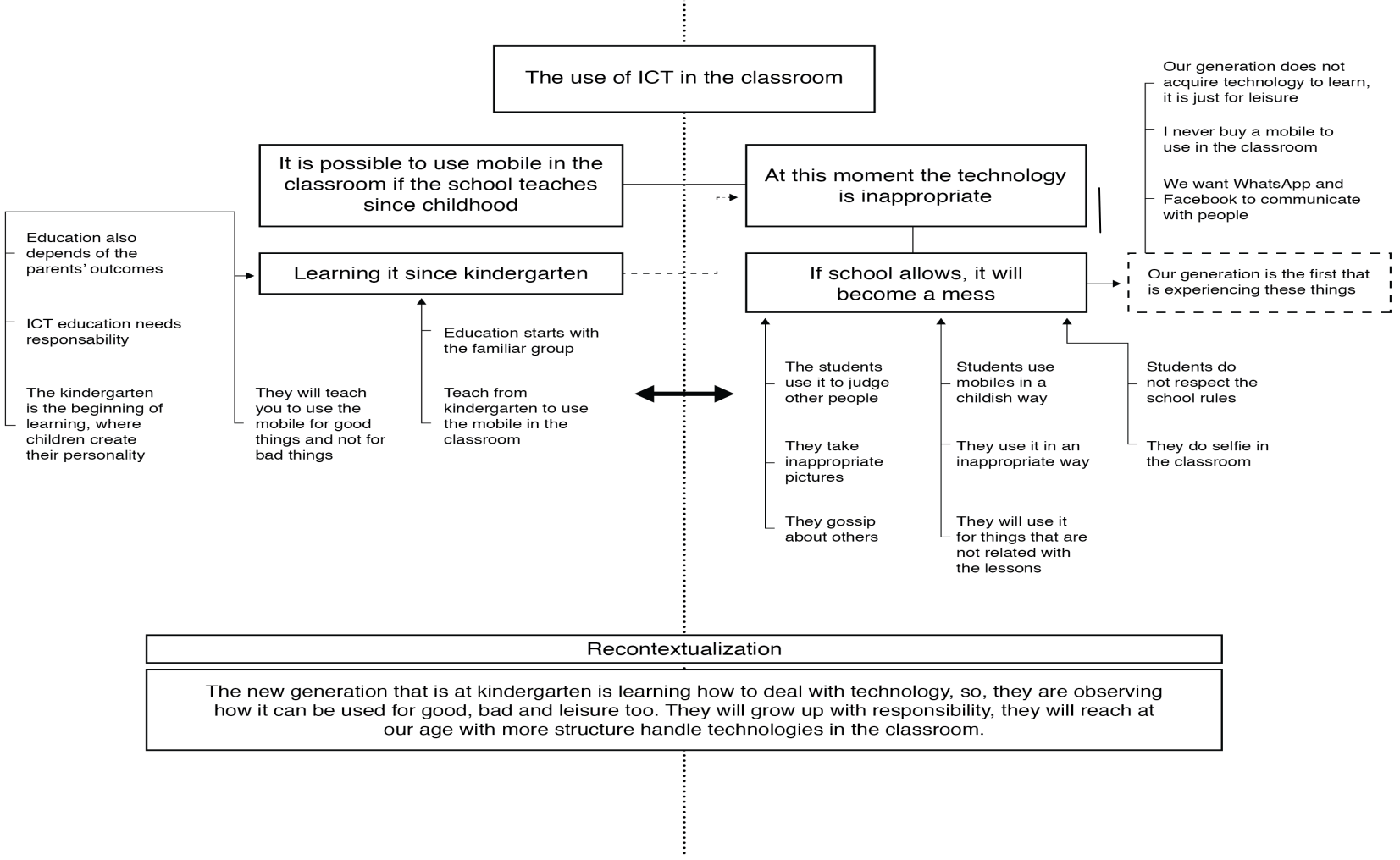
(1991). She was not absented of what was being carried out in the forum, as well at the interaction with her pair. Tottein had a more prominent presence in all sessions but the quality of the interaction between them had changed. It became more permeable in the last session. In this case, the intervention of the teacher would be essential, acting in the mediation of the conflict and regulation of the emotional aspects. Maybe using some teaching techniques to encourage the students such as in those examples presented in our study on intersubjectivity in the Tables 2 and 3.

