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LEARNING TO READ WITH GRAPHOGAME, AN ETHNOGRAPHY IN A PERUVIAN RURAL SCHOOL

ABSTRACT

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The purpose of the present ethnographic case study is to examine what happens when the literacy learning software Graphogame, designed in Finland, is introduced in a new and radically different context, that of a poor rural school in the Peruvian Andes. The research attempts to complement the quantitative approach which has dominated the research on Graphogame. It also aims to take into consideration the unique circumstances and challenges of rural Peru and how they can affect the use and implementation of the software.

I spent two months in the rural school of Quilcas, where nine struggling readers used Graphogame for daily 20 minutes remedial sessions. In this research setting, I conducted observations of the students and interviews of the teachers and school director, and collected photo and video data, as well as drawings from the children. The data was analysed inductively using a thematic analysis method and triangulated to increase validity and reliability.

The field research found the nine participants evolving over the two months away from the predicted usage of Graphogame, preferring instead to use the software collectively and for fun. They also displayed difficulties with the drilling methodology on which the software is based. The teacher was found to undertake a central role in the classroom, and having to build rapport and motivation, provide scaffolding and technical assistance, as well as maintain order. The data collected in relation with the wider rural context of the study suggested that the learning difficulties of the participants related to the background of poverty and exclusion of the children. It also indicated that there are remaining barriers to the implementation of educational technologies in Peru, such as the lack of competence of teachers, the deficient infrastructure and existence of numerous job stresses.

Keywords: educational technology, literacy, marginalized populations, Peru.

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Abbreviations and Acronyms

ADD: Attention Deficit Disorder

ECCE: Early Childhood Care and Education

EDIST: Proyecto de Educación a Distancia (Project of Distance Education)

EFA: Education For All

GDP: Gross Domestic Product

HDI: Human Development Index

ICTs: Information and Communication Technologies

INEI: Instituto Nacional de Estadística e Informática (National Institute of Statistics and Informatics)

MDG: Millennium Development Goals

NGO: Non-Governmental Organization

NRP: National Reading Panel

OLPC: One Laptop Per Child

PEN: Proyecto Educativo Nacional al 2021 (National Education Plan until 2021)

PISA: Program for International Student Assessment

ULPN: Una Laptop Por Niño (One Laptop per Child)

UN: United Nations

UNESCO: United Nations Educational, Scientific and Cultural Organization

UNICEF: United Nations Children's Fund

UPE: Universal Primary Education

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1. INTRODUCTION

"If we teach today as we taught yesterday, we rob our children of tomorrow" (Dewey, 1944, p.167).

In the information age of capitalism, we rely on technology to work, communicate and learn. Introducing technologies in the classroom therefore seems essential to prepare our children for participation in tomorrow's society.

This thesis presents the introduction of Graphogame, a literacy learning software designed in Finland, into Peru where it could be implemented in schools on a large-scale. Finland is renowned in the fields of development and education; Peru, on the other hand, has repeatedly ranked last in international tests of educational performance and is marked by strong social, economic and cultural inequalities.

To tackle this situation, the Peruvian government has invested heavily in technologies as a way to improve and modernize its education, and level its society. These initiatives however, have yielded mixed results. How will Graphogame interact in this new context? How will it be implemented and used? Will the findings for Finland be replicated in such a different environment? Or will it encounter the same obstacles as the other technology-based interventions developed to improve Peruvian education?

Inspired by the above initial questions, this inductive qualitative study aims to describe the interactions around and with Graphogame, as observed during its pilot study in Peru. Chapter 2 will introduce what we already know and what is still under discussion on the concepts surrounding this study, such as literacy and literacy instruction, technology for instruction, and educational development. Chapter 3 will present the context of the study, the Peruvian society and education, as well as the government's attempts to date to modernize education with technology. Chapter 4 will outline my three research questions, while chapter 5 will describe the methods selected to carry out the study and answer these questions. The chapters 6, 7 and 8 will present the findings and chapter 9 will conclude this study with recommendations for policy-making and further research.

2. ICTs FOR LITERACY LEARNING

Reading is a complex cognitive behaviour requiring 'complex interaction and integration of cognitive, linguistic, non-linguistic component processes' (Li, 2010, p.97). Furthermore, learning to read is different in different languages. So how do researchers think that one becomes literate? What are the best practices in literacy instruction –that is to say the practices with a reliable record of success (Gambrell, Malloy, & Mazzoni, 2011, p.17)? And why does one fail at the reading acquisition process?

2.1 Phonological approach to reading

This study focuses on the case of written languages using an alphabetic system. An alphabet is a reversible code according to which units of sounds are represented in writing by visual symbols, called graphemes (Stainthorp, 2003, p.212). The unit of sound on which the alphabetic code is based can be the phoneme -which is the smallest unit of the spoken language able to signal a change of meaning- as is the case in Indo-European languages for instance, including English, Spanish and Finnish (ibid.).

In languages using an alphabet, 'spelling' refers to the operation of turning the sounds or words of the spoken language into symbols, also called the process of encoding. On the other hand, 'reading' consists of the opposite operation, that is to say decoding the symbols of the alphabet back into sounds to recover the words (McGuinness, 2004, p.37). Therefore, what the new reader has to do is acquire the ability to translate from visual structures (graphemes) to sound structures (phonemes).

The phonological approach to reading takes its name after the field of phonology which studies the system of phonemes of languages (Stainthorp, 2003, p.210). According to the phonological approach, literacy instruction should first develop the learner's ability of listening and recognizing the phonemes of the language he or she intends to read. Indeed, people are not usually aware of phonemes spontaneously. Then the student needs to learn the relations between the phonemes and the graphemes of the language; in other words, the student needs to learn how to link phonemes to letters (McGuinness, 2004, p.35). In this fashion, it is believed that the learner can become an independent reader rapidly.

When presented with a word, a sentence or a text to read, the learner should first sound out each independent phoneme of the word –using the correspondences between

phonemes and letters that have been taught. The learner then blends the phonemes together into the word, and then finally checks the outcome. Overtime, this process of segmenting the phonemes, blending them together and checking for meaning becomes automatic and is not apparent anymore. Nevertheless, it is still taking place. This is called 'automaticity' and implies that the reader will require less processing capacity to read. Consequently, more attention will be available for comprehension (McGuinness, 2004, pp.161-162).

A direct implication of the phonological approach to reading is that the difficulty of acquiring this skill is related to the attributes of each language. Transparency refers to the extent to which the system of mapping of the correspondences phonemes-letters that the language contains is regular, uniform and consistent (Wydell & Butterworth, 1999 cited in Stainthorp, 2003, p.214). In a transparent alphabetic system, each letter corresponds to one unique phoneme, and vice versa. In this case, it is much easier and faster to learn the correspondences of the system, and the student can learn to read fast and early (ibid.) as is the case with the Finnish, Italian and Spanish languages (Ojanen, 2007, pp.5-6).

As the phonological approach to literacy recommends to teach reading through phonology, it also usually views readers' different abilities as a reflection of what researchers call the phonological processing skills. In his research *Phonological processing abilities and reading competence: theory and evidence*, Li (2010, p.26) defines phonological processing abilities as 'an individual's mental operations pertaining to phonological information, especially the use of the sound structure of one's spoken language, in learning to decode written language'.

Phonological processing abilities can further be divided in three subskills: phonological awareness, phonological memory and rapid naming. Li (2010, p.26-38) describes phonological awareness as the skill related to one's sensitivity to the sound structure of the language -in other words, the ability to manipulate the phonemes of the language, by for instance isolating, segmenting or blending them. As a consequence, learners presenting deficits in phonemic awareness are likely to have decoding difficulties which, if not addressed, can make them unsuccessful readers. Indeed, the decoding problems often lead these learners to be exposed to less text in class, eventually having both less opportunities to practice reading and lower motivation to do so.

Li (2010, pp.45-46) differentiates phonological awareness from phonological memory, explained as the process of coding letters into phonemes so as to be efficiently stored in working memory. Therefore, according to the phonological approach, deficit in phonological memory also leads to the development of reading disorders in so far as the reader presenting a phonological memory deficit will be unable to hold the letter-sound correspondences in the phonological working memory to be blended into words.

Finally, rapid naming is defined as the efficiency of retrieval of the phonological information from the long-term memory. Rapid naming is often tested for instance by showing pictures of objects to children and asking them to name the object represented as fast as possible. As such, it is more a skill related to semantic processing, that is to say to the reading comprehension side of literacy acquisition, rather than to the decoding process in itself (Li, 2010, p.47-48).

Hence, the phonological approach is concerned with developing phonological awareness –the ability to manipulate phonemes- in the student, so that he or she can rapidly become an independent reader through learning the phoneme-letter correspondences of the language. A great deal of evidence supports this approach (McGuinness, 2004, pp.107-152), the most well-known being the report of the National Reading Panel (National Reading Panel (NRP), 2000), entitled *Teaching Children to Read*. The NRP's report reflects the most extensive review and analysis of the research on reading instruction to date. The report concluded that children taught with whole-word methods consistently presented lower reading test scores than children taught with approaches emphasizing phoneme-letter correspondences. In addition, the report explained that phonemes are hard to recognize by the learners; therefore, phoneme awareness needs to be developed in the early reader by doing phoneme-analysis tasks in class. So, the NRP report supported the case of the phonological approach to reading (McGuinness, 2004, p.73-106).

Furthermore, the report gave some additional guidelines for reading instruction, such as the fact that the teaching should be from the phoneme to the letter and not the other way around. Indeed, teaching from the phoneme to the letter allow for the reversibility of the alphabetic code to be maintained, including in non-transparent languages –called opaque systems. In other words, the fact that the alphabet is a code should be made clear to the student, so that he or she can start reading faster in an independent fashion. In addition, the NRP report encourages reading instruction to be consistent in the sound units used to

teach reading. In fact, learners often get confused if teachers mix phonemes, syllables and full words in their classes. *Teaching Children to Read* explains that the instruction should be based on the unit at the basis of the alphabetic system –usually the phoneme (McGuinness, 2004, p.73-106).

The phonological approach to reading is also supported by neurobiological evidence. Shaywitz and her colleagues' research (Shaywitz et al., 2002 cited in Coles, 2003, p.169), compared the patterns of activation of areas in the brain between good readers and dyslexic readers. The research found higher activation of the left part of the brain in good readers across all phonological awareness tasks, when compared with readers affected by reading disorders. This research provided neurobiological evidence that dyslexic readers have an imperfectly functioning system in terms of phonological awareness.

In conclusion, a lot of scientific evidence supports that the phonological approach to reading is the fastest and most consistent method to teach students to become independent readers.

2.2 ICTs for literacy instruction

In the information society, being 'print literate' is often not enough anymore. Pupils are encouraged to be 'computer literate' too, which is best done when the Information and Communication Technologies (ICTs) are introduced in the first years of schools, a time at which children are developing literacy and numeracy skills as symbolic systems of representation (Yelland, 2007, pp.108-111).

ICTs have been used increasingly in classrooms, not for their own sake, but also to support the process of literacy acquisition, especially the phonological approach to reading. Indeed, as explained before, the phonological approach recommends that reading instruction should be based on the learning and stabilization of the correspondences phoneme-grapheme of the language, and that these correspondences should be practiced until they become automatic. This domain of practice can be done effectively using ICTs, by drilling the learner repeatedly, especially in the case of a transparent or near transparent writing systems (Lyytinen, Erskine, Kujala, Ojanen, & Richardson, 2009, pp.669-671; Lyytinen, Ronimus, Alanko, Poikkeus, & Taanila, 2007, p.124). Once the learner can fluently retrieve the phoneme-letter correspondences –in an accurate and fast manner-, cognitive space is freed for comprehension (ibid.).

Actually, ICTs can ensure that this process of stabilization of the phoneme-letter correspondences is done in an optimal and fast manner by providing individualized practice to the learner. Software developed for literacy acquisition can adapt to the level of each individual reader and offer the possibility to evolve at the pace of each learner (Biancarosa & Griffiths, 2012, p.164; Saine, Lerkkanen, Ahonen, Tolvanen, & Lyytinen, 2011, p.1014). Moreover, ICTs can give immediate feedbacks to the learner (Biancarosa & Griffiths, 2012, p.163; Schmid, Miodrag, & Di Francesco, 2008, p.64). The adaptability of ICTs, along with their potential to provide individualized support and feedbacks to students, make them an ideal individual teacher.

Furthermore, this support to the learning process can be done in a diverse and playful manner, so as to keep the learner motivated and focused on the reading acquisition. In her book *Shift to the future: rethinking learning with new technologies in Education,* Yelland (2007, p.37) underlines the greater diversity in terms of modes of representation offered by ICTs to the student: going beyond the linguistic alone, ICTs support literacy acquisition process using visual, audio, gestural and spatial modes of representation. By using a computer game format for instance, the child's practice can be perceived as 'more play, less work', guaranteeing the involvement of the child that is necessary in any learning process (Lyytinen et al., 2007, p.111).

It is for their contribution to the emotional development of pupils that ICTs are especially praised. In fact, as pointed out in Lyytinen et al. (2007, p.2), 'children with delayed acquisition of fluent and accurate reading typically face negative consequences such as development of avoidance behaviour towards learning in general'. With automation on the other hand, the learner is required to answer every time, therefore offering the possibility to provide positive reinforcement for each of the pupil's correct answers (Pressey, 1964 cited in Driscoll, 1994, pp.58-61). Skinner also pointed out that by arranging the content to be learnt in small steps with a progression from simple to complex task, the pupils answer correctly most times, further increasing the chance of receiving positive reinforcement (Skinner, 1958 cited in Driscoll, 1994, pp.58-61). Consequently, ICTs, by being learner-centred, can enhance the learner's self-esteem and confidence (Yelland, 2007, pp.49-50.)

These features of adaptability to the learner's level, providing feedbacks, keeping the reader motivated and positive about his or her abilities make ICTs a tool especially

adapted to the struggling and impaired readers. For example, Olson and his colleagues (1997, cited in Biancarosa & Griffiths, 2012, p.164) found evidence that pupils with reading disorders benefitted from programs offering individualized e-reading practice opportunities through a diversity of engaging word tasks. The NRP analysis also found general agreement in the experimental literature that ICTs have been used to provide successfully a variety of types of reading instruction (NRP, 2000, pp.430-439).

In addition, this support to struggling readers can be provided anywhere with the ICTs, regardless of whether there are trained remediation personnel, for instance when the remediation software is available via the internet (Lyytinen et al., 2007, p.109). Such ICT tools often incorporates additional mechanisms to gather useful data on the students' work. Some data gathering mechanisms are sometimes limited to frequency and duration of use but sometimes extend to include assessment of learning, which can be extremely valuable tools for the teachers' understanding of where the pupils are at –in terms of level and pattern of mistakes (Biancarosa & Griffiths, 2012, p.146).

In conclusion, the advances of ICTs make it increasingly possible to offer wide-ranging support to meet the needs of every learner. Nevertheless, the NRP report (2000, pp.430-439) also pointed out that relevant research was still lacking in the field of computer for reading instruction, especially in the case of research independent of specific computer platforms and software –as technology development seems to outpace research. Many questions remain according to the report (NRP, 2000, p.439), such as:

1. What is the proper role for integration of computers in reading instruction? In what contexts can they be used to either replace or supplement conventional instruction?

2. What are the conditions under which multimedia presentation is useful or desirable in reading text?

3. What are the requisite characteristics of software to teach reading?

4. What is the appropriate mix of reading and writing instruction delivered by computer?

5. How can professional development programs be structured to help teachers effectively integrate computer solutions with instruction?

6. How are the effects of computer usage in pedagogy most effectively measured? Do conventional assessments measure all of the learning that takes place in computer environments?

2.3 Remaining challenges to the introduction of ICTs in the classroom

Although there is ground to support the use of ICTs for literacy instruction, the empirical evidence of its effectiveness is not always equally conclusive. Furthermore, for effective implementation, researchers recommend to consider not only the quality of the ICT innovation, but also its compatibility with the context of introduction. Indeed, presence of the ICT software in a classroom does not alone predict or guarantee its use.

Researching the effectiveness of an ICT innovation should imply a comparison between the reading achievements of students in classrooms using the ICT with those of students in similar classrooms using traditional literacy instruction only. And when it comes to ICT software for which large-scale implementation is considered, one would imagine that such a research would be conducted on a large-scale, ensuring effectiveness and success of implementation. However, as Biancarosa and Griffiths (2012, p.148) explain, such empirical evidence is rather limited.

Looking through What Works Clearinghouse's reviews of 321 literacy intervention program over a decade's time, Biancarosa and Griffiths (2012, p.148) describe that only 13 of the interventions used ICT in some way, only six of which –all small-scale studies-reported to have found 'potentially positive effects with no overriding contrary evidence' for the use of ICTs (ibid., p.149). This implies a limited number of studies, all on small scales, and pointing towards limited effectiveness of ICTs for literacy acquisition. Considering large-scale studies, Biancarosa and Griffiths (2012, pp.148-149) reported that only two such investigations had been conducted as of 2012, neither of them providing evidence that large-scale introduction of ICTs for instruction made a significant improvement to educational outcomes.

Moreover, some research has demonstrated that ICTs do not support equally all learners. For instance, Moran et al. (2008), cited in McKenna, Labbo, Conradi, & Baxter (2011, p.379), found greater effect sizes for ICT interventions targeting general populations of students rather than special population, defined in the article to encompass struggling readers. Another category of learners that supposedly should benefit from ICT literacy

instruction are the younger learners. Indeed, the case has been made that ICT would help this group with motivation and focus. However, young children actually find it hard to engage with technology in an independent manner (Hutinger & Johanson, 2000 cited in Schmid et al., 2008, p.66). They need interaction with an adult to use ICT software in any type of meaningful fashion. On the one hand, they need scaffolding towards modes of visual thinking (Yelland, 2007, pp.108-111) and towards the complex skills required to manipulate such software (Schmid et al, 2008, p.64). On the other, younger learners need rapport and motivation from an adult to learn with ICTs, in the form of praise, acknowledgement and attention, most of all when encountering difficulties. Schmid et al. (2008, p.78) concludes that 'for beginning readers, even with a well-designed computer-based tool, the tutor plays a pivotal role in guiding and motivating the child'.

A great deal of research has also been conducted on the factors promoting full implementation of the ICTs in a classroom setting. Indeed, what good is the best ICT if it is not to be used? What a lot of this research has outlined is the importance of adopting a whole-system approach when introducing ICTs for instruction. Zhao and Frank (2003, p.814) for example, compare schools to ecosystems. In this framework, they compare ICT innovations to invasive species entering a new ecosystem. As invasive species, their survival will depend on their intrinsic qualities, as well as their compatibility with the ecosystem. Laura and Bolivar (2009, p.14) underline three factors of successful implementation: the context, the innovation and the innovator –by which they mean the classroom teacher. Tong and Trinidad (2005, p.16) conclude from their research that the introduction of ICT software will only be possible if all necessary conditions for such introduction are fulfilled, and if all critical constraints are removed, such as the proficiency of both teachers and students in ICT skills or the development of the school ICT capacity in terms of equipment and support.

Common to these different frameworks is the pivotal role of the teacher. In their ecology metaphor, Zhao and Frank (2003, pp.812-813) compare teachers to keystone species: the survival of the ICT will mostly depend on its compatibility with the teaching aims. Tong and Trinidad (2005, p.10) support this argument by explaining that adoption of ICT in the classroom setting is strongly dependent on the 'willingness, compliance and abilities' of teachers in so far as they are the ones controlling the teaching and learning process. Laura and Bolivar (2009, pp.10-11) also identify the training and will of the teacher, or innovator, as the most important factor of successful ICT implementation. In brief, for

ICT to make a contribution to learning, other factors than the innovation itself need to be considered, such as a supportive context of introduction and the willingness of the teacher.

But what makes a teacher willing to introduce ICTs in the classroom? On top of the list of most influential factors reported by researchers are teachers' perceptions of ICTs and of their potential for instruction (Frank, Zhao, & Borman, 2004, p.156; Laura & Bolivar, 2009, pp.62-63; Tong & Trinidad, 2005, pp.10-11; Zhao & Frank, 2003, pp.816-817). For example, Biancarosa and Griffiths (2012, p.150) explain that teachers often view ICTs 'not so much as a means for advancing learning and supporting instruction, but as just one more item on the list of things that students must learn, that teachers must make time to teach'. Another common attitude towards ICTs by teachers is to view it as a game learners can play with during their free time, or get access to as a reward after real work has been done (Turbill & Murray, 2006 cited in McKenna et al., 2011, p.383). Needless to say that such perceptions of ICTs are unlikely to support meaningful use of ICTs for instruction.

Such attitudes are themselves related to a diversity of elements such as teachers' own history, pedagogical practices and the perceived cost of introducing the innovation in the classroom practices (Zhao & Frank, 2003, p.830). Also, very important in shaping educator's attitudes towards ICTs is their immediate environment: the school. The school vision, the perceived adequacy of resources in terms of equipment and technical support as well as the job stress confronting educators –such as class sizes and emphasis placed on standardized tests- are all strong predictors of use of ICTs for instruction by teachers (Frank et al., 2004, pp.158-160; Laura & Bolivar, 2009, pp.21-22; Zhao & Frank, 2003). Furthermore, researchers warn about the common tendency of many educators to resist change (Harwood & Asal, 2007, p.72; Laura & Bolivar, 2009, p.12; Tong & Trinidad, 2005, p.14) and the necessity to provide adequate training. Indeed, teachers cannot teach about what they know little or nothing; doing so lead to great anxiety (Frank et al., 2004, p.815-816; Harwood & Asal, 2007, pp.51-78; Laura & Bolivar, 2009, p.10; Tong & Trinidad, 2005, p.14; Yelland, 2007, p.112).

In short, successful implementation of ICTs for literacy instruction depends on the quality of the innovation itself, its context of introduction and the perceptions of the innovator. In the book *Enabling praxis: challenges for education*, Kemmis (2008, pp.45-46) summarizes and generalizes this point:

"These material and economic conditions prefigure possibilities for practice and thus what the educator will think about as she or he works out how to respond to the circumstances of students, their families, their community and the place of all in the wider world […].

We can conclude, then, that dispositions are shaped culturally and discursively, so that situations are understood in different kinds of ways, as different kinds of situations calling for different ways of responding to them. In the same way, forms of action are shaped through previous actions and interactions, previous experience, and the ways situations themselves are arranged".

By situating practice in its cultural, social and material context, Kemmis helps us understand why the implementation of ICTs in the classroom setting have not always had the effect expected. This argument is also crucial to understand the educators' practices in terms of literacy instruction.

