EDUCATION ICT ASSEMBLAGE: ENCOUNTERS OF DISCOURSES,

EMOTIONS, AFFECTS, SUBJECTS, AND THEIR PRODUCTIVE FORCES

by

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ABSTRACT

Information and Communication Technology (ICT) is part of everyday life. It is not different in the education field. However, its use has implications for what it means to teach and learn effectively in contemporary education. When ICT is used in the classroom, things happen through divergent forces, components, and mechanisms, according to different contexts, and evidencing a complex environment. The purpose of this study is to show how complex the use of ICT in education is by analysing different components and their productive forces. Assemblage ethnography is the methodology adopted and a range of data collection tools are used. The thesis explores five case studies generated from different settings: Primary, Secondary and Post-secondary education.

The analysis offered shows how discourse, policy-making, budget, and CPD are not enough to account for all of the ICT-related situations that happen on a daily basis inside schools. ICT in education evidences a diverse and fragmented field of policy, money, and practice, pedagogy and many other elements.

This study concludes that there are three main productive forces emerging from the education ICT assemblage which: evidenced unsolved issues of the schooling process, enhanced or made emotions emerge; opened possibilities for other subjectivities to happen.

To my family

ACKNOWLEDGEMENTS

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CHAPTER 1 – INTRODUCTION AND POLICY CONTEXT

1.1 INTRODUCTION

The theme of this study is the use of Information and Communication Technology (ICT) in basic education (Primary, Secondary and Post-secondary) in the United Kingdom. When referring to ICT, it is possible to imply many different elements: hardware (computers, tablets, cables), software (applications, computer programs), infrastructure (network), theories (mobile learning, connectivism), practices (collaboration) and many other elements. These elements might occur together and form other things, for example, a Virtual Learning Environment in which hardware, software and infrastructure might enable specific practices and theories to be applied.

Because of this, ICT is not only multiple but also complex. By implementing and using it in education it demands specific conditions which influence what happens in classrooms. These conditions are shaped by policy and curriculum to orient practitioners, budget to acquire and adapt the infrastructure, pedagogy to reflect on ways of teaching and learning. Although these elements are independent of ICT, they impact how ICT is used in basic education and how teachers and learners understand what it is and its pedagogical functions.

Regarding these characteristics of ICT, this thesis argues that to make sense of ICT in education it is necessary to approach it as an assemblage. By using Assemblage Theory different elements can be considered as 'components' of the same whole and as independent units at the same time. However, the point of investigating the whole

is not to postulate its constitution, but to identify and exam its productive forces (DeLanda, 2006). By productive forces it is meant that each component has different capacities: to act, to affect and to be affected by other components and to make things happen. It results in a fluid, dynamic and productive whole which influences the way the education process happens in classrooms.

On the condition of calling this whole 'education ICT assemblage,' the main purpose of this thesis is to investigate the productivity of ICT in different levels of education in the UK, in a variety of classroom settings.

This approach also enables the researcher to critically engage with questions that have been interesting her for years. As an experienced teacher many classroom situations happened and impacted the way I sensed, felt, made sense, and understood ICT reflecting on the way I saw myself as a teacher and saw my students. For example, when a student freaks out and shouts during a lesson 'I hate computers' and starts crying or when some technological gadget breaks down, this leads the lesson in a totally different and unexpected direction. The fact that people judge and say 'good' or 'bad' things about ICT also intrigued the researcher as if ICT was 'possessed by an evil force' which had the power to ruin the teacher's plan.

Because of these factors, the researcher was curious about some issues and elaborated the following research questions:

- How do people feel using ICT in the classroom? Do these emotions differ across teachers and students? Under which circumstances do they differ? How do these emotions influence decisions regarding the use of ICT in lessons?

- What are the discourses of ICT in education in the UK? What do these discourses mean? Do these different meanings affect students and teachers? To what extent do these discourses influence how students and teachers feel about the use of ICT in lessons? How do these discourses influence decisions regarding the use of ICT in lessons?

- How are teachers' and students' identities constituted in lessons in which ICT is in use? What is the influence of emotions and discourse in the subjectivation process?

By taking this approach and answering these questions, it is believed that it will be possible to generate some insights about the complexity and multiplicity of the field. It would help people to understand what ICT demands, what can happen when it is in use and their productive forces. By saying this, this thesis is written for everyone related to directly (e.g. teachers, students, head teachers) and indirectly (e.g. developers, scholars, researchers, sellers) to education.

In an attempt to answer these questions five case studies are presented in ethnographic accounts. Each account refers to one or more different ICT elements, one school subject, one year group, one or more types of practice, and theories. Each account is analysed according to the three analytical tools chosen, which are discourse analysis, emotions and affects, subjectivation and identity constitution. As each case study is grounded on different ICTs, each account has its own literature review in the analysis, not in the introduction. The researcher chose to offer a broad contextual review of history and policy in the introduction and a focused literature review for each case, instead. This strategy was used to offer to the reader a more meaningful literature review and bring fluidity to the text.

Given these points, this thesis is composed of five chapters: introduction, reviewing the historical and policy context in Chapter 1; the onto-epistemological perspective and the analytical framework in Chapter 2; research design, methodology, data collection techniques and procedures of data analysis in Chapter 3; the analysis of five case studies is presented and discussed in Chapter 4, constituted by a table of components, the literature review of the ICT(s) element(s), what was said, sensed/felt and the subjectivities/identities of the account; Chapter 5 presents the conclusions of the thesis.

1.2 POLICY CONTEXT

A teacher is checking her Biology PowerPoint presentation. Twenty tablets are charging in the tablet case. A student is counting how many candies she needs to evolve her Dragonair on Pokemon Go. The projector and the interactive white board are on, waiting. A deputy head is showing photos of his cat from his Facebook page to another teacher. A laptop is not connecting to the wireless network. A mobile phone whistles. A group of students is silently sitting exchanging messages on WhatsApp. Physics A-levels past papers are being printed. Some photos are taken of students' work. These are situations or events that might be seen at any British school.

Independently of the type of school, Information and Communication Technology (ICT) is part of the everyday routine of mainstream education in the United Kingdom. From basic procedures of registering the attendance of students to the use of virtual reality in lessons, ICT has been present in education for at least 15 years. This use was cautiously introduced during the 1980's, with different investments and

initiatives. It was during the government of Tony Blair in the 1990's that strategies and policies started to be elaborated for the UK to be ahead of any other nation in relation to ICT use in education (BESA, 2015). Large sums of money were directed to schools to spend on technological infrastructure and in teacher training. It was believed that ICT was the means for developing the skills necessary for the jobs of the digital age. Not only did ICT become available to be used to enhance teaching and learning in any curriculum subject but also the subject 'ICT' was created to 'increase the use of technology in all aspects of society' with the purpose of making people 'confident, creative and productive' (DfE, 2012). According to the Department for Education, the subject ICT would enable pupils to participate and engage in modern society, as it could be used to 'find, develop, analyse and present information, as well as to model situations and solve problems' (DfE, 2012). There was a lot of enthusiasm in those days, according to some ICT leaders. Some new teachers were hired to teach this new subject. Others who were recognised by peers and by the school administration as the most capable ones regarding technology were allocated to these positions[1]. It was a time of trial and error for schools which were experimenting with different ways of teaching and learning (BESA, 2015).

However, after some years of repeatedly using the same tools for the same purposes, ICT lost its innovative character. As years have passed, and as a consequence of the increase in the number of computers available at home and internet access, students come to school knowing more about ICT and having had more practice to deal with these tools. According to the Office for National Statistics,

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[1] ICT leader statement during interview.

23.7 million households had Internet access in 2016. It represents 89% of the population of Great Britain, and an increase from 86% compared to 2015. Internet was accessed every day by 41.8 million people, representing 82% of the adult British population; a difference of 47% in comparison to 2006, in which 16.2 million people were using the internet. It means that the majority of the population has internet at home and some kind of computational device to access it. However, these data do not represent all the numbers related to Internet access. The same report also stated that the access to the Internet via mobile phones almost doubled between 2011 and 2016, an increase from 36% to 70%. It leads to the conclusion that, even if households do not have a desktop computer or a laptop, they might be able to access the internet via mobile phones.

The data provided above might not represent children and young people in Great Britain because children/young people's technological gadgets are not included in the statistics. In contrast, *PISA 2012 Results: What Makes Schools Successful?* indicated that the proportion of computers for educational purposes to students is 1:1 in the UK (OECD, 2013). It means that there is one single computer for every child in school and all these computers have internet access. These data indicate that, if children or young people do not have access to technological gadgets and the Internet at home, they will surely have at school.

Because of these facts, teaching children or young people the basic skills to use desktop computers, laptops and/or tablets and their elementary software or applications (apps) is not necessary anymore in all levels of education. Pupils will have contact with these gadgets one way or another since the early years, at home

or at school, and they will learn ways of using them. It makes teaching word processing and spreadsheets in Secondary education pointless. Moreover, after two decades of being repeatedly used by teachers, it has lost its innovative character. In other words, ICT has become dull (CAS, 2010) or as one Computer Science subject specialist involved in this research said "ICT is dead".

In order to understand whether ICT is dead, and if ICT has been killed then how, a review of literature will be provided. This review was not an easy task, because ICT is something that is not easy to define. According to UNESCO(2016)[2], ICT refers to Information and Communication Technolog*ies*. The fact that it is in plural indicates that multiple technological gadgets 'are used for accessing, gathering, manipulating and presenting or communicating information. The technologies could include hardware (e.g. computers and other devices); software applications; and connectivity (e.g. access to the Internet, local networking infrastructure, video conferencing)' (UNESCO, 2016). This definition seems to be adequate, but for the UK it is incomplete because ICT is also a subject which is part of the National Curriculum and could refer to computational thinking, computing, and coding (DfE, 2013). This kind of specificity should be considered when referring to what ICT means in the British context. It suggests that ICT should be defined according to the context in which it is used.

This fact leads to the second issue related to this definition: its multiplicity. As pointed out by Livingstone (2012), ICT is an 'umbrella term' that can include one-to-many technologies and peer-to-peer technologies. These technologies might be specific for

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[2] UNESCO (2016) Education & ICTs [online]. Available from: http://portal.unesco.org/education/en/ev.php-URL_ID=18645&URL_DO=DO_TOPIC&URL_SECTION=201.html [Accessed 11 November 2016]

schools (interactive whiteboards) or/and those used across formal/informal boundaries (education games). They also include stand-alone and online networked technologies. These multiple meanings might change from situation to situation, might be independent from each other, but they coexist, sometimes in the same space, sometimes in different settings. For example, desktop computers, Virtual Learning Environments (VLEs), Mobile learning, are all related to ICT and autonomous at the same time because a mobile phone could be used in one way in History lessons and in another way in Art; the same laptop in Primary school could be used in a different way in Secondary education. A study in which ICT is investigated demands first to define what the term means, according to the context in which it is inserted. It demands the researcher's position to be open, flexible and attentive to the context.

In an attempt to try to establish what ICT means in the British context a review of literature had to be organised in three ways: chronologically, politically and thematically. Chronologically to indicate the advancements of ICT throughout the years; politically to pinpoint how policymaking is related to the implementation of ICT in schools, and thematically to highlight which autonomous ICT elements constitute the definition of ICT in the British context. Based on these three themes, this thesis suggests that the definition of ICT in the UK should be organised historically, because it changes according to time; politically, because what is done in schools is oriented and informed by policy; and epistemologically, because a field of studies has been developed in which research and theory have been producing knowledge about ICT and its use. As a consequence, establishing which ICT themes are relevant just in the British context is challenging. Some topics which have been largely discussed

all over the world in the educational field might not seem appropriate to the UK. Some examples are the advantages of using Content and Language Integrated Learning (CLIL)[3] or Design Thinking[4] to inform and improve policy making and teaching practices. Another example is the need for teachers to have Technological Pedagogical Content Knowledge (TPCK)[5] to promote change in education.

In order to make this literature review more meaningful for the UK, two strategic decisions were made: the first step was researching a general broad theme (ICT in Education) from the period of 2010 to 2016 in three databases: Web of Science, ProQuest, and Google Scholar. From the 1031 articles that came up in the first round of search, two types of articles were selected: the ones in which the study was developed in the UK and the ones which were published in journals with a high impact factor with a broad perspective (not related to a specific place or context in the world). It resulted in 370 articles: some with broad reviews of the use of ICT (Trebbi, 2011), (Dudeney and Hockly, 2012), (Fu, 2013) and others which were used to establish the themes related to ICT relevant to the UK (Yang, 2012), (Livingstone, 2012). Another round of selection was done and from 370 articles 70 were chosen according to the number of mentions they had in these databases. The threshold number established was of eight citations. This strategy was used to identify the articles which were cited the most, the researcher was aware that studies from 2015 would have less opportunity for many citations at the time of writing. From these articles, the themes identified in no particular order were:

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[3] Mehisto, P., Marsh, D. and Frigols, M.J., (2008). Uncovering CLIL. *China: Macmillan Publishers Limited*.

[4] Dorst, K., (2011). The core of 'design thinking' and its application. *Design studies*, *32*(6), pp.521-532.

[5] Koehler, M.J. and Mishra, P., (2008). *Handbook of technological pedagogical content knowledge (TPCK) for educators*. London: Routledge.

- Learning (Mobile Learning, Blended Learning, Distance Learning, Learning strategies) (Beauchamp and Kennewell, 2010), (Mercer, Hennessy and Warwick, 2010), (Hosein, Ramanau and Jones, 2010), (Beauchamp, 2011), (Conway and Amberson, 2011), (Scott et al., 2011), (Kearney et al, 2012), (Mostéfaoui et al., 2012), (Royle and Hadfield, 2012), (Leask and Pachler, 2013;

- Games (Games and Gamification) (Hastie et al., 2010), (Deterding et al., 2011), (Connolly et al, 2012), (Dicheva et al., 2015).

- Teaching (Pedagogy, Teaching Methods, Teacher Training) (Ertmer and Ottenbreit-Leftwich, 2010), (Willson, Craven and Eskins, 2010), (Adams, 2011), (Childs, Sorensen and Twidle, 2011), (Donnelly, McCarr and O'Reilly, 2011), (Loveless, 2011), (Morley, 2010, (Underwood and Dillon, 2011), (Bradshaw, Twining and Walsh, 2012), (Fisher et al., 2012), (Beetham and Sharpe, 2013), (Voogt, et al, 2013), (Beacham and McIntosh, 2014);

- Leadership and Management (Kuzma, 2010), (Brosnan et al., 2011), (Hadjithoma-Garstka, 2011);

- Parenting (O'Hara, 2011), (Stevenson, 2011);

- Schooling[6] (Primary, Secondary, Postsecondary and Higher Education) (Savage, 2010), (Wright, 2010), (Kolikant, 2012), (Edmunds, Thorpe and Conole, 2012), (Heaney, 2012), (Toro and Joshi, 2012);

- Curriculum (Howard, Miles and Rees-Davies, 2012), (Harrison, Tomás and Crook, 2014); Performance (Schools, Pupils) (Aristovnik, 2012); Digital Divide (Hilbert, 2011), (Morris, 2011);

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[6] By schooling, it is meant in a systematic way, not as a research context.

- Efficiency and Effectiveness (use of tools/gadgets, use of software) (Fu, 2013);

- Learning Spaces (Virtual Learning Environments) (Abdulwahed and Nagy, 2010), (Jung and Latchem, 2011); Policy Making (Davies, 2011), (Dadameah and Costello, 2011);

- Economy (Growth, investment, and budget) (Fisher, 2011), (Cette and Lopez, 2011), (Vu, 2011), (Biswas and Baptista, 2012);

- Digital Literacy (Skills and Abilities development, Multimodality) (Breeze, 2011), (Gruszczynska, Marchant and Pountney, 2013).

For a final verification, these themes were compared and contrasted with the data collected during the field work. All the themes above were found in the field work and others were added to the list. The extra themes were:

- Cyberbullying (Tokunaga, 2010), (Kowalski, et al. 2012);

- Social Network (Ahn, 2011), (Rennie and Morrison, 2013);

- Emotions (Akbiyik, 2010); Ethics (van Weert, and Munro, 2013);

- Gender (Buabeng-Andoh, 2012), (Leask and Pachler, 2013);

- Security and Safety (Ghernouti-Hélie, 2010), (Solar, Sabattin, and Parada, 2013);

- Bring Your Own Device (BYOD) (Song, 2014), (Salomon, 2016);

- Learning Objects (Hadjerrouit, 2010), (McGreal, Kinutha, and Marshall, 2013);

- 21st Century Learning Skills (Bellanca and Brandt, 2010), (Griffin, McGaw and Care, 2012).