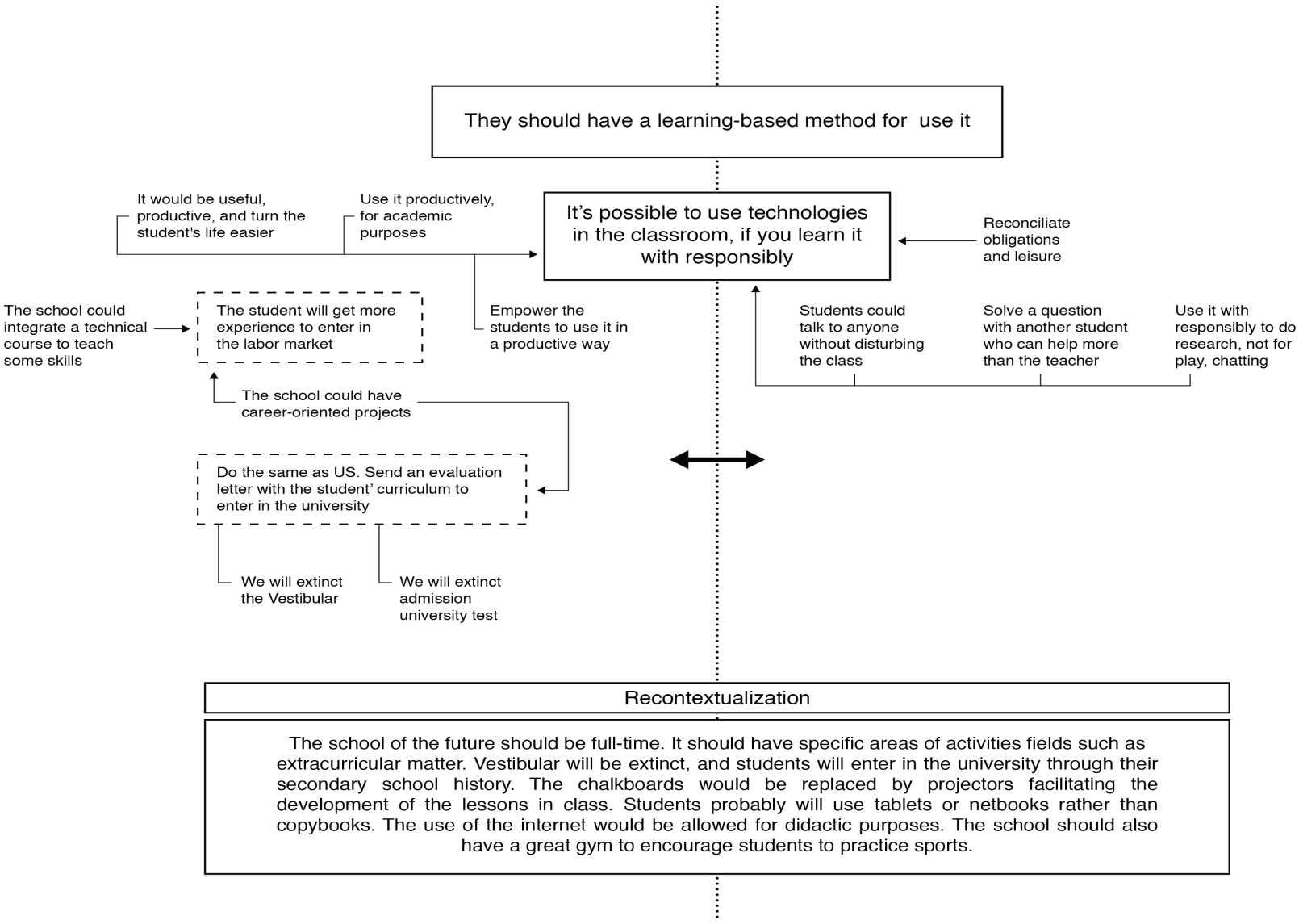
4.3.1.3 Dyad 3 – Bakufun and Snorlax

The following map represents the meanings attributed by Bakufun and Snorlax. In the left-hand rectangle is the initial proposition "Is possible to use mobiles in the classroom if the school teaches how to use it since childhood". The main ideas that emerged from this proposition were related to "education at early age", "since kindergarten", "education starts at home". They believe that their generation uses digital technologies for leisure, making friends, playing games etc. Their production comprises 249 turns.

There was no immediate delimitation of the theme as opposing structures or ambivalence. After refining the first argument "kindergarten is the beginning of learning", they state the first theme, that is shown in the rectangular figure on the left. Around it, are the sub-themes (rheme) in development as illustrated in the dotted rectangles. One more proposition was elaborated "At this moment technology is inappropriate" on the right rectangle, in the sequence, the second theme was defined "If the school allows, it will become a mess". On the dotted rectangle, there are themes in formation. Around the theme are the meanings referring to the verbalized statements, the connectors indicate expansion or interruption. Re-contextualization are at the bottom, it refers to the summarization of the main ideas. Taking together these general ideas, a third proposition emerged: "It's possible to use technologies in the classroom, if you learn it with responsibly", and around it there are new themes in formation.

Figure 7. Semantic Map – Bakufun and Snorlax




They should have a learning-based method for use it
It would be useful, productive, and turn the student's life easier
Use it productively, for academic purposes
It's possible to use technologies in the classroom, if you learn it with responsibly
Reconciliate obligations and leisure
The school could integrate a technical course to teach some skills
The student will get more experience to enter in the labor market
Empower the students to use it in a productive way
Students could talk to anyone without disturbing the class
Solve a question with another student who can help more than the teacher
Use it with responsibly to do research, not for play, chatting
The school could have career-oriented projects
Do the same as US. Send an evaluation letter with the student' curriculum to enter in the university
We will extinct the Vestibular
We will extinct admission university test
Recontextualization
The school of the future should be full-time. It should have specific areas of activities fields such as extracurricular matter. Vestibular will be extinct, and students will enter in the university through their secondary school history. The chalkboards would be replaced by projectors facilitating the development of the lessons in class. Students probably will use tablets or netbooks rather than copybooks. The use of the internet would be allowed for didactic purposes. The school should also have a great gym to encourage students to practice sports.

The findings show in turns 18, 19, 20, and 21 a great level of synchronicity and collaborative work. We observed two occurrences of discursive position followed by the reciprocal appropriation of the position where new meanings and connections emerged. The most evident characteristics were the alternation of the reading shifts, the coordination of the activity in the physical, digital and semiotic space, exchanges of information, and synthesis. In turns 25, 26, 27, 28, 29, and 30, the couple compare their own production with their colleagues' outcomes, as well they make comments and a depth-reflection. Snorlax offers more suggestions by the discursive position (turns 18, 20, 23 and 30), while Bakufun was attempted to their colleagues' posts. As noted by Pontecorvo et al. (2005) willingness, propositions, exposition of ideas, lead interlocutors beyond the merely factual knowledge towards to the discourse-reasoning and meta-discursive skills as showed on the last fragment of this episode. In this example, Snorlax seems to be complete immerse into the intersubjective space (turn 30).

Episode 5

18. Snorlax: Let's see. (commenting on one post) [She wrote the school should revise its rules on the use of the technologies in the class]. Yeah, I think it's possible, to conciliate such thing. That's what I wanted to put here.
19. Bakufun: Yeah.
20. Snolarx: You might have to start from childhood. It should be considered::: I think it doesn't depend only on the school, it starts at home. I think education will show to the student that he needs responsibility for use of certain things such cell phones. For good things not for bad, also for use in class. So, it will be useful and productive and it will make his life easier.
21. Bakufun: Yeah. It'll become easier, but I think the students are not prepared to use the mobile. Something is missing:::
22. Snorlax: Um, um.
23. Bakufun: They need to start from kindergarten, educating the students to use mobiles in the classroom. If the teachers release it now, the class becomes a mess. It's what I think, I see the problem in that way.
24. Snorlax: This is true::: Let me see, this was the first one.
25. Bakufun: Let's see::: Luciana's post!
26. Snolarx: I think the same.
27. Bakufun: (reading) [the internet can bring benefits to students, but it's the wrong way to deal with it. They talk about other people's lives. They should use some advantage of the internet as an instrument to help the school and not for fun].
28. Snorlax: Who said that?
29. Bakufun: Yeah, I told you on the issue of using technology in a childish way.
30. Snorlax: Um, um. It's inappropriate. They don't know how to deal with. I think education comes from home, and so::: with a responsibility, right? It doesn't matter if it's just a mobile. If you have responsibility to use it for your good things, here, in the classroom, okay. Because it would be for solving something. It would be used in a productive way. I do not agree with it for making gossip, memes or taking

> inappropriate photos, judgments. So, it totally escapes from the rules that should be followed.

This type of engagement is similar to the conversation proposed by Littleton and Mercer (2013) called Exploratory Talk in which interlocutors join in critically and constructively a goal-oriented talking activity. For the authors, each interlocutor offers information relevant to the subject under discussion and tries to enter into a consensus at each stage by asking questions, responding, and presenting reasons for their choices. In addition, gestures, eye-contact, teases, and laughs take part of their interaction. They challenging each other in a kind of joking manner. Visual information and these patterns of interaction/identification are observed in all sessions. The playful tone can be considered as an element of maintenance of intersubjectivity in this dyad. Laughter plays an important role in human activity, especially, on the intersubjective process because it is related to a convention, sharing, ambivalent words, wordplay, imitation as well by differentiation and contrast of the others. Thus, it is related to polyphony phenomenon, that is, representation of ourselves (We) and the others (They) in a specific situation. The following example shows this kind of play.

