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ICT Assessment in Teaching: Suggested Indicators for Brazilian and Portuguese Teachers

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Introduction

Discussions about the relationship between learning and communication technologies have become increasingly relevant, particularly when considering the current situation of education. Nowadays we need to think the pedagogical practices in the context of information societies (Unesco, 2009). The training of subjects who will develop activities in the labor market is being guided in a relentless pursuit of production growth (Carvalho, 2011), technological transfer and knowledge. These are two of the factors considered to be essential for social transformation by agencies such as Unesco, without, however, disregarding the need for focused training towards a reflexive use and contributes to the formation of competent individuals acting in modern societies.

During the last two decades there were several attempts to consolidate public policies wich aimed to fill this gap in the training process of the relevant subjects for the use of ICT and its digital inclusion. One of these policies was the program "One by One" developed in several countries, especially those with a major problem in digital inclusion. Among these experiences, we highlight in Brazil the UCA and in Portugal with the Magellan Project, both in order to encourage new perspectives on the relationship with the knowledge and to build new teaching practices inserted in contemporary reality. Although the efforts to consolidate the use of ICT as teaching devices were undertaken, it is evident there is a lack of follow-up proposals and lack of the evaluation of such use in the design of public policies, wich should present assessment instruments and assessment indicators.

Between 2012 and 2014 Portuguese teachers of four teaching units from the city of Aveiro and its sorrounding areas were interviewed. In Brazil, teachers of three educational units located in state of Sergipe participated in the investigation, which aimed to identify and discuss the potential and limitations of the use of “One by One” mobile computers in the teaching practice of these educators. The practical experience of these teachers with the use of computers and mobile technologies provided the basis for the understanding of the points considered successful and those that hinder the development of activities with the students, serving as a foundation to a discussion on the need to better define the indicators considered as most relevant.

The perception of these teahers about their practical experience with the use of mobile technologies provided the basis for the suggestion of indicators following their

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opinion, which are more suitable to evaluate ICT in teaching. This article presents a reflection on the set of indicators suggested by teachers and wich are seen as more appropiate in an ICT evaluation in education and especially in teaching, as a result of this study between Portuguese and Brazilian teachers involved in the Magellan Project in Portugal and PROUCA in Brazil. It also compares teachers' perception and their suggestions distinguishing the most and less relevant in an attempt to understand the place of ICT in various dimensions of the teaching practice

Use and evaluation of ICT in schools

In the context of the new socio-technical arrangements, teaching practice play a role that goes beyond the mere reproduction of the contents distributed in the various existing subjects in the curriculum of compulsory education. Gengnadel & Nicolodi (2012) advocate the consolidation of an educational model wich leads to the education of individuals able to have critical thinking and reasoning about a lifestyle strongly influenced by science and technology. These citizens and therefore the schools that train them, must stimulated the ability to interact with the constant changes imposed by technological advances.

Considered by many as important allies of teachers, the ICT contribute to the changes in pedagogical approaches of a model centered on talking to dictating, shifting to those which provide students with authorship, interaction and collaboration creating a stimulus for autonomous learning processes. According to Silva (2006) teachers should understand the various options available when using the ICT as a pedagogical device, such as: i) multiple information is available (images, sounds, texts); ii) the opportunity for different paths to connections and expressions with which students can count when manipulating information; iii) encouraging each student to contribute with new information, creating and providing more and better pathways during learning.

This reality, in which the technological (r)evolution becomes an intermittent factor requires continuous training of the individuals in order to broaden perspectives regarding the capacity of meaningful use, production and sharing of information towards knowledge. Castells (1999) explains that

> the new information technologies are not merely tools to be applied, but processes to develop. (...) For the first time in history the human mind is a direct productive force" (Castells, 1999; 23).

In this sense, in countries such as Brazil and Portugal, public policies for digital inclusion focused on the integration of ICT and on the access to internet in schools, have been developed in the past 25 years in order to meet the Digital Agenda presented by the Green Paper on Information Society released in Portugal in 1997 and Brazil in the year 2000. Although taking into account slight differences, overall these documents present actions to promote the consolidation of the Information Society in all its aspects, training of human resources, promotion of research and development, e-commerce, development of new applications in a vision where education is preceived as a driving element for the consolidation of the information society, aimed at preparing citizens for life-long learning (Takahashi, 2000).

