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TEACHERS TRAINING TO INTEGRATE HYPERMEDIATIC LANGUAGESAT SCHOOL: A CASE STUDY COMPRISING THREE PUBLIC FEDERAL UNIVERSITIES IN BRAZIL

***[1]Lucila Pesce, [2]Adriana Rocha Bruno and [3]Deise Juliana Francisco**

[1]Universidade Federal de São Paulo, Brazil; [2]Universidade Federal do Estado do Rio de Janeiro, Brazil; [3]Universidade Federal de Alagoas, Brazil

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Corresponding author: ***Lucila Pesce***

ABSTRACT

This article derives from an inter-institutional research developed with the economic support of CNPq (a national research funding agency), toinvestigate the initial training of teachers for the pedagogical use of Information and Communication Technologies (ICT). The qualitative methodology adopted the comparative case studyof three pedagogy courses from federal public universities in Brazil. The research informants were students, teachers, and course coordinators. The research developed a thematic analysis of the answers to the interviews. Thisresearch also developed a document analysis of course syllabus that discuss "Education and Technology", as well aspedagogical programs of these courses. The discussion indicates that there are substantial differences in the symbolic capital amassed by different higher education institutions related to teacher preparation to integrate ICT to social practices at school. Considering this finding, it is important to ensure that PUPs offer one mandatory course specifically aimed at providing theoretical discussion of and practical experience with "Education and ICT". However, a mandatory course on "Education and ICT" is not enough. Universities must also provide the infrastructure (hardware, software, internet connection) to enable those classes to go beyond theoretical considerations, an issue raised during data analysis.

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INTRODUCTION

As we face changes in contemporary social practices resulting from the rise and consolidation of cyber culture's hypermediatic languages, this paper analyses how those languages may be studied at Pedagogy UndergraduateProgrammes (PUPs) in order to be successfully integrated to social practices at school and to enable school subjects to fully exercise citizen engagement. This study publicizes the results of an interinstitutional research conducted between 2014 and 2017, funded by the Brazilian National Council for Scientific and Technological Development – CNPq (MCTI/CNPq n. 14/2014). The*corpus* is comprised of three PUPsin Brazilian public federal universities: Federal University of São Paulo (Unifesp), Federal University of Alagoas (UFAL) and Federal University of Juiz de Fora (UFJF), in the State of Minas Gerais. According to Santaella (2004), hypermediatic languages are languages native to cyberspace. Reticular and nodal in structure and combining multiple semiotic codes (such as text, orality, video, animation, images and so on), hypermedia is the language we use to build knowledge in cyberspace, where much of our contemporary social practices take place. The social and scientific relevance of this study is connected to Brazil's current educational policy, whichviews Information and Communication Technologies (ICT) as educational allies and proposes actions (BRASIL, 2001; 2006; 2010) to mobilize educators to employ ICTs in all education levels, as an important resource to democratize education and access to knowledge and culture. In this context, we address the following research problem: how do the Pedagogy Undergraduate Programmes of three public federal universities implement the existing legal guidelines about teacher preparation to integrate cyber culture's hypermediatic languages to social practices at school (BRASIL, 2001; 2006; 2010)?

Our investigations were focused on three aspects:

- How do the analyzed PUPsaddress in their respective curricula and Pedagogical Programs[1]the current legal

[1] Pedagogical Programs are documents requested by Brazil's Department of Education to allow higher education institutions to award degrees. PPs

guidelines about preparing Elementary School teachers to integrate ICT to education?
- How do course coordinators and the teachers who discuss ICT in their courses see the relationship(s) between Education and ICT?
- Whether Pedagogy students regard the contributions of hypermedia and those of "Education and Technology" studies as relevant to their formation, especially concerning their future work as Elementary School teachers.

Our analysis comprises 1) the curricula and pedagogical programs of Unifesp, UFJF and UFAL's PUPs; 2) the syllabi of courses from all three universities that directly discuss ICT's role in Education; 3) the voices of Pedagogy undergraduatestudents, course coordinators and teachers.