> Episode 6
> 40. Bakufun: Let's use the zoom. (icon of magnifying glass)
> 41. Snorlax: (typing their names) Snorlax and Bakufun it seems a country music duo. Bakufun and Snorlax (laughs)
> 42. Bakufun: Please put 'k'.
> 43. Snorlax: Your name is written with 'k'? (laughs)
> 44. Bakufun: Um, hum.
> 45. Snorlax: Okay. What are you up to?
> 46. Bakufun: Oh, go ahead! Question two, I'll put a hyphen here.
> 47. Snorlax: Um, um.
> 48. Bakufun: Do you want to re-read the question?
> 49. Snorlax: No, no. I remember everything at all. Okay, just the questions.

In the next episode, they discussed how the school of the future would be. Bakufun launches a challenge, saying "Let's choose the director, the teacher, the student and the Minister of Education". Snorlax asked "Four?" Bakufun insisted "Four. Yes!" and Snorlax accepted the challenge. The results indicated that Bakufun did not assume these profiles, he argued from his own position, desires, feelings, and intentions. To create the school of the future Bakufun states "I'll make the Vestibular extinct" (turn 154). As shown on the following except, there occurred various moments of reflection, turns 135, 137, 145, and 153. The data suggest that Snorlax didn't expect such ideas. The possibilities are many in this type

of task, which the interlocutors could engage with their own awareness or with the voices of the social other. In such case, more orientation and directionality in the semiotic field is necessary. In turns 147, 148, 149, 155, 156, and 157 occurred gaps and speech discontinuities, the coherence was established by inferences, interpretation, and remissions that brought a certain sense of order. Barbato and Cavaton (2016) explain that misunderstanding makes ourselves search for more in-depth levels of explanations and justifications that trigger dynamogenic actions that propel development. As discussed previously, space is no longer seen as a static background, but a whole formed by the relationships between people and their world. The chronotope concretizes various spaces and times such as Bakufun's time, Vestibular exam, Japan contests-model, United States-model of entrance, the school of the future, as showed in turns 147, 155, 156, and 157. Bakufun had a predominant discursive positioning (turn 131), he chose four persons to create the school of the future but assumed to himself this responsibility (turn 153). It may open more possibilities for creativity, imagination, and agency, as shown in the fragment "The researcher did not say that it had to be innovative? I think it's going to be the school of the future" (turn 157). The outcomes suggest the use of similar meanings that enlarges the semiotic space such as extracurricular activities vs. fields activities, special projects vs. social projects, entrance exams vs. curriculum analysis. The following example illustrates the negotiation.

Episode 7
130. Snorlax: Let's choose it.
131. Bakufun: Head-teacher, teacher, student and Minister of Education.
132. Snorlax: Four?
133. Bakufun: Yes, four.
134. Snorlax: Okay. Maybe in order to school prosperity:::
135. Bakufun: Take off that part of prosperity. Put here for learning, for improving the subjects. The school of the future should be full-time. It should have specific areas of activities.
136. Snorlax: Okay. What else? What else? (typing)
137. Bakufun: Could be full-time with field activities, the charts could be replaced by projectors and the disciplines::: (laughs)
138. Snorlax: Let's put it here:: extracurricular activities.
139. Bakufun: No. Field activity!
140. Snorlax: Hey, "Bro" it's the same thing! You are "fuc:::". Hey, "Bro" I just want to give you a tip.
141. Bakufun: No! It's activity field.
142. Snorlax: So, let me continue here. (typing)
143. Bakufun: No, hum::: it's better activity for do some, some work:::
144. Snorlax: Put here social projects.
145. Bakufun: Hey, "Bro" social projects has much more value.

146. Snorlax: What else? Special projects or social projects?
147. Bakufun: I think it's better not to have social projects because the world is capitalist, but that's okay. Why don't we put here for the creation of contests like in Japan?
148. Snorlax: What do you mean? How is it in Japan? Because I know you've already researched it and want to go there.
149. Bakufun: Go ahead, come on "Bro"! Have you ever watched Tomoko video? Did you never saw what they do there?
150. Snorlax: More or less::: Eh::: applications of test simulation.
151.Bakufun: In 20 years, "Bro"? Will the school be the same?
152. Snorlax: No, but do we have any test simulation in public schools today? There wasn't, "Bro"!
153. Bakufun: We won't have more entrance tests.
154. Snorlax: Are you take off the entrance exam?
155. Bakufun: Vestibular will be extinct. We won't have it anymore "Bro"
156. Snorlax: Hey! Why not? What is it the purpose? And how are you enter in the university? Ah::: you want to make it like the US, ah the same::: isn't? It's::: Ah, that's it::: Okay! Let's continue:::
157. Bakufun: Okay, wait! It'll be by analyzing the students' curriculum. The researcher did not say that it had to be innovative? I think it's going to be the school of the future.

The episodic interview took place in the multi-media room. We used the same procedures. To illustrate this session, we have chosen one longer extract where the boys used metalanguage to expose the main ideas. The answers are building from their own production which gives them the confidence to reintegrate the information.

Episodic interview – 3

Researcher: So, in one task you've said that the use of technology should come from outside, at home. And that mobile phones have benefits if students learn to use them since childhood.

Bakufun: Since an early age!

Snorlax: Yeah, from the beginning::: because since we started studying there was no cell phones in the classroom, no notebook, no slide, we did not see it. It's like:: We are the first generation for who all these things are happening. So, we are using and abusing and we are learning it slowly. So let's assume that this generation that was born now, in kindergarten, they are in the beginning of dealing with this technology. You know, a little, so, seeing that it can be used at school and can be used for leisure too. As an example, the person will grow up seeing that. They will grow up with responsibility. They will reach in our age with much more structure to deal with it in the class, instead of staying on Whatsapp with other person who is on the other side.

Researcher: And what do you think, Bakufun?

> Bakufun: I think that kindergarten is the beginning of learning, technology influences the beginning of learning, for example, if the person likes Maths or she likes Portuguese. It is from a young age, and what the teacher teaches will influence them to grow up, the influence of the college, at home as well. Since children are creating their own personality. Our generation buy technology not much for learning, we buy for leisure. We use, like::: WhatsApp, Facebook to communicate with other people. We don't buy a mobile to use in the classroom, it comes with the idea of leisure.