2.4 Remaining challenges to the phonological approach to literacy instruction

The effectiveness and success of the phonological approach to literacy instruction has also been criticized. As previously explained, the phonological approach to reading is based on neurobiological evidence. However, not all researchers agree on the interpretation to be made of the data in question. Indeed, Coles (2003, p.169) explains that the different patterns of brain activation found between good and poor readers show that a correlation do exist between brain activity and reading ability. However, he contests that the brain activity can be understood as a cause of the reading ability, or that it demonstrates in any way that there is a better method for teaching to read. In fact, the research conducted by Coles and Goldstein (Coles & Goldstein, 1985 cited in Coles, 2003, p.169-170) found that as the struggling readers improve, the brain activation patterns also evolve towards the ones of the better readers. Coles (2003, pp.172-173) explain that the view that a method of instruction would be superior to all others is grounded in the 'modular view' of the brain, according to which:

"the brain has specific modules for specialized operations that work in sequence and in coordination with other modules in learning written language. [O]ne or more modules that process basic sound-symbol skills are believed to be fundamental in the

hierarchy and organization of modular brain activities that underpin learning to read. That is, unless these fundamental modules first process written sounds and symbols, other brain modules involved in learning to read will not be able to function adequately."

Yet, this assumption is contested by many neurobiologists, in favour of the 'connectivity pattern'. This model understands that the brain areas involved in learning the sound-letter correspondences do not need to be activated first for the other areas to become active later on, or that there even exist such a fixed pattern. According to the 'connectivity pattern', if instruction was to stimulate different regions of the brain first, an alternative pattern would emerge, functioning equally well.

This idea has been reflected in alternative views of the relation between phonological awareness and reading. Actually, some researchers view phonological awareness as a consequence of the process of reading acquisition, while others understand it as a relationship of mutual development (Li, 2010, pp.38-41). Stanovich (1980) cited in Beard (2003, p.203) also outlines this idea when looking at the different subskills of reading. He explains that readers with deficiencies in lower level processes –such as poor word recognition skills- can compensate for them with greater reliance on higher level processes –for instance using contextual cues.

The effectiveness of the phonological awareness training itself has been contested. McGuinness (2004, p.35) attacks phonological awareness programs on their unwritten assumption that it is hard for children to learn to recognize phonemes. In her book *Early Reading Instruction: What Science Really Tells Us About How To Teach Reading,* McGuinness (2004, p.166) explains that the most often cited study to prove the phonological development myth is the one conducted by Bradley and Bryant (1983). But as she demonstrates, this study presented poor results and contained some major flaws in terms of design and data analysis. McGuinness (2004, p.179) then puts forwards a well-designed study conducted in Germany by Schneider and his colleagues (2000) which found that neither phoneme awareness tasks alone, nor sound-symbol associations alone, have a significant impact on learning to read. In addition, she reports that phonological awareness training can even be detrimental when offered as remedial training for struggling readers, if it is inconsistent with the method followed in class. For her,

consistency between remedial training and classroom instruction is critical so as not to confuse children.

Many researchers share the view that the crucial factor to successful literacy instruction is not actually the method to be used, but the teacher giving the class (Allington, 2011, p.96; Gambrell et al., 2011, p.11). A large-scale study conducted by Bembry, Jordan, Gomez, Anderson and Mendro (1998, cited in Allington, 2011, p.97) supported this argument: the study found that after three years in high-quality classrooms, children outperformed by 40 percentile ranks pupils whose initial achievements they shared. Such results were later replicated in various studies.

What makes a great literacy teacher according to these studies? A teacher who is able to detect the different needs of his students and respond with adequate strategies such as using letter-sound correspondences, re-reading or looking at the pictures for cue (Allington, 2011, p.104; Gambrell et al., 2011, pp.22-29). Very relevant is also the teacher's ability to contextualize literacy instruction, for instance by offering to the learners plenty of opportunities to read for meaning-making purposes –to collaborate on a project, to investigate, as well as for pleasure by presenting a wide range of reading material from which to choose for autonomous reading. The teacher should also develop a vision of literacy that is inspiring students to become readers and writers, such as promoting literacy as a social act, by encouraging peer talk for text interpretation for example (Gambrell et al., 2011, p.20).

Once again, the research indicates that best practices of literacy instruction are situated in their cultural, social and material contexts. We will now turn to the extreme cases of indigenous communities and rural areas, where context can present additional challenges to the current practices for literacy instruction.

2.5 Challenging the current trends in literacy instruction: the case of the rural and indigenous populations

The concept of 'indigenous', although frequently used in research, is not always clarified in terms of its meaning and limitations. A first dimension of this concept is in relation to a particular land (Aikman, 1999, p.13). The Oxford English Dictionary defines indigenous as 'Originating or occurring naturally in a particular place; native' ("Indigenous", 2014). However, this relation to the land goes further than being a place

of birth, to being a worldview. Eloy Licuy, cited in Aikman (1999, p.13) describe the land as being the main factor of survival of the indigenous populations. According to Burger, also cited in Aikman (1999, p.14), indigenous peoples present an alternative worldview rooted in 'custodial and non-materialist attitude to land and natural resources'.

Furthermore, Aikman (1999, p.13) and McGovern (2000, p.524) both describe indigenous people in relation to the process of colonization. Indigenous populations refer to the people who have been conquered and controlled on political, economic and cultural levels (ibid.).

Often, indigenous populations are identified in relation to the language they speak, and referred to as 'indigenous speakers' or 'native speakers' in scientific papers. However, the dynamics between indigenous communities and the language they speak are too complex for the former to be defined solely in relation to the later. For instance, the government of New-Zealand outlawed the Maori language in the 1880s; a century later, the Maori language was threatened of extinction, as less than one in four members of the Maori population could speak it (United Nations Educational, Scientific and Cultural Organization (UNESCO), 2010, p.173). The *EFA Global Monitoring Report 2010: Reaching the Marginalized* (UNESCO, 2010, p.201) also describes the struggle of the Australian aborigines children of school-going age, who speak Aboriginal English, a dialect related but separate to the Standard Australian English taught at school. According to the report, these children and their teachers are often ignorant of the difference between the two, so that the pupils are taught that their way of speaking is wrong, and the teachers believe them to be affected by a learning disorder, leading to the perpetuation of a circle of underachievement.

In Peru, the number of languages and dialects spoken by indigenous populations is unclear. Bizot (1975, p.13) writes that there are more than a hundred of them, whereas Cueto and his colleagues (Cueto, Guerrero, León, Seguin, & Muñoz, 2009, p.1) report forty. Quechua, which originates in the Andes, is the most widely spoken indigenous language (Ames, 2012, p.454; Cueto et al., 2009, p.1) although many dialects of it exist depending on location. It was the official language of the Inca Empire in pre-Colombian times, and was replaced by Spanish after the invasion (García, 2004, pp.457-459). The influence of the Quechua language continued after the conquest but as the language of the colonized, an oral language, considered inferior. It was later outlawed for nearly two

centuries, following the rebellion of 1780 (ibid.). Nowadays, Breitkopf (2012, p.86) reports that the Quechua language is disappearing from province capitals and that children of the surrounding areas she observed, although able to speak both Spanish and Quechua, were more confident using the Spanish language. Cueto and his colleagues (2009, p.2) confirm that nearly all school-age people can speak Spanish. These examples point out the limit of equating indigenous populations and indigenous speakers.

The indigenous children of Peru were mostly excluded from schooling until the mid-20th century. Nowadays, nearly all attend school; however, attendance has yet to translate in educational achievements (Ames, 2012, pp.454-455). The rights to education of the indigenous populations of Peru are rooted in the Constitution of 1993. In the translation of Cueto and his colleagues (2009, p.22), the Constitution affirms that 'The State guarantees the eradication of illiteracy. Also, it promotes bilingual and intercultural education, depending on the characteristics of each zone. It preserves the diverse cultural and linguistic manifestations in the country. It promotes national integration.' This right is also entrenched in international documents such as the United Nations' Declaration on the Rights of Indigenous Peoples which states that 'Indigenous peoples have the right to establish and control their educational systems and institutions providing education in their own languages, in a manner appropriate to their cultural methods of teaching and learning' (UNITED NATIONS (UN), 2008). The *EFA Global Monitoring Report 2010* (UNESCO, 2010, p.196) also points out that educational provisions for indigenous populations, and more generally for marginalized groups, relate to the principle of inclusive education, which asserts 'the need to work towards "schools for all" – institutions which include everybody, celebrate differences, support learning, and respond to individual needs' (Salamanca Statement and Framework for Action, 1994 cited in UNESCO, 2010, p.196).

However, reality still falls short of these promises, in the case of Peru as elsewhere, and striking differences can be observed between indigenous and non-indigenous groups in terms of educational achievements. In Peru, Cueto and his colleagues (2009, p.4) report that the adult illiteracy rate of indigenous populations was as high as 21% in 2007, against 4% for non-indigenous people. In addition, citing Young Lives Surveys, a longitudinal study of Peru, Cueto et al. (2009, p.13) present a large gap in overage between children of indigenous and non-indigenous populations, a gap further widening with time: from 15.5% when the cohort of children monitored were 8 years old, to 26.1% when they

reached the age of 12. Also mentioned, the overall educational achievements show a gap of 1.07 standard deviation in language assessment between indigenous and non-indigenous pupils, and 1.22 standard deviation in maths –among the largest gaps for Latin America reported in the literature (ibid.). Numerous studies have confirmed these findings such as the World Bank (2007, p.5), and Ames (2012, p.455) who describes that no more than 6% of Quechua children performed at grade level in reading comprehension in their mother tongue, and 19.2% of these pupils reached the required grade level in Spanish. Furthermore, the *EFA Global Monitoring Report 2013/4: Teaching and learning: Achieving quality for all* (UNESCO, 2014, p.19) underlines that Spanish-speaking children in Peru are more than seven times as likely to perform at a satisfactory level for their grade in reading than their indigenous speaking counterparts. Therefore, in spite of attending school, it seems that indigenous children are not acquiring the knowledge against which they are being assessed.

In fact, the educational inequalities described are usually rooted in deeper mechanisms of exclusion. At a worldwide level, being indigenous increases the probability of living in poverty to between 11% and 30%, depending on the country (UNESCO, 2010, p.170). In the case of Peru, Ames (2012, p.455) reports that 78% of indigenous children live in poverty and 45% in extreme poverty, compared with 40% and 12% for the rest of Peruvian society. Their access to healthcare and public facilities such as electricity and sewage is also much more limited than non-indigenous populations (Cueto et al., 2009, p.25). Moreover, in spite of attending schools and doing so for longer years, these gains have not translated in terms of better employment prospects and wages, demonstrating that discrimination remains in the labour market (UNESCO, 2010, p.170). Hence, not only do indigenous children start in life disadvantaged, but improved access to education has failed to reduce poverty. Poverty can in turn translate into child labour, making it even harder for children to perform at school (ibid.).

EFA Global Monitoring Report 2010: Reaching the marginalized (UNESCO, 2010, p.169) describes how rural households, lagging far behind urban ones in educational achievements, are particularly affected by this vicious cycle of exclusion. Indeed, geographical disparities often relate to larger processes of socio-economic inequalities, ethnicity, language and rural-urban divide (ibid.). Children growing up in rural areas live more often in poverty, have to travel greater distances to school, attend schools of lower

quality and have less educated parents, all factors getting in the way of their school performance (ibid., p.145).

Another factor affecting the educational prospects of indigenous and rural populations is the devaluation and exclusion of their forms of knowledge and literacy practices. According to the sociocultural view of literacy, literacy learning practices cannot be separated from the cultural context in which they are rooted (Gillen & Hall, 2003, p.7; Gutierrez & Stone, 2000, p.152; Razfar & Gutiérrez, 2003, p.34). However, in the case of the indigenous populations of Peru and elsewhere, their understandings and experiences of literacy usually differ from the model offered by the formal school setting. Actually, indigenous populations tend to understand literacy practices as holistic and local, rooted in a particular environment and history (McGovern, 2000, p.524; Prakash & Esteva, 1998a, p.3). Literacy is also understood in terms of its purpose, which is collective and relates to the survival of the community, the needs and objectives of its people (Aikman, 1999, p.17; Eady, Herrington, & Jones, 2010, p.263). On the other hand, the scientific model promoted by formal schooling often assumes that literacy is an autonomous subject, a culturally neutral set of skills (De La Piedra, 2006, p.389; Razfar & Gutiérrez, 2003, p.34; Viruru, 2003, p.14). This assumption does not value equally all the views of literacy, but privileges one, against which all the pupils are assessed. Performance failure is then perceived as a deficit of the pupil (Cairney, 2003, p.89; Razfar & Gutiérrez, 2003, p.37) and illiteracy becomes synonymous with ignorance (Viruru, 2003, p.14). Ethnographies in education have pointed out that pupils exposed to the same literacy practices at home and at school typically perform better (Eisenhart, 2001, p.210-211; Razfar & Gutiérrez, 2003, p.41), making the case for inclusion of the children's funds of knowledge in the classroom (Cairney, 2003, p.89; De La Piedra, 2006, p.387).

The exclusion of the voices and worldviews of certain populations has led to resistance and failure of development programs, in the field of education and literacy as well as others.

2.6 Educational development

Development has been defined as 'good change' (Chambers, 1997, cited in Thomas, 2000, p.23) or again 'change for the better' (Cremin & Goretti Nakabugo, 2012, p.499). According to Thomas (2000, p.23), 'change' refers to the potential disruptions to existing patterns of living entailed by the process of development. 'Good' or 'for the better' looks

towards the long-term improvements brought about in terms of standards of living; also, it points to the idea of a goal and of measurement towards achieving this goal–with some countries being labelled as developed, and others as developing. So, the developed countries are often viewed as the model that developing countries should emulate. In the words of Bernstein (1983, cited in Thomas, 2000, p.30) 'If you want what we have (and have achieved), then you must become like us, and do as we did (and continue to do)'.

In the 90s, the concept of human development emerged, which considered development in terms of the choices and possibilities available to people to live long and healthy lives and to acquire the knowledge and the resources for a decent lifestyle (Cremin & Goretti Nakabugo, 2012, p.302). The Human Development Index (HDI) was created as a measure of this concept, based on three indicators: life expectancy, educational attainment and income per capita. Therefore, human development underlines an interrelated approach of development, in which progress in either economy, education or health will favourably affect the other areas. This view has also been put forward with the eight Millennium Development Goals (MDG) elaborated during the Millennium summit of 2000, and to be reached by the 2015 deadline, including targets in eradication of poverty and hunger, achievement of Universal Primary Education (UPE) and gender parity in education, as well as in reducing child mortality and the spreading of infectious diseases, among others. So education is considered both as a mean to development and a goal of development too (ibid.).

Education is considered in the development field as an investment towards economic growth and poverty reduction (Cremin & Goretti Nakabugo, 2012, p.304). Indeed, acquisition of basic reading skills for all would lead to an estimated 12% cut in world poverty (UNESCO, 2014, p.13), by improving production (Weber, 2007) and productivity (UNESCO, 2014, p.14). This process is induced by the creation of a bank of knowledge and skills in the country, called 'human capital' (Cremin & Goretti Nakabugo, 2012, p.504). Moreover, education is considered in the development field as one of the most efficient ways of improving people's health (UNESCO, 2014, p.15). Actually, education saves lives every year, for instance by preventing and containing diseases and working towards an end to malnutrition (ibid.). For all these reasons and also because it is a basic human right (UNESCO, 2010, p.136), the educational agenda is strong within the development field. This agenda has been given predominance with the second and third MDGs, as well as with the six goals of the Education For All (EFA) framework,

which was set up in March 2000 and to be completed by the 2015 deadline: expansion of Early Childhood Care and Education (ECCE), UPE, development of learning and life-skills programs, improvement of adult literacy by 50%, achievement of gender equality and finally, improvement of the quality of education. However, none of these goals were reached by the 2015 target (Ahmed, 2015, p.64; UNESCO, 2014, pp.1-6).

Alongside this common agenda for education, similar educational reforms have been introduced in different countries around the globe (Cheng, 1998, p.11; Hallinger & Leithwood, 1998, p.126; Lam & Lidstone, 2007, p.178). This reform movement, called 'New Curriculum' by some researchers (Lam & Lidstone, 2007, p.179), understands that recent changes in the working world should be reflected in education, with schools teaching pupils to be independent innovators and researchers, making use of technologies; schools should become the annex of industry and help the country to be more competitive internationally (ibid.). With the 'New Curriculum', business concepts and management techniques have entered the education discourse, such as accountability, outcomes, assessments, indicators (ibid.). Furthermore, in the words of Lam and Lidstone (2007, pp.179-180), this reform movement promotes 'a shift away from a teaching syllabus-oriented curriculum to a focus on student learning outcomes' as well as the integration of 'computer technology in the curriculum as a major teaching and learning tool'.

However, both the global agenda for education in development, and the practical reforms promoted by the 'New Curriculum' have been heavily criticized. Firstly, critics have pointed out that this approach to education is not universal but is a reflection of Western theories and practices (Cheng, 1998, p.11; Cremin & Goretti Nakabugo, 2012, p.502; Hallinger & Leithwood, 1998, p.126; Hargreaves, 2010, p.105; Prakash & Esteva, 1998a, p.17). For instance, the idea of universal human rights does not make sense in many cultures which do not even have such concepts as 'right' or 'law' (Prakash & Esteva, 1998a, pp.21-23; Prakash & Esteva, 1998b, pp.110-124). Consequently, the implementation of similar programs in different contexts will lead to different responses from teachers and students, and sometimes to failure of the reform (Cheng, 1998, pp.26-28; Hallinger & Leithwood, 1998; Lam & Lidstone, 2007, p.180). Indeed, in educational reform, all the elements of the system are connected to each other; hence, changing one element of the system –such as by implementing a reform, and doing it in a different cultural context- will change everything else (Hargreaves, 2010, p.108). Moreover, this influence from the developed countries of the West has led to homogenization of

education systems and cultures, which has also been heavily criticized (Hallinger & Leithwood, 1998, p.127; Prakash & Esteva, 1998a, p.7), especially since the beneficiaries of such programs are not usually consulted (Escobar, 1995, pp.94-101; Freire, 1996, p.75). Freire (1996, p.76) described this process as being one of cultural invasion and its outcome as being a necessary failure: 'One cannot expect positive results from an educational or political action program which fails to respect the particular view of the world held by the people. Such a program constitutes cultural invasion, good intentions notwithstanding'.

Improving the reading performance of the children of rural Peru with ICTs is a case of educational development. As such, the beneficiaries of the program and the context of introduction of the reform should be considered. The next chapter will present the Peruvian context, with a particular emphasis on how educational ICTs have been introduced and used in Peru to date.

3. ICTs in the Peruvian Education

3.1 Children in the Peruvian society

Peru is an upper middle income country with one of the most stable economies of Latin America (United Nations Children's Fund (UNICEF), 2013, p.2). Its Gross Domestic Product (GDP) has grown by 6% annually since 2011 leading to important reductions of poverty overall, although 24% of the population was still under the national poverty line in 2013[1].

However, Peru is also a country marked by diversity and deep inequalities. On a geographical level, the half million squared kilometres of the Peruvian territory includes desert regions on the Pacific coast, the high Andean mountains and parts of the Amazon jungle. Historically, this diversity has rendered communication difficult between these different regions and the various cultures that inhabit them, so that they have developed in relative isolation from each other (Bizot, 1975, p.7). Nowadays, Peru is very much affected by this uneven development, with some regions recording poverty levels of just over 10% while others, such as the regions of Huancavelica and Apurimac in the Andes, have about 60% of their population under the poverty line (UNICEF, 2013, p.2). These economic disparities, which remain among the highest in Latin America, are reflected at all levels of the Peruvian society. In fact, the access to health infrastructures stays very low and expensive in rural areas, and so does the access to electricity, sewage disposal systems and sanitary facilities (Escobal et al., 2003, p.4).

Peruvian children are particularly affected by these inequalities, as 62% were growing up in poor households, and 22% in extremely poor households in 2000 (Escobal et al., 2003, p.10). Actually, nearly half of the six to nine years-old enrolled in primary school in Peru were too short for their age in 2000, a result of nutritional deficiencies or previous severe malnutrition, which affect not only their growth but also their intellectual capacities (ibid.). Furthermore, both the *UNICEF Annual Report 2013 – Peru* (UNICEF, 2013, p.2) and the *Young Lives Preliminary Country Report: Peru* (Escobal et al., 2003, p.4) established the relation between malnutrition and the wider inequalities of the Peruvian society, by indicating that chronic malnutrition was 12.5 times higher in the bottom

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[1] World Development Indicators: http://databank.worldbank.org/data/views/reports/tableview.aspx, accessed 21-04-2015

quintile of the population than in the top one (UNICEF, 2013, p.2) and that 62% of children affected by malnutrition lived in rural areas and 97% of them attended public schools (Escobal et al., 2003, p.6).

In addition, the incidence of child labour is high in Peru and 'should be a genuine concern for Peruvian society' (Escobal et al., 2003, p.8). According to the report, 24% of children in the poorest group worked for payment in 2000 against 6% in the wealthier group -not including non-remunerated labour, such as helping the parents to work the fields or to look after the cattle (ibid.). Although nearly all Peruvian children attend primary school, combining work and school has been demonstrated to be detrimental to educational achievement and to have adverse consequences for cognitive abilities (UNESCO, 2010, p.168).

Another issue confronting Peruvian children is the unrelenting domestic violence (UNICEF, 2013, p.7). Indeed, 41% of parents nationally confirm using corporal punishment in order to discipline their children. Once again though, this figure increases in the case of areas more affected by poverty and exclusion, such as in the previously mentioned region of Apurimac where 62% of parents use corporal punishment (Escobal et al., 2003, p.9).

These various indicators demonstrate the significant inequalities remaining between socio-economic groups in Peru, as well as between rural and urban children. As a consequence, Peruvian children overall still lag behind children from other Latin American's countries presenting similar development levels (Cueto et al., 2009, p.16; Escobal et al., 2003, p.10). Nevertheless, the budget allocated by the Peruvian government to address child health, nutrition, education and family violence has increased by 7.9% in 2013 (UNICEF, 2013, p.2) and has grown more than twice between 2001 and 2011 (Guadalupe, León, & Cueto, 2013, p.1), so that the Peruvian state currently spends on these issues amounts per capita similar to those of Chile or Costa Rica, which rank higher in terms of HDI. These figures confirm a highly inefficient management of spending and inadequate priorities in terms of spending by the Peruvian state (Escobal et al., 2003, p.14), though at the same time, the overall public investment in education remained at 3.3% of the Peruvian GDP[2], which is under the 6% that should be allocated

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[2] Government expenditure on education, total (% of GDP): http://data.worldbank.org/indicator/SE.XPD.TOTL.GD.ZS?order=wbapi_data_value_2014+wbapi_data_value+wbapi_data_value-last&sort=asc, accessed 25-04-2015.

to the education budget according to the Peruvian Education Law of 2003 (Guadalupe et al., 2013, p.1) and the recommendation of the UNESCO (UNESCO, 2014, p.9).