MATERIALS AND METHODS

This research is qualitative[2] and as such does not propose to be neutral, objective or exempt from subjective values. On the contrary, in accordance with Chizzotti (1998), we are aware that the researcher's gnosiological, interpretative and subjective conceptions play a part in his/her analytical efforts. In other words, a researcher's word-view is molded by relativist methodological and ontological conceptions. According to Bogdan and Biklen (2007), knowledge is partial, unfinished, and phenomena must be studied in process. Since all knowledge is based on interpretation, this study takes into account the underlying meanings of informants' linguistic choices, both in subjective and objective situations, as an attempt to better understand their perspectives. In terms of qualitative research types, this is a case study: an in-depth analysis of a unit that seeks to describe, explain, and understand the investigated phenomenon (Padua, 2004; Triviños, 1987); in the classification proposed by Bogdan & Biklen (2007), this is an action research. To be more specific, this is an instrumental case study (Stake, 1995 apud André, 2005, p. 19-22) insofar as the studied cases (the empirical *corpus*, comprised of Unifesp, UFJF and UFAL's PUPs) are not the focus but rather serve as reference to the study of a broader social phenomenon: how do PUPsimplement the existing legal guidelines about teacher preparationto use ICT in Education.

The partner universities (UFJF and UFAL) were selected because, like Unifesp, they are Brazilian public federal universities whose PUPs offer courses on "Education and Technology"; however, thereisone important distinction: their E&T courses are mandatory, whereas Unifesp'sare elective. In addition, both UFJF and UFAL are involved in research projects about the two knowledge fieldsthat form the theoretical underpinnings of this study: "Education and Technologies" and "Teacher Formation and ICT". Research informants are Unifesp, UFAL and UFJF's Pedagogy course coordinators, teachers and undergraduate students that fulfill the following criteria: teachers and students of "Education and Technology" courses and teachers that discuss in other courses the use of ICT in Elementary Schools. Regarding sample representativeness: purposeful sampling was used, based on a probabilistic approach (Jodelet, *apud* Guareschi & Jovchelovitch, 1998). Therefore, differently from a statistical approach, where a representative sample must compriseat least ten percent of the researched group, in this study, informants' individual responses were regarded as the manifestation of group trends. As previously stated, data-gathering consisted of analyzingthecurricula and pedagogical projects of Unifesp, UFAL and UFJF's PUPs, including the syllabi of courses that discuss the relationships between ICT and Education. Informants were heard by means of a) a survey with closed-ended questions (Richardson, 1999; Laville and Dionne, 1996), which was answered by students, and b) semi-structured interviews with course coordinators and teachers. Both research instruments aimed at grasping how students, teachers and coordinators see the experience of preparing teachers to use ICT in Education. Teachers and course coordinators (for the purposes of this research, the latter represent the remainder of the faculty) were interviewed only once, with the goal of understanding how those social actors perceive what actually happens when universities implement the legal dispositions regarding educational use of ICT. Students were heard twice: once to gather their first impressions on "Education and Technology" as a study field, andthe second time at the end of a course on "Education and ICT", now with the goal of understanding, in a historical perspective, what did and didnot change about the role attributed by students to that formative experience in view of their future work as Elementary School teachers.

The following step was document analysis of a) syllabi of the courses that discuss "Education and Technology" and b) Unifesp, UFJF and UFAL's PUPpedagogical programs. In addition, we did thematic analysis (Bogdan & Biklen, 2007; Laville & Dionne, 1996; Richardson, 1999) of the answers to the semi-structured interviews conducted with course coordinators and teachers. The analytical categories employed were derived from a mixed model, as described by Laville& Dionne (1996): in this model, categories are defined based on the theoretical underpinnings and evaluated at a later stage, when the researcher goes through the gathered data. We also performed a quantitative analysis of students' answers to the closed-ended question surveys. Data was organized in graphs and charts and analyzed usingpredefined categories grounded on the research's theoretical underpinnings, which cover the following conceptual fields:

- Culturalist approaches to teacher formation;
- Teacher formation and technologies – political context;
- Neoliberal educational reforms and their impact on teacher preparation;
- Education and ICT: requisites;
- Approaches to the use of ICT in Education;
- Education in the age of cyber culture;
- Digital inclusion and literacy;
- Languages and literacy for ICT;
- Curriculum;
- Digital Culture and ICT – legal guidelines and possibilities for formative processes.

The goal of our analysis was to detect progress and setbacks on the following aspects of student development: the concept of Technology; students' digital literacy; awareness ofICT's limitations and possibilities; Elementary School dynamics. Regarding research ethics, all investigative instruments were submitted to Plataforma Brasil and approved by the Ethical Research Committees (ERC) of the three universities taking part in the study. The Informed Consent Terms and institutional documents authorizing the research are in possession of the research general and regional coordinators. The umbrella research was approved by Unifesp's ERC (cf. 1592876/2016 CAAE 5632.3416.0.0000.5505). The final section of this paper discusses the investigation's results. Literature review was a joint effortof two researchers from different universities. It has been found that there are different understandings of ICT in ontological and epistemological terms, and that each one has fructified in the pedagogical, cultural and political spheres. Pedagogy undergraduate students still display incipient interest in how to approach ICT during formative processes. A number of studies indicatethat we should be concernedabout how teachers of all educational levels perceive their incorporation of ICT to their pedagogical work in the classroom. Literature review also highlights the importance of situating schoolteachers and students as social actors connected in a web-like structure that makes them social producers of information and communication. Another important aspect are the multiple challenges

stipulate course duration, activities and other formative actions (e.g. internships) based on the competencies and abilities to be developed by graduates. PPs must be in line with the existing legal norms and regulations for each profession; Pedagogy courses must observe Brazil's National Curriculum Directives for K-12 Teacher Preparation, among others.