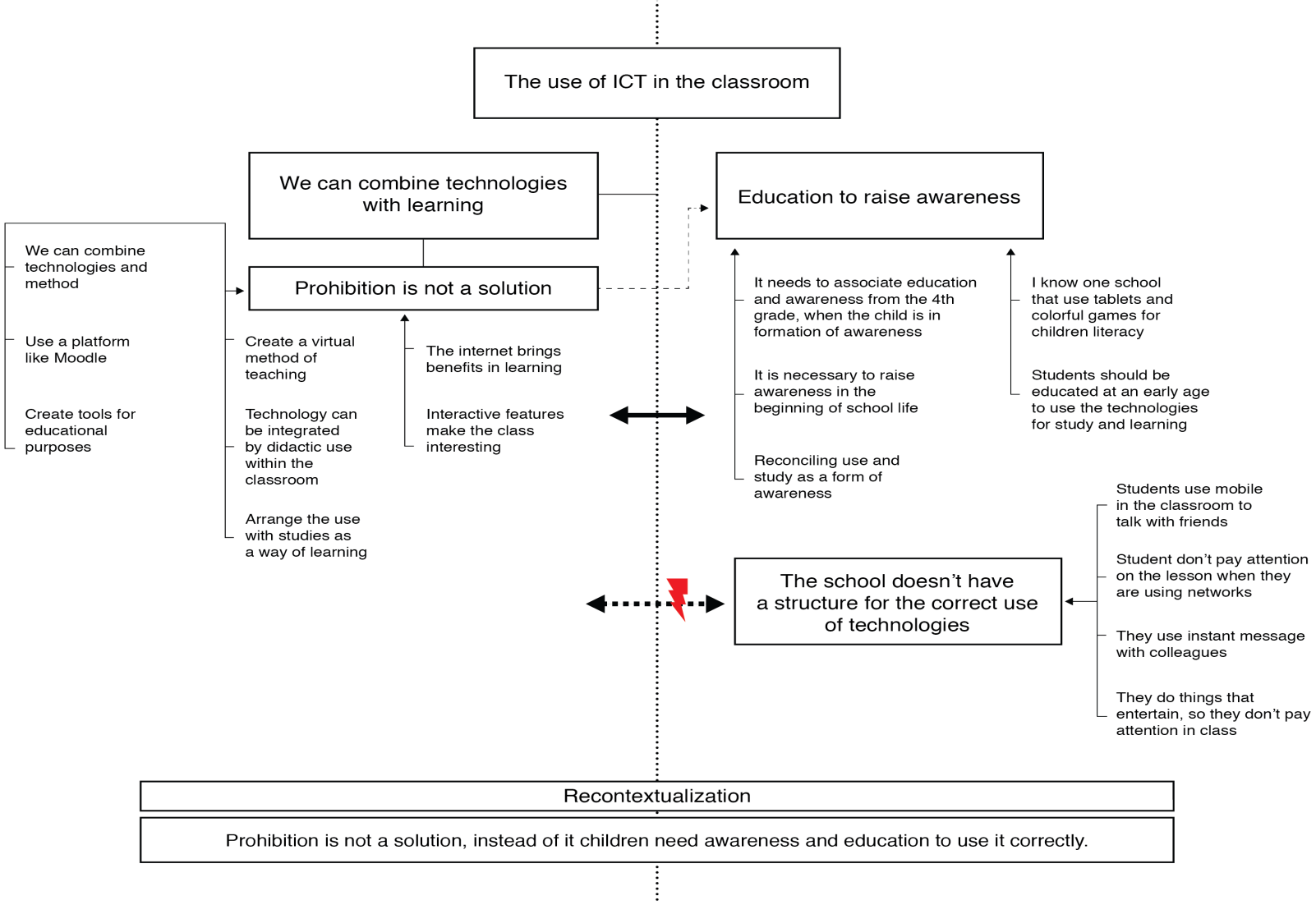
The findings show that they reaffirmed the main ideas in a more complex and consistent way, which may indicate authorship and agency. The processes involved in this dynamic were characterized by shared management, joint attention, mutual influence, coordination of activity, cooperation, elaboration of ideas, explanations with appreciations and suggestions, discursive and reciprocal positioning. They were also concerned with the formal writing as we found on dyads 1 and 4. Another significant result was shown by the knowledge of programming codes, technical terms, and many keyboard shortcuts.

4.3.1.4 Dyad 4 – Geo and Rick

Geo and Rick chose a different way to work. They built their responses mixing their colleagues' posts and the statement of Task 1. The two sessions comprise 327 turns. We had drawn the semantic map with the meanings produced verbally and we added the replies taken by the forum to complement some information that might be missing. The initial proposition was "We can combine technologies with learning", on the left rectangle. The central theme is inside of the rectangle "Prohibition is not a solution". The actualization of this theme moves around of "a creation of the virtual teaching method", "the use of mobile by a correct method", "the use of the internet to bring benefits in learning", and "interactive resources turns the class interesting". The findings showed some paraphrases, for example, "since childhood" (by dyad 3) is similar to "since the 4th grade" and "they should have a learning-based method" (by dyad 3) is analogous to "mobiles could be combined with a certain method". The second theme at the right side "education to raise awareness" and it was re-voiced in all sessions, all arguments revolved around the same idea. Also, all over are the meanings related to verbalized statements that were not expanded in other themes. In Task 1, they posted seven posts that include itself 18 replays, some more developed and others a simple agreement.

One more proposition emerged; “The school doesn’t have a structure for the correct use of technologies”, it was not connected with the other themes (at the rectangle on the right side) and it remained under-developed. For instance, the processes involved in this dynamic were characterized by collaborative work, coordination of physical and digital space, distributed cognition, cooperation, and alternation of talk shifts. The following map concentrates the production of this dyad.

Figure 8. Semantic Map – Geo and Rick



In Task 1, the results indicated an expressive number of actions through instrumental mediation, as well collaborative exchanges in reading and interpretation of the content, synchronicity with the community as shown in the following excerpt. The comments from this dyad is articulated with the idea that technologies, internet, and mobiles can be integrated into learning by a virtual method of teaching. In the following episode, they are completely involved with their colleagues' responses (turns 72). They positioned their colleagues and repositioned themselves by refuting or rejecting some ideas, hence generating movement into the dynamic that turns into possible agency (Davies & Harré, 1990; Harré & van Langenhove, 1999), as well authorial discourse, critical thinking, and originality (Brown & Renshaw, 2006; Matusov, 2001, 2015; Pontecorvo et al., 2005). The outcomes indicated a great level of synchronicity between Rick and Geo, as well synchronicity with the community since more attention was given to the posts. The dialogue between this dyad is similar to the conversation sequence identified by Littleton and Mercer (2013) called Cumulative Talk in which ideas are shared; new information is added, there is concordance among interlocutors with progression of the theme, but it is more linear. We noticed more complexity in the dyads 1 and 3 that followed the sequence of the statement. Considering this outcome, in future work we will re-formulate Task 1 into two activities: one for answering the questions on the statement, another for the replies within the community. In the following extract Rick and Geo seem to be more confident.