3.2 Education in Peru

Primary education in Peru is a public good, and attendance to primary school is compulsory. Enrolment rates for children of primary school age are very high (Guadalupe et al., 2013, p.1), across economic, geographic and ethnic groups (UNICEF, 2013, p.2), as a result of the significant efforts made by the Peruvian state throughout the 90s to improve enrolment rates and educational provision (Escobal et al. 2003, p.6).

However, as the World Bank report for Peru (World Bank, 2007, p.4) points out, the Peruvian state has placed more effort in putting children into school than in providing them with quality education. In fact, when the World Bank conducted their own evaluations in Peru (ibid., p.78), they found that average speed of reading at the end of first grade was of nine words per minute, far too slow to enable comprehension. The report also mentions that in rural schools, children often cannot read at all until grade 3 or 4 (ibid.). More recently, Peru has ranked last in the 2012 evaluations of the Program for International Student Assessment (PISA) (OECD, 2014), meaning that Peru ranked below lower income countries such as Indonesia or Jordan. These poor educational achievements have been confirmed by the data of Peru's 2012 national assessments, according to which less than one in three second grade pupils met the satisfactory standards in reading and less than one in eight pupils did so in mathematics (Guadalupe, et al., 2013, p.3; UNICEF, 2013, p.2). However low these values, they actually are the results of recent improvements in Peruvian education. Indeed, in 2012, there were twice more students performing to satisfactory standards in reading and mathematics than there were in 2007 (ibid.). However, Guadalupe, León, and Cueto (2013, p.4) also explain that the improvements have been found over the first part of the period (2007-2010) whereas the second part (2010-2012) has shown stagnation.

These poor results in terms of reading achievements have been attributed in part to the Peruvian curriculum, which does not provide guidance regarding content to be covered in each grade, but instead describes general educational goals to be reached over each cycle (Breiktopft, 2012, p.64; World Bank, 2007, p.10). This design officially aims to be open and flexible to facilitate its adaptation to the different cultural and linguistic realities

of Peru; however, it is considered by most teachers to be too theoretical, hard and inappropriate (ibid.).

In addition to the low levels of educational achievement, the Peruvian education also presents increasing levels of inequity (Guadalupe et al., 2013, p.8), affecting particularly rural and poorer children (Escobal et al. 2003, p.10). In fact, socio-economic background is highly predictive of achievement in Peru and pupils from the richest quintile of society were 15.3 times more likely than the poorer quintile to perform to the satisfactory standards in 2011, an increase from 6.6 times in 2008 (Guadalupe et al., 2013, p.6). Furthermore, there is a strong association between the wealth of the district and the presence of quality schools (León & Valdivia, 2015, p.76).

Moreover, striking differences in student achievement can be found according to location (Escobal et al., 2003, p.43), so that children in urban areas were 7 times more likely than children in rural areas to reach the satisfactory standards in 2012, a gap which has widened from 4.3 times in 2007 (Guadalupe et al., 2013, p.4). In fact, rural areas of Peru have fewer and more dispersed pupils of primary school age (UNESCO, 2010, p.192) so it is cheaper to implement better conditions in urban schools (Cueto et al., 2009, p.7). Consequently, there remains strong issues of inadequate infrastructures and resources in rural areas (Ames, 2012, p.455), which have been connected to decreased test scores by Hernandez-Zavala et al. (2006, cited in Ames, 2012, p.455). For instance, rural areas have a higher occurrence of multi-grade classes, in which pupils are 4.5 times less likely to perform satisfactorily when compared with single-grade classes (Guadalupe et al., 2013, p.5). Also, Breitkopf (2012, p.82) describes the hard conditions of work of teachers assigned to rural areas, such as the difficulty to reach some very isolated schools, to teach one-teacher schools, for a low wage that encourages teachers to seek a second job. Breitkopf (2012, p.83) further explains that parents of children in rural areas often have low levels of education themselves and show little interest and support to their children's educational achievements. She reports many cases of abandonment of children, left with their grand-parents or other family members as the parents had to migrate to the cities in search of paid employment (ibid.). For all these reasons, teachers try to migrate away from such areas (ibid.), and better teachers get hired in higher-quality urban schools while teachers with less experience and insufficient content knowledge remain in rural areas (Guadalupe et al., 2013, p.12). The quality of teachers being another high predictor of pupils' educational achievement, by equipping pupils from more advantageous socio-

economic backgrounds with better teachers, the Peruvian education system reinforces and increases deeply rooted inequalities (ibid.).

3.3 Modernizing the Peruvian education

To improve this situation, the National Education Plan (PEN) was designed in 2007, outlining the strategy of educational development in Peru to 2021. The PEN aims at improving the Peruvian educational achievements and decreasing educational inequalities, mainly by focusing on educational inputs, such as improving infrastructure, providing textbooks and computers (Guadalupe et al., 2013, p.12). The importance of ICTs is particularly emphasized in the PEN, as a tool to improve education as well as a way to join in the global 'information revolution' (Breitkopf, 2012, p.69).

In this way, the PEN is in line with a number of initiatives that have been put in place in Peru over the past fifteen years to encourage the introduction and use of ICTs in the classroom. First of all was the Project Of Distance Education (EDIST), in 2000, which saw the creation of 101 pilot centres with the aim of improving education and increasing the educational opportunities of the populations living in rural areas (Laura & Bolivar, 2009, pp.24-25). EDIST was followed by the Huascarán project, running between 2001 and 2004, which introduced computers into 1,800 secondary schools in order to improve the quality of education in rural areas, integrate the 'knowledge society' and breach the 'digital divide', recognized as existing both between rural and urban areas of Peru, and between Peru and its more developed neighbours (ibid.). Both projects were criticized for their high costs and lack of sustainability as well as for their lack of results in terms of educational achievements. Indeed, as Rocío Trinidad (2005, cited in Breitkopf, 2012, p.66) pointed out, introducing ICTs in the classrooms of rural Peru will not of itself reverse backwardness or improve educational quality.

However, the biggest initiative of the Peruvian state to date in terms of educational ICTs remains the One Laptop Per Child initiative (OLPC), also called Una Laptop Por Niño (ULPN) in Peru, which started in 2007 and led to the distribution of 860,000 laptops. The program targeted first the rural and impoverished areas of Peru, exhibiting issues of exclusion and low education levels, where the laptops were handed to all pupils of primary school on a one to one manner. After 2010, the remaining laptops were given to primary schools as part of Technology Resource Centres, and another version of the

laptop was also distributed to secondary schools (Breitkopf, 2012, p.61; Guadalupe et al., 2013, p.12; Laura & Bolivar, 2009, pp.31-32).

A number of positive outcomes of the ULPN project have been outlined, such as the positive change in many teachers' attitudes toward technology as they came to value the benefits of the laptops for teaching and learning (Laura & Bolivar, 2009, pp.62-63). The teachers interviewed by Laura and Bolivar (2009, pp.62-63) and Breitkopf (2012, pp.105-106) described the pupils as being more motivated and focused in class and as using the laptops for auto-instruction as well as to explain things to the teacher and to each other. Nevertheless, issues of discipline in the classroom were also uncovered in these two studies, as well as an overall lack of improvement in terms of educational achievements of the pupils and in terms of motivation to attend school (ibid.). Moreover, alongside the matter of electricity sources to power the laptops in rural areas (Breitkopf, 2012, pp.96-97), further issues of teacher training and laptop maintenance were also exposed (Laura & Bolivar, 2009, pp.52-54). In fact, the short ICT training given to most Peruvian teachers was found insufficient for them to use the computers in the classroom, as it usually consisted of a mere introduction to ICTs (Breitkopf, 2012, pp.95-97; Laura & Bolivar, 2009, pp.52-54). Therefore, the teachers often expressed feelings of lacking the necessary knowledge and skills to implement the ICTs in the classrooms, as well as their inability to solve the technical problems arising in class from ICT use (ibid.). Also, Breitkopf (2012, p.103) explains that teachers did not trust children to handle the laptops with care, especially since there is no adequate maintenance system organized to fix the laptops that would get damaged.

According to Breitkopf (2012, pp.70-71), these various initiatives to modernize the Peruvian education are attempts of the modern, urban part of the Peruvian society to integrate the rest of the country into the global system. Indeed, in 2013, 49.8% of urban households had a computer, as opposed to 25.2% for their rural counterparts. The difference is even wider in the case of internet access, with 41.4% of urban households having an internet connection in 2013, against 13.2% of rural households –and as little as 2.5% of households in the case of Huancavelica, a rural region of the Andes previously mentioned for recording high levels of poverty[3]. In spite of the lack of evidence that, in

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[3] Hogares con acceso a tecnologías de información y comunicación (tic): http://www.inei.gob.pe/estadisticas/indice-tematico/tecnologias-de-la-informacion-y-telecomunicaciones/, accessed 25-04-2015

the case of Peru, introducing ICTs in the classrooms can improve educational achievements, the urban elite seems determined to join the global culture of modern schooling and to embrace foreign educational ideals (ibid.). In this context of education policy supportive of the introduction of educational ICTs in rural areas, I had the opportunity to conduct a pilot study on a literacy learning game, Graphogame.

3.4 Graphogame: a literacy learning software

In October and November 2013, I conducted a pilot study in Peru towards the potential introduction of a further educational ICT, called Graphogame, into Peruvian classrooms. Graphogame is a software supporting children's process of literacy acquisition. It was developed in the context of a large-scale Finnish research project, the Jyväskylä Dyslexia Longitudinal project (Lyytinen et al., 2006, pp.538-540). It is a remedial or preventive tool for all children of learning-to-read age, especially those at risk of reading disorders. Indeed, it follows the phonological approach to reading by targeting the key skills of literacy in transparent languages: on the one hand, the learning and stabilization into memory of the grapheme-phoneme correspondences, on the other, the automatization of retrieval of these correspondences towards fluent reading (Lyytinen et al., 2007, p.669; Saine et al., 2011, p.1018). Once these two foundation skills of reading have been mastered, the child can achieve the ultimate goal of reading, reading with comprehension (Lyytinen et al., 2007, p.669).

The game plays as follow: the child hears a speech sound in his headphones as a selection of two to eight written symbols appear on the screen of the ICT. The child can select either the answer corresponding to the sound heard (called 'target') in which case he scores, or one of the alternative answers (called 'distractor') in which case the same target will usually come again next, giving the child another chance to get the right answer (Ojanen, 2007, p.10). The game therefore follows the recommendation of the NRP report (2000, in McGuinness, 2004, pp.73-106) by teaching from the phoneme to the letter, and by being based on the phoneme, the unit of language in Spanish, Finnish or English. The game starts with easy to differentiate phonemes and evolves progressively in difficulty according to each child's ability, towards more difficult phonemes, then syllables and finally words and pseudo-words (Jere-Folotiya et al., 2014, p.424).

Graphogame presents various advantages that have led to its success as a remedial and preventive tool for children with reading disorders. Firstly, because it works on

computers, cell-phones and tablets, it can be used anywhere, whether or not trained remedial personnel is available (Lyytinen et al., 2007, p.109). In addition, by taking the form of a game, it offers a non-threatening learning environment that guarantees the interest and engagement required for the child to learn (Lyytinen, Erskine, Kujala, Ojanen, & Richardson, 2009, pp.671-672). Also, the adaptive feature of Graphogame ensures that the child's rate of correct answers remains high, at about 80%, so that his interest and positive feelings towards the game are sustained (Jere-Folotiya et al., 2014, p.424; Lyytinen et al., 2007, p.119). Finally, because the game is individual-oriented, intensive and adaptive, it provides each child with the individualized repetitions and feedbacks just on those particular areas on which practice is most needed (Saine et al., 2011, p.1014). Moreover, for teachers and researchers, Graphogame presents additional features. Indeed, it records the exposure time as well as each choice made by the player, so that the child's development can be monitored as a function of time (Jere-Folotiya et al., 2014, p.424). Furthermore, the initial and final assessment features of the game can be used as indexes of the pupil's letter knowledge (ibid.).

According to the studies conducted by the Graphogame team, the overall gains of using the game are significant, in terms of letter knowledge, decoding, accuracy, fluency and spelling (Saine et al., 2011, p.1023). In fact, they found that some at risk children acquired basic reading skills in less than four hours of exposure to the game, although others needed more practice (Lyytinen et al., 2007, p.134). However, according to one of the most recent studies conducted by the Graphogame team (Jere-Folotiya et al., 2014, p.430), duration of exposure to Graphogame was found to account for only 6% of variance of the child's results -although attendance issues were reported which limited the players' exposure time.

Graphogame has been used in Finnish schools, kindergartens and homes, and also translated into other languages to assist children at risk of reading disorders in developing and multilingual countries such as Kenya and Zambia (Jere-Folotiya et al., 2014, p.417; Ojanen, 2007, p.1) and work towards reduction of illiteracy rates on a global scale. In fact, by focusing on student learning outcomes and using ICTs, Graphogame seems to be compatible with the global 'New Curriculum'. But before introducing Graphogame in a new country, a pilot study is conducted to confirm that the results of the software in Finland are replicated abroad. For the purpose of the pilot study in Peru, a Peruvian version of the game was designed. The contents of the game and the main structure of the

program were kept as close as possible to the original Finnish version, but the game sounds and instructions were translated and recorded by a Peruvian linguist.

4. RESEARCH TASK AND QUESTIONS

In this thesis, I present the ethnographic research that I conducted in a rural school of the Peruvian Andes, with the research task of observing how nine first grade pupils used Graphogame, and of listening to their perspectives, as well as that of their teachers and school director. Indeed, the literature on the introduction of educational reforms in general, and regarding ICTs in particular, has outlined the necessity to look at the entire context of introduction, or else risking the failure of the reform and the wastage of the investment. As was highlighted in the literature, rural schools in Peru face particular challenges to consider, especially in terms of the cultural and economic backgrounds of the pupils, and of the quality of the teaching and infrastructure that they receive.

To attempt to compensate for such disadvantages, several ICT initiatives targeting rural schools in particular have been put in place over the past fifteen years. These initiatives have had some limited positive results, but have failed to improve the educational achievements of rural pupils, along with raising issues of inadequate maintenance of the ICTs, training of the teachers, and discipline of the pupils among others. Would the introduction of Graphogame produce the same results?

In addition, while the research on Graphogame to date presents its potential as an individual instructor for young learners and describes how it can be used by the pupils in an independent manner, Schmid et al. (2008, p.78) explain on the other hand that young learners need an adult to be able to interact with ICTs in a manner conducive to learning. This contradiction raises additional questions regarding how children will use Graphogame in Peru and the type of support they will need. Therefore, my core research questions, supported and inspired by the aspects brought up in previous research, will be as follow:

- How do children use Graphogame for learning in a rural school in Peru?

- What role has the teacher in this type of literacy setting?

- What does this study add to previous research on ICT use in Peru?

5. METHODS

5.1 Developing the initial research focus

The research to answer these questions was designed and carried out in 2012 and 2013, in collaboration with the Graphogame research team of the University of Jyväskylä. During the first year of my degree, we worked together to prepare the Peruvian version of the literacy game as well as plan the pilot study on the field.

The pilot study was conducted between September and December 2013, including two months in a primary school of the Andean village of Quilcas. This time of the year was chosen as it is the end of the school year in Peru, so the first graders would have adapted to the school environment and would have been learning to read since March, the beginning of the school year in Peru. Nine pupils attending two different first grade classes participated in the study. They played Graphogame during daily sessions of 20 minutes, for a mean total exposure time across participants of eight hours.

My role as part of the team in the field was to be with the nine children everyday while they were playing. The software recorded the answers and the progress made by each player, and the data was then electronically transmitted to the Graphogame team in Finland for later quantitative analysis.

In parallel to this collaboration, I developed my personal research approach to answer my own research questions, outlined in chapter 4. From the start of this process of collaboration, I hoped to complement the existing research on Graphogame, by adding a qualitative element to the otherwise quantitative approach of the team. My personal interest was in observing what happens when this Finnish software is introduced in a new context and how the children in a rural school in Peru would learn with it.

This interest relates to my experience as a volunteer with an educational Non-Governmental Organization (NGO) in Peru in 2010. I observed the disappointing results of this NGO which offers free afternoon and evening classes for children and adults of the slums of Lima. Actually, and in spite of the best efforts of the volunteers and director, few participants attended the classes because as a number of locals explained to me, they did not feel the knowledge was relevant to the environment in which they lived.

As I was preparing my research, I found that the literature in both the fields of education and development confirmed the necessity to consider carefully the context surrounding such an initiative as the introduction of Graphogame in Peru. As explained in Chapter 2, in educational reform, all the elements of the educational system are connected to each other, so that changing one element will affect the entire system (Hargreaves, 2010, p.108). In the particular case of the introduction of ICTs in the classroom, the research confirms the importance of considering the context, the student and the teacher, as well as their relations, rather than just the innovation in itself, to ensure the success of the reform (Laura & Bolivar, 2009, p.10; Tong & Trinidad, 2005, pp.6-16; Zhao & Frank, 2003, pp.810-823). Moreover, the research in educational development also emphasizes the importance of listening to the beneficiaries of development initiatives, of considering their culture, their needs and their own models, to avoid resistance or failure of a development program (Escobar, 1995, pp.94-101; Freire, 1996, p.75).

5.2 An ethnographic research

Understanding the importance of the broader context of implementation of Graphogame, I opted for the use of an ethnographic approach for my research design. Indeed, the ethnographic approach is particularly adapted to research focusing on context, as the literal meaning of the word ethnography is to "write (or represent) a culture" (Parthasarathy, 2008). Ethnographers attempt to understand a setting and the relations occurring both within the setting and with the wider context (ibid.). In the case of this research, understanding the relations within the setting referred to the interactions between the pupils, this new software and myself in a classroom of rural Peru. These interactions also take place within a wider context in which some forces push for the introduction of ICTs in the classroom, such as the advocates of the 'New Curriculum' and the Peruvian government, while other forces in this setting may or may not resist this move, such as the teachers, the pupils and members of the communities for instance.

Furthermore, ethnography should be used when the researcher wants to answer a research question of the type 'what is going on here?' (Pole & Morrison, 2003, p.18). With my research, I wanted to explore what goes on in the classroom, and in the learning process, when Peruvian children are using Graphogame.

I also decided to adopt an ethnographic methodology for its underlying epistemological assumption, that human beings are shaped by the context in which they evolve and that

researchers should investigate social behaviours and meanings as situated (Pole & Morrison, 2003, p.5). For me, this idea is supported by the work of Vygotsky (1978, p.24) who explained how external processes are transformed to create internal processes, through the use of the culture-specific tools available to the human being in his context.

5.3 Criteria for selecting the research setting

I conducted my research in a primary school of the Andean village of Quilcas, selected as research setting because it corresponded to the criteria of location and data availability, which were established jointly with the Graphogame team.

5.3.1 Location of the school

First of all, the school chosen was to be located in a remote and poor area. The idea of the Graphogame team was that if the most disadvantaged children could show progress by using Graphogame, chances were that these results would be replicated in more urban, more modern areas. As described in chapter 3, rural Peruvian children accumulate educational inequalities, due to being taught by less qualified teachers in ill-adapted infrastructures and coming from poorer and less educated backgrounds. For my own research, choosing a poor rural context was particularly interesting since it is the most different context –apart from the indigenous case- from the Finnish context of creation of the literacy learning software. It was not possible however to choose an indigenous setting for the pilot study, as the version of the game developed was in Peruvian Spanish, so that the school also needed to be in a Spanish-speaking area. Lastly, the research setting needed to be reasonably easy to access for me to safely commute to the school on a daily basis with the pilot study equipment –which included three tablets, a laptop, four sets of headphones and a camera.

5.3.2 Data availability

The second criterion was the possibility to organize the pilot study and collect the appropriate data. In fact, the first grade children selected to participate in the study needed to stay daily after school to play with Graphogame for 20 minutes over a two months period. This way, no class time was taken away from the participating children and the Graphogame team could measure the progress made thanks to the intervention. The 20 minutes daily sessions over a two months period represented a total exposure time of roughly 10 hours to the game, theoretically sufficient to see progress.

For my ethnographic research, I needed to gather additional data on the research setting, including interviews, observations, photographs and video recordings. Consent forms were gathered for all these data (Appendix 2).

5.4 Arriving in Quilcas

I arrived in Peru in September 2013 and found an accommodation in the Andean city of Huancayo. With a population of about 450,000 Huancayo is the capital of the department of Junín, as well as the biggest of the 24 districts of the department (Municipalidad Provincial de Huancayo, 2015). There, I lived in the Peruvian NGO *Expand Peru*, which intervenes in educational projects in the rural areas surrounding the city, and the director of the NGO helped me settle in Peru. He established a list of potential locations for the pilot study, in poor, rural, Spanish-speaking areas and the village of Quilcas was the first to which we went.

FIGURE 1: Department of Junín, Peru

The village of Quilcas is situated 13 km to the North of Huancayo, at an altitude of 3,300m in the Andean mountains. The journey time by bus from Huancayo is of roughly an hour on dirt roads between the fields (Salome Zarate, 2013). 2,500 inhabitants live in the village of Quilcas, which is also the capital of the district of Quilcas (ibid.). There are two primary schools in the village, which are also attended by the children living in the surrounding mountains.

The data from the 2007 National Census of Peru regarding Quilcas indicate that it is marked by the social, economic and educational inequalities affecting rural Peru. Indeed, no more than 57% of houses of the village of Quilcas have access to drinkable water throughout most of the day, 6% of the houses are connected to the public sewage system and 3% have a computer –much below the 25.2% national average for rural areas[4]. Regarding education, 44% of the adult population of Quilcas has not progressed after the initial or primary school level, while 12% did not attend school at all[5]. Finally, regarding occupation, the

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[4] Censos de Población y Vivienda 2007: Vivienda y Hogar
http://censos.inei.gob.pe/cpv2007/tabulados/#, accessed 30-05-2015
[5] Censos de Población y Vivienda 2007:Educación

most commonly found occupational categories in Quilcas are the unskilled workers (including labourers, street vendors and waiters for instance) with 34% of the occupied adult population of Quilcas, followed by the qualified workers of the agricultural and fishing industries with 21% , and then the category of the miners and factory workers with 10%[6].

Furthermore, 95% of the population of Quilcas speak Spanish as their mother tongue[7], so that Quilcas corresponded to the criteria of location necessary for the pilot study and my research.