Taking this context into account, and based on the MediaLabs' "One laptop per Child"[5] Project developed in the Massachusetts Institute of Technology (MIT), created by the researcher Nicholas Negroponte, the PROUCA program was developed in Brazil in the year 2007 and in 2008 the program E-Escolinha in Portugal was launched. Before this program they had already been, since the 90ies, some well succeeded experiences

related with ICT use in elementary schools, although these schools were the ones with less investment concerning ICT.

These projects were a major attempt to include media devices and learning enviroments in the classrooms. By creating a new integration status of ICT in education, both projects aimed at: i) creating a program that would allow continuous access to computers and to the Internet with special access conditions for school community and ii) promoting the development of new learning practices to be implemented nationwide. Among the positive aspects of Project we highlight: the reduction of the digital divide, the democratization of access to computers, availability of good software and the possibility of introducing a technological revolution in schools (Souza, 2009).

Once the need for use of ICT for educational purposes is accepted, it is urgent to uderstand the teacher's role in this new teaching approach (Cortez & Lau, 2009). Teachers are active elements in the educational processes, even in models that emphasize self-management of studies by the students. In other words, it is said that to stimulate the effective use of communication technologies in educational spaces the teachers' expertise in terms of the use of ICT and the use of media has to be taken into account. These are the skills that will be determinant when trying to deal with some difficulties inherent to the integration of ICT as a technical instrument, such as the generation gap between teachers and students, the problems of their initial and continuous trainig, in addition to the implications present in the all to all relationships established within school communication.

The studies and researches developed in Brazil and Portugal, which followed the experience of these two programs are responsible for proving the premise that the mere existence and use of computers in schools does not translate into improved academic performance, such as the researches developed by Pereira (2014) and Gomes (2015), wich argues that the results below expectations regarding the pedagogical use of technologies are linked to factors such as lack of infrastructure, low digital inclusion rates and absence of teaching and managers training. For this to occur, an integration of teaching practices with the new economic reality is needed, wich is only possible when teachers and students adopt new perspectives towards technology and through the implementation of innovative practices. This concept is also heralded by reports that account studies addressing the question of the use of ICT by teachers, issued by various institutions, among which the Unesco (2008a, 2008b); the OEI (2008) and Unesco/Cepal (2006).

The reports[6] illustrate the impact of ICT in teachers' pratices and presents indicators based in data available for analysis. Those are tools related to management (Aenor, 2003) and focused on the measurement of phenomena serving as a strategie for taking decisions. Machado (2014) explains that the indicators are strategies aimed at productivity analysis, almost always quantitative, but allowing qualitative assessments. The indicators are inductive, as they starts with the analysis of general guidelines to infer universal standarts and have their own characteristics, defined by Sierra (2012) as: a) relevance, b) validity, c) reliability, d) feasibility and communicability, f) comparability g) handling resistance and h) link to the objectives. The use of indicators in the evaluation of teaching pratices became common in the last decade with the publication of the Wisis Outcome Document (Unesco, 2005), wich established analysis parameters of educational programs based on the use of informational technologies.

Since then, some researches about indicators have been verified. In Brazil, there are researches such as the one developed by Corradini (2008), wich analyzed the indicators that established the results achived by the studentes in the Program for

Educational Student Assestment (PISA) and in the Teaching and Learning International Survey (TALIS), concluding that the indicators' nature is detrimental to setting goals and comparisons.

Pasinato (2011) compared the evaluation indicators of technology-mediated teaching used in the United States, the European Union and Australia. The researcher concluded that there is no concsensus about indicators, wich justifies the need for more research on this object.

Despite the progress made on issues concerning the relationship teachers/students/technology there is still a gap when considering the assessment of such use or more specifically the impact of these technologies at school. Some of the reports issued bring reflections and even contributions in the form of instruments and strategies for evaluation, however, they do not meet or recognize how teachers think the construction of indicators aimed to measure the success and limitations of ICT use in the teaching practices.

Unlike institutional reports, which are intended to be broader, academic studies are in most cases small clips of micro realities, approached with very diverse insights and methodological contributions, therefore not allowing the contruction of a broader map when it comes to the assessment of the impact of ICT in education. Moreover, when it comes to public policy monitoring and evaluation of the implementation and impact of these projects in the school community, translate as a great void. The state that enforces these policies, does not assess how much they have or haven´t contributed to the achievement of their objectives.