Episode 8
69: Rick: (reading) [Your message has been published]. We answered this, right? The first. The first one. These girls, right?
71: Geo: Yeah. We answered the first one.
72. Rick: Um, um. (reading one post) [We think the internet can bring benefits to students, but they are wrong by talking about teachers' life and clothes. They should take advantage of the internet as a tool and not for fun]. (laughs)
73. Geo: That's right! I think if students were educated since childhood they'll use these technologies even for learning.
74. Rick: I agree.
75. Geo: Because you cannot permit it without:::
76. Rick: (typing) Awareness:::
77. Geo: (dictating) Without education, then it must be from an early age.
78. Rick: (typing) I agree, then:::
79. Geo: (reading) [the internet brings:::]
80. Rick: (re-reading) [the internet brings benefits to learning:::]
81. Geo: Put it like this::: the students:::
82. Rick: (reading) [With the vast amount of information the student…] (laughs) Let's put for this:::
83. Geo: Education is need since an early age:::
84: Rick: Okay. For this use in the classroom, you need:::

85: Geo: You write well, huh “Bro”!
86: Rick: Is need education to raise awareness.
88. Geo: From an early age:::
89: Rick: From the beginning of school life:::
90: Geo: Put a dot here.
100: Rick: I think it’s one of the funniest answers I've ever seen. (reading) [The use of this kind of technologies should be allowed at school]. Should be necessary awareness. Oh, “Bro” I can’t believe it.

In the next episode, Geo reacted to their colleagues’ comments saying “Which rules? There are no rules if you don’t have education” (turn 137) and seems that he orients Rick to assume his position. Rick responds “I’ll make a criticism” (turn 136) and Geo encourages, “Yeah, do it” (turn 137). In turn 140, it seems that they are trying to comprehend their colleagues’ and instead of critiquing, Rick tries to find a solution, he says “I won’t generalize. Some students don’t respect, eh::: the rules” (turn 140). Geo’s suggestion is that education is the basis to establish rules and students need “awareness”, so Rick assumes Geo’s position saying “Yeah, because we have our opinion, right? We think it can be used with awareness (turn 146). We point here to the new textualities by the use of the web-forum in discursive activities, with elements of polyphony of the other voices that touch and juxtapose each other to produce new formations. The data suggests various levels of acuity and perception of the theme. In turn 140, Rick made comments in a discursive position, he puts the proposition “It’s possible to arrange technology with learning” and Geo suggests, “it depends on awareness” (turn 145), after that, Rick agrees (turn 156). In the final turns, the boys talk about the keyboard as if it was an outdated technology. It highlights the aspect of mobility, ubiquity, connectivity into their everyday routine (146, 147 and 148).

Episode 9
135. Geo: Two.
136. Rick: (reading) [The students are very disobedient, they do not respect the rules]
137 Geo: Which rules? There are no rules if you don’t have any education.
138. Rick: I’ll make a criticism
139. Geo: Yeah, do it.
140. Rick: She is talked like::: if the students are disobedient. If they do not respect the rules of mobile phones in the class, she is right. I even agree, but I think it could::: how can I say it? It could be used in our favor, Okay? (typing and speaking aloud) I agree that students don’t respect the rules. I won’t generalize it. Some students don’t respect, eh::: the rules of mobiles in the class. But it’s possible, in our opinion it’s possible. So how can we say it? It’s possible to arrange the use of technology with studies as a way of learning.
141. Geo: She is talking about mobiles. (reading a post) [Because it would:::]
142. Rick: (reading) [Because it would prevent the use of mobiles incorrectly].
143. Geo: Oh, that’s right, because she wrote it separated, all right.

144. Rick: Um?
145. Geo: “Bro”, it depends on awareness or it’s going to be always on the same way Ctrl + C and Ctrl + V.
146. Rick: Yeah, because we have our opinion, right? We think it can be used with awareness. Yes, it could be made if there will be awareness. Oh, it’s a long time that I don’t type on the keyboard, “Bro”!
147. Geo: Only mobile, yeah?
148. Rick: Yeah, on my phone. I don’t know how I can get to type.

The results indicate the subcategories discursive position, reciprocal appropriation of position, and work in collaboration to set two themes “Education to raise awareness” and “Prohibition is not a solution”. Are many possibilities to develop sub-themes on these two paths but the Rick and Geo were very involved in reading the posts. As Barbato-Bloch (1997) posed, communication as dialogue implies overlapping singular voices that converge and may be recognized by the interlocutors and also provoke dissonances, fugues, and stabilizations in the intersubjective space.

Regarding Task 2, Geo and Rick responded briefly. They read the statement, but they did not choose any profile to create the school of the future. Geo wrote a single post and read it aloud, Rick read it in silence and rewrote. Geo typed the answer alone and read it to Rick (turn 299). Rick agreed and took the keyboard to revise the post (turn 304). We underline here that web-forum also contribute to develop writing skills, improving grammar / vocabulary / tracks, and develop language ability for planning, and, critical reviews. They did not read or answer their colleagues’ post. The following fragment illustrates the first version and the final response.

Episode 10
299. Geo: The question is what could change in the class, in the school of the future. I wrote something related to this matter. (reading) So, I’ll put that in the future the students probably will use tablets or laptops instead of copybooks and teachers would be better paid, respected. The salary could be better and the teachers would be able to give more quality in learning. The use of the internet would be allowed for didactic purposes. The school would have a large gym for the encouragement of sports.
300. Rick: Cool!
301. Geo: Ahm, let me see it.
302. Rick: Okay. We can change the name here.
303. Geo: The school of the future.
304. Rick: Here, the school of the future should be full-time. The students could also have activities, let’s put it.
305. Geo: You can correct it.
306. Rick: I’ll put (speak aloud while typing) In the school of the future the charts would be replaced by projectors facilitating the development of the lessons in the

class and students probably will use tablets or laptops instead of copybooks. The teacher would be better trained to give a better learning experience to the students. The use of the internet would be allowed at school for the didactic purpose. The school would have a great gym for the encouragement of sports.
307. Geo: Hold on! (correct a grammar mistake)
308. Rick: Hum, um.
309. Geo: Done!
310. Rick: I agree. I just want to see if the proposals that we:::
311. Geo: What else can be included? (reading) It would help the school activities, the teachers would be better valued:::
312. Rick: It's cool, "Bro". This is how I imagine the school. We'll use internet and technological devices in the class.
313. Geo: More valuation of the teacher, because teachers deserve respect. I think we don't have to put anything else. Only that.
314. Rick: "Bro", I already think it's done! We put sports practices, okay.
315. Geo: Nothing more.
316. Rick: There are more questions?
317. Geo: No.
318. Rick: Okay.

The episodic interview took place at the ICT Lab using the same procedures. The results obtained from the session shows that Rick and Geo tried to improvise examples and explanations for their choices. The answers were related to what they had produced, but the arguments were the same. In comparison with dyads 1 and 3, Rick and Geo did not integrate new information in a more complex and coherent way.

Episodic interview – 4

Researcher: You said that in high-level schools technologies are already being used in favor of students, like tablets, and this makes the class more creative. Could you explain?