Technologies of particular interest included Personal Response System or 'clickers' as they were identified to be part of the contemporary school routine in some contexts (Patterson et al., 2010), (Smith et al., 2011), (Tlhoaele et al., 2014) (Millor et al., 2015). Other articles were searched and added to ground the themes and, as they were not part of the UK research context, the most representative ones from the Educational and ICT field were included in the review, (Vesisenaho, et al., 2010), (Dicheva et al, 2015), (Kapp, 2012), (Howell, 2012), (Wu et al, 2012). The process culminated in a list of 75 articles that were reviewed.

The next step for this review is to exam what all these studies say about these topics and how they connect to each other. Understanding how these topics relate to each other in the British context is the first purpose of this thesis. This will allow the researcher to have an idea of what ICT means in education and raise questions about its use. With this in mind, some documents, news, and policy papers were added to the list of articles to provide a contextual background of what happened in the United Kingdom during the period of 2010-2016. However, each of these themes represented different fields of research with an extensive list of studies. It is not the purpose of this introduction to deal with all of them in depth. The purpose of the introduction is to situate the reader in the intersections in which this thesis is located, showing the multiple and problematic nature of the concept of ICT and, as a consequence, the field. The interrelations across these themes are going to be demonstrated during the analysis of the data collected. This strategy will enable the researcher to discuss how these themes are interconnected and show how their relevance change in relation to the context in which they are inserted, for example in

Primary schools or Post-secondary education. It will also allow the reader to engage critically with these themes, offering a meaningful reflection upon them.

One factor that motivated the introduction of ICT in education is the relationship between technology and economic growth. Based on empirical evidence, Vu (2011) suggested that ICT penetration is responsible for two elements that result in positive outcomes in the economy. The first one is fostering technology diffusion and innovation because it enhances the quality of decision making by firms and households. The second one is increasing the demand and reducing the production costs of technology. The author also reinforced that the investment in technology would also promote better working conditions, facilitate learning, productivity, communication abilities, enabling people to have better access to information. These aspects "effectively" enlarge the stock of human capital and also enhance technology's use. In other words, if technology was less expensive, people would acquire more ICT and would have access to information. This information would improve their knowledge, which would lead to better decisions, both regarding households and firms, resulting in economic growth.

However, in order to achieve a higher level of growth, Vu (2011) argued that it is necessary to increase broad-based education and improve labour skills and consumer sophistication. Two of these goals could be achieved via education, by being informed and motivated by economic growth. That is why Vu (2011) warned that there are a lot of policy implications when focusing on promoting ICT penetration. He suggested that policy should not focus only on upgrading ICT infrastructure and reducing costs of its use. Investing in the broadband structure is necessary, but also

reform the education system, in order to prepare people for the information age. Although the author did not explain what he meant by reform, his assumption suggested a change in practice in which ICT would be a basic tool for teaching and learning.

For Yang (2012) and for the British Educational Suppliers Association (BESA, 2015) it is necessary to understand what happened in the past to learn from it and then improve. Both studies referred to the government of Tony Blair as the period in which great initiatives and big enthusiasm were brought into education due to ICT. According to BESA (2015), the Labour government wanted to be seen as 'new and fresh' (p. 05) and investment in ICT could be the means to achieve these goals. The launch of the Building Schools for the Future initiative put technology as the main focus of education in 2004. The British Educational Communication and Technology Agency (Becta) was created in 1998 with the purpose of making the governments' goals and matching these with the needs of education. Becta was also responsible for drawing up the new curriculum in which ICT became a core skill alongside literacy, numeracy and personal development for Secondary and Primary education. However, this agency 'was axed' in 2010 when David Cameron was elected the new Prime Minister (BESA, 2015, p.05).

Not only was infrastructure necessary to provide the appropriate conditions to have and use ICT for teaching and learning, teacher training was also needed to develop the appropriate skills to those who would be at the forefront of this implementation. The New Opportunities Fund was launched by the Labour Government in 1999. It used the National Lottery funding and provided £230 million to train teachers until 2002. According to Davis et al. (2009), this national initiative stimulated a range of

approaches to ICT teacher training. For Preston (2004) the evaluation of these approaches had many negative points; however, after several rounds of evaluation, all training providers improved their methods.

In 2003, the Department for Education and Skills also launched the Towards a Unified E-learning Strategy to illustrate how ICT could support new ways of teaching and learning (Yang, 2012). In spite of the initiatives, the range of practices remained limited and practitioners rarely realised the full benefits of technology supporting learning (Becta, 2008). In addition, the training offered did not match the needs of teachers. According to BESA (2015), the teachers had to develop basic skills and what was offered did not match to the attendee's needs: the expectations from trainers were higher than the level of skills developed in the courses.

As a result, school leaders alleged that more than half of the teachers were not confident enough to deal with technology. Just a small percentage (47%) of teachers interviewed by BESA felt competent to deal with word processing tasks. BESA (2015) attributed this mistake to the proportion of money spent on training and infrastructure. It was expected that Continual Professional Development (CPD) and improvement in pedagogy had 40% of the budget in relation to 60% of infrastructure. On the contrary what happened was that training usually got 10% of this money invested (BESA, 2015). It happened because schools were focusing on maintaining their equipment and keeping it up to date as innovations in technology happen very fast.

These findings were also related to the ones highlighted by Davies et al. (2009) when evaluating the provision of two different types of ICT-related teacher training during the national initiative of NOF. The researchers examined two different types of

provision, one which they called 'organic' and another called computer-based training (CBT). According to their findings, the organic approach was more effective because it was school-based and school-focused compared to a globally focused model. Trainers were rigorously selected and trained and the community had space to share an increasing collection of resources produced by teachers during training. The most problematic feature of CBT was that it demanded the knowledge and skills trainees did not have yet. In fact, teachers needed that knowledge to manage effectively the training. This was one of the most criticised characteristics of CBT by participants.

One of the fields that illustrated how ICT could be used to teach and learn was English Language Teaching (ELT). As reported by Dudeney and Hockly (2012), teaching using ICT changed drastically from the 1980s-1990s to 2000. They report how computer-assisted language learning (CALL) used computers as a language recognition tool. From the 1990s to 2000s, multimedia and internet access integrated the implementation of the four basic communication skills (reading, writing, speaking and listening) with better interaction between machine and student. However, for the authors 'the great shift' (Dudeney and Hockly, 2012, p. 536) happened with the consolidation of networks and internet access as immediate communication among different people in different parts of the globe via e-mail, chats, forums, allowed more collaboration to be incorporated in lessons.

Web sites full of resources for teachers also became popular in the early 2000s. The exchange of such materials led to submissions to discussion groups, in which language teachers engaged in the discussion of what they were doing, how and why. For Dudeney and Hockly (2012) these discussions were taken into the daily work of

teachers and afterward, as they brought back their experience to the group for further discussion and development. They attributed the action of these groups to what were called by Etienne Wenger (Wenger, 2000, p.01) 'communities of practice'. Teacher training via online courses was also made available after these initiatives, but this initiative was restricted to the language teaching and learning field, not being so common in other subject areas as Physics or Arts.

In 2002, Estelle Morris, the new Education Secretary, reassured her audience at the opening of BETT[7] that the government had a vision for the high-tech school of tomorrow[8]. She wanted to show that there was still enthusiasm for the use of ICT in education with the purpose of raising standards. The Laptops for Teachers initiative was launched to enable teachers to be familiarized with this tool on a daily basis. The government made part of the investment and teachers assumed the other part, with the possibility of having these laptops for personal use. This initiative, plus the introduction of interactive white boards (IWB), were the two major events that affected the way teaching and learning was happening.

Although Dudeney and Hockly (2012) argue that there were not enough studies that evaluated the extent to which IWBs affect learning, they definitely affected teaching practice and the publishing of materials. IWBs opened the possibility for sounds, videos, animations to be part of lessons bringing dynamic types of resources into it. However, again the tools were available to be used but the training necessary to enable efficient practices did not happen. As a result, many teachers used the IWBs

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[7] British Educational Training and Technology Show. Available from: http://www.bettshow.com/ [Accessed 02 February 2016]

[8] Available from: http://news.bbc.co.uk/1/hi/education/1749817.stm [Accessed 16 November 2016]

as a projection of their laptops, which did not promote significant change in lessons (BESA, 2015).

In contrast, through the shift from a static, expert-produced resource (Web 1.0) to a more creative, consumer-driven space (Web 2.0), the internet enabled teachers and learners to produce content and resources such as personal blogs and podcasts (Dudeney and Hockly, 2012). In ELT it was possible for creative skills to be put into practice with a lot of different projects using the tools available from multimedia and hypermedia. But again, there were limitations from other subjects in basic education because they had other priorities (Yang, 2012). For Yang (2012), there was also a limited progress in Primary and Secondary schools in the UK regarding the use of ICT to support the transformation in teaching and learning, even after many years of practice.

Government policy was elaborated and directed to promote the means for schools to use ICT effectively, according to Yang (2012). The same researcher identified two problems in the two-phase agenda of integrating ICT into schools. The three steps in which this agenda was based were: securing basic infrastructure and practice support, promoting professional practice with technology, and enhancing personalized skills and higher order skills. Nevertheless, what was identified in schools was that replacing equipment was prioritised over pedagogy development. As a result, narrow uses of ICT, uncommon good practices, and largely unrealised benefits were found in schools (Yang, 2012). The assumption that pedagogy would be prioritised only after the equipment was in place was contrary to the fact that both should be happening at the same time. Together with the ICT agenda, schools had to

cope with internal and external elements in their own agendas. Some examples were provided by Yang (2012) informed by other studies: the Statutory Assessments Tests (SATs); change to GCSEs papers; the restricted and deprived access to ICT resources; lack of collegiality and latitude for risk-taking; lack of inter-departmental cooperation; lack of continuous support; and lack of time for experimentation.

Another problem pointed to by Yang (2012) was the National Curriculum and the assessment regime in the UK. They were the most direct influence on 'how far teachers are able to harness the potential of technology' (Yang, 2012, p. 106). For the author, the pedagogical tones embedded in the curriculum-assessment regime had a significant impact on teachers' pedagogical practice. As teachers have no control over the National Curriculum, they force themselves to subordinate their pedagogical planning to assessment needs, resulting in a practice of evaluation and measurement. According to the literature used by Yang (2012), it 'stifles' innovation and becomes a 'pedagogical trap'[9] (p. 106). The extra value ICT is capable of bringing to certain subjects may not be reflected in teaching practices, suggested Yang (2012). Because of this, a conflict occurs with teachers with a more innovative pedagogical outlook, because their beliefs are different from the tone embedded in the curriculum and assessment.

According to Yang (2012), there was a discrepancy between the kinds of achievements embedded in the National Curriculum and assessment and the kinds of achievements that ICT, with its potential effectively harnessed, could promote. According to the author, 'teachers' perceptions of what learners should achieve

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[9] Baggott La Velle, L., McFarlane, A., John, P.D. and Brawn, R., 2004. According to the promises: the subculture of school science, teachers' pedagogic identity and the challenge of ICT. *Education, Communication & Information*, *4*(1), pp.109-129.

determine their pedagogical actions as manifested in their chosen levels of ICT use' (Yang, 2012, p. 109). He also added that 'teachers' pedagogical perceptions and actions are often influenced by the aims and results set in the existing curriculum and assessment' (p. 109). Due to these problems, there is a gap in terms of the degree to which potential of ICT is harnessed, between ICT being used to improve test results and ICT use aimed at higher order learning purposes:

> 'Realigning the objectives embedded in assessment with technology's pedagogical potential is important, not only for helping to gauge technology's impact on learning more precisely, but also to encourage teachers and learners to explore technology's potential for teaching and learning' (Yang, 2012, p. 110).

Although this would be the ideal setting, it was not what Yang (2012) found. He identified empirically and in the literature that teachers prioritised teaching to the test due to fear of failure. The evidence showed that teachers' pedagogical actions result from the interaction between the established institutions of the curriculum-assessment regime and their personal attitudes. In other words, teachers' beliefs about what should or should not be done in education influence what happens in classrooms. These actions and beliefs vary not only according to the school year's purpose but also according to the subject they teach. Older teachers were not willing to embrace the use of ICT because they feel they will achieve their aims by using more traditional methods in terms of 'benchmarked results in the GCSEs'. However, these teachers recognize that their methods might not be that transformative in terms of the skills students need to master in order to move on from school to university or the world of work.

Curriculum subjects usually refer to a set of established ideas that epistemologically define what a particular subject area is all about, including the aspects of the contents that should be taught and the pedagogical approach they imply. Yang (2012) found competing paradigms related to the educational aims of ICT in British schools and inside some subjects. They were: scientific knowledge x scientific enquiry in Sciences; literary x multimodal in English; communicative approach x grammatical approach in Modern languages. For Yang (2012) these competing paradigms are generated due to the way the assessment of these subjects is structured, because 'teaching to the test will actualise and increase such a discrepancy and therefore underexploit the potential value of ICT' (p. 110). Again, teachers are guided by assessment.

Lack of time was also described as an obstacle for experimentation with ICT. For Yang (2012), this is because there is a 'biased' and 'unbalanced representation' of different paradigms in individual subjects in the curriculum-assessment regime. The fact that there is a prioritisation of teaching to the test undermines a progressive creative pedagogy. The use of ICT implies creativity and pedagogical inputs from the teacher, however, 'the constraints imposed by the curriculum and assessment will in turn result in the value of technology being underexploited' (Yang, 2012, p. 111), and as a consequence, it limits progress in terms of developing new ways of teaching and learning.

Not only Yang (2012) but also Osborne and Hennessy (2003) claim that relatively few teachers are integrating ICT into subjects. For Yang (2012) teaching has not been done in a way that motivates pupils and enriches learning or stimulates higher level

thinking and reasoning. The few who did tend to be the ones who already had an innovative pedagogical outlook. Yang (2012) suggested that an action that needs to be taken to harness technology's pedagogical value is to change teachers' resistant attitudes. Teachers' action towards collaborating and sharing ideas with each other are no less important since there is a strong connection between their willingness to share and collaborate with colleagues and their capacity to develop and improve ICT-integrated pedagogy.

Training is not enough to address teachers' needs. More and more teachers have started teaching with ICT in schools and they need more guidance to teach their subjects with ICT (Yang, 2012). There is no time for dealing with every piece of technological equipment as well, argued the author. A good way to solve this situation is to have good role models in schools to orient and show new teachers what they could do with ICT in subject-specific environments. These models could inspire teachers to be creative and away from bad practice explained Yang (2012). However, a question that comes to mind is what is considered to be 'good' or 'bad' practice in the UK. This is a question that this thesis does not aim to answer directly, but could provide some insights about.

Yang (2012) believed that transformation in the UK education must happen to really integrate ICT into teaching and learning with all its potential. For the purpose of achieving this goal, a shift from the traditional top-down to a bottom-up approach to the funding of ICT, teaching the curriculum and teaching training is urgent, argued the author. The limitations of the traditional top-down approach were identified as wasteful spending of funds, various constraints on teaching a balanced curriculum

and teachers' low confidence and competence in using ICT to support teaching. In contrast to what has happened, the bottom-up approach has the potential to make a difference as teachers and schools would determine and guide what they need to promote good outcomes.

Meanwhile, the advancements in technology and its potential continued growing and expanding. Social Networks such as Facebook and microblogs such as Twitter enabled teachers to join a global conversation about their practice, as reported by Dudeney and Hockly (2012). They believed that teachers were able to share and participate in this kind of conversation due to the relative costs of attending face-to-face teacher developing courses and conferences. The engagement between teachers, trainers and material producers increased via short conversations and resource sharing on the internet. These personal learning networks impacted the daily lives of language teachers in a way beyond the electronic, claimed the authors.

Further, three factors are claimed to have the potential to impact teaching and learning in ELT. They are mobile learning, blended learning, augmented reality and game-based learning (Dudeney and Hockly 2012). They based their predictions on the Horizon Report (Johnson et al., 2012) which analyses what has been done in K-12[10] schools in different parts of the globe and from what has been done, a list of predictions is provided for the next one, three or five years, classifying these trends from easy to challenging to be put into practice. From the list of the Horizon Report (Johnson et al., 2012), Dudeney and Hockly (2012) believed that these factors will be the most influential for ELT. These predictions are justified and reinforced by the fact

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[10] K-12 is the equivalent to Primary and Secondary Education, referring to 4-year-old to 19-year-old students in free education in the USA, Canada, South Korea, Turkey and other countries.

that mobile and handheld devices have been used in mainstream education and it is not going to be different in ELT. Schools have also invested in mobile devices as tablets and notebooks for students rather than setting up a laboratory. Mobile friendly apps have been produced not only by app developers but also by mainstream publishers: many have made available their coursebook components for easy access outside the classroom. VLEs also have been largely used for institutions to allow access to their materials at anytime, anywhere. According to BESA (2015), the shift to tablet technology and the use of more mobile devices in the UK started in education during 2013. BESA (2015) found that 45% of computers in schools were portable (laptops and tablets) in 2014. They alleged that the time to 'put the screens down' has come, but many schools have struggled: after acquiring the mobile equipment, they do not know exactly what to do, developing policies and regulations that aim to regulate and control the uses of these devices inside these environments.