[2]This approach was the best fit for our research proposal, since qualitative research may encompass both qualitative and quantitative analysis, as is the case in this study.

faced by teacher preparation programs (for this study, especially PUPs) to not only integrate ICT to formative processes but to do it thoroughly, to articulate it to the promotion of future work practices that can help K-12 students develop social practices geared towards engaged citizenship. Another finding was a budding trend to go beyond the contribution of media devices to didactic and epistemological processes when approaching ICT in teacher preparation programs. Lastly, the literature review emphasizes the importance of having teacher preparation programs discuss ICT and Education in mandatory courses focused specifically on thesubject. Before presenting the theoretical framework, we would like to clarify that although the academic investigations that are part of this research have a certain degree of independence between them and draw from a somewhat eclectic set of references, such as structuralist and post-structuralist thinkers alike, there is a unity to be found in their shared critical view of ICT as mediatic devices that may either work in favor of the full emancipation of historical subjects or reify the current social subjectivation processes and identity constitution practices. In order to try and avoid reductionism, the theoretical underpinnings draw from avariety of conceptual fields. We have adopted a culturalist perspective to teacher formation studies, based on Tardif & Lessard (2000), Tardif, Lessard& Gauthier(1998), Freire (1983, 1997, 2001), Nóvoa (1997; 1999), Imbernón (2011). In doing so, we have attempted to account for the consolidation of the roleof ICT in social contemporary practices as a defining feature of this research's historical context, where instrumental rationality prevails and is a key component in the definition of Brazil's current educational policy (BRASIL, 2001; 2006; 2010; UNESCO, 2018). This state of affairs includes the rise of cyber culture and has brought new challenges to those concerned with the digital literacy of social actors and with curriculum-related matters, which include the many approaches of ICT use in Education. From those theoretical considerations, we now proceed to data analysis and research findings.

RESULTS

Results are discussed based on three categories structured dialectically so as to stress the contradictions intrinsic to the investigated phenomenon (teacher preparation to integrate cyber culture's hypermedia languages to social practices at school). Working with dialectically structured categories is a strategy to detect consistencies and inconsistencies in each category's poles.

CATEGORY A: *ICT, authorship, and teacher empowerment; ICT &teachers' Work Alienation*

A current hot topic of discussion in Education is the value of Open Educational Resources (OER) and their Web 2.0 co-authorship dynamics. Over the last few years, OER have steadily gained on Digital Learning Objects (DLO), which still follow the Web 1.0 logicwhere one is either a web content produceror a consumer (PESCE, 2010). This discussion is not dissociated from another from our recent past, when Brazil's National Textbook Plan and the spreading of Standardized Educational Resource Systems[3] raised the issue of how textbooks pose a danger of alienating teachers from their work (which is, or should be, essentially authorial), when they should merely serve as one resource among others for teachers to use in their daily activities. On that issue, Pretto (2015) coins the concept of *web-linked author-teachers* and draws attention to the importance of regarding teachers as organic intellectuals (GIROUX, 1988) – and, therefore, as authors of their own work – when integrating ICT to social practices at school. By virtue of considering the historical materiality of students, teaching in an authorial perspective meets Freire's ideas (1997; 2001) of combating teachers' work alienation. This authorial perspectiveon teaching is a cornerstone of our discussion of ICT-related matters in a culturalist perspective (BONILLA & PRETTO, 2015).