Rick: In advanced schools, they already use tablets and interactive resources to making learning easier, and this is very interesting because it makes the class more interactive. We have a lot of boring lessons where only the teacher talks.

Researcher: Could you give me an example?

Geo: I already saw it on television, in a program where kids in the kindergarten pick up tablets with colorful games with the alphabet. So, they are learning using the tablet, that's pretty cool. From an early age, like this, cause when he became older he'll know how to use it for didactic purpose, use it in favor of the school.

Rick: I agree, I also think that it should start from an early age. Teaching children since an early age to have awareness. For example, in the 4th grade when a child is still starting to form its own ideas and form awareness. I think it could happen. Yeah, more information and conscience to teach to use it only for didactic purposes. Yeah, it can be integrated.

We carried more questions in this interview but they always returned to the idea that "Education is to raise awareness".

What we learned in study 2 indicated that the intersubjective dynamics mediated by web-forum impacted on the production of meanings, as well by the creation of singular tessituras which were systematized in the semantic maps. The theme was embodied into the concretization of the meanings, for the most part by authorial productions. The results suggest that polyphonic dynamics are potentially capable of generating more permeable and fluid intersubjective spaces, in which the co-production of meanings expresses their position on the theme. Affordances in collaborative work had a significant role to support dialogical space during a problem-solving task. Levels of interactions, definition of the space and time show how the tools/objects are perceived, as well voicing and positioning of participants being components that shape the intersubjective processes. For instance, the chronotopic dimension which was shown to be very relevant in our study, has just started to be of some interest for research and yet only a few studies are attempting to conceptualize it and systematically include it as a dimension of intersubjectivity.

DISCUSSION

In our investigation, we opted for a mixed method designed from an emic perspective using the precepts of Grounded Theory. Initially, we were oriented by our theme – the use of ICT in the classroom – as well by the research question: Which processes are involved in the dynamics of intersubjectivity between student-student and how these affect collaborative problem-solving tasks in a blended context (face-to-face and web-forum)?

Principal data was gathered from two empirical studies based on problem-solving tasks mediated by web-forum. Further information came from field observation, individual interviews, episodic interviews, resources provided by the school, and items from the Master's study (Beraldo, 2013).

Two perspectives guided us in this research; Cultural-Historical Activity Theory (CHAT) centered on the concept of activity mediated by tools, since activities of computer-based learning impact on the way the interlocutors construct knowledge. That is, the discourse produced within the community is, at the same time, a product and resource to achieve deep levels of understanding of the shared-object (the theme), as well to comprehend its transformation. The dialogic perspective informed us in the identification of the positions of the interlocutors and the concretization of the utterances in the chronotope, their viewpoint, intentionality, evaluative words, observations, social values and individual ideas. Added to this was the representation of self, others, the space-time of the activity, and the shared-object.

The theme – the use of ICT in the classroom – was concretized by the utterances as intentional and aim-oriented inter-actions as presented on the sematic maps. For instance, we learnt that socio-cognitive dimension, as a communicative process and according to the perspective adopted in this study, influenced the way that the intersubjective space was constituted. It seems that the process of identification discloses intersubjective interchanges, while beings are responsive to produce a joint response as shown in dyads 1, 3 and 4. Another aspect is the affective dimension; divergences, coalitions, or opposing positions could be seen as potentials in intersubjective dynamics when the teacher intervenes and applies strategies to reinforce the positive aspects of collaboration as in the management of the emotional aspects. As identified in the dyad 2, the interaction was marked by little visual contact, individual work, and physical distance in the process of socialization. This influenced the construction of the intersubjective space as well the cognitive and

communicative aspects throughout the development of the activity. Thus, more attention was given to the instrumental mediation of the regulation and self-regulation in the activity as well the gestures, body posture, referential language, and a lack of alternation of power was part of the intersubjectivity process of this dyad. This result, in particular, indicated a marked frequency of consultancy on the statement and use of deitic. However, at the episodic interview, we observed a qualitative exchange between the dyads. In these situations, we reinforce our position on the importance of the teacher mediation in using techniques and strategies to equalize such incompatibilities. We can cite the examples shown in Tables 2 and 3 such as Bird'-eyes perspective (BEV) (Enyedy, 2005), Problem-Based Learning (PBL) (Belland et al., 2009), pre-teaching collaborative and communicative skills (Davidsen & Georgsen, 2010), and Scientific Argumentation and Reasoning (Ford, 2012), as teaching strategies that seek balance to the achievement of the common goals.

When looking at the dyads interactions, we could see that metacognitive skills disclose critical observations and appropriation of their own production in a more complex way. When they explain what they did, these dyads went often back to their own production to achieve higher levels of comprehension, appreciations, and suggestions. This, ultimately, influenced the maintenance of the intersubjective space, as evident in the dyads 1 and 3. Patterns of interaction revealed more visual exchanges, signs of agreement, and also jokes and laughs. The intersubjectivity dynamics showed that mediation in collaboration impinges on the aspects of psychosocial development such as management of conflict, conscious sense, mutual trust, distributed cognition etc., with more recurrence in dyads 1, 3 and 4. All categories contemplate this plan at different levels of involvement, for example, the subcategory synchronicity between the dyads discloses responsiveness in collaboration. Similarly, distributed cognition triggers different levels of understanding to manage the environment at face-to-face and online space, contributing to making the intersubjective processes more permeable, especially, with the dyads that had more alternation of the position as well turns of speech. Tension, orientation and directionality allowed the interlocutors greater possibilities of inference, qualification, and variability of the meaning in the semiotic field. Interpersonal communication, especially in situations that occurred explanation, justification or argumentation, indicated more possibilities to concretize the meanings in the chronotope as well to re-contextualize the co-production at the episodic interview, found in the dyads 1 and 3. Collaboration in the production of a consensual response has triggered relations of cooperation, conflict mediation, reflexivity and self-concept, which possibly acts upon socio-emotional development. In future studies, we expect

to observe in depth, considering our subcategories: interstice, work in dyads, synchrony with the community, synchrony between the dyad and reciprocal appropriation of positioning.

The activation of reasoning processes in the intersubjectivity dynamics indicated that misunderstandings trigger inference of the content and its comprehension. Thus, the interlocutors activate the capacity of generalization and abstraction to evoke semantically references that are not concretely in the activity as shown at the Category 1 – 1.a Semiotic. Also, the subcategories related to the interpretation of the questions and prospecting of new scenarios allowed the dyads to move from one thought to another by evaluative contributions. We assume that the meaning conventionalized in the collaboration has gained a personal value aspect, as shown in the results obtained with dyads 1 and 3. This in turn, it has a relation with memory, when the dyads are making joint efforts to remember the content of the tasks or their own production to justify or clarify something. We underline that the sub-category 4.c "To think with" refers to the actions that are delegated to digital technology such as record instead of writing, using the reviser to check grammar, copying and pasting instead of typing etc. And we can also include here the web-forum as a technology/tool to "share with" because the discourse produced is understood as a means of instituting intersubjective processes and also as a vehicle for making increasingly complex the intersubjective dimension (Ligorio et al., 2005; Ligorio et al., 2008).