The perception that is necessary to evaluate ICT has become more evident from the last decade of the twentieth century, when in several countries, especially the English-speaking community, programs to verify results started to be developed (OECD, 1992). The first, and still leading, evaluation programs are centered on the analysis of students' learning, being prepared and analyzed by the community outside the school, but there are also programs that evaluate teaching practices, these most often developed by peers or superiors in school management hierarchy (Ferrer, 2006).

Regarding the evaluation methodologies of ICT they can be different in terms of model, but share similar characteristics. Generally this evaluation is pragmatic, focused on the detection of changes in practices, definition of uses, description, monitoring and legitimacy, always taking into account the objects are part of (Morduchovicz, 2006). This evaluation is always based on indicators that are classified as: a) descriptive; b) explanatory; c) simple or d) built. Regarding the type, they can be input; access or result.

At this point it is necessary to clarify the importance of building indicators that clearly address the need to understand the impact of policies in society. The main reason for the demand for assessment indicators lies in the management of school resources, whether economic or human. It is through the application of tools that use these indicators it becomes possible to measure, compare and set (or reset) investments in the policy area. These actions will enable the improvement of educational indicators, wich means more training of individuals allowing them to become more qualified for society and for labor in the context of information.

Course and results

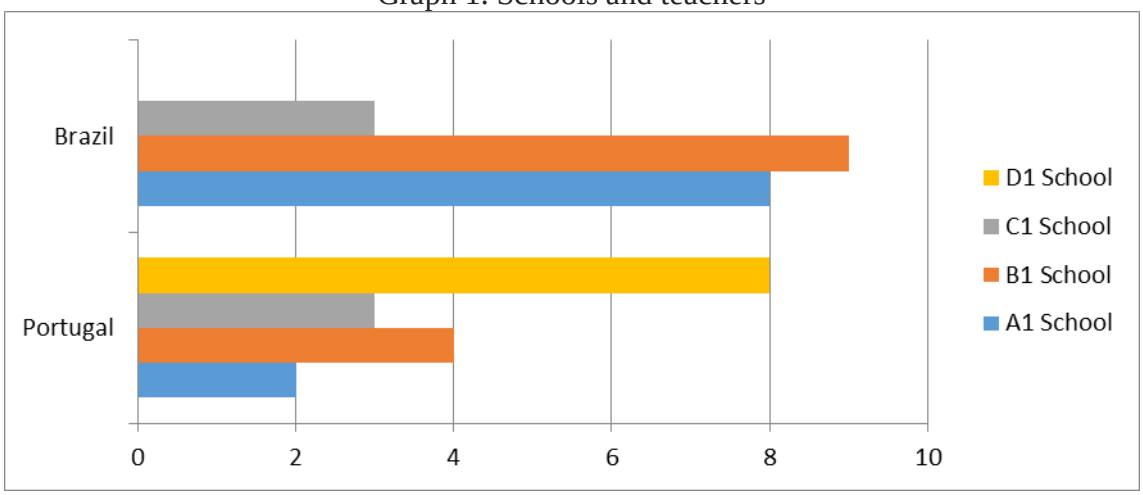
To better understand the ICT teaching pratices of Brazilian and Portuguese teachers so as to identify these teachers' regarding evaluative indicators of ICT use in the classroom, we relied on the collaboration of a group of 17 teachers from the city of

Aveiro and its sourrounding areas of central Portugal and a group of 20 Brazilian teachers who work in the cities of Nossa Senhora da Glória, Itabaiana and Tobias Barreto, all located in the state of Sergipe, northeastern Brazil. The two groups have in common the work they have developed with a series of primary school students and the participation in two projects involving technology in their respective countries (Magellan/Portugal and PROUCA/Brazil).

The study was divided in three stages: application of a general questionnaire, composed of three closed questions and five open questions about the use of PROUCA/Magellan computers; application of a specific questionnaire to teachers who accepted to participate in the interviews with questions aimed at establishing the social profile and opinions on the uses of ICT with the following questions: a) What teachers' opinions about the projects (PROUCA and Magellan)?; b) In what ways do teachers assess the impact of the use of ICT in teaching and learning processes? and c) Wich of the indicators do teachers consider the most important to assess their use of ICT? After this process they were interviewed. The research also aimed to identify the perception of teachers on the following questions: a) What are the teachers' views on the project (Magellan and PROUCA)? b) How do teachers evaluate the impact of the use of ICT in teaching and learning processes? c) Which indicators are considered by teachers as the most important when assessing the use of ICT?