5.5 The primary school of Quilcas

Consent was obtained over the phone from the director of one of the two primary schools of Quilcas to conduct the pilot study. I first visited the school on the 25th of September 2013, accompanied by the director of the NGO, for a meeting with the head teacher and the two first grade teachers, so as to explain the pilot study and find out if they would accept to participate. The three teachers expressed the need for such a project: they explained that in spite of the after-school remedial classes they set up and were teaching on a voluntary basis, some pupils still struggled with learning to read, including until second and third grades. They agreed to help collect the consent forms and data required for the pilot study and the ethnographic research, so that the school of Quilcas was meeting the second research criteria.

FIGURE 2: The research setting: the primary school and the innovation room.

http://censos.inei.gob.pe/cpv2007/tabulados/#, accessed 30-05-2015

[6] Censos de Población y Vivienda 2007: Actividad
http://censos.inei.gob.pe/cpv2007/tabulados/#, accessed 30-05-2015

[7] Censos de Población y Vivienda 2007: Población
http://censos.inei.gob.pe/cpv2007/tabulados/#, accessed 30-05-2015

During an interview with the school director (Appendix 1.3), she explained that this school was built in 1917, and that the original buildings were still standing, though others had been added over time to accommodate a total of 195 pupils in 2013, divided in 12 classes. The infrastructure of the school was in good condition. The furniture in classrooms corresponded to the age and size of the pupils and the classrooms looked modest but nice, with colourful hand-made displays on the walls.

As a rural school situated in a poor district, Quilcas had received technological equipment as part of the government initiatives to improve the quality of the education, including 26 XO laptops of the ULPN project and 30 brand new desktop computers for a computer lab. This equipment was used during the after-school computing classes, attended by all pupils for 1h30 per week, and conducted by a private teacher also in charge of the maintenance of the equipment. In fact, the other teachers at the school did not make use of the diverse ICTs, so that the parents' association, considering technology education a priority, hired a specialized teacher. The school also counted with a television and DVD player, set up in the innovation room, which I was invited to utilize for the pilot study as it was not used by the other teachers either. The school did not, however, have access to the internet at the time of the research, neither did it have a computer or printer available for teachers to use.

When asked about the socio-economic backgrounds of pupils attending the school, the director's answer seemed to echo the official statistics:

> "The parents usually have only been to primary school. So they do not really see the point of education, they do not encourage their kids to study and want more for themselves. Quite the opposite. They think they can go to work all day and leave the children by themselves, or they send them to look after the animals. So the education is not supported, but we really try to promote it, as a way out of Quilcas and extreme poverty. Most children have both their parents, but some are orphans, some have only one parent, but many are not well-taken care of."

5.6 Selecting the participants for the study

The population of the pilot study consisted of the Peruvian children learning to read, so that our focus was on the first graders. However, because the equipment available to conduct the pilot study only consisted of four ICT items, the sample could not comprise all the 28 first grade pupils of the school of Quilcas (two classes of 14).

A purposive sampling method was then used to select the participants in the study: each first grade teacher was asked to select the four pupils who were struggling the most with reading acquisition. Indeed, although Graphogame can be used by all pupils as a literacy learning software, it is particularly aimed at children at risk of reading disorders. The eight first graders selected would stay after class to participate in the study, and would play with Graphogame for 20 minutes, while arts and crafts were made available to the four pupils waiting. However, a ninth participant was added at the demand of his teacher and parents, although he had to wait for the two previous groups of four students to have completed their 20 minutes session.

FIGURE 3: Pilot study: impression.

I designed TABLE 1 to compile the information given on each participant before the beginning of the pilot study by their teachers, as well as their total exposure time to Graphogame. All the participants were seven years-old at the time of the study.

5.7 Instruments and data collection

As an ethnography, this study is a multiple technique approach, meaning that I collected different types of data, chosen for their appropriateness to each situation (Parthasarathy, 2008). This diversity of research tools helps to better capture the complexities and dynamics of the research setting and perceive them through different lenses (Yan, 2012, pp.21-28). Also it increases the validity and reliability of the research (Pole & Morrison, 2003, p.33).

TABLE 1: Information on the participants.

	Class Attended	Educational difficulties	Family situation	Exposure Time
O	1A	When trying to read, pronouncing 'wrong'. Distracted, slow, disorganized.	Only has his mother.	8h20
J	1A	Mixing the order of syllables and letters in the word and pronouncing them 'wrong'.	Absent parents: both of them are working, and his father only comes home from the mine once per month.	5h
M	1A	Struggling with vowels.	Has to walk over an hour to get to school.	6h
G	1A	Completely distracted.	Only has his father, who is absent a lot.	6h10
H	1B	Misbehave in class.	Absent parents: both of them working, and leaving him at home to look after the younger siblings. Victim of domestic violence.	10h40
E	1B	When trying to read, pronouncing 'wrong'.		9h30
R	1B	Mixing the order of syllables and letters in the word and pronouncing them 'wrong'.	His father only comes home from the mine once per month and his mother did not attend school herself.	8h
B	1B	Misbehave in class.	Absent parents: both of them looking after the animals, she is left to herself.	9h40
Y	1B			9h

Do not remember what they read.

5.7.1   Observations

To 'write about a culture', ethnographers immerse themselves in the research setting to gather local knowledge (Parthasarathy, 2008). Observations is commonly used by ethnographers to find out directly 'what is going on here', to witness first-hand how the actors in the research setting behave (Sharp, 2009, pp.83-85).

In my research, I made use of two observation techniques alternatively: direct observation and participant observation. Direct observation merely involves watching and recording what is happening, but not participating in the activity under observation (Yin, 2003 in Angers & Machtmes, 2005, p.778). I mostly used direct observations at the beginning of my research as part of the process of thick description recommended by Geertz (1973, p.6), to absorb the culture, to pay closer attention to the details of the research setting, and

reflect on it. Although direct observations happened throughout the day as I got acquainted with the school of Quilcas, I also conducted direct observations in both first grade classes, with a focus on the behaviours of teachers and pupils, including the nine participants of the pilot study in their regular classroom. Moreover, I paid close attention to the teachers, focusing on the teaching style adopted –especially for literacy learning- and trying to understand teachers' perceptions and meanings about teaching and learning. To this end, I sat in each first grade class every morning for a week at the start of the pilot study.

In addition, I used participant observations while the pupils played with Graphogame every day, at first recording what happened in the classroom in general, and progressively focusing on diverse themes such as children's learning, children's behaviours and manifestations of feelings, types of assistance they required from me and my own experience as their teacher.

I immediately recorded both the direct and participant observations with pencil and paper as field notes in my research log. I wrote extensive descriptions of what I was noticing, along with the new questions, ideas, potential explanations and impressions that developed. Later in the day, I transcribed the initial field notes into a Word document, eventually adding the thoughts and connections that were emerging.

The main limitation in conducting observations is that the ethnographer is the main research instrument, selecting what to record and how to interpret what is happening in the setting. But the reality recorded is being observed through one set of eyes only and filtered by the ethnographer's natural bias. This bias can be limited, according to Gillham (2000, p.18) when the researcher is foreign to the setting, as was my case in Peru, since the objects of the investigation are perceived as different from oneself, therefore limiting the assumptions of similarity. Still, being reflexive and self-critical is essential to the ethnographer at each step of the research process (Pole & Morrison, 2003, pp.28-29; Scott & Usher, 1996, pp.33-50; Sharp, 2009, p.56). During my time on the field, I tried to be aware of my 'close-mindedness', my prejudices and preferences as a researcher. I regularly asked myself what I was expecting to find happening here and what results I would prefer to find with my research.

Moreover, in conducting observations, the presence of the researcher always affects the setting and the behaviours of the actors. I attempted to limit the impact of my presence

by inspiring trust in the staff of the school (Gillham, 2000, pp.45-58). I presented myself from the first meeting onwards, as both a researcher and a fellow teacher, as someone who wanted to observe and listen to the specific challenges of their work, about which I knew nothing but that I wanted to understand. I explained that my intention was to help the teachers and the Peruvian education, by offering to include a literacy learning software if it can help their work, but also by offering to listen and report their perceptions about it.

5.7.2 Interviews

I also used interviews in my study, in order to collect additional ethnographic data from the two first grade teachers and the school director. Interviews are very commonly used for in-depth exploration of opinions, perceptions and behaviours in ethnography (Byrne, 2004; Pole & Morrison, 2003, pp.17-46; Sharp, 2009, p.74).

Firstly, I chose the semi-structured interview format for the teachers' interviews (Appendix 1.1 and 1.2) so as to allow sufficient flexibility for new, unpredictable insights to arise while maintaining a satisfying level of standardization (Pole & Morrison, 2003, pp.17-46). Indeed, in semi-structured interviews, the interviewer shares the control over the interview process with the interviewee, by using a mixture of question types (Sharp, 2009, p.74).

Teachers' views needed to be taken into account in the context of my research because they have a pivotal role in the implementation of educational reforms (Lam & Lidstone, 2007, p.180). Their responses to the change in work practices will be connected to their beliefs and values, and shaped by culture. In fact, previous research on educational ICTs in Peru has found that the teachers resisted the use of laptops provided to them, in relation to a variety of context specific factors, such as their perceived lack of training and time, technical problems or that they do not see the point of such an innovation (Laura & Bolivar, 2009, pp.51-59; Santiago et al., 2010, pp.6-11).

As a researcher, I attempted to be aware that the data emerging from the interview is not what people actually believe or how they actually behave, but rather what they say they think or do. Also, interview data are always a direct result of the method used to collect them, as the interviewer decides on the themes to be discussed and on the rapport

established between interviewer and interviewee (Pole & Morrison, 2003, pp.17-46; Scott & Usher, 1996, p.64).

Applying Zhao and Frank's ecological metaphor (2003, pp. 812-814) helped me build the interview questions for the teachers. According to Zhao & Frank's ecological metaphor, the case of Graphogame in Peru can be compared to an invasive species in a new ecosystem: survival will depend on its intrinsic qualities, and its compatibility with its new environment, and with the keystone species of this ecosystem: the teachers (ibid.).

In addition, I asked the teachers about the different factors to take into account when introducing an educational technology: compatibility and complexity, as suggested by Rogers (2002, cited in Laura & Bolivar, 2009, pp.12-13), as well as teachers' confidence with and vision of ICTs, and the support and incentives received in implementing ICTs (Schoepp, 2004, cited in Laura & Bolivar, 2009, p.17).

Moreover, Zhao and Frank (2003, pp.829-830) explain that according to the ecosystem metaphor, the interaction between the keystone species and the invasive species is a dynamic process and that as a consequence, teachers can change their attitudes towards the adoption of the technology. In this study, I conducted interviews with the teachers both before the Graphogame intervention and again at the end of the intervention so as to allow for this change of attitude.

The initial interviews lasted about 2h30 each, while the two final ones were about 1h long each. They took place in the classroom of each teacher so that they could show me any relevant material. I started by thanking the informant, guaranteeing anonymity and explaining that my intention was to understand what it is like to be a teacher in Quilcas. Throughout the interview, I reminded myself that the teachers would answer differently depending on their perception of the interviewer, and of the intent behind the questions (Pole & Morrison, 2003, p.33). Therefore, I tried to keep the conversation spontaneous and informal, like a teacher talking in the staff room to a new colleague, describing what the situation was for her. The teachers actually seemed relaxed and happy to have a listening ear. The interviews were rehearsed, conducted and transcribed in Spanish in a Word document and later translated into English.

Unfortunately, I was not able to use an audio-recording device during the interviews, and was taking notes with pencil and paper instead. In fact, I did not own such a recording

device, and was advised to use my computer instead. However, while setting up for the interview, the presence of the laptop felt too foreign and intrusive and I thought it might interfere with the natural flow of the conversation. It therefore affects the validity and reliability of the interview data. Nevertheless, and as explained below, the main focus of this thesis is on video data and participant observations, so that interview data were used to cross-check key themes emerging from the video data and observations.

Then, the director of the school was also interviewed, using a structured format (Appendix 1.3). Indeed, the intention was to collect factual data about the school and the surrounding community from an expert. In particular, I wanted to find out about the school ICT infrastructure in terms of student-computer ratio and access to the computers for instance -as suggested by Harwood and Asal (2007, pp.28-32). As the intention of the interview was different, so was the style and rapport: this interview was shorter, about 30 minutes, and more formal –in the director's office, with her desk between us.

5.7.3   Other data: videos, photographs, drawings

The Graphogame sessions with the nine participants were video-recorded using a camera that was set up on the teacher's desk in the innovation room, and to be triangulated with the participant observations so as to ensure the reliability of the research.

I watched the videos a first time while I was in the field, to compare and highlight the potential discrepancies between my subjective perceptions of the Graphogame sessions with a more reliable form of data. I also noticed many relevant aspects of the children's behaviours I had missed while being in class. However, I conducted the in-depth analysis of the videos later, when I came back from Peru.

Unfortunately, for memory reason, the camera only recorded half of the sessions, a total of 6h, which was still a lot of material to analyse. Furthermore, the sound quality of the recording was not ideal because of the noise in the classroom, so that sometimes it was not possible to understand with certainty what the children were saying.

FIGURE 4: Examples of drawings.

Furthermore, while the pupils were at the arts and crafts table waiting to play Graphogame, they were asked to draw on a diversity of topics. For instance, the teachers mentioned the appalling living conditions in which the pupils were being raised, so in class they were asked to draw their house and describe it. The drawings were not analysed for this thesis, but only used to cross-reference important themes and increase the validity of the research and the confidence in the findings.

Finally, the last type of data collected for this ethnography were photographs of the school and community. With photography, the ethnographers can use images to convey social reality, rather than rely on oral or written accounts from the researcher (Pole & Morrison, 2003, pp.63-68). Therefore, I preferred to capture photos of the school grounds, including the classrooms, the canteen or the playground rather than relied exclusively on my notes and my memory. Nevertheless, photographs are not a representation of objective reality, since the researcher still controls what to capture, when and where to do it. In this thesis however, photographs were not analysed but used to cross-reference the data collected during the director's interview, my field notes and the statistical data from the National Institute of Statistics and Information (INEI).

5.8 Data analysis

To analyse the data collected, I used a thematic analysis method, defined by Braun and Clarke (2006, p.79) as a method to detect, analyse and report patterns within data. Actually, I selected this method because of its appropriateness to this thesis, firstly because it is an accessible method for researchers with limited experience of data analysis. Moreover, it is a flexible method based on the identification of key aspects in the body of data, including large ones, and can offer both 'thick descriptions' and generation of unanticipated insights (ibid.).

The data was analysed using a contextualist framework, which understands both that participants interpret their own experiences, and these interpretations are affected by the wider context of the participants (Braun & Clarke, 2006, p.81). The analysis was mostly data-driven and started from the broad research focus -what happens when Graphogame

is introduced in a new context and how the children of Peru would learn with it. The initial research questions then evolved as I got to know the context, the literature and the data (Gillham, 2000, pp.15-19).

In the field, I read and transcribed my field notes and watched the video-recordings on a daily basis. Then, I reviewed the data at the week-end in the light of the new literature I had read and considered the potential explanations for the evidence uncovered, paying particular attention to the contradictory and discrepant data (Gillham, 2000, pp.20-26).

Coming back to Europe in July 2014, I started the second stage of analysis by conducting in-depth analysis of the field notes and the video data. First of all, I read the field notes and watched the videos repeatedly to become familiar with the content, while noting ideas which became my initial codes: behaviours of pupils in class, pupils' interactions with the teacher, pupils' feelings about the game, pupils' use and understanding of use of the game, other activities pupils are involved in. Then, the video data and field notes were coded systematically in an Excel spreadsheet, of which a model is presented in TABLE 2. This was a very lengthy process since it entailed watching each video data and completing the codes for each of the nine participants; but it allowed me to see each pupil within each session as well as the evolution of each pupil throughout the intervention. Going through the table, new codes emerged, which I highlighted using a colour-coding system. For instance, the code 'pupils' interaction with the teacher' was re-named 'role of the teacher' and the following codes were added: technical support, support reading acquisition, other scaffolding, rapport, praise and encouragement, motivation, and discipline. Then, I generated a map of the codes, which were collated into three main themes -my three research questions- and into sub-themes. Finally, to better understand the story of each theme throughout the intervention, I created a second Excel spreadsheet collating the data relevant to each theme in each session, as in TABLE 3.

Table 2: Encoding the data.

	Session 1	…
Participant 1	Code 1: -video data -field notes Code 2: -video data -field notes…	Code 1: -video data -field notes Code 2: -video data -field notes…
Participant 2	…	…

Table 3: Collating the coded data.

	Theme 1	…
Session 1	Participant 1: -sub-theme 1 -sub-theme 2… Participant 2: …	Participant 1: -sub-theme 1 -sub-theme 2… Participant 2: …
Session 2	…	…

5.9 Limitations and ethical considerations

In this chapter, I have summarized the approach and instruments used to design and conduct this research. However, in ethnography the main instrument is the ethnographer, so that the ethnographer's subjectivity affects the validity and reliability of the study to a certain extent (Pole & Morrison, 2003, p.28).

Throughout this investigation, I have tried to be aware of my personal biases and stay open-minded. For instance, over time I became attached to the pupils, but I attempted to be mindful of how my feelings could influence the processes of data collection, analysis and interpretation.

Mainly, I used triangulation throughout this research to limit the influence of my own subjectivity on the data. Triangulation refers to the combination of research methods in order to cross-check and increase confidence in the findings (Sharp, 2009, p.46). For instance, during analysis, the video data –which can be paused to confirm what has been said or done- were triangulated with the field notes. Then, the findings emerging from this analysis were cross-referenced against the rest of the data corpus –interviews, observations, photographs and drawings. They were also compared to the literature to see which findings were supported or not supported by the literature (Roberts, 2010, p.61).

Nevertheless, there are additional limitations to mention, specific to this research. Firstly, the ethnography was conducted in a single primary school for a period of two months. Therefore, it is the description of a single case and in spite of using a purposive sampling to choose a 'typical rural school', the findings cannot be generalized to all the rural schools, even less to all of the Peruvian schools.

The duration of the study was brief for practical reasons, so that my impressions of the settings were probably stereotypical sometimes, though I had lived in Peru before and tried to limit over-simplifications by arriving on the field a few weeks before starting the study. In addition, this estrangement to the research setting may have led to cultural misunderstandings or mistrust. However, when I was on the field, it felt like the opposite was also true, as there seems to be less suspicion towards me as I did not work for the school or the government and could not really harm anyone's position. Spanish is not my mother tongue either, which was a barrier sometimes especially with the children who do not speak Standard Peruvian Spanish. On the other hand, I believe that it helped me get some clearer answers too, in particular from the teachers, leaving less room for interpretation.

Lastly, I especially regret the limitations regarding the collection of certain types of data, in particular the interviews which were not audio-recorded and the video data which were not complete. However, I tried to compensate these limitations by the use of complementary data and the triangulation of research methods.

As for ethical considerations, the teachers and parents of the nine participants in the study were all well aware of the intentions and purposes of the study and gave their consents. The director of *Expand Peru* also openly agreed on the use of the NGO's real name instead of a pseudonym in the research. The participants were, however, kept anonymous by using a letter to refer to them rather than use their real names, and the teachers are referred to in relation to a fictitious class number. In the next three chapters, I will present the findings produced by the data analysis towards answering my three research questions.

6. USE OF GRAPHOGAME BY THE PARTICIPANTS IN QUILCAS

In this chapter of finding, I will answer my first research question on the use of Graphogame by the nine participants of the Peruvian pilot study. In particular, I will compare children's behaviours as emerging from the data, with the expected utilisation of Graphogame as described in the literature, including playing to learn, providing an individual training and learning with drilling exercises. The Graphogame sessions will be referred to by date.

6.1 Playing to learn

Firstly, Graphogame is expected to support children's reading acquisition simply by being a game. The literature explains that by being fun and exciting, by presenting 'the 'addictive' features of traditional children's games' (Lyytinen et al., 2007, p.110), Graphogame will guarantee the interest, the willingness and the involvement of the participant necessary to any learning process (Lyytinen et al., 2007, p.111; Saine et al., 2011, p.1025).

In the initial round of interviews, the 1B teacher concurred with the idea that Graphogame in particular, and ICTs more generally, would be conducive to learning by being entertaining and attractive to the children:

> "The main aspect of ICT for instruction is that kids are very motivated by it. […] Graphogame seems fun. And the kids learn better when it's more fun; it's a good methodology. It catches the attention of the kids, they are more focused. They see it as a game, as playing rather than learning. That's how learning should be."

FIGURE 5: Choice of avatar

FIGURE 6: The Maze.

In fact, Graphogame presents many such game features to ensure that the child's interest is sustained. For instance, when the child plays Graphogame for the first time, he is asked to choose an avatar from a wide selection of age-appropriate characters – among which a robot, a princess or a fairy. On the laptop version of the game, the child will then be evolving through a multi-level maze. To reach the next level in the maze, the player will be required to complete a certain number of phonological awareness

exercises in game format, until reaching a blue magic door. On the tablet version of the game however, the maze has been removed; but each phonological awareness exercise works towards the completion of an animal picture. The animal is fully hidden at first, and after each exercise, a portion of the picture is revealed to the player. Once the participant has completed the picture, the animal appears in an exotic location -such as an island, or a castle- along with a message of congratulations.

FIGURE 7: Receiving a reward.

Additional incentives have also been incorporated to maintain the player's engagement. First of all, an intrinsic reward system has been included, which functions by adapting the level of difficulty of the exercise to the capacity of the player (Jere-Folotiya et al., 2014, p.424; Lyytinen et al., 2007, p.119; Ojanen, 2007, p.16). Indeed, as Lyytinen et al. (2009, p.671) explain '[t]he most natural reward for playing is the experience of success'. The laptop version of the game further includes rewards in the form of clothes and accessories for the character –such as hats or swords for example- so that the player can progressively choose how to dress and equip the character.

The diversity of the format of the exercises, and their attractive visuals, also aim at sustaining the participant's interest. In spite of this diversity of display, the concept of each exercise remains the same: the child is asked each time to listen carefully, and select the sound heard.

During her initial interview, the 1B teacher presented her expectation that the children would respond positively to the different features of the game:

> "Yes the kids will love it of course. They love video games. It catches their attention, the drawings, the colours, touching the buttons when they use it… all of it is attractive to the kids."

The initial reactions of the nine participants in the study indicated that using a game to motivate the children to learn was truly a functioning methodology. The notes from the participant observations and the video recordings of the first sessions describe the children as focused, interested, quiet, engaged, reactive and on-task. Some participants responded particularly well to the features of Graphohame, such as J. and B. Extracts from the video data of J.'s sessions read as follow:

"Session 18/10: Quiet, focused, interested. Hardly talks or looks around, sits upright and not moving around. When H. talks or looks at him, J. looks back with angry eyes, clearly not looking to engage in conversation."