On the other hand, Livingstone (2012) claimed that a simple increase in ICT provision does not guarantee enhanced educational performance. The position that the UK occupied in the educational performance rank in OECD[11] was not satisfying. Aristovnik (2012) analysed the impact of ICT on educational performance and its efficiency in some OECD countries. He reviewed some studies which examined ICT efficiency and the impact on educational output/outcome. OECD, Unesco and the

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[11] A new report was released in December 2016. The report was based on the most recent assessment which happened in 2015. The focus was on Sciences and despite the fact that the UK climbed from 21st place in 2012 to 15th in 2015, there was a fall in the average points from 514 to 509. The UK also climbed two places for reading, from the 23rd to 21st, although there was a fall in the average points, from 499 to 498. However, the UK maths performance has fallen from 26th place to 27th, implying a decrease in the average point score from 494 to 492. These results caused discomfort and dissatisfaction to the Government, Media and public who raised their concerns despite the fact that it was assumed some improvement was made in education standards.
Available from: https://www.oecd.org/pisa/pisa-2015-results-in-focus.pdf [Accessed 29 December 2016]
Available from: http://www.bbc.co.uk/news/education-38157811 [Accessed 29 December 2016]
Available from: http://www.telegraph.co.uk/education/2016/12/06/oecd-pisa-report-does-uk-rank-international-school-league-tables/ [Accessed 29 December 2016]

World Bank's World Development Indicators database composed the data set, from the period of 1999 to 2007. The findings of his empirical research showed that the efficiency of ICT when taking educational outputs and outcomes into consideration differs significantly from the great majority of the European Union and OECD countries. Although this finding does not seem to be considerable, what was interesting about his research was the data related to the UK and its position in relation to the other countries.

The UK was classified as one of the worst efficiency performers in relation to the 28 countries analysed. Although the investments in ICT expenditure and Internet users were well above average, Aristovnik (2012) believes these factors were not enough to increase their educational outputs and outcomes. For the author, it happened because the UK suffers from low technical efficiency. In other words, the use of ICT is not efficient. The UK outputs should be increased from 4.4% to 7.9% in order to become efficient, leading to development and growth, says the author. Although he argues that it should become one of the top priorities of the country, there is no rigorous evidence that ICT investment results in economic growth. It would be necessary to conduct a properly controlled study to identify the nature of the relationships and any confounding factors.

However, attention should be drawn to the concepts of efficiency and efficacy in which Aristovnik (2012) grounded his research. The author justified that measuring ICT is relatively complicated because the comparison and measurement of costs and benefits might be difficult. To measure efficiency, an estimation of cost and an estimation of output are made, and a comparison between the two is developed to

identify the benefits achieved from the relation of both. ICT would be considered efficient if the cost was lower than the benefit produced by its use[12]. This kind of data is usually compared with other countries to establish if they are valid or not. The productivity and benefits of ICT were expected to be higher to indicate if the ICT use was effective.

In contrast, a high level of effectiveness is the relationship between the output and the outcome. If the final goals are achieved it is possible to say it is effective. The outcome is usually related to welfare or growth objectives of a country. For Aristovnik (2012), evaluating effectiveness plays an important role and it could affect drastically the outcomes, mainly because it is influenced by political factors. In other words, the effectiveness of the use of ICT is difficult to measure, even using appropriate methods and methodological strategies to manipulate and interpret data as it has to be done in comparison to other countries which might have different parameters to the UK's performance.

This fact might be explained by the divergent direction in which advancements of ICT and its use were going in relation to funding and policy making in the UK. Yang (2012) pointed out that there was an increase in investment in ICT in schools from 2001 to 2008 – around £400 billion to £600 million[13]. The Harnessing Technology Grant was launched by Gordon Brown, the Prime Minister after Tony Blair, also from the Labour party. The provision of £639 million was expected during the period of 2008 to 2011. The purpose of this grant was to help local authorities and their

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[12] To analyse the efficiency of ICT, the author considered: information and communication technology expenditure (% of GDP), internet users (per 100 people), teacher-pupil ratio, school enrolment, all levels (% gross), labour force with tertiary education (% of total), and the 2006 PISA average score.
[13] DfES (2001); BESA (2008; 2009)

schools to improve their services, for example, broadband and learning platforms. According to BESA (2015), £420 million of ICT budgets reached their peak in 2010. However, it diminished after that: as the outcomes did not follow the same proportion of investment, there was a decline in the ICT investment in Primary and Secondary schools during 2009-2010, even with schools claiming to be under-equipped and funding was available. One of the reasons it might have happened was the fact that in 2010, Michael Gove, the Education secretary halted the new primary curriculum elaborated by the Labour government which had ICT as one of the core elements, following the Secondary curriculum already in use. In an interview at BBC Radio 4 program, he justified the review of the curriculum by saying the curriculum proposed by the labour government was 'soft' and the content was not strong enough. For him, there was too much focus on how to teach instead of looking at what to teach to pupils (BESA. 2015). Becta was also closed two weeks after the election of the coalition government. As a result, the government and the schools dropped the investments in ICT. However, as time passed, BESA (2015) identified that the demand for training just increased: in 2012 it was 54% of secondary schools and 45% of primary schools; in 2014 the numbers increased to 68% and 71% respectively. For BESA (2015), these factors contributed to the shift of top-down government-led policies of ICT implementation and use in education to a bottom-up approach based on local needs. At the same time, Michael Gove started promoting a change in the curriculum when he invited all state schools to apply for academy status. This status would allow them to become free from following the National Curriculum[14] after 2010, (Yang 2012).

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[14] Although there is a large discussion whether this change in the status was good or not and the implications of this change, talking about it is not the intention of this thesis. However, this fact could not be ignored.

In spite of all the discussion in relation to the change in the status of the school, the bottom-up policy approach seemed to be what motivated the Computing at School (CAS)[15] to be formed. In their white paper launched in 2010, this group formed by teachers, examiners, parents, university faculty, local authority advisers and employers presented their purpose of promoting the teaching of Computing instead of ICT. Despite the campaign to get ICT skills taught in schools had been largely successful, they classified the pre-sixth-form curriculum regarding computing as a 'disaster' (CAS, 2010). They believed that the attractiveness of learning ICT skills had declined 'as computers have become ubiquitous' (CAS, 2010, p. 02). The group argued that more than training students in skills related to particular artefacts, they needed something to get excited about again. CAS (2010) believed that this goal could be achieved by focusing on how computers work and how to program them, rather than how to use computers.

CAS (2010) defined Computing as:

> 'the study of how computers and computer systems work, and how they are constructed and programmed, and the foundations of information and computation. It is a discipline, like mathematics or physics, that explores foundational principles and ideas (such as techniques for searching the Web), rather than artefacts (such as particular computer programs), although it may use the latter to illuminate the former. Its aspects of design, theory and experimentation are drawn from Engineering, Mathematics and Science respectively.' (CAS, 2010, p. 03)

For CAS, Computing was based on Computer Science and as a science; it was supposed to be taught by specialists with appropriate degrees in the area. They believed that as other sciences as Maths and Biology are taught by Mathematicians

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[15] Available from: http://www.computingatschool.org.uk/ [Accessed 29 August 2015]

and by Biologists, computer scientists should be teaching Computer Science. Because of this fact, CAS (2010) supported a change in the subject ICT to Computing. This change would involve a shift in the content of the curriculum taught including the study of algorithms and data structures, the understanding of computer systems and networks, the challenges concerning human-computer interaction, and how computers work. On their document, CAS (2010) reinforced that Computing is not ICT because the former is about the design and construction of computers and the latter is about the application and use of computers. At the same time, they also emphasised that Computing is not just programming. A working knowledge of programming would play a special role in education, involving problem-solving, creative, sequencing and logic, which could also work as a motivator for pupils. Programming would be just part of it.

Michael Gove announced at BETT the change in the ICT curriculum to Computing in 2012. The 'harmful' ICT curriculum was going to be dropped for a 'rigorous computer science' (Gove, 2012). This move would equip pupils with 'the skills employers want'. According to Gove (2012), the ICT curriculum was classified by experts as 'dull and unsatisfactory'[16] and 'harmful, boring and/or irrelevant'[17]. In his speech, he also reinforced the need for change:

> 'Our school system has not prepared children for this new world. Millions have left school over the past decade without even the basics they need for a decent job. And the current curriculum cannot prepare British students to work at the very forefront of technological change.
>
> (…)

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[16] British Computer Society and The Education Technology Association - Naace
[17] e-Skills

The best degrees in Computer Science are among the most rigorous and respected qualifications in the world… and prepare students for immensely rewarding careers and world-changing innovations. But you'd never know that from the current ICT curriculum.' (Gove, 2012)

The Education Secretary also made some projections about the future regarding this change:

'Imagine the dramatic change which could be possible in just a few years, once we remove the roadblock of the existing ICT curriculum. Instead of children bored out of their minds being taught how to use Word and Excel by bored teachers, we could have 11-year-olds able to write simple 2D computer animations using an MIT tool called Scratch. By 16, they could have an understanding of formal logic previously covered only in University courses and be writing their own Apps for smartphones.' (Gove, 2012)

The New ICT Curriculum was changed to Computing in Primary and Secondary Schools in the school year of 2014[18]. The first A-levels certification in Computer Science is going to happen in 2017 by some examining boards[19]. The enthusiasm seemed to be back and after 20 years of practice and a lot of gains, drawbacks, obstacles and challenges were faced by teachers, parents, students, schools, staff, leaders, developers, manufacturers, government, policy makers, charities, scholars and many others who were directly and indirectly involved in this long process. Besides the change in the ICT/Computing curriculum, there were also other elements regarding ICT in education in general. Augmented reality and game-based learning were pointed by Dudeney and Hockly (2012) as other possibilities for teaching and learning.

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[18] This change in curriculum refers to England only.

[19] OCR is going to apply the first round of assessment in 2017. AQA is finalizing the text book material to make the course available. It will be launched in the spring of 2017

Augmented reality was popularized by the app Pokemon Go, in which the player could look for pokemons (pocket monsters) in the real world and catch them, making a collection to battle later on in gyms. It was possible because of the way the game was elaborated. The game uses the phone's GPS and clock to detect where and when the person is in the game and it makes pokemons appear nearby. As the person moves, more pokemons appear. The fact that it is done with the camera of the mobile phone on, makes the person see the pokemons in the 'real world'[20]. In ELT, Dudeney and Hockly (2012) believe this is the opportunity for integration of language and learning to everyday objects and places as many projects have been developed from this kind of technology.

Game-based learning has been largely seen in different language games websites (Dudeney and Hockly, 2012). They have been available for decades and day by day they have become more sophisticated. Second Life[21] is an example in which a game environment enables learning. It is a 3D virtual world in which people create virtual representations of themselves (avatars) and are able to interact with other avatars, places, and objects. Some of the possibilities of Second Life is that users can explore the world, meet other people, and build things while they practice another language.

In the *Horizon Report: 2016 K-12 Edition* the New Media Consortium and the Consortium for School Network presents the trends, challenges, and developments in technologies that schools are going to face in the next five years. They based their findings on empirical evidence provided from 195 countries. These findings were

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[20] Available from: http://www.vox.com/2016/7/11/12129162/pokemon-go-android-ios-game [Accessed 07 November 2016]

[21] Available from: http://secondlife.com/ [Accessed 01 November 2016]; Available from: https://en.wikipedia.org/wiki/Second_Life [Accessed 07 November 2016]

classified in short to long term in relation to trends, in near-term (one year or less) to far-term (four to five years) regarding developments in technology and the challenges are classified as solvable, difficult and wicked (Adams Becker et al., 2016).

In relation to developments in technology, they believed that makerspaces and online learning are going to be achieved in one year or less. A growing number of libraries, classrooms and community centres have been transformed into makerspaces. By makerspaces, they mean 'informal workshop environments located in community facilities or education institutions where people immerse themselves in creative making and tinkering activities' (Adams Becker et al., 2016, p. 36). These spaces are believed to foster the development of 21st-century skills, 'preparing them [the students] for the demands of the global technological economy' (Adams Becker et al., 2016, p. 36). These places are believed to offer tools and opportunities for hands-on learning and creation. As a method for engaging students, educators admit that they are developing creative, higher-order problem-solving through design, construction, and iteration. In order to do that, design thinking approaches are necessary. While schools are implementing these places, online learning is assumed to be done at different scales and in different ways. When coupled with immersive technologies, it has the potential to facilitate simulations which can help students better understand and respond appropriately to real-life environments and situations. But, more project-based learning, personalized learning, and interactivity are necessary to orient these practices (Adams Becker et al, 2016).

In the mid-term the Horizon Report (Adams Becker et al., 2016) indicates that robotics and virtual reality would be adopted in two or three years. By referring to

robotics, it means the design and application of automated machines that accomplish a range of activities. In education, robots can be used for hands-on learning, in programming to promote critical and computational thinking as well as problem-solving among students. There have also been emerging studies which associate the use and interaction with robots to develop better communication and social skills in learners identified as having 'spectrum disorders' (Adams Becker et al., 2016). Virtual Reality (VR) refers to computer-generated environments that simulate the physical presence of people and/or objects and realistic sensory experiences. These applications allow users to more 'authentically "feel" the objects in these displays through gesture-based and haptic devices, which provide tactile information through force feedback' (Adams Becker et al., 2016, p. 42).

In the far-term, they suggested that artificial intelligence and wearable technologies will be present in four to five years. Artificial Intelligence (AI) has the potential to enhance online learning, adaptive learning software, and simulations in ways that intuitively respond to and engage with students (Adams Becker et al., 2016). It is because knowledge engineering has allowed computers to simulate human perception, learning, and decision-making, based on the access to categories, properties and relationships between various information sets. On the other hand, wearable technologies have the potential to encompass multidisciplinary efforts of design, building, and programming. Defined as smart devices that can be worn by users, taking the form of an accessory, clothes or shoes, they interact with other devices allowing the tracking of personal data such as sleep, movement, location and social media interaction. Wearables not only track and provide information about what people do but also if people accomplished their goals.

Concerning the trends in education, the report proposed that coding as literacy and students as creators are going to be the first to happen. As a way to stimulate computational thinking, coding combines deep computer science knowledge with creativity and problem-solving (Adams Becker et al, 2016). The UK was one of the pioneers to introduce this practice into basic education at a national scale approaching Primary and Secondary curriculum. This strategy is intended to facilitate students to be more creative regarding the content and not consumers. As creators, students engage in learning experiences to investigate, narrate and produce content in relation to the topics they are studying.

After implementing coding in schools, collaborative learning and deeper learning approaches will be the next trends. The Horizon Report (Adams Becker et al., 2016) advocates that collaborative learning models are providing successful examples of improvement in the engagement and achievement of students, mainly the disadvantaged ones. Based on four principles - placing the learner at the centre, emphasizing interaction, working in groups, and developing solutions to real problems – it is also believed to be an advantage for teachers as well. By engaging in peer groups, teachers participate in professional development and interdisciplinary teaching (Adams Becker et al., 2016). The shift from the perspective of the student from passive to active has facilitated deeper learning. Pedagogical approaches such as problem-based learning, project-based learning, challenge-based learning and inquiry-based learning enable problem-solving and students are encouraged to be creative and propose solutions to real-life problems.

The long-term trend in education will be redesigning learning spaces and rethinking how schools work. The Horizon Report (Adams Becker et al., 2016) advocated that formal learning environments require an 'upgrade' to reflect the 21st-century practices. It would be a natural consequence of the evolution of conventional teaching models and emerging technologies gaining a 'solid foothold in classrooms'. New approaches to classroom design and infrastructure have been inspired by student-centred approaches with the belief they will contribute to better preparation of the future workforce. However, it also implies the rethinking of how schools work. Methods based on project, competency, and challenge demand a fluidity of movement from students, not only in space, removing barriers of desks and walls, but also in time, allowing flexible timetables and independent study. From this point of view, the traditional classroom paradigm needs to be rearranged (Adams Becker et al., 2016).