The teachers were divided in groups of two to eight, held at their place of work, with consent and all recorded in audio and video. On avarege these interviews had a time of 50 to 60 minutes. In Portugal they were asked about: i) their training for the use of ICT and the Magellan Project; ii) when and how they use computers; iii) how they plan the daily use of the device; iv) their experience in using ICT in the teaching practice; v) research, use, production and delivery of content and; vi) knowledge, mastery and use of software. It is noteworthy that the same questions were reproduced at Brazilian teachers, but directed to PROUCA. The chart below shows the schools' data and the number of teachers who agreed to cooperate with the survey.

Graph 1. Schools and teachers



During the second phase, based on the content of the interviews and on the analysis of national and international reporting on ICT assessment in education, teachers were emailed a link to a questionnaire with 40 suggested indicators to assess the teaching dimension. Teachers indicated those they regarded as more relevant and appropriate to evaluate the use of ICT in their teaching practices in order of importance.

The questionnaires returned by 14 Portuguese teachers and 11 teachers form Brazil were then analyzed.

First the results from the interviews with the teachers were analyzed, allowing us to create a general profile in terms of their use of ICT ando n the way they perceived ICT as pedagogical tool. Despite some differences we have to register, responses indicate similarities in the approaches and views of both the Brazilian teachers and the Portuguese ones regarding the use of the devices provided by PROUCA and the Magellan Project in various stages of the educational process, from training to use of the devices in the classroom.

Regarding the training focused on the use of ICT, the two groups said they had participated in courses and training proposals, however, they mention that such training was not enough especially if we consider the programs/softwares in question. What they claim is that there was no training to deal with computers delivered by the governments from Brazil and Portugal. The similarity of the answers was also verified in the questions concerning the use and the planning of the activities.

In both countries it was found that schools not create a specific time to plan the activities to be developed during the year with the use of the devices. For this reason, teachers plan their work individually and at home. All schools surveyed determined one single day for the use of computers in classroom. This shows a complete lack of coordination between the teachers and the school and can set up some school resistance to the use of ICT. The fact that these devices are used at a specific time, marked with date and time is against the innovation suggestions, and so, ICTs become nothing but a mere platform to replicate models and ancient.

The lack of a coordinated planning among teachers also undermines the establishment of cross curricular/interdisciplinary projects, wich promote new approaches to learning, thus making the work developed in the classroom focused on the contents of each subject. In this respect, both in the Portuguese schools and in the Brazilian ones, the use of ICT in projects usually happened in the Portuguese subject. Teachers tend to use computers to write texts and PowerPoint presentation without neither producing audiovisual objects, nor providing presentations to the students.

Another point in common between the groups of teachers from both countries is how they think and start to use ICT in their teaching practice. In Brazil, the teachers reported that before PROUCA Project they didn't carry out activities were the ICT were presented. For this reason they still show some resistance to approaches based on technological devices. In Portugal, some teachers have shown some lack of knowledge when it comes to the software os these devices, and state they do not approve the use of the internet claiming it can be fertile soil for exploration of negative processes, using plagiarism as an exemple.

In all cases the teachers point out that both the Magellan Project as well as the PROUCA has positive contributions in the process of widespread access to technologies, working through the steps of planning and learning. In this regard ICT become allies trying to decrease the gap between generations (Almeida & Assisi, 2010), since, after being trained in the use of these devices, students play the role of multipliers to become common the use of these devices in their homes.

The similarities between the answers given in the interview by the members of the two groups are also presented when they criticize the projects. In both cases, the teachers considered the ICT projects promoted by their governments presented the following weakness: i) lack of technical support; ii) lack of continuing education, iii) the project suspension; iv) problems with internet access.

The questionnaire submitted to teachers aimed to stimulate positioning on the most qualified indicators to better assess the impact of ICT in their teaching practice. The questionnaire showed 40 indicators. The following table shows the 10 indicators teachers considered crucial to evaluate ICT in teaching.