"Session 24/10: Seems focused, on-task, interested. Not moving around but facing tablet and looking at it. Quiet. Engaged. Reactive: seems hesitant sometimes to choose an answer, then gets the feedback and immediately selects it."

The notes from the video data and participant observations frequently mention how much the children enjoyed the game features of Graphogame, in particular the choice of avatars, as well as the animal rewards on the tablet, the accessories and the magic door on the laptop. During the first sessions, some participants even refused to stop playing. Extracts from the participant observation notes indicate:

"1/10: O. loved the game so much that he refused to leave at the end of his session, although his mum was here to pick him up. He even started crying!"

"9/10: The kids played for about 25 minutes as it was impossible to stop them before that, so I had to bribe them with snacks to stop."

However, both interviews with the 1A teacher presented a completely different opinion regarding the nexus playing-learning. Before the intervention, she simply mentioned that 'kids are not going to play Graphogame to learn, they just want to play'. After the intervention, she explained this point in greater detail:

"they took Graphogame only as a game, as a diversion, not as learning. If they had seen it as learning, they would have applied it in class, but they didn't. [...] But the kids who did go just saw it as an opportunity to use material that they don't have in class or at home. I think things could have been different if you had done an evaluation and then measured the progress of the kids each day and then tell them 'look, you have not made progress, so you have to stop playing', so that they are motivated to apply themselves and are not just coming to have fun. Like O. or G., they were just coming to have fun."

These comments present the game approach of Graphogame as detrimental to the learning process: instead of motivating children to learn, the game would be doing the opposite as the participants were not transferring the skills acquired to other literacy contexts.

As surprising as I found this point of view when the 1A teacher first expressed it, the participants' behaviours actually seemed to evolve in the direction of using Graphogame as a game for playing sake, and as opposed to a game for learning.

Indeed, the children increasingly became described in the notes by adjectives such as agitated, unfocused, distracted, restless or argumentative, although these behaviours were recorded more for some participants than others.

As the kids progressively paid less attention to the game during the sessions, they got involved in other activities, so much so that 'other activities pupils are involved in' became one of the initial codes of data analysis. Among the activities reported in the notes figure for instance singing, dancing, screaming, using the desk as a drum, playing with the headphones –using them as a sound system, as a microphone or eating the cord- or interactions between participants and with kids outside of the classroom. Extracts from the video data tell better this story:

> "Session 6/11: Code 'Other activities pupils are involved in': R: someone knocked at the door, R. first turns around, then takes off the headphones and goes to the door. Later, he goes sit at the arts and crafts table with his tablet. Finally, he moves back at the adequate table again but not in his seat, and places the tablet on his knees. Then, he's on the move again, this time heading back to his original seat, which has been taken by H. Fight with H. to get his seat back. Taking off his headphones, playing with the sound wheel and listening as if the headphones were a sound system.
> H: While I'm at the door, he's first looking at me while I'm talking, then he takes off his headphones and runs away. Later, he moves seat repeatedly, starts conversations, looks at R's tablet. He also plays at plugging and unplugging the TV. Then, R. changes seat so H. moves into R's seat.
> J: interactions with O. throughout the video recording.
> O: Looking at J. on the laptop instead of his own tablet. Then he comes sit next to J. and looks at him and chats away. Then he starts playing with the headphone cord."

Such disruptive behaviours were also recorded during the direct observations conducted in their classrooms with the 1A and 1B teachers; it was expected however that Graphogame would keep the children more focused than regular classroom instruction.

Furthermore, later in the pilot study, the participants started asking to stop playing before the planned 20 minutes and displayed negative feelings when asked to keep on playing. H. started this trend within a week of starting the pilot study and all the other children progressively emulated him, as the extract from this video data reveals:

> "Session 22/10: H: H. just stands, packs his belongings and leaves to go draw instead.
> E: E. wanted to stop playing after 10 minutes and he started negotiating when to stop."

Attendance issues were also noted: although some children attended the study on a daily or near daily basis, several started missing the sessions frequently and could be seen hanging out in the street outside the school instead. As I witnessed the participants becoming more agitated, getting involved in other activities or stopping to attend the sessions altogether, I started to wonder if children's understanding of Graphogame was that as a game, it should be fun. When it no longer felt like fun, they did not want to participate anymore.

Moreover, even for those participants who kept on attending and playing the game rather than getting involved in other activities, it seemed that Graphogame as a game was increasingly coming into conflict with the reading acquisition process.

Firstly, this was observed by the children not thinking their answers through before making a selection. Actually, the participants were seen repeatedly making a mistake in spite of feedbacks or selecting answers too fast to possibly allow time for reflection. For instance, field notes on Y. show that he repeatedly displayed such behaviours:

> "Session 11/11: selecting answers without thinking about it first, unless I sit next to him and tells him so/hold his hand. "
> "Session 12/11: Y. touches everything on the tablet unless I'm next to him."
> "Session 13/11: Y. wants to touch all answers, I have to remind him every time to think first, or I even have to hold his hand. Does he understand the game is to learn to read? What can he gain from Graphogame if he does not try to find the correct answer?"
> "Session 14/11: I still have to hold Y's hand so that he thinks before answering."

Although some participants exhibited this behaviour throughout the session, it could be observed more particularly in two specific games, which I nicknamed the 'balloon game' and the 'pirate game'. Indeed, in most games, the pupils could only make one selection

at a time. If a distractor is chosen instead of a target, the correct answer is normally given to them and they hear a new sound. In the pirate or balloon game however, if the player makes a wrong selection, the distractor chosen turns red, indicating a wrong answer, and the player has to choose another answer from within the options already offered. Consequently, the children started selecting all answers until getting the target. Increasingly, I started to wonder if the pupils understood that the point of Graphogame is to recognize sounds, not just to finish the levels and win a reward. If the participants were playing to win the rewards, rather than making the effort to think about their answers, how could they learn to read?

Secondly, playing to play rather than playing to learn also became apparent in the use of the maze available in the laptop version of Graphogame. In fact, the children preferred spending time playing with the maze and the character, rather than going through the exercises which would teach them how to read. This extract from the field notes show this phenomena:

> "Session 18/11: J. was quiet and was not trying to stop playing like the others. But when I was looking at what he was doing, he was not moving in the maze but changing the costume and accessories of his character, or playing at going back and forth through the magic door."

The way children used the tablet also seemed to indicate they were taking it as a toy. Indeed, they would play with the headphones and the headphone cord, as well as with the sound wheel, they would go into options (sometimes accidentally, but sometimes on purpose) or would move the entire tablet in the pirate game as it would make their character move too.

Finally, the participants wanted to avoid the features of the game they disliked. For instance, E. particularly did not like one of the phonological awareness exercise, which he nicknamed the 'blackboard game'. In this game, the background looks like a classroom blackboard. The child hears a sound and has to select between the letters written on the board, so that the features of this exercise may not be as exciting as most other games. E. was repeatedly observed complaining that he has to play that game, saying for instance 'I want to play another one' or making strategies so as not to have to play it; eventually, he would ask to stop playing Graphogame all together because of it.

All these examples indicate that participants in the study used Graphogame mostly for fun, and that playing for fun increasingly came into conflict with playing the game to learn. Also, as soon as Graphogame was not perceived as fun anymore, they did not want to play any longer.

6.2 Providing an individual training

Graphogame was designed to be used individually, as an additional teacher, by pupils affected with reading disorders. Saine et al. (2011, p.1014) explain that 'overcrowded early literacy settings are likely to challenge at risk-students, who acquire reading skills by degrees and require abundant repetition for decoding'. Graphogame provides such students with the opportunity for the individualized repetitions needed (ibid.).

However, in the case of the Peruvian pilot study, some pupils were unable to use Graphogame independently. In fact, at the beginning of the intervention, some participants could not use the tablet or laptop by themselves at all, as they had not been exposed to such technologies before. E. in particular struggled with manipulating the laptop in an autonomous fashion. Field notes from his first session retell:

> "Session 1/10: E: E. doesn't manage to move the cursor with the touchpad –and tries selecting his answer on the laptop screen instead. He's unsure of what he's supposed to do so he does not play if I'm not with him. If I'm helping someone else, he waits until I come to do the levels with him."

In addition to his problems handling the ICT equipment made available to him, E. also struggled with the game in itself. At first, he could not understand the maze and how he was supposed to evolve through the levels.

> "Session 3/10: E. needs help to use the laptop game: where to go in maze, how to get to the next game... He wonders around the maze if left unsupervised, going down levels or even simply waiting for assistance as he doesn't know what to do" (field notes).

E.'s problems with the maze subsided after the first couple of weeks of the intervention. However, his issues with some particular games continued further, such as with the

FIGURE 8: The bubble game.

'bubble game'. In the 'bubble game', the player hears a sound and is presented with moving bubbles containing letters – several of which contain the target letter, others containing distractors. The player should select all of the bubbles containing the target letter. When the player selects a target bubble, it turns green, and the player should move on to selecting other target bubbles. E. was repeatedly witnessed 'stuck' while playing the bubble game, which seemed too hard for him to play on his own:

> "Session 22/10: E. still cannot play the bubble game: is it because he does not understand it or because he does not manage to play it? He played for several minutes, just shuffling around the bubbles, scoring nothing" (field notes).

Some students also needed additional support at the beginning of the intervention because they did not know at all the letter-sound correspondences, and needed help choosing their answers. For instance, R. could not even recognize /a/ during the first sessions, in spite of attending first grade for about 6 months. E. was in a similar situation himself and insisted that we would complete the levels together: he would take off his headphones so that we could hear the sounds together, and I would then read out the letters available on the screen for him to choose from. Such findings seem to support Moran et al. (2008, cited in McKenna et al., 2011, p.379), who found greater effect sizes for ICT interventions targeting general populations of students rather than struggling readers.

Actually, some participants could play individually from the start, such as G. or O. Field notes from O. and G's early sessions show that they displayed the expected behaviours as per the Graphogame literature, including playing individually, pronouncing the sounds heard and thinking before selecting the answer:

> "Session 3/10: O: O. is doing very well. He's taking his time to think his answers through –even in the pirate game- and explains that it is faster to come up with the right answer than try all answers."

> "Session 9/10: G: G. is not asking for help when playing. He pronounces out loud the phonemes he's asked to recognize. He improves through the levels fast and is already playing with some words like 'muchacho'."

Therefore, some participants needed support in the initial sessions, while others could play individually. Nevertheless, the main evolution observed for most players throughout the intervention was towards scaffolding. Scaffolding signifies that 'meaning is thus constructed by the learner through joint activity, rather than being simply transmitted from teacher to learner' (Lee & Smagorinsky, 2000, p.2). During the pilot study, the evolution towards scaffolding was observed between participants, and between the pupils and myself.

Indeed, the kids were seen interacting with each other more and more as the study unfolded; in the second round of data analysis, 'interactions' became a code. The most common forms of interaction observed were eye-contact, conversations regarding their game experience, and looking at each other's tablet or laptop. They would for instance compare where they were at in the game, ask each other questions when they were unsure of the answer or showed each other the animal rewards and where their animal 'went on holiday'. The following extract from the video data shows this trend:

> "Session 24/10: M: M. starts conversations with O. by grabbing his arm, addressing him a few times, pushing O. on the chest.
>
> H: H. asks B. for an answer and checks with her that he has the correct one by drawing letters on the table with his fingers, then shows her his tablet.
>
> Y: Y. looks repeatedly at R's tablet and describes what's happening in R's game; he tries to talk to R. and when R. doesn't respond, he insists by grabbing his shoulder."

During the study, I decided to use this desire for interaction to motivate the kids to focus on their own work and improve their reading skills, by letting them play Graphogame together on the laptop after they completed their individual sessions. This way, the participants accepted more easily to finish their own 20 minutes session. This experiment was a great success and when together, the participants would happily play Graphogame for half an hour or even an hour:

> "Session 8/11: O. then staid to play with B. on the laptop. O. helped B. to recognize the sounds she finds difficult, like /f/, and she was thinking carefully her answers, rather than selecting randomly when she did not know" (field notes).

In addition to peer-interactions, interactions between the participants and myself also increased throughout the intervention. As mentioned earlier, some pupils needed

scaffolding from the start of the intervention; but the other participants also gradually required more attention from me, to the extent that they would refuse to keep on playing unless supervised. For example, G. initially played individually as expected. Yet, after a few sessions, he seemed to lose interest in the game, unless he could share his game experience with me:

> "Session 23/10: G: G. talks to me a lot, pronouncing sounds and telling stories about the game: 'the sea worm is really really small', 'what will this animal be?', 'oh, the pirate, i'm gona pchou pchou' (hands in gun position), 'the cow-boy, he's taking a good shower' (several times) 'a horse!'... Every time, he makes eye-contact with me when talking" (video data).

In the next chapter, I will describe in greater detail the different types of interaction between teacher and pupils around Graphogame. Many factors may explain this need towards greater interactions in the classroom. According to Gambrell et al. (2011, p.27), literacy is a social act, so that readers and writers develop meaning as a result of co-constructed understandings within particular sociocultural contexts. Gambrell et al. (2011, p.20) regard peer talk as an important way to promote comprehension, motivation to read as well as the development of higher-order thinking skills.

In conclusion, I attempted to illustrate the evolution in the use of the game by the participants with the following graphs (Figure 9 and 10). They allow to see at a glance how each player moved towards a scaffolded use of a game, and towards a 'playing for fun sake' approach.
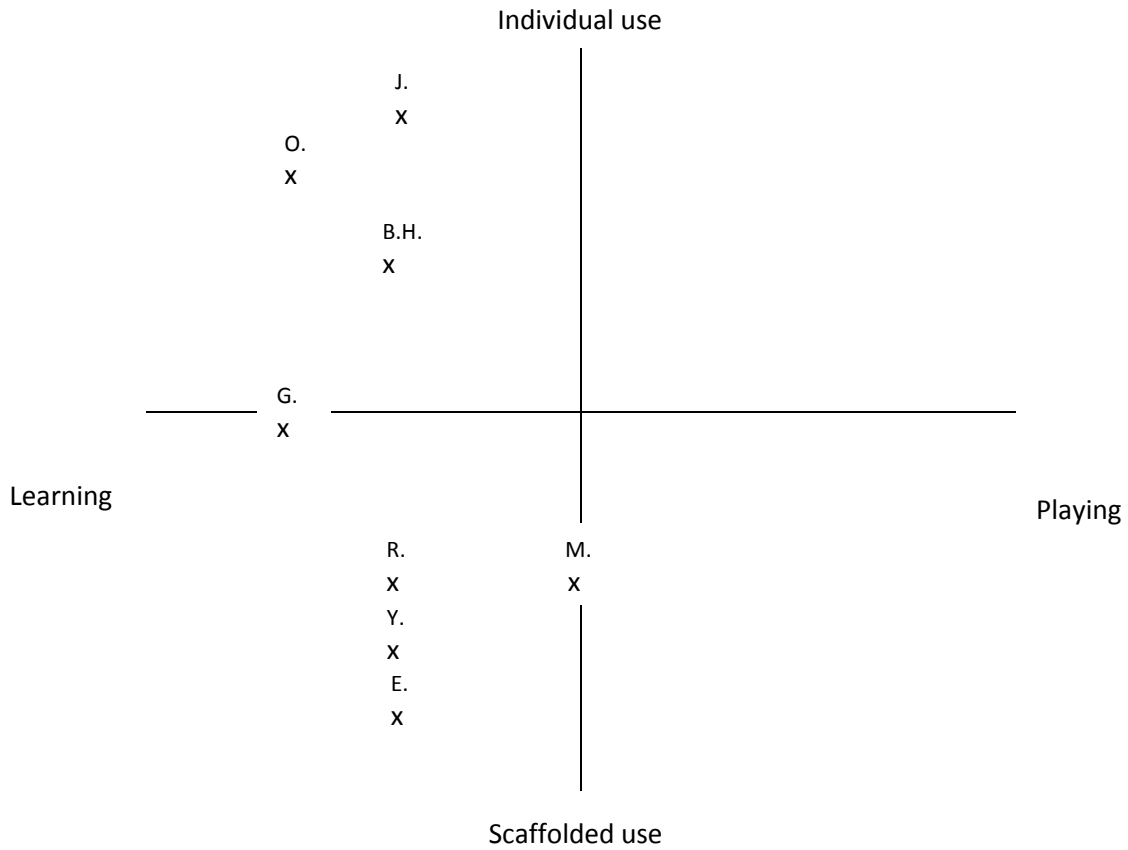
Individual use

J.
x

O.
x

B.H.
x

G.
x

Learning   Playing

R.   M.
x   x
Y.
x
E.
x

Scaffolded use

Figure 9: Use of Graphogame by the participants during the first 3 sessions of the intervention.

Individual use

J.
x

Learning   Playing

O.
x

B.   R.   E.
x   x   x

Y.
x

M.   G.   H.
x   x   x

Scaffolded use

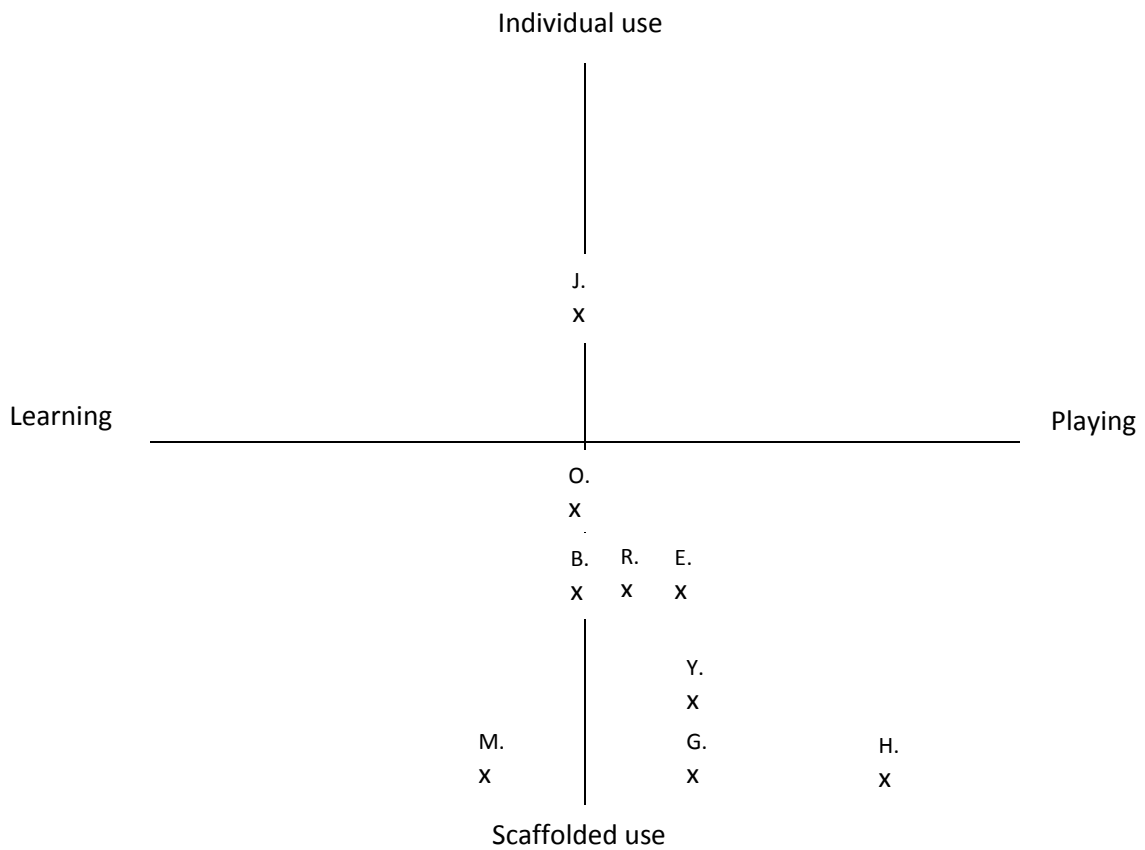*Figure 10: Use of Graphogame by the participants during the last 3 sessions of the intervention.*

After describing how the participants in the Peruvian study of Graphogame have made use of the features promoting 'playing to learn' and individual learning, I will now examine how they used the drilling exercise format of the game.

6.3 Learning with drilling exercises

Lyytinen et al. (2009, p.669) explain the choice of a drilling format for the Graphogame exercises in relation to the difficulties behind delays in reading acquisition: difficulties in storing and retrieving letter-sound correspondences. The number of such letter-sound correspondences being relatively low in transparent writing systems, they can be drilled 'efficiently and without complications' (ibid., p.672) to train for faster retrieval (ibid.).

As previously explained, Graphogame comprises of exercises diverse in their outlook, but similar in terms of the task to be accomplished so that the instruction remains the same throughout the game: 'Listen carefully. Choose the sound you have heard'.

Some elements from the initial interview with the 1B teacher indicated that the drilling methodology would indeed function. She explained that the main obstacle to reading acquisition seemed to be that the kids simply did not remember what they read. This could suggest that the pupils required abundant repetition for decoding. Observations of the participants' behaviours also intimated this difficulty in retrieving the letter-sound correspondences.
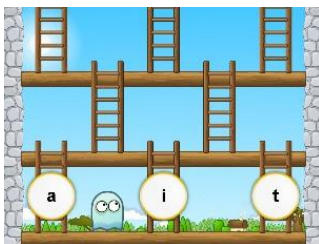

FIGURE 11: The ladder game.

"Session 15/10: E: E. got stuck in the ladder game: he has to choose between 2 answer options to go to the next level of the ladder and doesn't know the answer. But he keeps on trying the same answer option, instead of trying the other one and going to the next level of the ladder" (field notes).

But in spite of these elements, factors in the Peruvian study limited the efficiency of the drilling format. A first issue with the use of drills in the study is one regarding the sounds recorded for the Peruvian version of Graphogame. In fact, both the Peruvian linguist from Lima -the capital city- and the population of Quilcas spoke Peruvian Spanish. However, soon after the start of the intervention, it became apparent that the kids uttered sounds that do not belong to Standard Peruvian Spanish, which could be an issue of dialect or indigenous language interference. The field notes also mention the use of alternative words, so that 'bathroom' in Quilcas was 'pichi' instead of 'baño', or 'rubbish' was 'tacho'

instead of 'basura'. These differences made it harder for the participants to find the target answers, and although it is specific to the village of Quilcas, it can be expected to be encountered in other places in Peru.