The Horizon Report also identifies challenges that schools will face. The first ones will be authentic learning experiences and the rethinking the role of teachers. Authentic learning is considered as an umbrella term because it encompasses several important pedagogical strategies that 'have great potential to immerse learners in environments where they can gain lifelong learning skills' (Adams Becker et al., 2016, p. 22). Authentic learning reinforces the importance of metacognitive reflection and self-awareness for students to understand the reason why they are learning specific contents or developing specific skills. In order to facilitate these experiences teachers could provide expert-level knowledge to construct these learning environments. By providing opportunities for students to direct their own learning trajectories, teachers act more like a mentor or a guide and engage in their

continual professional development. By doing this, teachers would have the reason and means to engage in their continual professional development, rethinking their roles in schools.

The difficult challenges for schools are advancing digital equity and scaling teaching innovations. By digital equity, the Horizon Report meant uneven access to high-speed broadband. By using blended learning, schools have increased the probability of evidencing the gap between the ones who have access to these tools and the ones who do not, as students are expected to engage in online activities at home. This is an issue, according to the report (Adams Becker et al., 2016) which should be resolved in policy making and with the help of school leaders. Teaching innovation is another issue for schools and it is closely related to testing results. It is because teachers are not frequently rewarded for innovative approaches and improvements in teaching and learning (Adams Becker et al., 2016). It leads to frustration of educators, which in fact are also not prepared to lead innovating and effective practices. In order to achieve teaching innovation adequate funding, capable leadership, strong evaluation practices and the removal of restrictive policies are all necessary.

Further challenges are regarded as 'wicked' by New Horizon Report. They are achievement gaps and personalizing learning. These challenges are characterized as wicked because they are complex to define and address. Achievement gap refers to 'an observed disparity in academic performance between student groups, especially as defined by socioeconomic status, race, ethnicity, or gender' (Adams Becker et al., 2016, p. 30). The report said that environmental factors such as peer pressure,

student tracking, negative stereotyping and test bias are exacerbating this challenge. However, adaptive and personalized learning have opening possibilities for integrating and diminishing these differences. It has helped leaders and educators to understand contributing factors and enabled the elaboration of different targets and strategies to close the gap. Customizing instruction to meet students' unique needs is resulting in the development of new technologies and providing more choices for learning and differentiated content delivery. Notwithstanding, the major barrier to promote personalized learning is the lack of infrastructure within school systems to support dissemination of personalized learning technologies at scale and the incorporation of effective pedagogy, including teachers in the development process.

Based on these predictions, coding could be regarded as a reality already in practice, as it has been implemented since 2014 via the National Curriculum. But the question raised is: could it? Which of these predictions are applicable to the UK context, from the historical conditions presented before? Is it possible to rethink the roles of the teacher in an assessment-based education model? How could students have authentic learning experiences and manage the pressure of the revision for exams? In which extent could these trends be considered achieved or achievable? And, once as becoming policy, could it be considered effective and meaningful, contributing to authentic teaching and learning?

Although there are other topics in the Horizon Report (Adams Becker et al., 2016) that could be claimed to be the reality in the UK or to near to becoming it, research has shown that the goal of achieving a 21st century education that was discussed during the Labour Government of Tony Blair has not happened after 20 years of

practice (BESA, 2015; Yang, 2012; Aristovnik, 2012). The Horizon Report says that 'at the moment we have 21st-century classroom practices with a 20th-century examination system'. BESA (2015) suggested that the move forward will only be achieved when both were brought to the line, with a cultural change. This finding is similar to what Yang (2012) stated.

As noted so far, the implementation and use of ICT in education in the UK had four main aims:

- Economic: to increase economic growth
- Political: to be the pioneer to develop and implement a large-scale policy, as part of geopolitical positioning
- Pedagogical: to improve educational outcomes
- Strategic: to create an adequate workforce, enabling the development of skills needed for the jobs to come.

However, from the literature examined, to achieve all these goals different measures and actions should be taken and some of them are paradoxical. Change is necessary in pedagogy and assessment. Teacher training is a basic need that should happen constantly, so is an investment in infrastructure. Toro and Joshi (2012) reinforced that all these four factors should be considered when dealing with ICT. Their study identified a range of benefits that ICT promotes in education, but in order to achieve them, investment and change are necessary.

After all, the questions that remain regarding 20 years of practice of ICT use are: Has only the ICT/Computing curriculum changed, with teachers' mindsets and practices

remaining the same? How was the funding directed to the change in the curriculum? Has any funding been left for training teachers from other subjects who still need guidance? Has teacher training not only in ICT/Computing improved but also in other subjects? With all the attention to the Computing curriculum, the question remains whether there is still a place for ICT in other subjects. If other subjects are still in the same situation, will teachers choose what Trebbi (2011) called 'frozen traditional pedagogical approaches'? If teachers are immersed in a context in which assessment-based teaching is common (Yang, 2012), there is no need to develop learner autonomy or change in the teachers' practice. As Livingstone (2012) said, the considerable expenditure and transformation of infrastructure that ICT demanded would only be justified if ICT improved education in a way that it could be identified in outcomes across the curriculum, revealed in examination grades and other standardised measures of assessment. If the expectations of teachers and students are driven by having good outcomes in the exams, ICT is going to be used for this purpose only, not being necessary to expand ICT's potential in education.

On the other hand, it would be 'overly pessimistic' to conclude that ICT has no benefit for education (Livingstone, 2012). Some positive findings exist. For example, Kozma (2005) pointed to the fact that specific applications of ICT can positively impact student knowledge, skills and attitudes, not only improving children's motivation to learn as Livingstone (2012) argued. However, it is still difficult to explain why only some learning outcomes are improved for some children using some technologies and in some subjects. A range of different factors might affect these outcomes.

Kozma (2012) advocated that the mere availability or use of computers does not impact learning. There might be a positive impact if ICT is used in a student-centred

approach. A combination of input factors should also be considered by policymakers and project leaders, coordinating the introduction of computers with national policies and programs related to changes in curriculum, pedagogy, assessment, and teacher training. This combination is more likely to result in widespread use and learning.

For Higgins et al. (2012) the increasing variety of digital technologies and the diversity of contexts and settings in which research has been conducted, combined with the challenges in synthesising evidence from different methodologies makes it difficult to identify clear and specific implications for education. This is because a causal link cannot be established between provision and use of technology with attainment, argued the authors. What they suggested is that it seemed probable that more effective schools and teachers are more likely to use digital technologies more effectively than others. Nevertheless, this fact deserves further investigation.

Similar issues are raised by Michael Trucano (OECD, 2009) in relation to developing countries. For him, a lack of reliable data related to the impact of ICT on learning and achievement, as well as a lack of useful indicators and methodologies to measure such impact, hampers policy guidance in this area.

For Condie et al. (2007) the difficulty in identifying the impact of ICT on learning and attainment relies on the lack of clarity about what attainment means and how it is measured in different reports and studies. In some, attainment refers to performance on standardised tests. In others, this definition is broader and impact is related to observed improvement in students' understanding within specific subject areas.

Livingstone (2012) attributed the failure to demonstrate clear benefits of ICT in the classroom to the limited (instrumental, reductionist) expectations of educationalists in

relation to the potential ICT has. In other words, as educationalists do not have higher expectations of using ICT, no great achievements will happen. For this to become reality, it will demand changes in teacher training, classroom management, and curriculum design. Even so, Livingstone (2012) believes that the minimum that is done purposefully with ICT is justifiable:

> 'The best that could be said for the role of ICT in the traditional classroom is that, even if ICT is unimaginatively used only for further traditional outcomes, and even if it produces only moderate improvements in basic literacy and science, while also enhancing pupil motivation and compensating for some forms of disadvantages, this would still be a valid enterprise. (…) There are also signs, tentative as yet, that some uses, under some conditions, are associated with improved test scores measuring standard educational outcomes.' (pp. 19, 20)

Despite the fact that there has been research regarding the emotions of students and teachers in education, ICT has not been considered and investigated with this in mind. Since its implementation and the change in the curriculum seemed to be strongly oriented by people's feelings: as Gove (2012) mentioned, students and teachers were bored about the ICT curriculum and this is one of the reasons why the curriculum needed to change. This is one aspect this thesis will investigate.

Based on the UK context, what is possible to say about ICT is that it involves macro aims (strategic, political, economic and pedagogical). These aims attempt to define which ICT is going to be used and the purpose to which this use is going to be directed. Yet the enactments of policy are not straightforward (Ball, Maguire, Braun, 2012). In micro-settings (schools and classrooms) the multiplicity of meanings, aims and uses demanded a theoretical perspective to interpret the actions and relationships established among different ICTs, users, policies, teaching and learning and many other elements. It was necessary to find an ontological view which could

enable the researcher to observe ICT, its use and all elements involved in it in different levels. It was necessary to look at the setting and context in which ICT is inserted in to try to understand it. However, not only one element would be considered in a flat way, but as much of the multiplicity and complexity that ICT implies as can be captured.

With this in mind, this study is composed of a multiple case study (Thomas, 2011), in which three different schools in three levels of basic education were investigated: one Primary School, one Secondary School, and one Post-secondary School. The methodology used is assemblage ethnography (Youdell, 2015 and Youdell and McGimpsey, 2015). Composed by a mix of traditional and innovative methods, different techniques were used to collect data: classroom observations, field notes, reflective diaries, interviews, document analysis, virtual mapping. However, the criteria for the selection of participants, places, and documents were done in a rhizomatic basis (Deleuze and Guattari, 1983, 1984, 1987), considering the composition of the education assemblage (Youdell, 2011; DeLanda, 2005). By rhizomatic, it means not in a linear, pre-determined way, but taking into account the connections each element in the assemblage establishes with each other.

The structure of this thesis is composed of five main chapters: introduction providing policy and research background; ontological perspective and analytic framework; research design, methodology and data collection techniques; analysis and discussion; and conclusion. In the introduction, an overview of how technology has been approached in education in the UK was provided. A broad view of academic themes and subthemes related to ICT and the problematic of its multiple meanings

entangled with policy development and implementation were presented. The ontological view and the analytic framework were given in the second chapter. The third chapter described and explained the research design, the sampling techniques and issues and why Assemblage Ethnographic was chosen among many other ethnographic approaches already in use in social research. The fourth chapter is subdivided into five case studies in which education ICT assemblage is presented and discussed in different ways. Each case study presents an ethnographic account based on specific themes, topics, curriculum, practices and other elements. The last chapter presents the conclusion, issues of the study and further research.

The ontological and epistemological perspectives, as well as the analytical framework which will orient this thesis, will be discussed in the next chapter.

CHAPTER 2 – ONTOLOGICAL PERSPECTIVE AND ANALYTICAL FRAMEWORK

2.1 INTRODUCTION

The previous chapter of this thesis provided an overview of the implementation and use of ICT in education in the UK in the last 15 years. This review was based on the research literature and policy documents grounded in studies that analysed different types of ICT in different contexts. Despite these differences, all these elements were components of what is known as Information and Communication Technology and have been used in various ways in the UK.

As stated in the previous chapter, the multiplicity of meanings, settings, aims and users demanded a theoretical approach and an analytical framework to exam and interpret critically the actions and relationships among ICTs, users, policies, teaching and learning and many other elements. The ontological view which offered the possibility to look at the complexity in which these elements were entangled was Assemblage Theory.

According to DeLanda (2006), this 'approach to social ontology' regards assemblages as 'wholes constructed from heterogeneous parts' (p. 03). For him, these parts are social entities 'ranging from atoms and molecules to biological organisms, species and ecosystems' which are products of historical processes (p. 03). These entities can be characterized not only by their properties but also by their capacities: what they are capable of doing when they interact with other social entities (DeLanda, 2006). However, these social entities are not just humans (teachers, students, parents) but they include other things that might be implicated, in

our case, in the classroom practices: furniture, ICT, materials, curriculum, timetables, policies and any other element that might be part of it.

Assemblage Theory has been used by scholars in different ways as a strategy to engage critically with education. Allan (2008) proposed the use of Deleuze and Guattari's ideas as an alternative way to think about inclusion. Concepts as rhizome, becoming and deterritorialization were presented as tools to understand and think about strategies to manage inclusion in schools. Blaise (2013) worked with childhood sexuality assemblage and re-assembly. On her work, she showed how policy and expert accounts invoke childhood innocence/development and child sexualisation and risk. Instead of criticizing or deconstructing these ideas, she advocated a re-assembly that might generate different logics about childhood gender and sexuality.

Based on the concept of the rhizome from Deleuze and Guattari, Hickey-Moody (2009) traced and mapped the power of dance in relation to corporeality. She contested the production of medical and sociological discourses which reinforce the idea that intellectually disabled bodies are fixed and limited. Leahy (2009) worked with the notion of pedagogic assemblage in which bio-pedagogies supported classroom assemblages. Both assemblages were part of a wider governmental assemblage concerned with the control of obesity. For the author, these assemblages reflected contemporary governmental practices.

McGimpsey (2013) described and analysed youth service assemblage. He indicated how policy is a component of contemporary youth services and how monetary and labour flows influenced the composition of the assemblage. From his critical reflection, he offered ways for policy sociology to think about neoliberalism and

capitalism as two distinctive ideas, but interrelated. Ringrose (2011) brought the notion of affective assemblages to explore the relationship between school and online spaces (Social Networking Sites – SNSs) and subjective interfacing with these spaces. For her, by using concepts from Deleuze and Guattari it was possible to think about discursive subjectivation and also map complex desire-flows and micro movements through and against discursive/symbolic norms.

Tamboukou (2008; 2010) worked with Art education assemblage exposing interrelations of social structures, economy, power/knowledge relations, architectural and spatial arrangements, forces of desire and pleasure. For her, the art educator should be seen as a continuum that needs to be mapped on a grid of intelligibility, in a machinic model of transformation, enabling rhizomatic connections to work together. Webb (2009) worked with the notion of teacher assemblage. Starting from the relations between teachers, the author's focus was on different vectors of powers to demonstrate how these interactions happened and how they were affected by policy making.

These studies have contributed in many ways to theory development and to reflect upon contemporary education, engaging with different viewpoints that compose education, raising important questions. However, there is still need to reflect upon the force and capacities of ICT in education.

For Youdell (2011) the idea of assemblages is helpful in conceptualizing 'the complex terrain of education and the ways that economy and politics, policy, subjectivities, pedagogy, everyday practices, and feelings come together to form the education assemblage' (p. 14) Based on Deleuze and Guattari's works, Youdell believed that in

order to understand how these entities or 'components' (Youdell after Deleuze and Guattari) come together it is necessary to map them in a particular assemblage. But this map should not be based on the presence of the components in an assemblage but on its productivity.

As suggested by DeLanda (2006), the point of using Assemblage Theory is to look at processes of production rather than the list of properties of components or the finished product. This thesis argues that the education ICT assemblage has productive forces which influence the constitution of the identity of teachers and students, the way they feel, the way spaces are composed, for example. These forces are related to two other concepts: affect and power.

For Bennett (2010) affect refers to the capacity of any body for activity and responsiveness. This capacity creates a field of forces that 'produce effects' and 'make things happen' (Bennett, 2010, p. 05). Building on Deleuze and Guattari's concept, she advocated that any body (or component for this thesis) can or cannot enter into composition with other affects, with the affects of other components, to destroy components or be destroyed, to exchange actions or to join in the composition of more powerful components. In other words, components have the capacity to act and this capacity is productive.

Considering the education ICT assemblage it is advocated in this thesis that each component of the assemblage has a capacity to act. Independently of their nature, people, things, processes, and emotions have the capacity to act, to affect and be affected by other components. This process is not static, but productive, shaping the

way the education ICT assemblage is composed and influencing how these components behave.

In an attempt to make sense of ICT in the education using Assemblage Theory is going to be used as starting point. In addition, some theoretical tools will also be used to make sense of what has been happening in education and make the case of education ICT assemblage and its productive forces.

These theoretical tools have been used by sociologists of education with the purpose of understanding contemporary education and its complexity, their causes, consequences, and implications. What is interesting about these tools is that Assemblage Theory enabled the research to bring together different pieces of theory to compose the analytical framework in a way that was unlikely to be done. Bringing these tools together also enabled the researcher to analyse different components at the same time, which were unlikely to be done. Because of it, it will be possible to bring emotions, teaching techniques, the use of clickers, coding and identity constitution together, for example.

This strategy was necessary first because ICT itself is multiple, demanding an examination of different elements from various angles at the same time. It was also necessary because these tools enable the researcher to engage with different questions about the productive forces of the components of the assemblage and the productive forces of the education ICT assemblage as a whole.