Table 1. Most rated indicators

BRAZIL	PORTUGAL
Frequency in the use of technology in terms of planning, teaching practices and evaluation	Frequency in the use of technology in terms of planning, teaching practices and evaluation
Educational strategies and practices developed with the use of ICT in teaching and centered in education	Educational strategies and practices developed with the use of ICT in teaching and centered in education
Teaching strategies and practices developed with the use of ICT and focused on learning	Teaching strategies and practices developed with the use of ICT and focused on learning
ICT integration in student learning	Acknowledgement of the positive results of ICT in the students' learning
Integration of ICT as mediators of content	Integration of ICT as mediators of content
Teachers' level of familiarity with ICT (the teacher links the content to the application of ICT to student learning)	Teachers' level of familiarity with ICT (the teacher links the content to the application of ICT to student learning)
Percentage of students and teachers with electronic mail accounts, weblog, personal web page, membership in at least one social network	Percentage of students and teachers with electronic mail accounts, weblog, personal web page, membership in at least one social network
ICT present in lesson plans and some types of formative assessment and summative programs	ICT present in lesson plans and some types of formative assessment and summative programs
Lesson plans that include ICT education: word processors, web browsers, e-mails, blogs, weaks and other emerging Technologies	Ability to network
Use of virtual learning environments	Basic skills of ICT use

When analyzing the ansewrs given by the teachers from both countries when it comes to the choice of the indicators they consider as most important to analyse the work of theachers, the similarities in the indicators chosen is quite evident. Among the top 10 indicators, eight (80%) were the same in both cases. Also, in this first analysis it is clear that in the opinion of teachers, for proper evaluation of the use of ICT there are three indicators that are directly related to students' learning and also teaching work wich is mentioned in three other indicators. This means that for them there is an inseparable relationship between teaching practices and the results with the students and that technology need to be involved in this relationship.

Teachers' familiarity with the use of ICT, especially when it comes to the personal use, is regarded as important for the evaluation of teaching in the other four indicators (40%). Taking into accouting that the top 10 indicators can be divided into three groups - centered in teaching, centered in learning and centered in personal usage

– we can infer that in the educators' opinion mastering ICT use and the habits of using technological tools beyond the professional sphere is a determining factor to reflect upon the pedagogical practices wich employs ICT.

This result is consistent with the clear need in an information society to reflect upon teaching pratices wich integrates technologies as a cross-curricular aspect and not just a tool perspective. Thus, ICTs are no longer a mere platform for content and begin to play the role that will enable the teacher to reflect upon their use as mediators in the teaching practice, reflecting in issues that range from the skills to use them, critical awareness about their use and their outcomes in educational planning, and also reflecting upon issues such as autonomy of production and dissemination, as well as reflecting on the role ICT play in the classroom and use the results in learning.

This question is linked to the indicators related to the personal use of ICT. For teachers the constant use of technological devices to build knowledge about them. They understand that the level and frequency of ICT use as personal devices through e-mail, access to news and entertainment is also a determinant factor of success of teaching experience that resort to ICT. It is noteworthy that the personal use of technology is considered as important both by the teachers, as by the student. Thus, we can infer that this teacher-student dichotomy guides all understanding teachers have about the pedagogical work.

Teachers also consider that the ICT should be present not only in one specific moment of the educational process, but at every stage, as this is an indicator chosen by 100% of the respondents as critical to evaluation that is put forward. According to the responses to the questionnaire, they consider that the frequency of use of technology in planning, execution and evaluation of the work with the students is another determining factor for the success of the experiments wich use the technological devices used in the PROUCA and Magellan Project.

There is disagreement between the choices made by Brazilian and Portuguese in only three of the indicators. For Brazilian educators it is important to assess how ICTs are included and how they contribute to the learning processes of students, wich is not so much highlighted by European teachers. In contrast, the Portuguese listed as important practices that result in collaborative work sharing and networking.

There are also similarities and differences in indicators that were less mentioned by the two groups, as outlined in Table 2.