Joint attention in the dynamics of intersubjectivity was verified in the performance of the two tasks, in the physical, digital, and semiotic subcategories. In a more complex way, in situations where necessary to interpret the tasks or to prospect new scenarios. The situations that triggered processes of negotiation opened possibilities of actualization of the meanings (rheme). Still the subcategories exotopic positioning, appropriation of other voices and discursive positioning opened possibilities to comprehend the problem-task with more acuity since the students should put themselves in someone's place. And it may stimulate empowerment as we found in the dyad 1 and 3. These are situations that activate different types of knowledge such as procedural, in the categories of instrumental use and boundary between tool and thinking. As well declarative knowledge when they justify, bring examples, or plan strategies, as observed on Subcategory 3.e – Future perspectives. As previously mentioned, the type of task designed by us also focused on the configuration of the dynamics, especially with regard to the alternation of positions. Therefore, more occurrences of Category 5 were observed in the dyads who dedicated more time to solve the tasks. We opted for free time to solve the task, thus in future study we will reformulate it focusing specially in

this category. For instance, this category actuated as tool to disclose an 'extra' view of the shared-object by the polyphony phenomenon, such as the exotopic position and appropriation of other voices. For example, it was observed that the appropriation of other voices allowed the students to show their aspiration for equality as well the apprehension to ingress in the university.

We point here that dynamics of intersubjectivity also contribute to share the responsibility to manage the information and the virtual environment but it requires new teaching strategies aligned with the potential of the digital resources and knowledge of what Internet is and its potential in the contemporary life. Furthermore, it establishes a challenge in education that entails the approximation of knowledge of one generation to other as well to share the responsibility of learning with the students.

As we observed, a new symbolic spaces and hybrid textualities are emerging, such as the rehearsals at the Lecture Hall, in which images, written texts, movement of bodies, sounds are mixing to compose new texture of language. We also highlight the new forms of communication related to writing, which gains new contours of the spoken language and is also expressed by symbols, emoticons, infographics, gifts etc. that are potentialities that digital tools offer. Moreover, content produced in collaboration and mediated by digital technologies introduced new ways to build, shape, and transform shared-objects. In relation to hypertextual possibilities, the students had free internet access if they wanted. The four observed dyads did not use this feature, yet other dyads selected images and links to compose the response. Thus, in the future, we will give emphasis in the multimodality of communication.

The codebook became an instrument that allowed us to observe the procedural and sequential dimensions of the interaction. The dialogical Thematic Analysis consented to explore the relations from the psychosocial viewpoint and the contextual factors that involve the intersubjective phenomenon. Video recordings were also important to look for the other aspects of social interaction. The frequencies of the codebook showed that it was common to the four dyads the construction and maintenance of intersubjectivity by the configuration of the chronotope in the physical, digital and semiotic aspects. As well the instrumental use, the cognitive interdependence and the activation of communicative language regardless of the time dedicated to each task.

On the other hand, we observed that a greater time dedicated to the task made the intersubjective space more permeable in which the thought was taken as a type of space of

the dialogue (interstice) generating possibilities of alternation of positions and use of metalanguage. In the case of dyads 1 and 3, the discourse produced became a source of reference in different levels of reasoning and explanation. Pontecorvo et al. (2005) reinforce this argument and, according to the authors, it is through knowledge itself in a close relationship between learning and discovery processes, that exploratory or discursive-thinking knowledge develops. As well the complementarities and qualification of the opinions, propositions, exposition of ideas etc. In other words, the interlocutors become agents of their own productions.

Taken together the whole information, we observed that this school, at the time of the research, was in transition from exclusively face-to-face practices to a hybrid domain in its culture/micro-culture. In that moment, students and teachers were appropriating the resources available in their space and creating new forms of expression that were not yet clearly perceived by the two teachers. For example, the rehearsals in the Lecture Hall could be seen as a place for negotiation where traditional practices and novelties are being generated. As well the use of the platform as an experimental project that are maintained along eleven years, it probably responds of some expectations for the inclusion of the ICT as well for the assumptions that the teachers had such as security, control, beliefs, experiences, expectations etc. Thus, the transition that this school is facing depends on a more complex change, maybe looking back of the whole process that they passed to institute the use of the platform by them as well the projects that they developed in the last years. As pointed by Ritella and Hakkarainen (2012) the technologies as an instrument of learning/instruction need a long time to develop a system of cognitive-cultural activity. Considering the constrains and affordances that the resources chosen by the teacher-students or students-students allow. Our study in the database (section 1.3 in this work) shows many possibilities to mix the face-to-face and digital resources (Table. 3) that may be adopt at the Brazilian schools.

Moreover, our results gave us an extensive dimension of the transition in this school by the inclusion of ICT in the school practices such as Moodle platform and the project Virtual Scenarios, as well by the students' discourse. As Valsiner (2012) claims, people cultivate symbols, images, values, and beliefs that regulate personal and collective psychological functions. Values or beliefs can be understood as truth, and sometimes it is not questioned by the students. For instance, the outcomes from the two tasks indicate some of these beliefs such as "the students are not disciplined to use technologies", "the use of technologies should be controlled in the class", "no need to use internet, ask for the teacher"

or “we can search only in the presence of the teacher”. That their generation does not feel prepared to use such devices, as posed by the dyads, since “early age”, “kindergarten”, “the beginning of learning”, “childhood” or “the 4th grade”. Also, the teachers’ comments in the Study 1 indicated the idea of the teacher roles in the center of the teaching-learning process. And it may suggest that it is necessary to institute and sustain a culture of teaching and learning in collaboration in contemporary times, especially when it comes in contexts mediated by digital technologies. A set of values was displayed by dyads 1, 3 and 4. For example, the result of the maps could become an instrument/theme of discussion in teacher training because it is related to representation that these students have about themselves. It may open many possibilities, for example, to provoke reflection of the theme proposed in this work – the use of ICT in the classroom.

The transition from face-to-face interaction for collaborative activities in educational contexts mediated by digital devices in this school requires the efforts of teachers to develop new parameters for their practices. For example, recognizing the students’ knowledge as showed by all dyads in the illustrated episodes. All of them were capable to make critical comments, transform the shared-object, produce original contents, participate collaboratively in the web-forum, imagine new scenarios etc. Also, the five categories showed the various dimensions that evolves the intersubjective phenomenon. Thus, our codebook could be used as an instrument for future studies in psychology and education.