Moreover, by practicing drills extensively, some participants developed mal-adapted reading strategies, for which the game does not correct. Graphogame is an adaptive game, evolving in accordance with the level of the player. It progresses from drilling letters, to syllables, and towards pseudowords and words. Yet, it does not explain to the pupils how to transition from the letter, to the syllable level of difficulty. Consequently, some participants devised their own, sometimes incorrect, strategies. R. was in this situation and he staid stuck at the letter level for a long time, until he developed a strategy which I nicknamed 'spot the vowel'. He would search among the answer options for the one which incorporated the vowel sound he had heard in the speech sound. For instance, if he had heard the speech sound /da/, he would look for /a/ among the options on the screen. Although this strategy would sometimes work, other times several of the answer options would include the same vowel sound, such as /pa/ or /ta/. R. was confused by the fact that his strategy would work sometimes, and sometimes not. Until the end of the intervention, he kept on using this method, in line with McGuinness's (2004, p.328) remark that 'ineffective decoding strategy leads to habits that can be hard to break'. In a game, this strategy is somewhat valid since it still helped R. to score; it is not however an adapted strategy for a real-life situation when the child has to read and understand a text.

Actually, the importance of learning to read for meaning-making purpose was highlighted by the 1A teacher in her initial interview:

> "But the problem with your program is that it is not impacting anything. Nothing happens if they choose the wrong answer. It's not real. So it doesn't motivate the kids to apply themselves as much."

The 1B teacher also explained that her method to reading instruction relies on the use of context cues:

> "I use small texts and then asks the kids to answer some simple questions. I teach them by making them focus on three moments: before they read, they should look at the picture along the text and imagine, make hypothesis regarding the topic of the text; then they start reading together and explain the words; finally after reading, they

discuss what they have understood and use the reading fiche to answer some simple questions."

The importance of reading for meaning-making purpose is also highlighted in the literature, for pupils to see the relation between instruction and real-life literacy tasks. Gambrell et al. (2011, pp.21-22) encourage tying reading instruction to authentic reading activities that are meaning centred and to give access to a variety of print material. They explain that reading instruction should encompass reading for pleasure, to be informed and to perform a task, as opposed to teaching pupils to read solely to learn –for instance, by having to complete assignments or answer teacher's questions.

The 1A teacher also described this diversity as being key to successful reading instruction:

> "This game is only drilling them, making them repeat again and again. But kids also have to investigate. Kids in my class are doing better than in the other. That's because I create material for them, using poems, stories, drawings and I do them all myself. I make them write and draw, and I write and draw with them to show them. And I look in their copybooks, I analyse what it is that they are failing at and why, not just if it's correct or not."

Using multiple strategies for instruction is especially important in the case of struggling readers. Allington (2011, p.104) recommends to tackle a single text, to make use of: picture cues, making sense, use of letter-sound relationships, reading on to find out what happens, and re-reading along with meaning making in order to cross-check...

The Peruvian pilot study pointed out an additional limit to the drilling format, which may or may not be related to the above-mentioned lacks of the drilling format –namely the lack of real-life meaning, of diversity, and of opportunity for interactions. Indeed, the participants in the Peruvian study complained repeatedly that Graphogame was monotonous, as highlighted by the following extracts from my field notes:

> "Session 5/11: The kids have been complaining for about 3 weeks that the tablet game is repetitive. They are more interested in the computer version, as there are more games and the character is evolving through the maze."
> "Session 15/11: After their 20 minutes session, the kids played together on the laptop. Some kids asked if we could put another game on as this one was boring."

In spite of being in the classroom with the participants, I could not identify with certainty what part of Graphogame it was they were finding 'boring'. However, I mostly intimate to the lack of interaction explained above. But in the case of the session 15/11, the children were in fact playing together, so that I was led to believe that the drilling format of the game, when used massively, became too repetitive. Yet, the intensive use of Graphogame is prescribed by the Graphogame team itself (Saine et al., 2011, pp.1014-1015).

Consequently, the effectiveness of Graphogame in the Peruvian study seemed to be somehow limited by the repetitive nature of the drilling format, which challenged the interest of children and was mal-adapted to a situation of numerous local dialects. Furthermore, it may have led to the development of incorrect reading strategies by children, and was criticised by the teachers for lacking in authenticity and creativity.

In this chapter, I have explained how the participants of Quilcas have progressively evolved away from playing as expected and predicted in the literature -playing to learn, playing individually, and playing using the drilling methodology- towards alternative ways of interacting with the game. It seemed that the participants were playing for fun, as indicated by the avoidance of the undesired features of the game, or of playing Graphogame altogether, and instead getting involved in other unrelated activities. Also, the participants increasingly displayed needs for interactions with peers and teacher to keep on performing the exercise. Lastly, the use of the drilling methodology in the case of the participants of Quilcas came to highlight issues of conflict with local pronunciation, emergence of mal-adapted reading strategies, and boredom –which could relate to the repetitive use of the methodology or to the lack of real-life meaning and creativity of the methodology.

7. THE ROLE OF THE TEACHER IN THE CLASSROOM USING GRAPHOGAME

Turning now to my second research question, the data collected in Quilcas clearly highlights the importance of the teacher in the classroom using Graphogame and the diversity of the interactions between teacher and pupils. These findings came as a surprise to me, and against my initial expectation that my job in the classroom would consist merely of the following two tasks: setting up the ICTs for the participants to use and observing the participants' interactions with the game. Once in Quilcas however, I had to step up and take a more active role in the classroom.

This chapter therefore considers this role and how it developed during the study, based on the descriptions I recorded in my field notes and the observations collected watching the video data. The interactions in the data were found to serve the main purposes of providing rapport, motivation, scaffolding and technical support to the students, as well as maintaining order in the classroom. The interactions were also found to evolve throughout the study. Indeed, at the beginning of the intervention, most participants were shy towards me and their attention was directed towards Graphogame. The main exceptions were R. and E. who needed additional support −as described in chapter 6. But rather fast, the other participants warmed up to me, asking for more support and attention, and it eventually became difficult for me to manage all of their demands. In this chapter too, the sessions will be referred to by date.

7.1 Interactions participants-teacher

When the participants wanted to interact with me, they would usually do so by calling me directly. They would often use the nickname they chose for me -'Bonita'- or my title as they understood it to be −'Profesora' - often repeatedly and until they could witness a reaction on my part. In some cases, they would combine it with other noises to amplify the effect created. H. tended to be particularly creative in that regard, and he would for instance hit the table repeatedly while calling out my name. A less direct way the children would use was to pronounce the speech sounds heard in the exercise in a repetitive manner as I would walk by, signalling they couldn't find the answer or needed help. If these attempts were unsuccessful and I was unable to come, they would often wait for me, while playing with the cord or the headphones, or they would start conversations and look

around. Sometimes, in the case of the children using the tablets, they would decide to take matters in their own hands, by showing me the tablet as I walk by, by lying across the table with their tablet for me to see, or by standing up and coming to see me with the tablet:

> "Session 7/11: B. screams 'holiday!', hands in the air. But I'm busy with Y. and fail to react, so B. stands with the tablet to come show me: 'Look where I'm going on holiday!'" (video data).

Other times when I did not come fast enough, they would share out loud what was happening to them in the game, for instance by screaming or raising their arms in victory when they completed a level, went on holiday, saw their animal. These constant demands on the part of the pupils were difficult to manage and respond to.

7.2 Building rapport

The main motives I identified behind the interactions I had with the pupils regarded rapport, motivation, scaffolding, technical support and keeping order in the classroom. In this study, I understand rapport to mean 'relationship, especially one of mutual trust or emotional affinity' ("Rapport", 2011).

In the case of the pilot study in Quilcas, rapport with the children was mainly built around the use of the ICTs. Indeed, most participants would not initially say much when entering the classroom, and they would often go straight to play Graphogame. But the video recordings captured in detail the development of the relationship teacher-pupil around Graphogame:

> "Session 24/10: Sitting next to O. and looking at his work. He's regularly looking up at me, telling jokes and stories about the game, and smiles excitedly. When something happens to him in the game, he looks up and smiles at me, as if to check that I saw it too. He positions his body towards me, and places the tablet between us. He communicates much more now when he's playing than he used to."

On a physical level, eye-contact, smiles and nods were found to be regularly exchanged between the teacher and pupils to build rapport, and the kids would usually look up at me after each answer or level to check that I was indeed paying attention.

"Session 7/11: At the end of the level, E. checks again that I'm looking at him. But I'm jotting down some notes about his playing performance. So he grabs my shoulder and tells me: 'I got it correct, did you see?'" (video data).

Moreover, the two female participants, M. and B, most often wanted to build rapport through physical interactions. They would for instance insist on holding my hand when they were playing.

On a verbal level, jokes were also frequently used to bond with the participants and were found to help them relax and sustain their effort. For example, H. would try to stop playing most days before the end of his 20 minutes session. So, I would joke frequently with him, gently shaking his head and telling him 'we have to wake up this brain then!' when he would complain he was tired or bored, or we would vent each other with a copybook when he would complain about the heat.

Most of all, the participants enjoyed building rapport by co-constructing meaning around the game. They enjoyed sharing with me their game experience and how they understood it, such as what their character was doing in the different exercises and in the maze. I encouraged them to do so as it seems to help motivate them by increasing their interest in the game, as in the cases of the 'star game' or the 'sea game'. The 'star game' was an exercise that most participants found rather uninteresting at first. The background of the game is dark blue and initially, there did not seem to be much happening except for the traditional instruction of listening to the sounds and identifying the correct answer. After a couple of weeks however, O. shared with me that there was a white star in the background, and that it was getting bigger with every good answer, until it eventually exploded. After that, all the participants were invited to look at the star, and it increased their interest in the game and their motivation to get the correct answer option. They would also call me to witness the explosion of the star. In the case of the 'sea game', the character of the game is a sea worm which comes and eats the answer option selected by the player each time. Once again, the players did not find this game particularly exciting at the beginning, but after a few sessions, G. discovered that the sea worm was getting bigger too after each correct answer, and the pupils would often comment to me on the length of their sea worm and the reasons behind it. Some participants cared more particularly about developing such a narrative and sharing it with me, such as O. and G.

Another way that rapport was constructed was through praising the participants, as a mean to give positive feedbacks, to acknowledge the child's effort and to encourage to continue. I would give verbal praise to the players when giving a correct answer, for instance by telling them 'well done' or 'you're a champion: you finished an entire level correctly!'. Additionally, I would nod, pat their back, give a high five or raise their arms in victory. Some participants even developed their own preferred way of receiving praise, such as M. who would touch my head with hers when she completed a level without making any mistake.

Acknowledgement and praise were found to be very important for the participants and they would gradually ask for it when they finished a level, completed the animal picture or 'went on holiday'. In fact, Graphogame includes its own system of rewards as described in chapter 6, but it did not seem to be fully satisfactory to the participant until the teacher had also witnessed the child winning the reward and acknowledge the activity mastered. So increasingly, the participants would call me to come and witness the rewards obtained. If I was unavailable to come observe the participants, they would signal their progress to me for instance by shouting 'Teacher, I won a prize!' or 'I finished the level teacher!'. They would also usually manifest their victory in a diversity of other ways such as shouting the animal they got, singing a victory song, moving their hands in the air as if they had finished a competition.

However, building rapport also progressively entailed conversations that were not related to Graphogame. As we got to know each other better, the kids became less shy and they would increasingly comment for instance on what was happening to them at home, or outside the classroom. They would ask me random questions, regarding for instance the different buttons of the tablet of which they were not making use.

Therefore, rapport was built with the participants throughout each session in diverse ways to set the stage for the learning opportunities and encourage the pupils to sustain their effort. Rapport evolved throughout the intervention, being at first completely centred around Graphogame and progressively becoming more organized around the teacher-student-ICT triangle.

7.3 Motivation

Rapport contributed to motivate the participants, but as keeping the children on-task progressed to be my main role in the classroom, I also used additional means to encourage the players to stay focused. Indeed, the kids usually started the session motivated. For instance, they frequently escaped their classroom to come see me set up the ICTs and make sure that the session was happening as planned. The 1B teacher recounts the enthusiasm of the participants in her final interview:

> "Every day when the bell rings, they want to go play with you. They say every day 'Miss, can we go play with Bonita, it's time to go play'."

However, as explained in the previous chapter, the kids refused to keep on studying by themselves and usually wanted to stop playing before the end of their 20 minutes session or else made random selections in terms of answer.

So I used various strategies to convince them to keep on playing, the most effective one for all the participants simply being to sit with them and look at them while playing. Indeed, both the field notes and video data record frequent examples of the change in the participants' behaviours when their work was being supervised:

> "Session 14/11: R: At the beginning of the video, I'm looking at R's work. R. is very eager about it. Very focused: sitting straight, tablet on the desk, thinking hard before answering, he's not touching the tablet repeatedly and he pronounces the speech sounds. Then he turns towards me, shows me the tablet and asks me: 'which one is it?' Then he leaves the tablet between the two of us on the desk. Attention and effort sustained. Then he turns towards me again, asking me for /das/. At 5 minutes on the recording, someone knocks on the door and I go open. Immediately R. starts touching the tablet repeatedly. After that, R. is quite unfocused: looking up and around; and not motivated anymore. Quickly, he calls for me and tells me he wants to stop playing and go draw instead."

Sitting with the kids and providing individualized attention functioned particularly well when they would arrive in class very agitated or experienced repeated frustration with the game.

"Session 22/10: H. arrived first in class and was very agitated, pressing all target options as usual. But I sat next to him, gave him positive feedbacks and told him to think before answering and he started to slow down and do much better" (field notes).

For most pupils, this individualized attention was the only way to motivate them to complete the 20 minutes exposure time, or to motivate them to think their answers through rather than make a random selection and engage in other activities. In some cases, when a child would ask me to stop playing, I would for instance say 'but you haven't showed me how well you play today!' and the child would usually respond with a grin. Other times, it was enough to sit for a couple of levels with a player who had asked to end the session early, and the player would keep on playing by himself for another few minutes after that.

Yet, in some cases, it seemed to me that the attempts of the participants at negotiating to stop the game were not genuine, but rather like a ploy to obtain the individualized attention they craved. For instance, the following example from the video data presents a situation when I was unable to support a participant asking to end the session early -as I was otherwise engaged with another player- and the participant staid on-task anyway:

"Session 11/11: B. starts negotiating to stop playing. I told her she has only gone half of the session and she has to continue. She tells me no, shaking her head. Eventually I tell her that she can go home if she doesn't want to study. She looks down at her tablet and starts playing again."

FIGURE 12: Sitting arrangement.

Since individualized attention appeared to be the best way to motivate the participants to play and focus, I eventually adapted the way the pupils were sitting in the classroom to maximize the attention I could provide. I brought several tables together and made the participants sit two on each side, with an empty chair in between them. This way, I would spend about half of the session motivating two of the students, and would then sit on the other side of the table and supervise the other two participants.

In addition to providing individualized attention, encouraging and challenging the participants was also key to keeping up their motivation. For instance, acknowledging the difficulty of the exercise was found to encourage the children and motivate them to keep

on trying. In addition, I would challenge a kid to show me he could do an entire level correctly. Other times, I would defy two participants to see who could get the biggest sea worm. I could also challenge the kids to improve their own performances, by using the progress chart included in Graphogame to measure the player's development. Actually, in the tablet version of the game, when the child completes a level, the animal picture appears in the middle of the screen, along with the player's percentage of correct answers (showing separate scores for letters, syllables, and words) in the bottom left hand corner. It was also possible to see the line graph showing how the player's percentages had evolved. Seeing their score would regularly motivate the kids to keep on playing and improve it further –and try to reach 100%. For instance, B. got into the habit of checking her progress after nearly every level towards the end of the pilot study.

Such challenges and encouragements were found to increase the kids' focus and desire to complete the levels correctly. But sometimes –and more particularly towards the end of the intervention or the end of the 20 minutes exposure time- it was no longer enough to keep the children motivated, so that I also used a number of 'last resort' technics. First on my list was to explain the real-life applications of reading to the pupils who asked to stop playing. We would for instance brain-storm together on all the things they would be able to do once they knew how to read, such as get information independently, or read their own books. Secondly, I would remind them that they get a snack when they complete the session, which the pupils usually got excited about and they would take as their cue to start guessing what the 'snack of the day' was. Finally, I could also use the possibility of the pupils playing together at the end of the session as a motivation for them to finish their exposure time, especially with B., Y. and O. who particularly looked forward to working together on Graphogame.

In brief, keeping the children motivated and on-task turned out to be the most important role I had in the Graphogame pilot study, and to do so, I made use of a variety of technics, such as providing individualized attention, encouragements, challenges, real-life applications of reading and additional rewards -like snacks or team-play with the laptop. The technics were chosen according to each situation, and the more distracted or bored the child would appear, the more child-friendly I would try to make the session.

7.4 Scaffolding

Another role I undertook commonly with the participants in the Graphogame pilot study was scaffolding. At first, I felt ill-equipped for this role, especially in term of scaffolding reading instruction; as a consequence, during my time on the field, I read extensively on the best-practices for literacy acquisition. However, scaffolding in the case of this pilot study did not only mean scaffolding reading acquisition, but also included instructional scaffolding.

Indeed, and as already mentioned in chapter 6, the participants frequently needed additional instructions to know what they should do in the game -such as where to go in the maze. Moreover, I would also warn them when the answer they had to find was particularly difficult -for example if several answer options were similar- so that they would slow down and pay particular attention. Furthermore, I would sometimes add instructions to a game. In the case of the 'bubble game' for instance, the player has to select all of the bubbles containing the target answer. To make sure that the player would not just touch all of the same identical bubbles randomly without paying close attention to the corresponding speech sounds, I would make him repeat the speech sound every time he would select one of the target bubbles. Yet, the main instruction I would add repeatedly to the game was to encourage the children to think their answer first before making a selection. If necessary, I would even hold the player's hand. Indeed, some players, like Y, would not slow down and examine properly their answer options otherwise.

Nevertheless, instructional scaffolding remained limited in terms of occurrences in comparison with the scaffolding supporting the identification of correct answers. Although the players are supposed to be able to use Graphogame in an individual fashion, in the case of the pilot study in Quilcas the participants needed assistance more often than not to make their answer selection: sometimes they needed confirmation of an answer choice, other times support with the letter-sound correspondences, or assistance regarding how to read syllables and words.

When in doubt, some players would ask me for confirmation that the answer they were about to select was the correct one. For example, they would ask me: 'this one?', 'the second one?' or 'which one is /ma/?'. This frequently happened with M. and B, the two

female participants, who displayed confidence issues and therefore asked for confirmation before almost every answer.

> "Session 29/10: B. seems to improve. But she seems to have a confidence issue: often she seems to know the answer but she's hesitating for a long time to select the target and eventually just asks me. It's as if she didn't dare to press the answer" (field notes).

In the case of the students who needed help with the letter-sound correspondences, I would usually take off the kid's headphones and I would read the answer options available on the screen for easier identification. Some phonemes were particularly difficult for the participants, such as /f/ /s/ /p/ or /b/. For such phonemes, I would suggest a word starting with the phoneme sound –always the same one to facilitate memorization- such as /b/ like 'baby' ('bebe' in Spanish). This method was effective in helping the pupils identify the phonemes correctly. However, it took a long time –and a lot of repetitions- before they would think of using this method independently. This extract from the video recording relates the first time that E. was able to recognise /f/ by himself:

"Session 27/11: I look at E. works and he selects /f/ correctly. I praise him and I tell him 'this is /f/ like...' and he answers 'like /fiesta/!'. I praise him again. Later he calls me back for help with /t/. He asks me about diverse distractors, so every time I say 'careful, this one is /l/ like /luna/, this is /d/ like /dedo/'. I praise him when he won the level."

By end of the intervention, thanks to Graphogame's intensive drilling and the use of words to remember the letter-sound correspondences, the participants had mostly mastered the letter-sound correspondences –except for a few difficult speech sounds with which they still struggled. However, the 1B pupils did not manage to improve past the letter level by themselves. The field notes repeatedly mention this situation:

> "Session 29/10: R. can recognize most letters. But when he's asked to recognize a syllable, he doesn't know what to do, he doesn't know where to start to select the target answer."

Consequently, I introduced two main technics to help the participants: firstly, slowing down the words so the pupils could hear better the different phonemes that made up the word; secondly, breaking down the words into smaller and more manageable parts. These methods could then be combined together if necessary.

"Session 18/11: B. asks me 'this is /gral/?', showing a distractor. So I slow it down for her, '/g/ /r/ /a/ /l/'. But she still hesitates between 'gral' and 'gran', so i read it slowly again for her: '/g/ /r/ /a/ /nnnn/ or /g/ /r/ /a/ /llllll/' showing each time the answer options. She's still unsure. I add: 'look at the last letter: this one ends with /n/ like /nido/ and this one ends with /l/ like…?'. 'Like /luna/' she answers" (video data).

These diverse methods worked well with the participants, so that by the end of the intervention the majority of pupils could identify some syllables and words when we used these methods together. However, the 1B remained unable to use these methods independently and needed systematic scaffolding to attempt to find the target answer. Without scaffolding, in the best cases they did not know how to go about the exercise and would call me, and in the worse cases they would not actually attempt the exercise, but would make a random selection instead. Therefore, the teacher was instrumental during the Graphogame pilot study for the participants to be able to use the game appropriately and demonstrate progress in reading.

7.5 Technical help

In addition to building rapport, providing motivation and scaffolding, another important role I undertook during the Graphogame sessions was one of technical support. As the researcher collecting data for the Graphogame team, I would set up the ICTs before the session, charge them at night, and send the data to Finland. But also, while playing the game, the participants would regularly touch the wrong button by mistake and it was my role to intervene and fix the issue.

For instance, the students would frequently pause the game by accident, or would go into the tablet's settings, as the icon for the settings is located just above the sound icon –the sound icon allowed the pupils to hear again the speech sounds during the Graphogame drills. On several occasions, the players' data were lost because some participants went into the tablets' settings and uninstalled the Graphogame software by accident.

It would also happen that the participants played with the sound wheel of the tablet or the headphones, and consequently, they would call me because they could not hear the speech sounds they had to recognize anymore. In some instances, they played with the headphones and then needed help adjusting them back to the proper size –or else they would fall constantly.

In some other occasions, the program would stop working, and it needed to be restarted. This happened mostly on the laptop version of the game. The assessment levels –used to monitor the player's level at the beginning and at the end of the intervention- also required to be closely monitored. Indeed, at the end of the assessment levels, a message –written in English- would appear on the screen, telling the participants that the levels had been completed. But the kids could just touch the message –which meaning they did not understand- and the game would move on to the 'regular' levels. Furthermore, the assessment would sometime start at the second or third level of evaluation, leaving me unsure that the players had actually completed all the evaluation levels.

Overall, and although there were only four players at any one time, technical assistance was frequently needed during each session, and required to intervene fast –or else the player was left idle. Therefore, I often wondered how a teacher could manage a full class, especially if the teacher was only equipped with limited ICT competences.