Following from these ideas, the main purpose of this thesis is to investigate the productivity of ICT in various school and classroom settings, in different levels of

education in the UK: Primary, Secondary and Post-secondary. Based on these purposes, the research questions that guided this study is:

- How do people feel using ICT in the classroom? Do these emotions differ across teachers and students? Under which circumstances do they differ? How do these emotions influence decisions regarding the use of ICT in lessons?

- What are the discourses of ICT in education in the UK? What do these discourses mean? Do these different meanings affect students and teachers? To what extent do these discourses influence how students and teachers feel about the use of ICT in lessons? How do these discourses influence decisions regarding the use of ICT in lessons?

- How are teachers' and students' identities constituted in lessons in which ICT is in use? What is the influence of emotions and discourse in the subjectivation process?

For the purpose of analysing the relationship between subjects and ICT, Youdell's (2011) perspective on subjects and subjectivation is going to be used. Selwyn's (2013; 2015a; 2015b) approach to discourse relative to the use of ICT in education is going to be applied. In view of the actions and reactions that happen in the classroom regarding ICT, Kraftl's (2013; 2015a; 2015b Kraftl and Adey, 2008; Kraftl and Blazek, 2015; Blazek and Kraftl, 2015) viewpoint on emotions and affect are going to be utilized. The next subsections are going to deal with each element separately and they will provide an overview of how they will orient the research and the analysis of the data collected.

2.2 SUBJECTS AND SUBJECTIVATION

Deborah Youdell advocated that the schooling process makes particular sorts of people. By people, she referred to teachers and students which are constituted as subjects through everyday practices inside schools. For her, subjectivation[22] is what 'makes us subjects' (Youdell, 2011, p. 27). Based on Judith Bulter and Michel Foucault, she believed this process is a constraining condition and the price of subject-hood (Butler, 1997a, 1997b, 2004; Foucault, 1990) and it happens via two main factors: the discourses in which people are immersed in; and the categorisation used to identify people.

Youdell (2011) works with the idea of identity politics in which she is informed by post-structural, queer or deconstructive theorizations. These ideas enable the researcher to place questions of the subject and how she/he comes to be perceived and located in and between particular categorical identities at the centre of the enquiry. Youdell's concern was with how categories themselves are constituted, how they relate to each other, how these constitutions are made in hierarchical relations and how these relations are implicated in creating intersecting inequalities. Echoing Butler, she believed that identities are constituted by a set of practices, which can be conceptualized by post-structural theory, enacting a politics of identity to which subjects are attached.

As pointed by Youdell (2011) hierarchical binaries are perceptible in constructions of identity: man/woman, White/Black, hetero-/homo- and so on. Identity categories are

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[22] Subjectivation, sometimes also referred to as 'subjectivization' or 'subjectification', comes from the idea of 'subjection' from Louis Althusser *Ideology and Ideological State Apparatuses*, in which this notion refers to the action of being 'named' or as he said 'interpellated' (Youdell, 2011). For her it suggests that people are 'called' or 'hailed' and as one turns to the call one accepts it, allowing oneself to be recognized in its terms in order to be recognized as such. Because of this acceptance and recognition, one becomes a subject according to the terms of the call. This process is immersed in power relations.

axes of domination/subordination in which subjects are made and it would not be different for the binary teacher/student. Youdell (2011) argued that the problematics of these binaries are the key to critique the identity formation and the usefulness of other categories that are created to reinforce the basic binary, such as teacher and student, and for example 'good' teacher/ 'bad' teacher. However, the constitution of these identities is not flat. It is suggested by the literature used by Youdell (2011) that a person is made up of a collection of identity categories or identities. The problem inherent in considering a multiple identity approach to a subject is that it does not enable the researcher to investigate the nature of the connections between these categories. It also does not allow the understanding of the subject about whom these identity categories speak, argued Youdell (2011). Nevertheless, they are still important to the constitution of teacher and student in the schooling process. Subjectivities are established and foreclosed at/by the intersections and interactions of identities. The question that deserves to be asked for Youdell (2011) was how these intersections and interactions of identities are implicated in or tied to particular inequalities through processes that operate at a range of levels of political and social life.

Youdell (2011) used the concept of performatives from Judith Butler to explain how people become subjects. It is argued that subjects are made through their deployment in the classificatory systems, categories and names that are used to designate, differentiate and sort people. Youdell (2011) explained that in order for performatives to work in subjectivation they need to be recognizable in the discourses that are circulating in the settings and moments in which they are deployed. In other words, what teachers do in schools should be associated to what

is said about them. It is the same for the student. Teachers and students' actions are supposed to make sense inside schools, regarding particular discourses of education. If they do not make sense, 'subjectivations will fail' (Youdell, 2011, p. 42). She also emphasized that 'while this failure might be seen as "freeing" the subject from subjectivation, if this is a freedom from subject-hood then the question of whether we can "be" anyone or anything if we are not subjects becomes pressing' (p. 42). This fact is something that this study is going to look at.

Notions of subjectivation, the performative constitution of the subject and the question of intelligibility will help us to understand the nature of the subject, the limits of 'who' this subject might be and the constraints and disavowals that are intrinsic to particular subject positions. In order to do this, Youdell (2011) reinforced that it is necessary to have a post-structural understanding of the discourse in which subjects are located. Both discourse and agency are important due to what Butler called discursive agency (Butler, 1997a, p. 127). Butler thought agency as discursive in a way that it can conceive a political subject which challenges the prevailing constitutions as part of a set of self-conscious discursive practices without assuming a rational self-knowing subject who exists outside subjectivation. For Youdell (2011) 'by understanding identity categories as performatives, names that *make something happen*, they become the ground and object of the performative politics' (p. 28). However, she pointed to a limitation of discursive agency. She claimed that 'subjectivated subjects have the capacity for intentional action and their practices inevitably have discursive effects' (p. 28). Nevertheless, she also argued that the constitutive force of these discourses exceeds the subjects' intentions and performative misfire can work in ways that restrict, unsettle and constrain identities.

Thinking of the subject as discursively constituted through multiple discourses is what Youdell (2011) does. By doing this it is possible to establish lines of identification and recognition and so subjectivities and spaces for practice. Youdell (2011) used the notion of 'constellation' to understand the constitution of identities. For her, this notion enabled her to ask how classificatory systems and their categories come to be meaningful through their relationships to other classifications and categories within particular constellations. It also asks whether these constellations might be necessary for apparently singular categories to be meaningful. She also suggested that:

> 'intrinsic to the meaning of the set of identity categories within a classificatory system is its intersections and interactions with the terms of further sets of identity categories, such that the markers from within each classification (boy; White; Social; Emotional and Behavioural Difficulties (SEBD)) form a "constellation" that comes to "be" the apparently "whole" person.' (Youdell, 2011, p. 44)

By considering the constitution of the identity of the subject through constellations, it is possible to think about the subject experiencing her/himself, and by others, as a unitary and complete whole and not a group of intersecting categories that might rupture and shift at any moment. Youdell (2011) investigated the subject of schooling: it means the ways in which students and teachers are constituted as recognizable and legitimate subjects inside the education assemblage. She also believed that:

> 'the identifications and recognitions that are intrinsic to processes of subjectivation are made available both by the educational discourses that frame schooling and by those wider discourses that permeate the school, circulate inside it and are deployed and foreclosed through the practices of institutions, teachers and students. This understanding allows us to explore the multiplicity, contingency and malleability of students' and teachers' identifications and recognitions and show how

struggles over subjectivities are a part of the politics of education.' (Youdell, 2011, p. 76)

The same move is going to be done in this study, but with reflecting upon the impact that ICT and its uses have on the subjectivation of teachers and students.

2.3 LANGUAGE AND DISCOURSE(S)

Neil Selwyn claimed that when investigating education, it is necessary to take a careful look at what is said about it. The language that pervades descriptions of education should not be treated as neutral: language is 'opaque, obtuse and often self-serving' (Selwyn, 2015b, p. 02). He advocated that language is highly political in its nature and effect, being 'powerful means of advancing the interests and agendas of some social groups over the interests of others' (Selwyn, 2015b, p. 05). Based on Michel Foucault perception of language, he stated that restricted forms of language play a key part in maintaining the parameters of what is, and what is not, seen as preferable and possible. Language informs ideas and shapes actions within the educational context. Given these points, looking carefully at language would enable the researcher to identify what has been said about ICT and the interests of different groups regarding its uses in education.

Grounding his studies in Foucault (1971), Fairclough (1989, 1995) and van Dijk (1993), Selwyn (2013; 2015b) analyses the language used to define, explain and contextualize what he called digital education. In other words, his focus is on the discursive construction of technology in education[23]. By digital education, he means education in which digital technologies are used. He claims that the discourses

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[23] Selwyn uses the notion of discourse from Michel Foucault in which it is produced historically and culturally by systems of knowledge and beliefs that are shaped and shape our behaviour (Foucault, 1981).

related to the use of ICT in education play a subtle role in rationalising contradictory perspectives, motivations, and goals, with the purpose of seeking the popular consent of sceptical practitioners and the general public (Selwyn, 2013; 2015b). These facts have direct implications for policy-making. He advocated that by studying carefully the discourses employed it is possible to have insights into the growing place of digital technology and media within education, which would not be possible just by examining the practice alone.

Selwyn (2013; 2015a; 2015b) identified that there is an imbalance between promises and delivery of digital technology regarding education improvement and innovation. He proposed that these discrepancies are embedded in a field of intense conflict and struggle. By struggles he refers to allocation of resources and maximization of profit, and concerns with epistemology or equality of educational opportunities. Because of this, Selwyn (2013; 2015a; 2015b) believed that any digital technology use in education needs to be framed in terms of societal conflict over the distribution of power. In this sense, notions of control, conflict, and resistance would enrich the debate in relation to digital education.

In order to problematize digital education regarding politics and power, it is necessary to focus on the discourses surround it (Selwyn, 2013; 2015b). Analysing these discourses can help reveal the structures of power and dominant shaping concerns behind the 'bland face of the seemingly common-sensical "digital turn"' that has seized education in the last twenty years. It enables to think about digital education as a construction of political, professional, academic, and commercial discourses. Critical Discourse Analysis (CDA) fits this purpose because its basic premise is that

language use is not neutral but infused with issues of power, privilege, ideology and politics. Language use is seen as a form of social practice that is entwined with social struggle, which is contested and contestable. Selwyn (2015b) argued that:

> '… what is said about "new" digital developments in education is clearly shaped by existing relations of power, ideological agendas and forms/conditions of dominance. However, what is said about digital technology also acts to shape on-going educational conditions in terms of the knowledge, social relations and social identities that surround them. In this sense, discourse should be understood as a key element in the production of the social reality of contemporary digital education – how people understand "the way things are" and (perhaps most importantly) "the way things could be" when it comes to the use of digital technology in education.' (p. 02)

Because of this, CDA could be used to ask questions of how certain meanings and understandings of digital education come to dominate over others, and how discursive power is exercised in particular groups. CDA approach enables the unpacking of meaning making process implicit in the discussion of the uses of technologies, for example in promoting better outcomes. Based on CDA approach, Selwyn (2013; 2015b) suggested making a distinction between different dimensions of the digital education discourse, which would include: the contents of the discourse (what is said and what is not); the implicit social relations that the discourse assumes and helps establish between participants; and the subject positions which the discourse sets up (implicit power relations, social distance, authority claims and construction of oppositional groups). Based on Fairclough (1989), Selwyn (2013; 2015b) also added that CDA draws attention to question how particular representations of the content, relations, and subjects come to dominate popular understandings of digital education and in particular, come to be 'naturalised' as a generally unchallenged form of 'common sense'. The ideological character of

discourse could also be identified: interests, dominant agendas, and power imbalance disguised not only in specific uses of language but also in social relations and power hierarchies that exist between different actors and interests.

In his studies, Selwyn (2013; 2015a; 2015b) investigated the role of discourse in the construction, consolidation, and reproduction of the reality of education and digital technology. He examined the various ways in which the topic of education and digital has been framed. He did it by examining recurring rhetorical structures and argumentative structures that articulate seemingly diverse discourses as Fairclough (2005) recommended: 'together in a particular way'. In using CDA, Selwyn also suggested examining how various linguistic and rhetorical features, such as lexical strategies, propositions, and presuppositions, metaphors, attribution, interpersonal functions, and agency have been mobilized to implement the argumentative and discursive strategies at play within ongoing debates over education and digital technology. For the purpose of identifying what ICT and its use mean for different people in different contexts, the claims and counter-claims made about it are going to be analysed, based on the same strategy used by Selwyn. It is believed that multiple and competing discourses will be found, as well as marginalised and hybrid discourses (Selwyn, Bulfin and Pangrazio, 2015).

2.4 EMOTIONS AND AFFECTS

Peter Kraftl advocated that when dealing with children and young people it is necessary to consider their emotions. Working with the notion of children's emotional geographies (Kraftl, 2013), he believed that emotions 'make spaces' because they constitute and are constituted by a range of scales, places, geographical contexts,

mobilities and boundaries (Blazek and Kraftl, 2015). In other words, the space in which people are situated influences how they feel and the way they feel in these spaces also influences its constitution. From Kraftl's point of view, childhood is not only a social construction but a spatial one in which emotions have a crucial role. The ways children [and young people] sense a space, establishes an iterative relationship between their emotional development and their sensing of physical spaces. For Kraftl (Blazek and Kraftl, 2015), the material constitution of spaces evokes particular kinds of atmosphere, for different purposes.

However, Kraftl pointed to the fact that some spaces are designed and thought to make people feel in determined ways and not others (Kraftl and Adey, 2008). According to him, sometimes this is achieved and sometimes it is not. It suggested that, even if space is designed to make some perceptions emerge, there is no guarantee they are going to happen because other perceptions and emotions might emerge. Kraftl explained this through the concept of affect. The notion of affect comes from Benedictus de Spinoza and Brian Massumi clarified it in Deleuze and Guattari (1987) as an ability to affect and be affected, being a prepersonal intensity corresponding to 'the passage from one experiential state of the body to another' (p. v). It means that different bodies have the capacity to affect other bodies and all bodies can be affected by other bodies. Massumi also stated that this process also implies an 'augmentation or diminution in that body's capacity to act'. What Massumi is saying is that the actions of bodies, or components for this study, might act more or less regarding the action of other components upon them. The fact that all components have the capacity to act, not only people, enables the researcher to reflect upon the capacity of other things to act, for example, ICT, and to ask

questions about the extent to which the actions of teachers and students are increased or diminished due to the action of ICT in schooling.

Kraftl (2015a) emphasizes the difference between emotions and affect. For him, emotions are characterized by 'how an individual feels' (p. 49), in which happiness, joy, sadness, and fear are some examples. On the other hand, affects are difficult to be named and they do not correspond to a single emotion. While emotions refer to the individual, affects refer to the collective as modes of feelings 'sometimes understood as atmospheres or temporary sparks of connectedness (…) are *shared*' (p. 49). According to Kraftl (2015a):

> '… affects are multiple, extensive and distributed. Emotions may be directed outward, as for instance, as individual projects fear onto a dark alley in a city; but emotions tend to be located within the cognitive process of an individual agents. Affects, rather, begin in the interstitial space *between* agents – agents who may, incidentally, be human or non-human – and, therefore are constitutive of the very lively but the evasive forces that characterise non-representational notions of spatiality.' (p. 50)

Looking at emotions in the study enables the researcher to engage with questions of how people feel in relation to each other and in relation to other components in the assemblage. Looking at collective modes of feelings it would allow the researcher to reflective upon the forces that emerge in the space between components and what is produced by them. The expression of emotions and the impression of shared feelings among people might be one indication of the productive forces of the components of the assemblage and the researcher is going to be attentive to it.

For Kraftl (Blazek and Kraftl, 2015) the constitution of children as subjects happens in schools, which are considered as *dispositifs* (Foucault, 1972). For him, *dispositifs* are heterogeneous sets of discourses, institutions, architectural forms, regulatory

decisions, laws, administrative measures, scientific statements, philosophical, moral and philanthropic propositions. (Foucault, 1980, p. 194)[24]. All these elements involved in schools provide a guideline for action and Kraftl believed these actions are often 'emotionally driven and charged, as are the embodiment acts of advocating, promoting and disseminating policy' (Blazek and Kraftl, 2015, p. 6). Policies directed to children [and young people] *are propelled* by emotions and they *target*[25] emotions. However, at the same time, they are barriers for reasoned judgement. Emotions are instrumental in policy *deliberation* and in relation to media *representation* of emotions; they have a stronger effect on the reception of policies. The *implementation* of policies is an emotional process that invokes emotional responses from those affected, including children and their parents. As stated in Blazek and Kraftl (2015), there is an effort to distance policy from the emotional nature of experiences, dilemmas, and contexts, but it is not possible because these elements are embedded in children's lives. The authors tried to reconnect emotions regarding childhood in policy-making and the development of professional practices. The same movement is going to be made in this study considering emotions as a key component regarding the use of ICT in education.