CONSIDERATIONS

The main contribution of the study was related to the understanding of the concept of intersubjectivity while collaboratively solving problems in contexts mediated by digital technologies such as web-forum. We consider this research as an attempt to understand, from the perspective of the participants, how these students re-signify these new subjectivities and sociabilities. Furthermore, our research may support the understanding of how they interpret our theme – the use of ICT in the classroom – and how they perceive themselves and others in the transition of the school in the contemporary world. Affordances in collaborative work had a significant role to support dialogical space during a problem-solving task. Levels of interactions, the definition of the space and time show how the tools/objects are perceived, as well voicing and positioning of participants are components that shaping the intersubjective processes. For instance, the chronotopic dimension shown to be very relevant especially when mediated communication is involved. Nevertheless, few studies are attempting to conceptualize it and systematically include it as a dimension of intersubjectivity.

We point here to the possibility of exploration on the authorial construction of knowledge by the use of intersubjective dynamics as a tool to disclose constructive critics, new positions, and cooperativeness. We also point out the need for future studies in contexts mediated by students' own digital devices, aimed online and offline activities.

The results of our study may indicate new paths of research and future research that, considering the strengths and limits of our work, could have implications for the use of technological innovations in school practices. We point out the possibility of more exploration of the Category 5 – Voicing and positioning by practices in computer-support collaborative learning CSCL and CSILE models. Certainly, the subject requires further investigation. We highlight the relevance of future studies that focus new strategies, techniques, and methods of teachers' guidance, in view of new repertoires, transfer of responsibility, more democratic and open to school practices. In the time of the approximation of the differences of knowledge from one generation to another. Our study raises several new questions that can be addressed in the future, for example, the aspects related to empathy, emotions and identification processes in the construction of intersubjective space.

Of course, we acknowledge this study has some limitations. Our sample is limited, although the corpus of data produced was conspicuous and the mix qualitative and

quantitative analysis we performed allowed us to go in depth in the processes we wanted to study. Furthermore, the specific cultural context within which the data was collected may has affected the results.

Moreover, there the philosophical question of how a researcher can understand what people do and think and how they come to understand each other needs to be addressed in a clearly way.

Further research is surely needed to clarify these aspects. We hope our research design could be replicated in other countries and at different school levels, as well and with different types of problem-solving. Our expectation is that the study here presented could attract interest and be pivotal for further investigations.

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APPENDIXES

Appendix. 1 Task 1 – sample 1

Parks' Schools opens an exception for students to use mobile phone, but only one selective class

O Globo Online, reporter Joana Dale.

Rio de Janeiro – After a spot of break-time banter with pals in St Agostinho's College, Leblon, it's the normal heads-down on BBM (a type of Messenger for Blackberry, since the students use Facebook and Twitter on a huge scale, although the use of mobiles and tablets are strictly prohibited in class by the Head. If they're discovered in a test, it means zero.

– We take photos in class and post them on Facebook – on time, all the time and full time – confides a 15-year-old in the 2nd year of Middle School, who, like all his friends, doesn't take the iPad earpiece.

The cheekiest even risk tweeting their teachers' fashion choices.

– *Right or wrong, we're honest when we like a teacher's clothes and also, we joke about a weird coat. They don't even know! – That's the best bit, enthuses a 17-year-old in her third year.*

– Sometimes, when there's a general check, iPods and iPads are rounded up. And everyone knows.

During our first interview, the Middle School coordinator Afonso Celso showed us two tablets he kept in his drawer.

– *Rules are rules, says the teacher. The gadgets are only returned when the student's parents or guardian comes to retrieve them personally.*

Forty-two years ago, when Afonso joined the teaching team, the biggest enemy was the calculator, which even today is forbidden in class.

– What scares me is the speed with which these innovations appear. It took decades before the calculator the calculator appeared. Now everything happens so quickly.

The conventional school, known for its educational strictness, is falling behind. From the window of his office, the teacher points towards an ancient residential block which was bought to house the new middle school centre. Work has already started.

– It's planned for 2012, adds the coordinator *Afonso. There'll be twenty rooms all media connected via laptops.*

In the School, the staff continue to discuss the merits of gadgets in education. Meanwhile, the use of devices is permitted only at break-time, when the learners head towards the "de-regulated" garden space, with their giant ear-pieces and mobiles.

– We're living through a period of change. We need to re-think certain concepts to better deal with this transition, says teacher Luciana Salles, in charge of educational technology at Park School.

Luciana says that the School is looking at using the computer like a notebook, a suggestion that came from the students some three years ago. No doubt that the mobile

will be allowed in class. – *It's prohibited in cinemas, theatres and classrooms.*

The School made an exception for optional classes, such as Cinema Studies. Here the students may use the phone camera to film.

- *We made a film of a break time in class. It was the only time that I switched on the mobile without worrying, says Flora Beatriz Filardi, 16 years old.*

Activities, which integrate new technologies with learning, will be ever more common, according to Lucas Liedke, one of the directors of Box 1824, a company which researches trends in youth behaviour. For him, as there is no ethical framework on these questions, it's important for parents and teachers to discuss openly.

- *In a short time, these trends will exist in close harmony, and one will even come to depend on the other. There is no way that portable technology can be banned for school reality, as that would create an artificial bubble in the lives of students.*

Lucas doesn't dodge the fine line between learning and playing. And votes strongly against the strict control of gadget use. Training in the use of these resources, at the appropriate times, is vital to the preparation of tomorrows adults., who will have an enormous daily selection of electronic devices at their disposal. They will have to healthily deal with this reality, without becoming slaves or tech-weary'.

Author of the recently-published "Children: instruction manual for X and Y generation parents by Record Editor, Tania Zagury stresses that these times come and go, but education from the cradle is never out of fashion. After all, Control+C Control+V in any questionnaire is only quicker than copying a track from a book in the library.

- *The teacher and the Family will need to show to the student and the child that knowledge has to be a conquest, says this educator.*

Appendix. 2 Task 1 – sample 2

Expert in new Technologies supports the use of mobiles and tablets in class

O Globo Online, reporter Rodrigo Gomes.

Rio de Janeiro – While many teachers aim to keep their students away from their smartphones, tablets and social media such as Facebook and Twitter, the new educational technology expert Oge Marques from Atlantic University, Florida, supports their use in class.

He was in Brazil for a lecture on the subject in Curitiba last Friday. For him, with a little caution, these tools can be transformed from the enemy into the best way to understand subject matter.

- *These technologies are ending the paradigms, since they are part of everyday life and can be integrated into schools. Putting technology into education is an attractive option in making classes more exciting, he says.*

According to OM, Twitter can afford a deeper understanding of themes which crop up in class

- *Social sites can be used for students to exchange ideas with teachers and classmates. We can get the best out of our students through social media and by allowing access to these sites in a school environment, says the expert.*

Marques warns that it's essential for the teacher to act as gatekeeper, showing if information should or should not be used.

- *Without the right guidance, sites can cease to be educational aids, he emphasised. Oge Marques states that social links cannot be used as educational aids in an organized way, as there aren't enough teachers for this purpose.*

- *The idea that on the Web we all help each other is too idealistic. What happens is that the blind will lead the blind. For this not to happen, educators must be ready to work with social media in class. Lack of teacher readiness is one of the biggest obstacles.*