Table 1. Analyticalcategories

Consistencies and inconsistencies of how teacher preparation programs prepare pedagogues to integrate ICT to social practices at school	
ICT, authorship and teacher empowerment	ICT &teachers' WorkAlienation
ICT: centralizingobligatoriness	ICT: decentralizingoptionality
ICT&culturalism	ICT & instrumental rationality

Source: Pesce *et al*. (2017)

CATEGORY B: *ICT: centralizing obligatoriness; ICT: decentralizing optionality*

At Unifesp's Pedagogy undergraduate program, all courses that specifically discuss "Education and ICT" are elective and tend to treat ICT not as mere instruments, but mainly as cultural artifacts. On the other hand, the mandatory courses that approach the subject are those that deal with 'Theoretical and Methodological Principles for teaching X' (where X stands for various school subjects, such as Mathematics, Geography etc.). Although these courses approach ICT in a constructionist perspective, they tend to treat ICT as didactic and epistemological instruments – something along the lines of ICT's contributions to the cognitive development of K-12 students. It is not the same at UFAL or UFJF, whose PUPs instituteone mandatory course on "Education and ICT", aside from the available elective courses on the subject (two at UFJF and one at UFAL). In terms of consistencies, this offers all students the opportunity to learn about "Education and ICT" during their formation. In terms of inconsistencies, this curricular organization may cause other, nonspecific courses to not approach the subject at all, which would have negative effects for Pedagogy graduates. A documental analysis of the Pedagogical Program of UFAL's PUP shows that, aside from the specific courses (one mandatory and one elective), only one other mandatory course addresses "Education and ICT": Theoretical and Methodological Principles of Teaching Mathematics. At UFJF, "Education and ICT" is not discussed at all outside the specific courses on the subject. An analogous situation takes place at schools. The São Paulo State Department of Education institutes the roles of Educational Informatics Advisor (EIA) and Reading Room Advisor (RRA) for public schoolteachers already in employment; once their qualifications have been established, those professionals are relieved of classroom duties to work exclusively at schools' informatics laboratories and reading rooms, respectively. While EIAs and RRAs undoubtedly contribute to student formation, the other teachers often end up delegating those formative processes to the specialized professionals. A similar phenomenon occurs when Portuguese Language is regarded as the only subject tasked with developing students' literacy, without acknowledging that each school subject has an important contribution to that complex process. Unlike UFAL and UFJF, at Unifesp'sPUP all courses on "Education and ICT" are elective. In terms of possibilities, this tends to decentralize the discussion because other, nonspecific courses end up approaching matters related to "Education and ICT" and thus the subject is discussed throughout different knowledge fields. In terms of inconsistencies, this curricular makeup restricts student formation, since not all of them choose to take the elective courses and may thus miss out on learning about "Education and ICT" during their undergraduate studies.

CATEGORY C: ICT & instrumental rationality; ICT & culturalism: When it is not centralized byspecific courses on the subject, the discussion of ICT's role in Education tends to happen in the aforementioned 'Theoretical and Methodological Principles for

[3] Standardized Educational Resource Systems are proprietary sets of Textbooks, Lesson Plans, Activities, Tests and Test Answers, among other educational resources such as video lessons. They are produced and commercialized by private educational companies and acquired by private schools. They are widely popular in Brazil as a privatized answer to the varying quality of education: parents feel secure knowing that their children are using a tested-and-approved system that may compensate for any possible shortcomings on the local school's part. However, those systems tend to be rather restrictive for teachers and are heavily criticized by specialized studies.

teaching X' courses. Our findings indicate that although those courses tend to adopt a constructionist approach (Vieira, 2017), their focus on didactic and epistemological matters means that they usually discuss "Education and ICT" in a perspectivemore aligned to instrumental rationality. As previously noted, that is very understandable given the wide array of aspects that those courses must address, of which ICT is but one among many. This matter cannot be properly discussed without reference to its macrostructural context: Brazil's National Pedagogy Curriculum Guidelines (BRASIL, 2006). Because Pedagogy Undergraduate Programs must prepare students for the many work contexts ahead of them– Preschool, Elementary School, Adult Education & Literacy, school management, non-formal education – in under 4 and a half years, they often end up yielding to a logic of instrumental rationality inspiration and prioritizing aspects that will enable the future professionals to perform adequately, especially in the first two aforementioned work contexts. In doing so, this aspect dictated by instrumental rationality eclipses others just as important to a solid formation. In this context, a pedagogue's preparation to integrate ICT to social practices at school(when at all addressed in PUPs, as is the case in all three researched universities) tends to follow the same vein of instrumental rationality. This happens above all in 'Theoretical and Methodological Principles for teaching X' courses, since they are not primarily concerned with discussing the finer points of the relationship between ICT and Education. In the end, the existing legal guidelines onteacher preparation set the blueprint for a formative process that fails to address important aspects of "Education and ICT" as a knowledge field in itself, even when it is the focus of mandatory courses. Therefore, Unifesp Pedagogy undergraduate students do not get to properly study and reflect on the importance of fully experiencing digital culture (Bonilla & Pretto, 2015) to contemporary society's subjectivation dynamics and identitary processes.