Blazek and Kraftl (2015) criticized the fact that there is a limited acknowledgement of how emotions tend to influence children's lives. What the authors pointed out is that the referential models oriented towards a modification of children's realities in order to achieve a targeted (emotional) state, rather than to attend to how children actually

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[24] Although Kraftl works with the notion of *dispositifs* and this thesis focuses on assemblages, this thesis has no intention to discuss the differences between dispositive and assemblages. The researcher is aware of these discussions in academia and the implication of these different perspectives. What is considered here are the questions raised by the authors and the critical engagement with the space of schools.
[25] Italics are in the original

feel. The authors believed that emotions are not a problem or a target, but they should be used to pay attention to how such a conceptualization might serve as an anchor for policy and practice. In other words, emotions should be observed as indicators of how policy and practice could happen. Another argument that also reinforces what Kraftl advocated is the fact that he believed emotions shape spaces of professional practice: emotions emerge at the entanglements of the structural organisation of practitioners' work and their embodied experiences with clients. It suggests that the actions of teachers and students in classrooms and how they feel about their actions and about each other's actions are going to affect the way classrooms are shaped. At the same time, students and teachers are going to feel the action of the components of the classroom (and policies, and curriculum, and furniture, and ICT) on their bodies and they will act in relation to what and how they feel.

Kraftl advocated that childhood experiences are understood in terms of meaning-making processes in which children feels not only in terms of emotions but also it is sensed through the body (Blazek and Kraftl, 2015). From this perspective, the experiences of students (children and young people) and teachers (adults) can be identified by the emotions they have and how their bodies react in classrooms. For the authors, it is difficult to disentangle children's emotions from their bodies, including in policy and practice. It is also difficult to disentangle emotion-embodiment from the discursive frames in which childhood are socially constructed. Emotions and embodiments are evident and their manifestations are going to be observed from teachers and students in an attempt to understand how teachers and students feel about using ICT as this could give clues about how they make sense of this use.

This position was justified by Blazek and Kraftl (2015) because they argued that emotional responses and acts of children are embodied as they are articulated in visceral ways, contingent upon their multi-sensory engagements with the world. For them, responses are doubly felt: as expressed as emotions and as embodiment engagements with the space where they are. From this point of view, it is possible to think there will be bodily strategies from student and teachers to avoid or engage with ICT encounters, due to the way they feel about it. But these strategies are going to differ because adults are believed to be more used to managing their own emotions than children are. Because of this, bodies are arranged in particular institutional spaces, with rules and regulations to control children's bodies. It is believed that children are immersed in a process of learning how to be. For the authors, this process is turbulent, unpredictable, entailing long periods of waiting followed by intense bursts of activity that require a high degree of immediate emotional-embodied competency. These facts raise questions about how ICT have affected the bodies of students and teachers in classroom settings.

For Kraftl the conception of childhood affect adults and how adults' emotions play a role in the construction of childhood is key (Kraftl and Blazek, 2015). These two processes are interrelated: adults' emotional dispositions impact on children's lives, by addressing children's own emotions. Paraphrasing Faria (2014), the authors claimed:

> 'there is a strong underlying emotional intensity between adults and children, yet the everyday experiences consist mostly of banal and trivial acts, events and interactions unfolded in the regimes of duties and stereotypical practices, often devoid of emotional content, but through which adults project their

identities and emotions onto children.' (Kraftl and Blazek, 2015, p. 295).

Does it mean that the way teachers feel about ICT affect children's feelings as well? How do children and young people feel about it? Is it the same the other way round? Are emotions from young adults different from children regarding ICT and does it affect differently teachers?

Based on different studies, Kraftl and Blazek (2015) stated that the engagement with children's emotions might be a double-edged sword, as it often results in a view of how children feel is a problem, a challenge to be addressed rather than a reality to be celebrated or at least acknowledge. One deficiency of targeting children's emotions as a problem is the limited recognition of the character and implications of the difference between adults and children, which comes from contrasting experiences of uneven power relationships. There is a mismatch between adults' concerns and children's experiences. It is not only a question of children and adults experiencing or feeling differently but a question of children's emotions being a potential problem not being an element of autonomous agency. In which extent are teachers directing the use of ICT in the classroom based on the students' emotions?

What Kraftl concluded is that children's emotional responses should be in conformity to what adults regard as acceptable and desirable in particular contexts, for example, the school. Children's emotional responses might develop in compliance with adults' ideal notion of subjectivity, even when children are 'made to act' (Kraftl and Blazek, 2015, p. 301) in a particular way. Children's and young people's emotional acts are not just reproductions of adults' interventions, but also autonomous constituents of young people's agency. Thinking about the classroom environment, the question that

comes is: what one (teachers and students) is permitted to feel and act. There are clear articulations of embodiment-emotional experiences in the classroom, and they deserve to be heard, mainly regarding the use of ICT to understand the impact of the use of technology in education.

After discussing the ontological background and the analytical framework of this thesis, the next step is explaining the research design, methodology and data collection techniques in which this thesis was based on.

CHAPTER 3 - RESEARCH DESIGN, METHODOLOGY, DATA COLLECTION TECHNIQUES AND ANALYSIS

3.1 INTRODUCTION

The research design, methodology and data collection techniques which constitute this study were supposed to reflect the ontological and epistemological position of the researcher, considering ICT as an assemblage. However, different types of schools and lessons, in different key stages would have different kinds of ICTs and different ways of using them. In order to have a broad view of the education ICT assemblage, three schools were selected to develop this research. The amount of participating schools was defined according to its type: one Primary, one Secondary and one Post-secondary school. Investigating these types of schools would provide a large amount data with diverse examples of ICT in contrasting ways: subjects, learning purposes, teaching techniques, and curriculum to mention some aspects.

The condition of these schools to be state schools and following the National Curriculum were two other criteria of selection. These schools would also be under the same local authority: Birmingham City Council (BCC). An amount of one hundred schools were randomly selected from BCC website. An e-mail was sent to these schools as a first contact. On this e-mail, the research project was explained and the researcher asked for permission to observe the daily routine of the students in lessons, focusing on the use of ICT. From the schools contacted, only three answered: a 6th-form centre and two Nurseries. One Nursery said they would not allow the observations, but the head teacher agreed in being interviewed. The 6th-form centre dropped their participation when they realised the observations would be

carried daily for the period of a term. They alleged it was 'too much time' for a stranger to be in the school and 'too demanding' to arrange someone to escort the researcher all the time.

According to one Ofsted inspector and one charity member, 'these are difficult times for education in Birmingham'[26]. The researcher was told that it would be very difficult to find schools which would be open for a study to be developed. As the Primary school was defined, it was necessary to change the strategy to approach schools. Two more criteria were added: the Secondary and the 6th-form were supposed to have a good practice of using ICT and this expertise should be recognized by other schools/peers. Instead of making things more difficult, it facilitated the approach to schools. The snowball technique was used, and other schools were contacted via two ways. One way was the indication from the Primary school which accepted to take part in the research. This school was known by its technological reputation in using effectively ICT and was aware of Secondary and Post-secondary schools with the same background. The other way was through the recommendation of some tutors from the Postgraduate Certificate in Education course of the University of Birmingham. They had many contacts in different schools and they were aware of those which could fit into the profile searched. After contacting six more schools, two answered positively to the researcher and arrangements were made. Both were Secondary Schools and 6th-form Centres, being possible for observations to happen on both levels of these schools. One was a school for girls and the other was a school for boys.

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[26] According to the Ofsted inspector it might be due to the Trojan Horse Operation that happened in Birmingham during the year of 2014. This operation referred to an organised attempt by a number of associated individuals to introduce an Islamist ethos into several schools in the city. No further investigation was carried by the researcher to identify if this was the reason or not.

The Primary school is a mixed sex school. It has a similar size to average-sized primary schools. The proportions of pupils with disabilities or special educational needs who are supported through school action are average. The proportion of such pupils supported at school action plus[27] or have a statement of special educational needs is above average. The proportion of pupils supported through the pupil premium is well above average. The proportion of pupils from minority ethnic background is average. Very few speak English as an additional language. According to the last Ofsted report the school is rated 'Good' overall. However, there are no government floor standards setting the minimum expectations for pupils' attainment and progress. The school also provides a school-to-school support for other schools to help them raise the quality of teaching and learning.

The school for girls is a Secondary School and a Sixth Form Centre. It is larger than an average-size secondary school with a sixth form. The majority of students are from minority ethnic heritage, the proportion being four times higher than average, as is the proportion of who speak English as an additional language. The proportions of students with disabilities or special educational needs are slightly higher than average. However, the proportion supported at school action plus or with a statement of special educational needs is below average. The proportion of students supported through the pupil premium and those known to be eligible for free school meals is much higher than average. According to the last Ofsted report the school is rated 'Good' overall and meets the government's floor standards, setting the minimum expectations for students' attainment and progress.

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[27] School Action or School Action Plus is used when there is evidence that a child is not making progress at school and there is a need for action to be taken to meet learning difficulties.

The school for boys is a Secondary School and a Sixth Form Centre. It is smaller than an average-size secondary with a sixth form. Over half of the students are from minority ethnic backgrounds, although there is no student at an early stage of learning English. The proportion of students with disabilities or special educational needs are very low, as is the proportion of students claiming free meals. According to the last Ofsted report the school is 'Outstanding' and meets the government's minimum standards for students' attainment and progress.

The data collection process in schools happened in one year (2015) and each school was investigated for a term. Because of the restriction of time and the difficulty in finding schools interested in joining the research, it was defined that this study would be a multiple case study. Despite these limitations, more than 800 hours of observations were done and very rich data was collected from the lessons witnessed.

3.2 RESEARCH DESIGN – CASE STUDY

The most appropriate research design for this investigation was a case study (Thomas, 2011). This is because the intention of this thesis is to present how education ICT assemblage is composed, based on different uses of ICT, by different people, with different gadgets in different contexts, for teaching and learning. It was not the aim of this thesis to propose determined ideas that could be generalizable. On the contrary, the aim was to offer an in-depth study which could offer other possibilities of critical engagement with a topic that still seem to be analysed by being good or not for educational purposes.

This case study has the purpose of providing insights for teachers, students, policy makers, scholars about their practice, curriculum implementation, teaching

techniques, learning experiences in which ICT is part of. It has also the purpose of being evaluative and explanatory: in order to analyse how ICT has been approached by academia and how it has resonated in schools; use the analytical framework to reflect upon what happened when ICT was used in everyday practices; and what it implies for the components of education ICT assemblage.

Based on these purposes, the most appropriate strategy to make the case of education ICT assemblage according to Thomas (2011) was to 'draw a picture' (p. 91) to better understand how ICT has been used in education in the UK and interpret this picture to answer in-depth questions. However, considering the ontological approach of this investigation and the characteristic of ICT, a single case study would be very limited and would offer specific insights about the gadget used. In order to reflect the ontological approach and to offer a richer range of data, this study is composed of multiple cases (five case studies) which are part of a broader case – the education ICT assemblage. Researching different cases from three different schools enabled the researcher to look at different components in classrooms and the productive forces of these components.

Observing teachers, students, technology and any other thing in the classroom at random might not be enough to identify, describe and analyse the encounters of these components. Researching continuously one group of students and teachers for a period of time would increase the probability of these encounters happening. Moreover, all three schools were used to having education students coming and going as part of their routine. Because of this, the researcher's presence would not represent a significant disruption in any group. It was agreed that the researcher's

timetable would be composed according to the timetable of the group observed in a day. For example, if the researcher would be with Year 9 on Monday, she would follow Year 9's timetable. The next day, she would follow Year 11's timetable. Teachers were informed about the presence of the researcher by the ICT leader of the school via e-mail, endorsed by the head teacher. The e-mail was saying that the researcher would come to observe lessons and ICT in use, but teachers were free to use it or not, as the researcher was interested in everyday uses of ICT. There was no need for special lessons to be planned.

As Thomas (2011, p. 115) explained, the purpose of a case study is to 'gain rich, detailed understanding of the case by examining aspects of it [the focus of the research] in detail'. In case studies there is no aim of generalisation of what is investigated in relation to a broader context. However, studying the education ICT assemblage in three different types of school would allow the researcher to have a broader picture of what has been done in education regarding ICT and have some insights about it. It would also enable the researcher to engage with assemblage theory and contribute to the field of social research.

As the general purpose of this research was to define what ICT was in the British context, its use and its productivity in different Key stages, it was necessary to employ a methodology which could enable the researcher to look at various components at the same time. In other words, it was necessary not only observe the classroom setting but the education in this context as an assemblage. Different components should be taken into account, for example, ICTs, furniture, food, teachers, students and other elements that were part of the classroom observed. The

human components would not be the only ones to be observed. Once thinking about observing classrooms and what happen in this setting, ethnography has been largely used in education as a way of approaching the field.

3.3 METHODOLOGY

3.3.1 TRADITIONAL ETHNOGRAPHY

Ethnography has been largely used in different studies in the educational field. What happens in schools has interested different scholars in social sciences and this methodological approach was borrowed from anthropology with the purpose of allowing deep insights about the field researched. Ethnography is based on the description of the way of life of a group of people (Woods, 1986). It is concerned about:

> 'what people are, how they behave, how they interact together. It aims to uncover their beliefs, values, perspectives, motivations, and how all these things develop or change over time or from situation to situation.' (Woods, 1986, p.04).

For Brewer (2000) to achieve these purposes it is necessary to use:

> 'methods which capture their [people] social meanings and ordinary activities, involving the researcher participating directly in the setting, if not also the activities, in order to collect data in a systematic manner but without meaning being imposed on them externally.' (p. 10)

For the purpose of seeing how people behave and understand why Hammersley and Atkinson (1995) indicated what should be done in ethnography. The first step was that people's behaviour is studied in everyday contexts, not in unnatural or created environments. It enables the researcher to see what usually happens and how people act in the environment observed. The authors alleged that the creation or

simulation of environments would not be the same as researching in the original field. The second step regarded the data collection techniques: many can be used, but the most traditional one is observation. This technique is mainly used because it is considered to be the easiest way to witness what people are doing. This explains the reason to develop the study in different schools: to see what is usually done with ICT. However, this observation according to the traditional ethnographic approach would be focused on the actions of humans only and would restrict the scope of the investigation.

The third step pointed by Hammersley and Atkinson (1995) is regarding data collection. It is usually unstructured based on what happens in the field and not on what the researcher expects to see there. Although the focus of the observation was ICT in use, no direct recommendation was made to teachers to use it. This is because many factors could influence people not to use ICT: the type of lesson, the material needed, the pedagogical purpose, technological faults and many others. Teachers were free to use ICT or not and the researcher would observe the lesson anyway.

The fourth feature was the focus of the observation: it is normally a single setting or a small group. By doing this, it is believed that a richer and deeper description of the environment observed could be provided. Observing many elements at the same time, some elements might not have the same attention as others and this is why it is avoided. However, the researcher would be ignoring facts and may be assuming these things did not happen or influenced what was observed. By looking at a limited number of people, the researcher could be neglecting other things that happened in

the field which was also important. Focusing only on people, other actions that could be determinant for the lesson would be neglected.

The last feature Hammersley and Atkinson (1995) mentioned was that the analysis of the data involves the interpretation and attribution of meanings to the human actions described in the research. It means that after collecting the data, the researcher will interpret it providing some explanation of what happened and the reasons why these things happened. Again, the focus is the human actions which seemed to be insufficient for the current research as its main focus of observations is ICT.

Using ethnography as a methodology would allow the researcher to have contact with the field, witnessing what happens there. It would also provide rich evidence, contributing to the process of understanding what ICT is and what is done with it. However, by adopting a traditional approach, some demands that emerged from the field and some issues from the researcher would not be resolved. The first issue was regarding the amount of time the researcher had to develop the research. According to the time available, it was necessary to collect data for the period of a year. But it is known that the access to schools is not done during twelve months, but ten, including the periods of half-terms and holidays. It means that the period of a calendar year would not be possible to develop the research. The demands from schools should be respected and accepted otherwise the researcher would not find other schools to develop research in the time available. The purpose was also not to cause any disruption and because of this, the maximum time agreed between school and researcher was a term. This amount of time was reasonable because it would be

possible to see sequences of work and projects which would take a longer time and human participants would get used to the daily presence of the researcher.