Table 2. Least rated Indicators

BRAZIL	PORTUGAL
Plans that include/integrate: I- online platforms; mentoring programs and II-exercises in digital form, III-resources and electronic content	Plans that include/integrate: I- online platforms; mentoring programs and II-exercises in digital form, III-resources and electronic content
Sharing plans with peers	Sharing plans with peers
Selection of specific programs (software) linked to the contents to teach	Selection of specific programs (software) linked to the contents to teach
Content and learning products produced and published by teachers with the support of students	Content and learning products produced and published by teachers with the support of students
Number of registered teachers who participate in educational sites	Number of registered teachers who participate in educational sites
Number of resources created by teachers and made available in the national education portal	Number of resources created by teachers and made available in the national education portal
Hours of lessons with ICT	Hours of lessons with ICT
Number of resources created by teachers in relation to the total resources available for national educational websites	Number of resources created by teachers in relation to the total resources available for national educational websites
Number of teachers who develop and share educational content	Number of teachers who develop and share educational content
Teachers involved in ICT (hours of continuing education in ICT)	Teachers involved in ICT (hours of continuing education in ICT)

When analyzing the indicators classified as less important, we immediately realize the similar perception of the two groups regarding these indicators, as all 10 less selected indicators were the same both in the perception of Brazilian and Portuguese teachers. Despite considering network production as positive aspect for the education process mediated by ICT, teachers do not think of steps such as content sharing between peers, content publishing and participation in educational sites as significant in the evaluation of ICT. This result raises questions about the understanding these teachers have on collaborative work and networking. We have to reflect on how far educators understand the context and the possibilities arising from the use of ICT and relate these to their own ability to authorship, production and content disclosure wich are more suitable for the reality of each classroom.

Another factor that emerges from the data analysis is the teachers' perception related to online learning spaces, for example, virtual learning environments, and specific software aimed at education. Although they stated in interviews that the internet can be characterized as a space that encourages dispersion and plagiarism, they reveal they believe educational sites are not very important indicators when assessing pedagogical approaches that use ICT.

When it comes to the amount of hours devoted to training for the use of technology or devoted to the development of activities to be used in the classroom, the results show they do not consider them very relevant indicators. According to their

replies, this workload does not evaluate the achievement through technology, another important reflection we may infer from this research. In what this item is concerned we highlight most of the speech of teachers have mentioned in their interviews that the training they had was not effective and mostly they mentioned the number of hours was not enough to develop competences to use ICT in schools. Scores on the quality and length of training experiences is present in almost all the results of evaluation involving this dimension in academic studies in Brazil.

Finally, the questionnaire had an open question to encourage teachers to present other indicators not covered by the questionnaire, but that they consider relevant to assess teaching practice mediated by ICT. The suggest indicators can be divided into three dimensions: i) professional (training necessary to work with ICT, software used in professional level, maintenance of machines and Internet access); ii) Personal (gender and age profile, sites accessed at home) and iii) apprenticeship (models that consider collaborative learning; models that consider self-directed learning).

Conclusions

Reflections take into account the role the ICT play in today's society, thought under the light of knowledge and information society, unanimously acknowledge that digital communication technologies play crucial roles in today's daily lives and also in activities wich are directly or indirectly linked to lerarning processes. In this context some changes are required in pedagogical approaches, moving from repetition models to those wich favor learning practices aimed at the education of autonomous, innovative individuals, who master the skills needed to use technology.

Some experiments have sought to develop this perspective in schools, for example the PROUCA and Magellan programs, but these have not produced. Think about these assessment instruments means knowing how teachers relate to the ICT and how they think, build, implement and evaluate methods that can assess their teaching pratices.

The results of this study indicate that teachers themselves recognize the need for a more complete and continuous education to encourage the development of skills in technology use. They also consider essential that the ICT are effectively used at every stage of the educational process, from lesson planning, to the planning of activities and in the measurement of students' outcomes.

Yet it is perceived that teachers have little knowledge about the ICT and therefore can´t recognize all the possibilities that lie in teaching practice mediated by technologies. They show little clarification regarding the networking, collaborative and still show resistance in providing their outputs on the web, outputs wich tend to be only textual, disregarding audiovisual resources common in digital devices.

When it comes to the possibility of setting indicators to evaluate the use of ICT in teaching practice, the teachers mentioned 27 indicators, of which we highlight in the perception of the two groups, those which deal with the dimensions of technology use in classroom, production and sharing of content and especially those related to the use of ICT in times of planning lessons.

The next step to be taken after analyzing the outcomes of our study is to create an instrument with these dimensions/indicators that will then be applied to Brazilian teachers so that can be validate and later present results that may contribute to a better understand the use of ICT use by teachers and the impact of their use in teaching pratices.

Notes

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[6] The reports analyzed were: Unesco (2009a); Unesco (2009b); Chile (2006); World Bank (2005); OEI (2008); Cepal (2006); CGI (2010); BID (2010); Kennisnet (2010); USDE (2011).

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