7.6 Maintaining order

Finally, another important role I had to undertake in the pilot study in Quilcas was to maintain order in the classroom. Indeed, and as explained in chapter 6, the participants' behaviours became increasingly disruptive; however, such behaviours were also exhibited in their regular classroom and were not limited to them using Graphogame.

The following vignettes from the video data give examples of how I handled a couple of different situations:

> "Session 5/11: G. is already trying to attract B's attention: he grabs her by the shoulder and talks to her. Then she checks out his tablet. So I move B. to another seat, where she can concentrate better."
> "Session 26/11: H screams because his animal is going on holiday and he tries to grab me as I walk by. I tell him to be quiet and not to scream like that. He keeps on talking about his animal going on holiday, and stands to show me his tablet. I tell him to sit down and I'll only look if he stops screaming."

7.7 The central role of the teacher

In conclusion, as the teacher in the pilot study in Quilcas, I was in charge of diverse roles in the classroom, including building rapport, sustaining interest, scaffolding instruction

and reading acquisition as well as maintaining order and providing prompt technical support. The data highlight clearly that it is not enough to give the tablets to the pupils, but that the teacher has a central role in enabling the learning process with the ICTs.

On the one hand, the literature supports these findings on the ground that young learners encounter difficulties interacting independently with technology (Schmid et al., 2008, p.66; Yelland, 2007, pp.108-111). Young learners need rapport, praise, motivation and scaffolding to be able to work with technologies, leading Schmid et al. (2008, p.78) to conclude: 'for beginning readers, our study showed that even with a well-designed, computer-based tool, the tutor plays a pivotal role in guiding and motivating the child, especially when the learner encounters difficulties'. In the case of Peru, Breitkopf (2012, p.104) had also found the teachers were not usually using the XO laptops of the ULPN project with the lowest grades.

On the other hand, the ICTs cannot diagnose kids' needs the way a teacher can. According to Gambrell et al. (2011, pp.22-29), it is this ability of the teacher to differentiate and contextualize instruction, adapting it to the needs of each student, which is the most critical variable of reading instruction. In our study, the 1B teacher also mentioned in her interview how the teacher and ICT worked in tandem during the intervention:

> "It looked like they were applying themselves when they were in class with you because they are attracted to this type of material. But most of all, they were getting support from you."

This central role of the teacher raises some questions in the case of a potential large-scale introduction of Graphogame in Peru. Indeed, in Quilcas, the study included one teacher for four participants at any one time. Yet, this configuration was only for practical reasons regarding the equipment available to conduct the study.

However, being with only 4 participants at a time, I already felt overwhelmed in the classroom, juggling all these different roles. The field notes mention that I increasingly felt apprehensive of the sessions or even that 'it feels like too much work for just me'. Indeed, the participants would mostly play the game to learn if they were monitored, which meant they were actually attempting to recognize the speech sounds a few minutes per session only. In addition, the field notes frequently record my feeling of not being able to provide support to the participants who needed the most help, such as R. or E.

Instead, I had to focus on the students who were the most disruptive, such as G., H. or M, as they would simply refuse to participate without my supervision. How would it be to implement Graphogame for an entire classroom in rural Peru? Would the teachers have the required skills, especially in terms of IT competences?

In conclusion, when looking at classroom's dynamics in the data, the teacher emerged to be central to the implementation of Graphogame in Quilcas. The roles of the teacher encompassed building rapport, motivating the students, scaffolding the learning process, providing technical assistance and maintaining order in the classroom. The diversity and importance of these diverse tasks made it challenging to provide timely assistance in all instances during the pilot study.

8. GRAPHOGAME IN ITS WIDER CONTEXT OF IMPLEMENTATION

After presenting my findings regarding the use of Graphogame and the role of the teacher in the classroom, I will now answer my third research question by introducing my findings on the wider context of ICT use in Peru and outlining what this study adds to previous research on the matter. I will focus particularly on Quilcas as illustrative of the rural reality of Peru, and then, on the infrastructural obstacles still in the way of full implementation of ICTs in Peru.

8.1 The case of rural Peru

Considering Graphogame in its wider context of implementation, it is important to remember that several ICT initiatives have already been set up in rural Peru. They aimed to improve the quality of education, enable the rural areas to join the 'knowledge society' and compensate for the situation of mutually reinforcing inequalities affecting rural Peru. However, these initiatives had mixed results. Indeed, as Rocío Trinidad (2005, cited in Breitkopf, 2012, p.66) pointed out, introducing ICTs in the classrooms of rural Peru will not of itself reverse backwardness or improve educational quality. Indeed, my findings indicate that the learning difficulties affecting the participants of the study have contextual roots.

8.1.1 Cultural Difference theory

First of all, during my time in the field, I observed that the children of Quilcas experience a situation of cultural difference or cultural disadvantage when attending school. Eisenhart (2001, pp.210-211) explains that cases in which the school represents a single culture, students raised in different environments will be unfamiliar with the behaviours and attitudes expected of them, leading to underperformance -unless special efforts are made to teach those culturally different students.

In fact, the participants in this study attend a school reflecting a different culture to their own -the urban, modern culture of Lima. The culture of Quilcas however is rural and inherited from the indigenous culture of the Andes. The dialect of Peruvian Spanish spoken in Quilcas for instance puts the pupils in a situation similar to that of the aborigines of Australia described in chapter 2: the pupils and teachers of Quilcas are unaware of the

difference between Standard Peruvian Spanish and the dialect spoken in Quilcas, so that the teachers believe their pupils to pronounce 'wrong' and to be affected by learning disorders –further undermining the confidence of the pupils and perpetuating the circle of underachievement (UNESCO, 2010, p.201). Nonetheless, Stainthorp (2003, p.212) explains that teachers need to be particularly sensitive to regional variations in the phonemic structure of words in order to work with them and not against them –all the more so when working with young children.

Yet, in the case of Quilcas as often in rural Peru, the schools goes further than reflecting the one urban culture of schooling, it also devalues the pupils' home culture. Indeed, during their interviews, the school director and the first grade teachers often underlined the difference between the rural culture of Quilcas on the one hand, and the urban, modern culture of the school on the other, describing the former with terms relating to illiteracy, poverty, diversity, filth, backwardness, physical labour or early marriage while the later was referred to in relation to education, career, financial security, material possessions or progress. The following quotes, extracted from the interviews with the 1A and 1B teachers, demonstrate this cultural opposition and the devaluation of the rural culture of the pupils:

> "In Quilcas, I have had years and years of students finishing primary school. Do you know how many went on to university? About 10. All the others, they get married after secondary school, or during, just have kids and that's it. I try to explain to them, 'children, the one who studies does not cry. He doesn't have to wait for the rain to fall on his land. He can eat what he wants, he can have a nice house –not a tiny one in adobe-, he doesn't have to worry about food production or about other people having to give him money. But no, in spite of all the time and effort we invest in them, they just decide to get married. I see some of my ex-pupils and I ask them 'oh, what about that girl?' and they tell me 'oh, yes she has a kid now' " (1A).
>
> "The parents do not have this vision for the children, to study and go to university and better themselves and get away from this life" (1B).

In these quotes, the school is portrayed as a vehicle of modernity with the potential to transform the children of Quilcas into modern Peruvian citizens (De La Piedra, 2006, p.388). Such attempts however, are more likely to damage the children's self-esteem and precipitate their academic failure (Ames, 2012, p.460).

Additionally, Ames (2012, p.459) described how the culture of the pupils of the Andes is usually excluded from the school. The children are used to walk through the fields and mountains, play with their siblings and help their parents work the land and with the animals (ibid.). Yet, this fund of knowledge is ignored by the modern culture of schooling (ibid.). The 1B teacher explains how this difference can be traumatic for the pupils of Quilcas:

> "Here, school is like a trauma for the kids. Before, they are just playing around and hanging out with the family, they are just relaxed. And then all of the sudden, they arrive in primary school, they have to be serious, they can't play anymore, they have to sit down all day and be quiet. They get traumatized by that. And then, they arrive in secondary school and it's another trauma, they have all these different teachers, they are abandoned. And then, they go to university and it's another trauma again. And all these traumas, this lack of sequence is destroying the self-esteem of these kids."

Consequently, by promoting one culture and one type of knowledge while excluding rural practices, the school reproduces wider relations of power and exclusion rather than measuring the actual competences of the students (Ames, 2012, p.456; Baquedano-López, 2003, p.69; Cairney, 2003, p.87). Not only are the pupils of Quilcas asked to perform outside of their own cultural frame of reference, but their own culture is also being ignored and devalued by the school and teachers. Therefore, it should come as no surprise that children in urban areas were 7 times more likely than children in rural areas to reach the satisfactory standards in school in 2012 (Guadalupe et al., 2013, p.4).

8.1.2 Family background of the pupils of Quilcas

The children of Quilcas start their schooling with this cultural disadvantage, which is aggravated by additional factors. In fact, the school director and both first grade teachers explained that the pupils of Quilcas are not supported by their family in their academic learning. According to the teachers, this lack of support is mostly related to the parents' illiteracy: the parents do not know how to accompany the children in their academic experience. The teachers reported that the parents do not for instance supervise homework, enquire about their child's progress, or provide the pupils with the required school supplies.

Nonetheless, the teachers also explicated this lack of support in relation to the situation of extreme poverty of many families in Quilcas, which pushes family members –usually the fathers- to move away in search of work, and leave the family in Quilcas. As a consequence, the mothers are left overwhelmed as they are usually working themselves in the fields or with the animals, and are also in charge of the house and children. Breitkopf (2012, p.83) reported similar findings in other areas of rural Peru:

> "Many teachers lamented about the lack of interest in and support for the children's education. One of the contributing factors to this problem is often the low level of education, or illiteracy of the parents themselves. Another reason for the lack of priority attributed by parents to their children's education, seems to be the lack of economic resources of many households, and the resulting poverty and work migration of family members."

In addition to affecting their academic performance, the teachers of Quilcas explained the emotional toll that such migrations and abandonments have on the pupils' performance at school. During the interviews, the 1A teacher gave ample examples among her pupils of what she refers as 'the tradition of abandoning children' in Peru. She described, among others, the case of G. who was abandoned by his mother after the fall-out between his parents, and whose father is also working away:

> "[…] the kid is completely distracted in class. […] he can't focus in class, he's not there, he's thinking all the time about his mum abandoning him, and his father who is absent too."

In the interviews, the teachers further reported that the emotional hardships of the children of Quilcas is aggravated by the experience of alcoholism and abuse in the family. In the words of the 1A teacher:

> "When the teacher here tries to explain to the parents that there are problems in class with the kid, you know what they say? They just say 'hit him Miss, that's how we correct him at home'."

These findings echo the statistics outlined by Escobal et al. (2003, p.9) that 41% of parents nationally use corporal punishment to discipline their children, and that even more do so in areas affected by widespread poverty and exclusion.

An additional factor to be taken into account when considering academic performance in rural Peru is the issue of nutrition. Indeed, stunting -cases of children being too short for their age as a result of poor nutrition- affects about half of the six to nine years-old enrolled in primary schools in Peru (Escobal et al., 2003, p.6). In Quilcas, I immediately observed that children were indeed very small and looked and behaved younger than their age. Nevertheless, malnutrition does not only affect children's growth, but also their cognitive development and ability to read: for example, stunted children are 19% less likely to be able to read a simple sentence aged 8 (Save the children, 2013, p.6). Moreover, such results go on to affect the children's self-esteem, self-confidence as well as their future aspirations (ibid.).

In Quilcas, as in the study conducted by Breitkopf (2012, p.83) in Peru, the first grade teachers both underlined the connection between poor nutrition and the pupils' very short attention span and difficulties with memorization. During the interviews, the teachers explained the situation of misinformation regarding the nutritional value of food and highlighted the nexus poverty-malnutrition: in Quilcas, the parents are often producing the nutritious food that their children would need for healthy growth -such as vegetables, quinoa or maca- but they usually sell those in the neighbouring city of Huancayo and buy cheap products instead –such as white bread, rice or pasta. The teachers summarized the nutrition problem in Quilcas by saying that either their pupils are hungry, or their parents prefer 'quantity over quality' when it comes to food -for example by serving them large portions of potatoes or noodles.

During my time in the field, I observed the free school lunches which are distributed to school children by the government in order to tackle the issue of malnutrition. Nevertheless, the first grade teachers criticized this initiative during the interview. According to the teachers, there is not usually enough food per portion so that the kids are still hungry after eating, or there are not enough lunches for all the students so they have to share. They reported additional issues related to distribution, for instance the lunches would fail to arrive some days or the food had not been properly packaged. On such days, I occasionally observed the 1B teacher buying additional food for her pupils with her own money. In addition, by offering food to children of school-going age, this free lunch initiative is missing the most important time for brain development -which comprises of the nine months in the mother's womb, and the first two years of life of the baby (Save the children, 2013, p.6).

These recurring references to the emotional and nutritional deficiencies of the pupils, along with the behaviours displayed in class and towards learning, could indicate that the participants in the study suffer from Attention Deficit Disorder (ADD). Indeed, Maté (2000, p.11) describes the symptoms of ADD as including 'poor attention skills, deficient impulse control and hyperactivity'. This description by the 1A teacher of O.'s behaviour in class resembles Dr. Maté's symptoms of ADD:

> "Oscar is slow and unfocused in class, he writes a word or so and then looks around and then one other word and then just procrastinates some more. Same with the drawing. He always finishes last and needs to stay during breaks and after class - making me stay later too. […] Not only does he do nothing and he's always last to study but he's also first to promote disorder, with G. always the one following him. Yes he can read, but he's very lazy, except to play."

Maté (2000, p.39) explains that ADD is caused by incomplete development of pathways of the brain, more particularly in the cerebral cortex and between the cortex and the lower areas of the brain. As a consequence of this incomplete development, kids suffering from ADD can only work if they are highly motivated (ibid., p.123) -which could explain why the participants in the study were on-task during the first sessions of the intervention, as Graphogame appeared new and interesting then. Furthermore, pupils suffering from ADD are hyperactive and cannot stay still (ibid., p.15) -which once again could explain their behaviours in the classroom. Finally, students with ADD find it hard to engage in work in an independent fashion, because of the relation between attachment and attention. If the ADD child is struggling with emotional anxieties, he cannot focus and will try to interact with his peers or the teacher rather than complete the schoolwork at hand. If the child cannot get his emotional needs met, he will try to create this emotional connection even more desperately (ibid., p.172) -which could explain the participants' urgent attempts at getting my attention by asking to stop playing or by calling out every time something happened in the game for instance. Yet, the child with ADD can work well under supervision:

> "Attachment promotes attention, anxiety undermines it. When the child is not concerned with seeking emotional contact, his prefrontal cortex is freed to allocate attention to the task at hand" (ibid., p.126).

This diagnostic could explain why the participants could work and learn well when I was sitting next to them and doing the exercises with them. It may be that the students are not failing at learning to read because of difficulties related to the skills of literacy, but rather because of their inability to focus on their own.

According to Maté (2000, p.50), ADD is linked to genetic predispositions and is very much connected to the family environment in which kids are brought up. In fact, ADD is more commonly found in children whose first-degree relatives are alcoholics –as in the case of Quilcas- or suffer from depression or anxiety. Additionally, ADD can occur when the conditions for healthy brain development are not met. This include good nutrition, a physically secure environment, and the unbroken relation with the mother –conditions which have not been met in the case of Quilcas where malnutrition, poverty and abandonment are widespread.

More generally, Maté (2000, p.109) writes that ADD is more likely to be encountered in societies where the traditional structures are breaking down:

> "The effects of rapid social and economic shifts on the parenting environment are too well known to need detailing here. The erosion of community, the breakdown of the extended family, the pressures on marriage relationships, the harried lives of nuclear families still intact and the growing sense of insecurity even in the midst of relative wealth have all combined to create an emotional milieu in which calm, attuned parenting is becoming alarmingly difficult."

This echoes the findings of Breitkopf (2012, pp. 91-92), who reports:

> "In Peru, the community as social institution has already suffered for a long time from disintegration as many people migrate to the cities in search of paid work. This migration changes the social structure in the countryside and makes it more difficult for the people to survive and to keep up their traditions."

Therefore, there is good ground to think that the participants in the study are suffering from ADD, as opposed to some of their classmates –who have successfully learnt to read, and who have been observed displaying appropriate classroom behaviours such as the ability to focus and complete individually the tasks assigned to them by the teacher.

The ADD diagnostics however, will not be helped if the parents are not supervising their children's learning at home. It will not be helped either by the first grade teachers' strategy to make the pupils stay during breaks and after class to complete the tasks assigned. Indeed, if the ADD child has no motivation or supervision, he will not be able to work in spite of his best attempts.

Additional contextual factors may be affecting the cognitive development of the children of Quilcas and impairing their learning ability -especially the poverty in which they grow up. Indeed, Schoon, Jones, Cheng and Maughan (2011, p.719) demonstrated the strong negative effect of income poverty on cognitive functioning. The factors shaping the nexus poverty-cognitive abilities include exposure to hardship during the first year of life as well as the housing conditions -especially crowding. The first grade teachers spontaneously brought up the question of housing conditions during the interviews, in particular the situation of crowding:
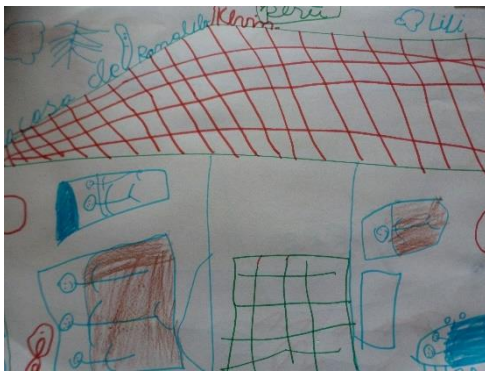
"The living conditions are terrible. Here there is only one room in each house: all the beds are together and then on the other side there is the kitchen" (1A).

During the pilot study, the children were also asked to draw their house at the arts and crafts table. The drawings confirmed the description made by the teachers.

FIGURE 13: Drawing of a pupil's house.

In addition to the difficult housing conditions, poverty affects the occurrence of child labour too. As mentioned in chapter 3, child labour is still common in Peru, with 24% of children in the poorest group working for payment in 2003 (Escobal et al., 2003, p.8). This statistic does not include non-remunerated labour which is even more commonplace, especially in rural Peru, such as helping the parents to work the fields or to look after the cattle. Cueto et al. (2009, p.8) describe the case of children in the rural Andes as often having to work 'from very young and when older are engaged in physically demanding labor in harsh conditions of heat and lack of access to basic services'. Yet, child labour too is detrimental to educational achievement and the development of cognitive abilities, even in the cases of modest levels of work and if the kids still attend school (UNESCO, 2010, p.168). As a consequence, child labourers significantly under-perform in language

and mathematics tests in third and fourth grades in each country (ibid.). The pupils of the school of Quilcas are often expected to be working after school, such as helping with the farm or looking after their younger siblings. During the planting season, some of the participants -like R. and M. – missed school and the Graphogame sessions several days in a row and went to work the fields with their family instead.

Moreover, physical distance to school can also potentially be damaging to the educational success of school children. According to the UNESCO (2010, p.191), two kilometres or a walking distance of 30 minutes should be considered as the upper limit that the children can walk to reach school -although the terrain must be taken into account too as it can make the journey longer. Some students attending the school of Quilcas were coming from the village of Quilcas itself, but others were walking every day from the hamlets located in the surrounding mountains. On one occasion, I decided to walk home with M. for instance and it took us over an hour and a half to reach her house, hiking on strenuous terrain. Consequently, the first grade teachers explained that the children often arrive tired and hungry at school, and even more so since their parents do not usually give them food before class.

Breitkopf (2012, p.83) reported similar findings in her ethnography of rural Peru:

> "Some children, coming from very remote places, leave their homes early in the morning without breakfast and walk long distances to the schools where they then fall asleep during the lessons. Furthermore, many children need to help their parents in agricultural and farming activities."

In brief, when looking at the context of the Graphogame study in Peru, the findings highlight the situation of mutually-reinforcing inequalities to which the children of Quilcas are exposed. These findings are in line with the literature describing the disadvantages facing the children of rural Peru and how they can affect their learning ability and educational performance. Therefore, closing the reading achievement gap in Peru will take more than adding technological or infrastructural inputs into school. All aspects of teaching and learning must be taken into consideration and addressed, including the life conditions that do not support the development of those specialized academic abilities necessary to handle academic work (Gambrell et al., 2011, p.13).

8.2 Peruvian infrastructure

If it is necessary to consider the wider context to understand the factors affecting the learning ability of the pupils in Quilcas and be able to address them, it is also crucial to look at the bigger picture in the case of the implementation of educational ICTs in a new environment. Indeed, as Tong and Trinidad (2005, p.16) explicated, the introduction of an ICT software in the classroom will only be possible if all necessary conditions of such introduction have been fulfilled, and if all critical constraints have been removed.

As presented above in this chapter, the teachers of the participants in this study understand the roots of the reading difficulties to be found mainly in the contextual factors affecting rural Peru. This point of view may bear on the main condition of implementation of ICTs in the classroom, which is the willingness, compliance and competence of the teachers to use ICTs (Tong & Trinidad, 2005, p.10). Let's now consider whether remaining critical conditions and constraints are met in Quilcas -in particular the proficiency of teachers in computing skills, the development of ICT capacity in terms of equipment and support, and the reduction of job stresses surrounding teachers' work.

8.2.1 Competence of teachers with ICTs

According to Zhao and Frank (2003, p.809), the teacher's expertise with ICTs is the main predictor of use of the innovation. Indeed, teachers cannot teach what they know little or nothing about, as doing so would lead to great anxiety (Frank et al., 2004, pp.815-816; Harwood & Asal, 2007, pp.51-78; Laura & Bolivar, 2009, p.10; Tong & Trinidad, 2005, p.14; Yelland, 2007, p.112). In the teacher interviews I conducted, the issue of competence with technology was brought up by both teachers as being the main obstacle to the potential implementation of Graphogame in Quilcas:

> "We still have not been trained to use them. And before the teachers can use it, they must receive training for it, they must be given the knowledge, they must be updated on the change. Of course, in the West, people have ICTs since a long time and are familiar with it. But in Peru, the use of ICTs is recent and it hasn't really spread outside of Lima. In the rural areas, we are always the last ones to get the innovations but then we are supposed to catch up with Lima! The ministry of education needs to invest in the training first for that to happen" (1A).

"The main difficulty would be the way of using it. We have to learn to use it first. Like how to turn on the tablet, change the program, and what happens if it breaks down. Yes, the maintenance is a big problem to consider" (1B).