The purpose of the researcher was not only to describe what happened in the field, to identify the meaning of ICT but critically analyse its use, its implications, the context of use and many other factors which could not be directly related to the lesson observed or the classroom environment. The correlation of other elements which could be considered as 'outsiders' from the classroom observed was part of the analysis and another approach was necessary.

3.3.2 NEW ETHNOGRAPHIC APPROACHES

Different ethnographic approaches have been developed by researchers as a response to dealing with the demands of social sciences and social scientists. According to Brewer (2000) the criticism that emerged led ethnographers to redefine and improve procedural rules, claiming their practice was scientific. It led to the differentiation of positivist, post-positivist and modernist phases of the 'scientific' mode of ethnography. Independently of the position of the ethnographer and how it was called in social sciences, adopting a critical attitude influenced significantly the way ethnography was developed and established contemporary ways of doing it.

Critical ethnography (Thomas, 1993) was developed by ethnographers who were interested not only in describing and analysing the field, but also scrutinizing 'hidden agendas, power centres, and assumptions that inhibit, repress, and constrain' (Thomas, 1993, pp.2-3). The focus of the ethnographer is mainly to ask questions to the field of what it could be and not what it is. For Thomas (1993) critical ethnography is traditional ethnography with a 'political purpose'. From this perspective,

researchers have a mean of invoking social consciousness and societal change, being simultaneously hermeneutic and emancipatory.

According to O'Reilly (2008), feminist ethnography is one variety of critical ethnographic approach. She explained that the purpose of the researcher is to discover 'flaws and faults in society, and to find ways of dealing with these; to reveal their policy implications or suggest (or even take) action to implement change' (O'Reilly, 2008, p. 65). Research based on this view is on issues of dominance and oppression, related to women's lives, advocating that structures of patriarchy, control, and dominance exist as phenomena. With this approach, researchers show how everyday practices contribute to the maintenance of power (Skeggs, 2001). However, contemporary feminist ethnographies not only look at women. They are informed by feminist politics warned O'Reilly (2008), acknowledging that gender cannot be separated from race, class, and sexual identity.

O'Reilly (2008) summarised many contemporary ethnographic approaches and some of them could be insightful and useful for research in education. O'Reilly (2008) distinguishes some approaches as postmodern ethnographies. Researchers who adopt this view abandoned attempts to provide 'objective, ordered, authoritative accounts' (p. 169). Postmodern ethnographers believed that no single account of any reality is of any more value than any other and because of this there is no ethnographic account that can claim to 'be more trustworthy, reliable, or representative than a story or tale anyone else might create' (O'Reilly, 2008; citing Spencer, 1989). For Harmmersley and Atkinson (1995) there has been an attempt to create ethnographies that reflect the complex, ambiguous, messy nature of the social

world and the traditional way of doing ethnography is not able to deal with these elements. A way of illustrating these characteristics pointed by O'Reilly (2008) is the introduction of different devices into the account, for example, dance, poetry, film, autobiography, and audience participant. Travers (2001) suggested four experimental ways of doing ethnography: dialogic ethnography, polyphonic accounts, auto-ethnography, and performance.

Dialogic ethnography is characterized by a dialogue between the researcher and the researched in which there is an honest reflection of the difficulties of interpreting another person's world. The dialogic nature of research is evidenced by the involved, subjective and emotional nature of ethnography itself (O'Reilly, 2008). This approach implies the conversation of two or more people: in other words, this way of researching considers only human participants. In the case of this research, in which different technological gadgets are regarded as components of the education ICT assemblage, it would not be possible to be developed, as no linguistic interaction would happen between researcher and computers.

By using Polyphonic accounts diverse passages of different types of data are pieced together. Paraphrases are used in an attempt to develop theory. For O'Reilly (2008) the theory developed is so abstract that sometimes no coherent story is told. Although the aim is not to privilege one voice over another, the result could become too abstract and even impose the 'narrator's view' of the field when editing. The decision of data selection, presentation and editing is part of the job of any ethnographer, independently of his/her approach. It means that displaying the data collected is already a way of stating the researcher's interpretation of the topic

investigated. It suggests that the researcher which opts for an ethnographic approach is not going to be immune to this kind of criticism regarding his/her interpretation of the studied field.

The researcher presents personal accounts on his/her own experiences in an autoethnography. Sometimes it is done alongside others' experiences with the purpose of conveying their experiential understanding of a phenomenon (O'Reilly, 2008). The acknowledgement of an intimate relationship researcher and researched is provided, using the self as the only data source. Although life stories can be used to illuminate sociological themes and illustrate discourses in a self-reflexive manner, it is only one voice presented amongst many others which could have been ignored, silenced or neglected in this process. The question that remains is in which extent the multiplicity and complexity of the field would be depicted by using a limited number of sources.

O'Reilly (2008) stated that there are a variety of ways in which ethnography can be presented. These ways include all sorts of performances including poetry and dance. The author gave the example of Travers (1997) who described a poem in an attempt to 'break away from social sciences rhetoric' (p. 172). Although the researcher was interested in the actions of the components of the assemblage, this was not the case of using this kind of ethnography.

Another type of ethnographic approach that could be used is insider ethnography. It has been adopted by researchers who are already in the field as O'Reilly (2008) stated. However, there has been criticism about this attitude as the researcher could be 'too familiar' with the setting. It has been seen as biased and with political aims,

whereas an outsider could provide a more 'scientific' description and it would be more likely to 'question what others see as familiar' (O'Reilly, 2008, p. 112). One benefit of being an outsider is that the possibility of being told something is higher if compared to an insider mentioned O'Reilly (2008). The author also said that some questions are also easier to be asked for the sake of 'understanding what is happening' when the researcher is an outsider. In order to develop this type of study, the researcher was supposed to work in the schools in which the investigation took place. Due to visa restrictions and time limitations, the possibility of becoming an insider was disregarded.

Visual ethnography (Pink, 2001) uses visual resources as tools to help understand the field. Pictures, images, and photographs (digital or not) have been enabling the focus on emotional and artistic elements in the field, explained O'Reilly (2008). For her, digital media has also provided different ways of representing the world, not only focusing on text or words anymore. Visual representation has also allowed the criticism of images as anything can be merged, cropped, altered and enhanced, and montages can be created. This approach opens the possibility of images to be considered as elements to be observed in the field work, amplifying the focus of the researcher, which is usually in humans. However, this approach was not enough to deal with other components of the classroom assemblage, for example, the policies related to the use of ICT in education. For this reason, this view was not appropriate for this research, but the fact that visual resources could bring into the study some helpful insights would not be ignored.

Part of the data collected for this study was from the internet. One way of 'observing' this data would be by developing virtual ethnography (Hine, 2000; 2015). This approach considers the internet as a field site. Against the traditional ethnography in which is based on a physical and geographical location, it does not have a single or a specified site. It means that the researcher would pursue the 'journeys of discourses, ideas, and texts as much as people and things' on the internet (O'Reilly, 2008, p. 147). On one hand, documents, websites, virtual communities, e-mails could be used as source and data. On the other hand, these types of data raise the criticism of in which extent the information given and identity assumed by participants are real or not. However, what is the guarantee of talking to a person in an interview in a physical place would imply he/she is telling lies or not? Or by being observed in a geographical location, a person would pretend or fake his/her actions just because of the researcher's presence? Information from news, communities, blogs, and documents which are available on the internet as well as the interaction of people in social networks was valuable for this study, but not the only source of data to be collected. Searching on the internet would be necessary, but not enough to achieve the purposes of this research.

Because of the concept of internet and the idea of not having a specific location or site in which the research would take place, multi-sited ethnography and mobile ethnography emerged. According to O'Reilly (2008), these approaches pursue links, relationships, and connections, following unpredictable trajectories, and tracing cultural formations. These facts could be explained with a different idea of place or space, being described beyond borders, illustrated the author. For Maria (2002) these approaches invoke a sense of voyage, where the ethnographer traces clues by

travelling spatially, temporally, virtually, or bodily along different pathways. Marcus (1995) advocated that multi-sited ethnography examines the circulation of cultural meanings, objects, and identities in diffuse time-space. By adopting a multi-sited or mobile ethnography it would be possible to pursue cultural artifacts, stories, ideas or people through networks of global capital, across time and/or space, explained O'Reilly (2008).

These two previous approaches seemed to be more closely related to the purpose of this research as not only humans would be considered, but also discourses, ideas, and things. However, their focus is on the circulation of things in time and space, with the expansion of its boundaries. This research is interested in the components that are part of the education ICT assemblage coming from the inside of a physical place (the classroom) and from outside of it (Virtual Learning Environments or internet forums, for example). Rather than identifying the components and tracing their mobility through networks, this study is also interested in the productive forces of these components. What happens when these components are together? What is produced by these encounters? These are questions which this research aims to answer and these two last ethnographic approaches were not enough to answer.

3.3.3 ASSEMBLAGE ETHNOGRAPHY

For this investigation, it was necessary to find an approach that enabled the researcher to observe the components of the field, their actions, what happens when they interact, the result of these interactions and consequences. Not only human components (teachers, students, parents, head teachers, app developers, and many others) would be observed but also the practices related to them, their feelings, the

pedagogy related to lessons involving ICT and Computing, the influence of policy making and policy implementation, the classroom and the school arrangements, curriculum, architecture, furniture, food and any other things that would be related to and would be in the education ICT assemblage.

According to Youdell (2015), the concept of assemblage offers a framework for investigating the complexity of social formations. For her, by using this idea, a whole range of orders, domains, and substantive concerns could be taken into account when mapping education:

> 'movements and productive interplays between a range of components that include money, political orientations, media and popular climates, policy and legislation, institutional arrangements, formal and informal knowledges, subjectivities, pedagogies, everyday practices and feelings.' (Youdell, 2015, p. 03)

By adopting assemblage as an ethnographic approach, it allows the researcher to recognize all these elements as part of the education ICT assemblage being possible to analyse their interconnectedness and potentialities resulting in different productivities from these components. As proposed by Youdell (2015), the point of using assemblage ethnography is to understand the productive forces of 'ever-shifting, complex, social formations' and this is what makes the adoption of this approach challenging. The fact that an assemblage is mobile, with trajectories that cannot be anticipated, means that this methodological approach is supposed to have the same strategy: be open to different research components, be flexible to move along the assemblage in order to map its components, movements and productive forces, and be attentive and receptive to the unexpected things that could happen during the field work to adapt to them.

Assemblage has been used as a framework for different research in social sciences, particularly in education - for more information see Allan (2008); Blaise (2013); Hickey-Moody (2009); Leahy (2009); McGimpsey (2013); Ringrose (2011); Tamboukou (2008; 2010); Webb (2009); Youdell (2011). What assemblage ethnography does differently, according to Youdell (2015) is using the assemblage as a point of departure. In this case, a rhizomatic, multidirectional and never-ending view of the ICT should be taken, which leads to the first challenge in adopting this approach: delimiting the boundaries of the assemblage. The risk of being led by networks of flows and trajectories of productive forces to the outside of the assemblage was imminent. As a way to avoid it, the researcher needed to be very attentive to identify in which extent some components, affects, feelings and productive forces were part of the education ICT assemblage.

Another problem pointed by Youdell and McGimpsey (2015) about assemblage ethnography is the difficulty in representing an assemblage. A study which uses assemblage as a framework is supposed to indicate the components of the whole in a machinic production (Deleuze and Guattari, 1984) in which independent parts are in a relationship with other parts of the whole. These parts are 'not fixed in their purpose or singular in their connections and productive potential, but variables in the actualisation of productive possibility in multiple and temporally non-linear relations' (Youdell and McGimpsey, 2015, p. 119). The authors also advise avoiding lists; to avoid the idea of components as separate, static elements arranged to collectively produce a whole formation. The authors stressed that the emphasis should be on the analysis of movements, flows and productive relationships and the multiple significances, potentialities, and realisations. They also suggested that assemblage is

an on-going movement, in which the movements of disassembly and reassembly are also possible. It means that the education ICT assemblage can be disarranged and rearranged while being observed in the data collection process.

The field was not restricted to the classroom but encompassed a broader and multiple environment. It was crucial to expand the range of observations implying different ways of collecting data from these environments. Assemblage ethnography allowed the development of different types of observations: observation of the classroom, observation of tweets sent, observation of professional conferences, observation of information provided by media, observation of policy making, observation of an Ofsted report. The purpose of observing these components is not to 'look' to what they are, but to the productive forces they have in the assemblage in which they are. However, for the purpose of developing these observations, other data collection methods were fundamental. As Youdell and McGimpsey (2015) advocated, this methodology requires the researcher to move, the methodology itself to move, using creatively a range of quantitative and qualitative methods to account for the details of assemblage components, the nuances of their productive relations and far-reaching assemblages produced.

3.3.3.1 DATA COLLECTION TECHNIQUES

In order to investigate the education ICT assemblage and its productive forces, it was necessary to observe the field with multiple approaches. The starting point of the observations was the classroom, so the main observations took place during different lessons in the three participant schools. From these observations, the researcher was attentive to the components' actions that were present in the setting. Even the

elements that were not physically there were noticed. For example, the Ofsted report/inspection that was guiding the practice of teachers or the new National Curriculum that oriented the tasks students were performing.

From what was observed in different classrooms, it was inferred that other techniques of data collection were necessary to map the productive forces of the components of the education ICT assemblage. In order to achieve this, it was necessary to: talk to teachers, to students, to ICT leaders, to technology experts, to app developers, to Ofsted inspectors; read and evaluate documents related to policies and policy making, not only regarding the change in the curriculum, but in relation to schooling and ICT in general; look at what was published on media would be interesting to identify what had been said about education in Birmingham; attend events such as seminars, study groups and teacher's communities to understand what had been discussed in the field and the relationships established; track social media as tweet exchanges and hashtags to identify the trends that had been circulating on the internet. Performing all these activities would enable the researcher to map the components, their mobility, their affects and emotions, discourses, subjectivities and their productive forces. I would also enable the researcher to consider unexpected components to be identified as part of the assemblage which would not usually be.

Some conventional data collection methods were chosen because they seemed to be the most appropriate in relation to the field and to the task. The criteria in selecting these methods were the tradition in their use in ethnographic research and how accessible they were for the researcher to perform them. The conventional methods

were: observations, field work notes, documents, and interviews. Nevertheless, due to the characteristics of the field, additional methods were necessary: researcher reflective diary, mind map, and a virtual tracking, composed by different searches on search engines, social media, websites, blogs and news media.

In this study, observations are characterized by two different levels: on a micro scale and on a macro scale. On a micro scale, observations happened in classrooms from Primary, Secondary and Post-secondary education. Each type of school was observed for the time range of a school term, starting in January 2015 and ending in December 2015. The researcher attended different lessons, from different subjects in different groups, from Reception to Year 13. The timetable the researcher followed was provided by each school. It was an agreement between schools and researcher in an attempt to minimize disruption and to not affect negatively students' outcomes in exams.

The observations were annotated in a digital word processing file. The researcher brought a tablet in which what was observed during field work was described. The researcher tried to be the most descriptive as possible providing details of what was seen, keeping the questions raised from what was witnessed to be annotated in a separated word processing file – a reflective diary. After typing what happened during the observations, the researcher opened a different file in which different queries, feelings, and reflections were written. According to Brewer (2000), this separation is not possible as the act of describing the field is not only description. It is an act of interpretation in which the researcher uses his/her experience to describe the world which he/she is observing. The use of two different diaries was not an attempt to try

to separate what was objective to what was subjective. On the contrary, the reflective diary was a place in which the researcher was able to freely write about the emotions that emerged in the field, think about and critically make queries about what was witnessed in the field and by doing that, interesting insights about what was seen (even if it was seen or not) were possible to happen.

The purpose of using these two different diaries was to annotate what happened during lessons. It made it possible to annotate what was said by participants. It was also possible to make inferences about the emotions of participants based on their actions. These tools also made data available for further consultation in a different period of time. By doing this, the researcher could reflect on what happened and make inferences about what felt and the subjectivation process of students and teachers.