DISCUSSION

In line with our literature review, this studyalso finds that the PUPs we researched face the challenge of articulating ICT to students' social and cultural practices, which demands transversal efforts togo beyondthe didactic and epistemological aspects of ICT and acknowledge those technologies as a sociocultural process. In other words, teacher preparation to integrate ICT to social practices at school must not consist solely of fostering technical competencies and reflecting on the role of ICT on the development of Elementary School students. These aspects, although indispensable, are not enough: PUPs must widen their approach of "Education and ICT" to include theoretically sound reflections on the cultural and political roles of those technologies in Education, thus equipping the future teachers to relate to ICT in an authorial perspective. Research findings confirm the indicators listed on Literature Review and lead to recommendations that will be presented next. The investigations conducted over the course of this study reveal that teacher preparation to integrate ICT to social practices at school must enable the participating social subjects (students and teachers) to assume an authorial role. To have teacher formation processes approach "Education and ICT" in adialogic (Freire, 1983; PESCE, 2010) and authorial (PESCE, 2007; Bonilla & Pretto, 2015) perspective, and in accordance with "UNESCO ICT Competency Framework for Teachers"(UNESCO, 2018), it is of the utmost importance that PUPs afford their students the opportunity to discuss the relationship between digital inclusion and empowerment. It is especially relevant concerning working class teachers and students, as is the case of most UFAL, UFJF and Unifesp Pedagogy students, according to the survey answered by the student portion of our research informants. Discussing the relationship between digital inclusion and working class empowerment is also relevant given the profile of public school students, whose vast majority belong to that socioeconomic stratum, and the fact that most Pedagogy graduates attended public school as students and are extremely likely to work there as teachers. Teacher preparation regarding "Education and ICT" must contemplate the culturalist perspective, which will – in the very least – help broaden the reflexive scope to go beyond instrumental matters (such as the priority given to didactic and epistemological aspects, as evidenced by the findings of this study). The culturalist perspective also works with the historical materiality of students, whose social practices are widely mediated by cyber culture's hypermediatic languages, a fact raised by Literature Review and verified during our investigation. In accordance with Literature Review and research findings, it is important to ensure that PUPs offer one mandatory course specifically aimed at providing theoretical discussion of and practical experience with "Education and ICT", for two reasons. Firstly, so that every Pedagogy graduate may come into contact with that knowledge field during their formative process; secondly, so that ICT's intrinsic contradictions can be discussed, as well as the limitations and possibilities ofdifferent approaches to ICT usage, such as the culturalist and the one shaped by instrumental rationality, since research findings reveal that 'Theoretical and Methodological Principles for teaching X' courses tend to prioritize didactic and epistemological aspects, often leaving others unaddressed. However, a mandatory course on "Education and ICT" is not enough. Universities must also provide the infrastructure (hardware, software, internet connection) to enable those classes to go beyond theoretical considerations, an issue raised during data analysis. In addition, as verified by the investigations conducted at both UFJF and UFAL, whosePUPshave mandatory "Education and ICT" courses, this alone does not guarantee that students will acquire proficiency in this knowledge field. Aside from the mandatory course and from 'Theoretical and Methodological Principles for teaching X' courses, it is also necessary to develop a transversal approach that encompassesthe courses onEducation Fundamentals, so that a critical discussion of how to integrate ICT to social practices at school may cover not only methodological matters but also political, psychological, philosophical, historical and sociological ones, as pertaining to the field of Education as a whole.

Next, we will discuss the two most sensitive limitations of this study. The first one concerns research instruments. Although they were validated (by means of a previous test with Unifesp students one year ahead of those interviewed), this involved only Unifesp students. In their report, UFJF researchers pondered the survey's degree of complexity, the option for the Likert scale and how it impacted respondents' answers, making us realize that for future studies it is necessary to validate research instruments at all data-gathering loci so that the particularities of each one may be known and properly addressed by the data-gathering instruments. The other limitation concerns the generalization of research results. Case study results lead to conclusions that hardly lend themselves to generalization, with the exception of applying naturalist principles and transposing results exclusively to other studies whose *corpora* present similar a social and historic makeup. This is in line withthe observations of CNPq's*ad hoc* evaluator about how research in digital technologies & Education varies greatly throughout the country, with some Brazilian federal universities spearheading that research field since the 1980s while others have only recently began working with it. In other words, there are substantial differences in the symbolic capital amassed by different higher education institutions on our research topic – teacher preparation to integrate ICT to social practices at school. That is one of the many reasons why we reiterate that research results presented in this papershould be considered as recommendations and not instructions, so that we may contribute to further discussions of the matter.

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