The question of providing training to the teachers expected to use technology in the Peruvian classrooms had already emerged in the studies related to the ULPN initiative (Breitkopf, 2012, pp.95-97; Laura & Bolivar, 2009, pp.52-54). Actually, in their evaluation of the ULPN project in Peru, Laura and Bolivar (2009, pp.52-54) found inadequate training and low competence of teachers with ICTs as important remaining barriers to the success of the ULPN project; these findings were confirmed by Breiktopf (2012, pp.95-97) who reported that Peruvian teachers had not been sufficiently prepared to use ICTs in the classroom. The 1A teacher mentioned the mixed results of the ULPN initiative in her interview to justify her position on the necessity to give adequate training:

"They didn't give training courses to the teachers, and the teachers there do not have other access to technology, or anyone to ask for support. So the teachers have the XO but they don't use them."

The situation in Quilcas seemed to be no different to the one described by these two studies, as neither of the first grade teachers attended ICT training provided by the Ministry of Education. The 1B teacher did attend a basic ICT training course the year previous to the pilot study, for which she paid by herself. According to the two first grade teachers, their lack of expertise is the main reason why they had not made use of the XO laptops or the computer lab available in the school of Quilcas.

"Because how can I teach something that I don't know or don't have access to? I haven't had personal access to ICTs at school, or at home either because I don't own a computer. So I have to go to an internet café and rent a computer for an hour. That's not enough to get ideas on how and what to teach you see" (1A).

As this issue was recurrent at the school of Quilcas, the parents' association, considering technology education a priority, decided to hire and pay for a specialized teacher to conduct the computing classes.

8.2.2 Maintenance of the ICTs

In addition, the question of maintenance of the equipment and technical support has been underlined in the literature as a critical barrier to implementation which needs to be removed to enable the introduction of educational software, all the more so since it also affects the crucial condition for full implementation: the willingness of the teacher to use the ICTs (Tong & Trinidad, 2005, p.10).

Nevertheless, previous studies conducted in Peru highlighted that this critical constraint had not been eliminated. In the case of the ULPN project, both Laura and Bolivar (2009, pp.52-54) and Breitkopf (2012, p.97) reported that the Peruvian ICT infrastructure was deficient in terms of technical support and maintenance. As a consequence, Breitkopf (2012, p.97) found broken or deactivated laptops, which could not be fixed without exterior assistance, in eight of the twelve schools she visited.

The question of maintenance is made particularly acute in the case of Peru as it is connected to the issue of responsibility for the equipment. Breitkopf (2012, p.102) explained that the teachers she met repeatedly expressed their concerns over having to pay for the XO laptops if they would get lost or damaged. As a result, in many schools she visited, the teachers had chosen to lock away the laptops to ensure their longevity. This question of responsibility of the equipment was also brought up on two separate occasions by the 1A teacher during the interviews:

> "And oh yes, there is another main obstacle. You see the teachers have the responsibility for all the materials we have. I told you for the books: if they get lost, if the kids write on them, well we have to pay for them. So I don't want to use those books! Imagine with the tablets! You have seen the kids, they are not careful. What if the tablets get broken, or get lost? It's an additional responsibility for the teacher. And here people don't take care of things. Even when we were giving the books away, maybe 5% were taking care and using them with care. But all the others… They were destroying them, or even selling them! Yes, for a few soles, or for a kilo of potatoes. The kids would tell me 'I'm sorry teacher, we needed it to buy sugar'. Imagine with technology!"

As this extract from the interview with the 1A teacher indicates, the anxiety over matters of maintenance also relates to the handling of the tablet by the pupils. My notes from the

participant observations and video recordings show that there is ground for such concerns: the pupils made their answer selections by pressing on the tablets repeatedly and vigorously, sometimes with other items than their fingers –such as pencils or even their nose, they often walked around with the tablet and would occasionally drop it on the ground. Of course, I frequently reminded them the proper way to manipulate the tablets, but to no avail, so that my field notes make repeated mentions to my preoccupations regarding the health of the tablets. The 1A teacher had predicted this issue during her initial interview:

> "Besides, the kids are not careful enough to handle this type of equipment, especially if it is not their own, they are going to break it. It's good for the kids who are responsible, but most are not."

In addition, during the two-months of the pilot study, I did encounter technical difficulties with the equipment. In some cases, I was able to solve them by myself; yet, in one case, I had to go to a private business to get the equipment fixed.

8.2.3 Job stresses

Another potential obstacle to full implementation of Graphogame in Peru is connected to the job stresses related to teaching in the rural areas. According to Frank et al. (2004, pp.158-160), job stress should be taken into account when introducing a new educational ICTs too, as schools resist changes which will put pressure on existing practices.

The teachers of Quilcas reported experiencing a number of such stresses. Firstly, the teachers of Quilcas explained they have to teach seven subjects within the 30 hours allocated to them with the pupils every week. On top of the official curriculum, the teachers of the school of Quilcas also give English classes, of which the teachers have only a basic knowledge. ICTs therefore seemed to be perceived 'as just one more item on the list of things that students must learn, that teachers must make time to teach' (Biancarosa & Griffiths, 2012, p.150). The 1A teacher summarizes the situation:

> "The main problem is time you see. We are teaching the kids less than 30 hour a week. So when would we do it? We already have seven subjects to do. And then, we add extra subject for the kids. For instance, we add English classes as I was showing you. That we are doing as an extra-curriculum activity, it's not in the curriculum. So the subjects that are not part of the seven of the curriculum we have to do it outside of the

regular class-time, that is to say after 1:30pm. But if it's after class time, the kids wouldn't stay for it –once again because the parents do not encourage them to learn. We do have IT class after school, but that's because the parents' association have decided that and therefore they are paying for the IT teacher […]. And it couldn't be during class time either because we already have all the subjects to cover. For this reason, we used to have technical courses, related to agriculture. The kids were learning how to plant and everything. But we had to stop that, because of the lack of time already. Also the kids can't stay after class because they do not live so close. It's not the city here. So some kids are coming from far. The parents don't want them to stay until later because there is no way for them to go home, they just have to walk for a long time. It's the reality of the rural areas."

Adding to the pressure of having to cover this large curriculum, many events are also organized by the school of Quilcas, consuming class time. During my study in the school of Quilcas, several of the Graphogame sessions were cancelled because the pupils went on a hike or a visit to the market; in some other cases, the session was postponed until later in the afternoon because of the school Olympiads, elections, poetry competition, and also for the celebration of a saint 'el Señor de los Milagros'.

Furthermore, the position of teacher in Quilcas comes with a number of additional responsibilities. In their interviews, the first grade teachers described the job of the teacher in rural areas of Peru to include being 'a guide' (mentioned twice), 'a doctor, a nutritionist, even a priest' and 'the parents too'. The 1B teacher described her feeling of being like a mother to her pupils, for whom she has to provide –may it be for their nutritional, emotional or material deficiencies. For example, she occasionally buys lunch and school supplies as the parents do not procure them.

These job stresses appear all the more overwhelming in the light of the modest salary of the teachers –especially when taking into account the travel, food and other work expenses- and the feeling they expressed of receiving no respect or acknowledgement for their work. As in Breitkopf (2012, p.82), the 1A teacher underlines the main consequence of their low wage:

"So because of that, a lot of teachers look for another job in the afternoons, instead of trying to improve the methodology or trying to do a better job with the kids."

8.2.4 Other infrastructural issues

Lastly, the question of the electricity to power the ICTs, especially in rural areas, already mentioned by Breitkopf (2012, pp.96-97), as well as that of saturation of lines were reported by the first grade teachers as obstacles to using Graphogame. During my time on the field, the electricity was cut for a few days in Huancayo, so that one day I was unable to charge the tablets for the session.

To conclude on the question of the infrastructure in Peru, the 1A teacher summed up that 'ICTs don't work here, because everyone wants to use them but we don't have the infrastructure for them yet.'

Therefore, the findings of this study are in line with the previous studies regarding ICT use in the Peruvian schools. The four areas detected as barriers to the success of the ULPN project by Laura and Bolívar (2009, pp.51-54) were still present in Quilcas at the time of the study –namely, the issues of inadequate training and lack of competence of the teachers, as well as discipline issues encountered when the kids handle the equipment and the deficiency of the Peruvian infrastructure, especially in term of technical support. On the positive side, this study also confirmed the positive disposition of the pupils towards ICTs (ibid.).

Furthermore, this research highlighted that teachers in Quilcas identified the exposure of their pupils to the hardships of poverty, abandonment, abuse and child labour among others, as main barriers to their academic performance –hardships which cannot be addressed simply by adding computers into the classroom of rural Peru.

9. DISCUSSION

The last chapter of this thesis will present a summary of the study and of the findings introduced in chapter 6, 7 and 8. A brief explanation of where these findings are situated within the existing literature will be included, as well as their implications for policy-making and for further research.

The initial research focus of this study was broad and concerned what would happen when this Finnish literacy learning software was introduced into such a new and different context. The choice of the initial research focus related to my background as a student of the field of education and development studies. Indeed, the literature of the education field recommends to contemplate all the elements of a system when considering an educational reform in general (Cheng, 1998, pp.11-30; Hallinger & Leithwood, 1998, pp.126-151; Hargreaves, 2010, p.108; Lam & Lidstone, 2007, pp.178-193), and when introducing educational ICTs in particular (Biancarosa & Griffiths, 2012, pp.149-154; Frank et al., 2004, pp. 148-172; Laura & Bolivar, 2009, pp.51-59; Tong & Trinidad, 2005, pp.1-19; Zhao & Frank, 2003, pp. 807-840). In the field of development, the literature also explains that to do development –and implement 'change for the better' (Cremin & Goretti Nakabugo, 2012, p.499) - one must consider the beneficiaries of the program (Escobar, 1995, pp.94-101; Freire, 1996, p.75).

With this research focus in mind, I adopted an ethnographic approach so as to be able to observe 'what is going on here?' and to include considerations of the wider context. I spent two months in a school of Quilcas with nine participants using Graphogame daily for 20 minutes. In this research setting, I conducted observations (direct and participant) and interviews (structured and semi-structured), and collected photo and video data, as well as drawings from the children.

I analysed this data using a thematic analysis method, which produced my three research questions, answered respectively in the chapters of findings. How do children use Graphogame for learning in a rural school in Peru (chapter 6)? What role has the teacher in this type of literacy setting (chapter 7)? What does this study add to previous research on ICT use in Peru (chapter 8)? The data highlighted the interactions of Graphogame from micro to macro-levels.

9.1 Interactions with Graphogame from the micro to macro levels

The first chapter of findings (chapter 6) described the interactions of Graphogame at the micro-level, between the literacy learning software and the nine participants. The data pointed out to a pattern of evolution in the usage of Graphogame across participants and the duration of the pilot study on three main aspects of use. Actually, the participants initially played as expected and predicted: playing to learn (1), playing individually (2), and learning the letter-sound correspondences with the drilling methodology (3) (Lyytinen et al., 2007, p.110; Lyytinen et al., 2009, pp.669-672; Saine et al, 2011, p.1014). However, over time, the participants evolved away from the prediction and towards alternative ways of interacting with the game. First of all, it seemed that the participants were playing for fun, as indicated by the avoidance of the undesired features of the game, or of playing Graphogame altogether, and instead getting involved in other unrelated activities (1). Secondly, the participants increasingly displayed needs for interactions with peers and the teacher to keep on performing the exercise (2). Lastly, the use of the drilling methodology in the case of the participants of Quilcas came to highlight issues of conflict with local pronunciation, emergence of mal-adapted reading strategies, and boredom −which could relate to the repetitive use of the methodology or to the lack of real-life meaning and creativity of the methodology (3).

At the intermediate level of interactions, chapter 7 described what unfolded within the classroom between the teacher, the pupil and Graphogame. The data pointed out to five main roles for the teacher, including building rapport (1), sustaining motivation (2), providing scaffolded instructions and learning (3), assisting with technical difficulties (4) and maintaining order (5). The main element emerging from the data on this level of interactions was the crucial role of the teacher in the classroom, and the increasing importance of this role throughout the pilot study to keep participants on-task.

Finally, chapter 8 presented the interactions of Graphogame at the macro-level, positioning Graphogame within its wider context of implementation on two levels. Indeed, the data suggested that the learning difficulties of the nine participants could be context-related, resulting from the background of poverty and exclusion of the children (1). Therefore, the wider context also affected the interactions described in chapter 6 and chapter 7. The findings presented in chapter 8 also indicated that there are remaining barriers to implementation of ICTs in Quilcas, such as the lack of competence of the

teachers, a deficient infrastructure and the existence of numerous job stresses, which would all be likely to bear on the willingness of teachers to use ICTs (2).

9.2 The findings and the literature

Although at the start of the intervention the data mainly confirmed descriptions of use and behaviours reported in the Graphogame literature to date, the unexpected patterns of usage related in chapter 6 showed how Graphogame could also be used alternatively. Similar processes of hybridization in the Peruvian Andes had previously been described by De La Piedra (2006, p.401) who showed how contact between different literacy practices could lead to unforeseen adaptations. The data presented in chapter 6 further underlined unreported obstacles with the drilling methodology, in particular the issues of regional variations in pronunciation, of development of mal-adapted reading strategies and of boredom.

Moreover, the use of Graphogame in a scaffolded rather than individual manner as outlined in chapter 7 came as a surprise too. In fact, the importance and the diversity of the roles undertaken by the teacher in using Graphogame has not been previously documented for Graphogame. Nevertheless, the difficulty to interact independently with technology -especially by young or struggling learners- has been reported in the case of other educational ICTs (Hutinger & Johanson, 2000 cited in Schmid et al., 2008, p.66; Schmid et al., 2008, p 78; Yelland, 2007, pp.108-111). Indeed, Schmid et al. (2008, p.78) found that scaffolding was necessary for young learners to be able to manipulate such software and that they needed rapport and motivation from an adult to interact meaningfully with ICTs.

In addition, the findings of chapter 8 confirmed the already-documented situation of mutually-reinforcing disadvantages to which rural children of Peru are exposed and how these disadvantages affect their educational performance (Ames, 2012, p.456; De La Piedra, 2006, p.389; Escobal et al., 2003, p.4; Guadalupe et al., 2013, p.8). The findings of chapter 8 also corroborate the barriers to implementation of educational ICTs in Peru and how these barriers may affect the willingness of teachers to use ICTs (Breitkopf, 2012, pp.95-97; Laura & Bolivar, 2009, pp.52-54).

Most of all, the findings of this study underline the importance of considering context in conducting educational research and considering educational reform (Cheng, 1998,

pp.11-30; Hallinger & Leithwood, 1998, pp.126-151; Hargreaves, 2010, p.108; Lam & Lidstone, 2007, pp.178-193). Otherwise, the reforms may lead to further investments in ICTs that could end up not being used and which have not been designed to tackle the actual roots of the pupils' learning difficulties.

9.3 Recommendations for policy-making

The situation of mutually-reinforcing disadvantages in Quilcas as outlined in chapter 8 and in the above-mentioned literature would call for comprehensive policy-planning on the part of the Peruvian government. Piecemeal or fragmented reforms –such as the Huascaran project or the ULPN initiative- cannot successfully address the state of educational, social and cultural discriminations of the marginalized groups of Peru - among which the indigenous and rural populations (UNESCO, 2010, p.191).

For the Peruvian education, thinking comprehensively could include rethinking teacher training and selection (1), as well as developing an inclusive curriculum (2). Indeed, the findings regarding the importance and diversity of the roles of the teacher in the Graphogame classroom (chapter 7) could imply that implementing ICTs in general or Graphogame in particular would require trained personnel -or else the pupils would fail to focus and learn by themselves with the technology. Furthermore, in Peru, where personnel remains cheaper than technologies and the ICT infrastructure is still deficient, it would be worth considering to develop adequate teacher training in terms of reading acquisition and provide small-group tuition for struggling pupils, instead of investing heavily in technology as a way to improve educational performance. Moreover, teacher training could prepare educators to understand the problems faced more particularly by marginalized children and struggling learners. The report of the UNESCO (2014, p.i) also encourages to select the 'right teachers', teachers from the marginalized groups themselves to represent the diversity of learners. According to the report, it can help combat discrimination, as well as promote positive identities for the learners from marginalized areas such as Quilcas (ibid.).

9.4 Recommendations for further research

Finally, in view of the limitations of my own study, I would make some propositions for further research. This thesis presents an ethnographic case study, for which I stayed in the research setting during two months only, due to time constraints. Two months is short for

an ethnography, and this brevity was pointed out to me by the teachers as they explained that everything takes time in rural Peru. Future research could involve a longer period spent on the study context, and it would increase the reliability of the findings.

Also, replicating the study in another setting could confirm, disprove or further explore the unexpected findings which have emerged from the data collected and analysed, such as the obstacles connected to local pronunciation and the children's ability to focus and work individually, or the role of the teacher in the Graphogame classroom. Moreover, the teachers have repeatedly highlighted that rural Peru is like a mosaic in which each village is a different reality, a different world. Although some educational ethnographies have already been conducted in rural Peru –including among the indigenous people- there is a need for more studies considering local contexts and challenges, so as to better understand the diversity of rural Peru and be able to better tackle the complex mechanisms of mutually-reinforcing disadvantages. Such ethnographies could provide insights regarding how to better develop an inclusive curriculum for marginalized children or pupils with ADD.

Furthermore, I collected and analysed the data by myself for this study. Future studies could be conducted by several researchers to increase reliability of the analysis and findings. In addition, no assessment of the children's progress was included in the ethnography, other than my own and the two teachers' observations. The quantitative data collected through the assessment tool of Graphogame could be analysed and compared with the field notes and observations I reported in this thesis.

Lastly on Graphogame, I believe that this research points to new directions to be explored on the matter of the use of Graphogame by struggling learners. For example, what is the potential of Graphogame as a game to be played collectively? What is the best way to provide scaffolding for Graphogame? What is the optimal exposure time and frequency of use to maintain the player's interest? Finally, the questions raised by the NRP report (2000, pp.6-9) and outlined in chapter 2 could also be explored in the case of Graphogame:

1. What is the proper role for integration of computers in reading instruction? In what contexts can they be used to either replace or supplement conventional instruction?

2. What are the conditions under which multimedia presentation is useful or desirable in reading text?

3. What are the requisite characteristics of software to teach reading?

4. What is the appropriate mix of reading and writing instruction delivered by computer?

5. How can professional development programs be structured to help teachers effectively integrate computer solutions with instruction?

6. How are the effects of computer usage in pedagogy most effectively measured? Do conventional assessments measure all of the learning that takes place in computer environments?

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Appendix 1: interview questions

1. <u>Teacher interviews: first interview, before implementing Graphogame:</u>

• Intro: Background information about teacher

Gender/ Age

Mother tongue

Time spent as a teacher? In this school? Permanent position?

Education

Job stress: number of students? Workload?

• Part 1:

Perception of educational situation in Peru

Perception of education: its meaning? Its role for students?

Perception of literacy: its meaning? The teaching method? Perception of literacy level
of pupils? Any obstacle to reading acquisition?

Feeling about ICT/innovation in general? For instruction? (importance; pressure; how
often used in class by students? for what type of activity?)

Equipment at school: quality and quantity? Type and frequency of access? Technical
assistance (what type, from where, quality)? Competing innovation?

Perceived potential of ICT?

Perceived potential of ICT for instruction?

Perceived competence and expertise with IT: experience of the teacher and student?
Training?

The teacher tests Graphogame by herself.

• Part 2:

Perceived characteristics of the tool: perceived complexity (for the teacher and for the
student)? Perceived relative advantage (for the student, and for the teacher

Perceived compatibility with the new environment? (teaching methods)

Expected results in student learning? In students' response?

2. <u>Teacher interviews: second interview, after implementing Graphogame for 2 months in the classroom:</u>

Visibility: perceived benefit of Graphogame? Difference in children before/after using Graphogame? Difference in children using Graphogame/ other pupils?

Compatibility: with teaching style? With values and goals of education? Could it be included easily in the pedagogical practices? Obstacles to implementation of Graphogame?

Relevance: how useful is it for this context?

Has affected views on IT/innovation? For instruction?

Has affected views on literacy?

3. <u>Director interview:</u>

• About the school:

How old is the school?

How long have you been director of this school?

How many classes are there in the school?

How many students are there?

Where do the children come from every day?

Where does the director come from every day?

• About Quilcas:

How many inhabitants are there in Quilcas?

What is the main economic activity in Quilcas?

From what type of socio-economic background the pupils come from?

Do the children have access to books? To computers? To the internet?

What is the 'plan lector'?

• About the technological infrastructure of the school:

How many computers are there at school in total?

How to access computers/laptops?

Is there the internet in the school?

Do you have other technologies in the school?

Appendix 2: consent form

Estimados padres,

Graphogame es un software educativo que se ejecuta en un computador, el cual facilita el aprendizaje de la lectura. Fue desarrollado en colaboración con la Universidad de Jyväskylä y el Instituto Niilo Mäki, expertos de la lectura, en Finlandia. Graphogame da la oportunidad a los niños de practicar y mejorar la asociación letra-sonido, adaptándose al nivel de cada niño. Por esta razón, Graphogame también fue utilizado en otros países en desarrollo, como Zambia, Kenia y Namibia.

Antes de empezar a usar el juego, necesitamos las informaciones siguientes: consentimiento escrito de los padres para que el niño use el juego, el nombre de su niño, su fecha de nacimiento y el lugar de nacimiento. Esta información es usada para no confundir a los niños.

También, los jugadores usando Graphogame participarán en una investigación sobre la eficacia de la capacitación que también nos ayuda a desarrollar Graphogame aún más. Los datos son guardados automáticamente en nuestro servidor internet. Además, necesitamos unas informaciones para entender el contexto donde vienen los niños.

Toda esta información es completamente confidencial y solo los investigadores de la Universidad pueden verla. Además, los padres pueden decidir a cualquier momento de terminar el uso de Graphogame y la participación en la investigación, escribiéndonos a graphogame@nmi.fi, o hablando con los profesores de la escuela.

Si les gustaría que su niño juegue con Graphogame, por favor devuelvan la ficha de consentimiento a la profesora de su niño/niña. Si tienen una computadora en casa, su niño también puede usar Graphogame en casa: https://graphogame.com/

Podemos responder a cualquier pregunta adicional sobre el juego y la investigación.

Cordialmente,

El equipo Graphogame

Ficha de consentimiento

Mi hijo/hija puede jugar Graphogame y la información sobre el juego puede ser usada para la investigación*:

☐ si ☐ no

*El permiso puede ser retractado en cualquier momento

Nombre del niño: _____

Fecha de nacimiento: _____

Lugar de nacimiento: _____

La información a continuación solo sirve para contactarles si el equipo Graphogame necesita más detalles sobre el niño, para desarrollar el juego aún más. Pueden dejar en blanco la información que no quieren compartir o que no tienen:

Nombre: _____

Teléfono: _____

Dirección: _____

Dirección de correo electrónico: _____

Lugar y fecha: _____

Firma: _____