Based on what was observed in classrooms, human participants were interviewed. In order to collect data regarding what happened in classrooms, teachers, head teachers, ICT leaders, teacher assistants, students, were interviewed. As there were other people not physically present in these lessons, but directly implicated on them, other people were interviewed in order to have a macro picture of the education ICT assemblage: researchers, academics, developers[28], sellers[29], examining boards experts, ICT consultants, parents, charity staff, communities representatives, Ofsted inspectors. A total of 56 people were invited to participate and 35 agreed. Some people were not interested or thought they would not be able to help in the research, for example, the news media representative. Others, such as parents from the Primary Schools, opted for not having their children interviewed. A semi-structure

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[28] Hardware and software
[29] School material as furniture, for example.

schedule composed of 15 basic questions was asked to all participants. Depending on the role of the participant, some questions or themes were added, for example, for ICT leaders, questions about the specificity of their role and Computational Thinking were asked. Some interviews happened via video call, due to limitations of time and availability of the interviewees.

The purpose of interviewing participants was to have further data regarding each participant's opinion about ICT. From their point of view, it would be possible to obtain the linguistic evidence about the discourses which were circulating about ICT. It enabled the researcher to ask questions about how people feel when using ICT and how this use influences who they are if they are aware of that.

On a macro scale, the education ICT assemblage was observed for the period of two years – September 2014 to September 2016. This observation considered other components which were (supposed to be) related to classrooms to be observed: documents, news, websites, hashtags, forum discussions, social network posts, and interactions. In order to collect all these data, a virtual tracking was performed.

A list of 112 documents was collected with the purpose of contextualizing the field. These documents were reports, policy papers, studies, laws, speeches, statistics analysis, surveys, summaries, census analysis, frameworks, policy briefs, videos, manifestos, acts, National Curriculum, and strategic plans, all from the years of 2005 to 2016. These documents come from reliable sources as Unesco, Department for Education in the UK, Office for National Statistics, Organization for Economic Co-operation and Development (OECD), and the Office for Standards in Education (Ofsted), for example.

The documentary analysis also was useful to identify linguistic evidence of the discourses about the use of ICT in education: expectations, orientations, examples of good and bad practices and consequences of its use. The choice of pictures, language (adjectives, verbs) in texts would indicate how discourse has been built regarding its use in education.

Search engines were used to identify what digital media had been broadcasting about education in the region in which the research took place. News from the period of 2014 to 2016 were collected for the researcher to be informed about what had been said about education. On the internet, tweets were tracked under specific hashtags (#ict; #ictinuk; #ictinedu; #edtech#; #computing; #technology) in an attempt to try to identify the trends discussed or talked about in social media. Some community fora and expert websites/blogs were accessed for the same purpose.

The purpose of tracking news and social media was to identify the flow of dynamic elements on the internet. As publishing and posting are immediate it could provide clues about how people were feeling about specific topics, why these topics were more important than other and raise questions why other topics were not important. It could also provide linguistic evidence about how participants were feeling about specific issues and how these issues influenced how they saw themselves.

One last resource was used to map the direction and connections among all these amounts of sources and data: a mind map. The tool chosen to organise this information was CMaptools[30]. This choice was based on the availability on the internet and because the researcher was already familiarized with it. Every new

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[30] Available from: http://cmap.ihmc.us/ [Accessed 15 January 2015]

connection or link among components and data were added to the map, linking different components.

The purpose of using the CMaptools was to map the researcher's pathway and show a broad picture of the assemblage. It was not the intention to have a fixed and delimited view of the education ICT assemblage. The idea was to have a dynamic and ongoing map which could be constructed while doing the research. This map would illustrate different routes and alternative pathways the researcher could go. It could also show unlikely connections between components of the assemblage, illustrating the complexity and multiplicity of the whole. It would also raise questions about the relationship between discourse, emotions, affects and identities from a broad perspective.

3.4 PROCEDURES OF DATA ANALYSIS

As there were different types of sources, resulting in different types of data, they had to be prepared to be inserted in NVivo. All interviews were transcribed in a text file. The diaries, documents, news and tweets were already in the text format and because of this, they need no preparation. All data were anonymised and then inserted in NVivo.

In order to be familiarised with the data, the researcher had a first round of reading in order to identify emerging themes from data. These themes were used to orient the researcher in three elements: identifying recurring ideas and interesting stories that could inform the ethnographic accounts and the policy review presented in the introduction; establishing the concepts that would be the basis of the literature review.

From these themes, five ethnographic accounts were selected to represent the diversity of the field work, the multiplicity and complexity of the education ICT assemblage. With this in mind the criteria of selection were: the account should have at least one ICT component as part of the lesson; if a gadget, it could be in use or not, but it was supposed to be present physically or discursively; at least one theory or theoretical point should be related to the ICT identified in the lesson; each account should have a different ICT component and practice; the practice and the ICT component and should be part of the routine of the school.

From these accounts, another round of reading was done. The purpose of this round of reading was to code the ethnographic accounts based on the analytical framework. The five accounts were first coded in four elements: discourse, emotions, affects, and subjectivities. The aim of coding all accounts based on the analytical framework was to identify if all had these four elements and validate them. As the accounts had the four items, all the data were then coded using the same four coding elements in the third round of reading. The fourth round of reading was done to validate the four analytical elements. The coding results were read to identify if all data had these elements. Data that did not have these elements were not used as a secondary source.

The ethnographic accounts were used as primary data. From what happened in those lessons documents, interviews, news and tweets were used to inform the accounts. Each coding element (discourse, emotions and affects, and subjectivities) were used as sections in the analysis. One more section was added to introduce the results of the analysis. This section had the purpose of reviewing the literature related

to each ICT topic discussed in academia. This section was needed as this kind of review had not been done in the introductory sections of this thesis.

3.5 ETHICS

Before conducting the data collection and data analysis of this study, it had the approval of the Ethical Review Committee of the University of Birmingham. Forms were filled in which the project was explained with samples of the presentation letters, consent forms and the semi-structured interview questionnaires[31]. After being analysed, the project got the approval for the research to be conducted. The University of Birmingham Ethics Review Process is based on the British Educational Research Association (2011) ethical guidelines. The purpose of this process is to ensure that no risk or harm was going to happen neither to researcher nor to participants.

During the elaboration of the project, the researcher reflected on the issues that could happen during the study and every effort was made to minimise and to avoid them. The first thing that was elaborated by the researcher was a letter detailing the study. This letter introduced the researcher, explained the purpose and background of the study, the procedures, the extent of confidentiality, the contact details of the researcher and her supervisor, and the deadline for withdrawing the study. Although participants have the right to withdraw the study, the Ethics Committee of the University of Birmingham asks for researchers to have a deadline in order to minimise conflicts. This is because once the study is finished and/or published it would not be possible for the participant to withdraw and claim for his/her/their data

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[31] See Appendices for samples.

not to be used.

From this letter, two types of informed consents were elaborated based on the type of recruitment: schools and interviewees. When recruiting schools, this letter also described the researcher's intentions and expectations in the site. When recruiting interviewees, the letter explained why listening to his/her point of view was important. Before the acceptance of participants in taking part of the study, the researcher checked once more if they had understood the research, their role, their importance in participating and their right to withdraw the study.

When the school accepted to participate, another informed consent letter was sent to staff by e-mail, with the head teacher's consent. The purpose of this letter was to explain to staff the study and what the observations involved. Both letters were sent via e-mail. As the observations timetable was elaborated by the ICT leaders the researcher also brought hard copies of the letters and consent forms. Before starting each lesson, the researcher approached every teacher, asked if he/she was aware of the reason why she was there and reinforced they had they right to not accept her presence and withdraw from the study. According to the ICT leaders, the researcher timetable was elaborated based on the teachers' consent. They alleged that they believed that teachers consented because they did not have any reply manifesting any issue. Independently of what was claimed by the ICT leaders, the researcher carefully approached teachers asking once more for their permission.

Another issue the researcher had to deal with was the consent of children, young people and parents. As the main type of data collection was observations, the head teachers suggested that it was not necessary to send the consent forms to parents at

first. This was because the main focus of the observations was the ICT and not the students. It was also agreed that no photos or videos would be made to protect the students' identity. This way of dealing with children and young people as participants may not be considered appropriate. However, as the head teachers from the Secondary and Post-secondary schools claimed, since the composition of each year group changed from subject to subject, it would be very difficult to send, control and trace back the informed consents from students to parents for then starting the observations. Waiting for all parents to give the consent would not be practical, making the research not possible to happen. As the head teachers analysed that no harm would be done to students, they would be responsible for the study to happen.

The consent from children, young people and parents/guardians were obtained in the second phase of the research: when the interviews happened. Some students and parents/guardians were randomly selected by the ICT leaders to be interviewed. When the participants were parents/guardians, they were contacted via school. The interviews were arranged by the ICT leader to happen on the school site and a copy of the letter and consent was sent by e-mail. On the day of the interview, the researcher brought a hard copy of the letter and consent for the interviewee to sign. Before the interview, the researcher explained the study one more time, why their opinion was important and their right to withdraw the study.

Students were interviewed after obtaining parents/guardians' consent. Despite this type of consent, students were also asked if they wanted to be part of the research: the study was explained again and it was reinforced that they had the right to withdraw, even with their parents/guardians agreeing with their participation. The

students' interviews also took place at the school site in the presence of a teacher or the ICT leader. There was no problem during this process, except for the Primary School. Parents/guardians did not feel comfortable in having their kids talking to the researcher and they did not let their children take part in the interview. However, they did not demonstrate any concern regarding the observations.

All data collected were anonymised to protect the participants and schools identities. Although schools can be traced by their profile and by the fact that they were recruited via snowball technique, every effort was made to protect their data. Students and teachers were not given names and were treated as any other component of the assemblage. Pseudonyms were only used when the role and subjectivity of one or more participants were relevant for the case study. All participants received a copy of the letter and consent form. During interviews, written and verbal consent was obtained. It was also explained for interviewees they did not need to answer all questions, leave them with no answer. They were also assured they could interrupt the interview at any point and withdraw the study for no reason until the deadline provided in the letters and consent forms.

CHAPTER 4 – ANALYSIS

4.1 INTRODUCTION

This chapter of the thesis refers to the analysis of the data collected. Based on what was observed in Primary, Secondary and Post-secondary schools, five ethnographic accounts were presented to provide an overview of what was witnessed in classrooms. Each account focuses on different schooling levels, implying different curriculum, curriculum areas, practices, ages, places (schools) and locations (classrooms, labs) inside schools, relationships and emotions. It was not the intention of the researcher to have a complete view of the schooling process with these accounts. Trying to cover the field and presenting as if it was complete would be against the ontology in which this thesis is grounded. The intention of the researcher was to offer to the reader a variety of meanings of ICT and their uses. All these meanings are different, but they all composed the education ICT assemblage. Those meanings and uses had productive forces and they affected how each classroom setting was formed and what happened there, influencing emotions of teachers and students and their subjectivation process.

Each account is analysed according to Selwyn (2013; 2015a; 2015b) regarding discourse, Kraftl (Kraftl and Adey, 2008; Blazek and Kraftl, 2015; Kraftl and Blazek, 2015) regarding emotions and affects, and Youdell (2011) regarding subjects and subjectivation. These three approaches provided a framework in which this section is based on. The strategy used to analyse each piece was:

- Identifying and discussing what is said about ICT.

It would allow the researcher to have clues about the discourses that were circulating in the settings observed. By identifying what was said, who or what said that would provide keys to establish some of the discursive components of that account and how the relationships between components and their actions were shaped by these discourses. A list of discursive components will be provided based on each account. These discursive components (DC) will be analysed in relation to their meanings and implications to the setting and their consequences.

- Identifying and discussing what was felt due to ICT use or its presence.

It would provide some insights about how ICT was experienced by human components. By identifying the emotions felt by humans, it would be possible to establish their influence in the arrangement of the ICT schooling assemblage – socially, physically, its boundaries – and also the other way round, how emotions were evoked from these compositions. In order to do that, it is going to be analysed the effect of things on human components, their bodily reactions, and emotions that emerged from these actions and interactions. With this in mind, a list of components will be presented based on what each component did in each account. From this list, affects and emotions will be examined and discussed in relation to the actions and reactions they caused and they were the cause.

- Identifying and discussing the constitution of identity of human components.

It would enable the researcher to determine which actions were expected to be performed by teachers only and students only, the influence of these actions in the constitution of the identity of teachers and students. Different categories and subcategories related to what was considered to be a teacher and a student will be

examined and the relationship between them. Their influence on their actions and reactions will also be explored, focusing on what they were supposed to do in order to be recognized as teachers and students.

As discourse, subjectivation, emotions and affects are intertwined their actions upon each other are going to be discussed. Their effects on the trajectories of the education ICT assemblage will also be discussed. In addition, other components from each account, their actions, what these actions caused to happen, the affects and emotions that emerged from them are going to be identified and analysed. The implications of these actions, affects and emotions are also going to be discussed in relation to the education ICT assemblage.

With this in mind, three strategic moves were done. The first one was providing a brief literature review of the most noted technological tool(s) present and/or used in each account. The aim of doing this was to demonstrate what has been researched and said in academia about these tools. Some ICT gadgets were used in more than one account. In order to avoid repetition, each account focused on some gadgets instead of others. For example, Virtual Learning Environment might appear in more than one account and just once it was chosen to be analysed in the literature. The second strategy was coding each account in an attempt to find recurrent themes regarding: discourse, emotions and affects, and identity constitution. These themes were compared to other types of data collected during the field work, for example, interviews and documents.

Because of the amount and variety of data, some events from the fieldwork were selected to form each case. They were represented by ethnographic accounts based

on different criteria. These criteria were: the type of ICT gadget in use and/or present in the lesson (e.g. mobile phones, tablets); the theoretical perspective related to ICT (e.g. mobile learning, learning spaces); type of activity (e.g. discussion, correction, and revision); school year; school subject; item from curriculum. The intention of the researcher was to present to the reader a broad perspective of different contexts.

After performing these analytical actions, data was presented in the following way:

After each account, the first section of analysis is a table of components. Its purpose is to highlight to the reader which actions were performed in the account, beyond the physical action performed by people. Based on these actions and on these components, the account was examined and discussed under three perspectives that composed the analytical framework of this study. The second section of the analysis regards discourse as a component and is divided into two subsections. The first subsection refers to what was said in academia in relation to the ICT topic observed. The second subsection refers to what was said in the account by the components of the setting. The purpose of introducing academia here was to offer a brief literature review of the specific ICT topic observed in the particular account. The third section of the analysis refers to the flows of affects of components and the emotions identified in the accounts. The fourth section of the analysis discusses the identity constitution and the subjectivation process of teachers and students in the accounts provided.

4.2 CASE 1 – MOBILE HISTORY

Case study one took place in the Post-Secondary school. The school subject was History and students were part of Year 13 group. They were having classes in the

History room, located in the main building of the school, in which the Secondary School have classes.

"I was going to the 6th-form centre building to observe the second period after lunch. It was located outside of the main building. It was necessary to cross the hall, leave the building and walk over the extensive patio where the boys used to play football during lunch. I was quickly entering the room when two students arrived with me. Nobody was there. Because of the expression on their faces, they were as surprised as I was. Then, one of the boys realised that the History class would probably be in Miss Mills' room, in the main building. I asked if I could walk along with them as I did not know where it was and they agreed. We walked fast and there was no time for awkward silence between us. They knew me: I was the lady who was there to see them use technology.

When we arrived at Miss Mills' room she greeted me with a smile. Most of the Year 12 was already there. She apologised for the inconvenience of not having the classes in the 6th-form building. She said that today they were going to use tablets for research and it was really difficult for her to transport the tablets' case. I said that there was no problem with that, smiled back and went to the back of the room. Two more breathless students arrived after me. Miss started the class talking about the field trip they would have to Auschwitz during the next half-term. While she was explaining how things would work I started thinking about her carrying that massive tablet's case.

She was a short lady. She was probably around her 50s. With her short red hair and her reading glasses held with a leather neck strap cord, she reminded me of those

lovely ladies we expect to find in museums or libraries. She spoke with a low soft voice as if she was lullabying a baby. I felt comforted, even with the talk of such a disturbing topic. Then, I imagined that lovely lady, who could be my aunt, carrying that gigantic case of tablets. The case had space for 25 iPads. There was also a charger in which the iPads were connected when they were not in use. I had no idea of how heavy it was. What I knew was that I was not able to carry that thing and unless that lovely lady had super powers she would not be able to manage that either. The case had a trolley, but it was not enough to move along with 'that thing' around the building. Miss Mills' room was on the first floor of the school. The building was too old to have an accessible ramp and of course, it did not have a lift. She was supposed to take 'that thing' up and down for at least two floors of stairs. She could have asked someone to carry 'that thing' but it would be her responsibility and someone else's if something happened to 'it'. It was safer to have 'that thing' in her room.

Students stood up to help themselves to the tablets in the case. When I was lost in my thoughts she explained the task: in pairs, students would search for something on the internet. Today they would need only to collect information. There was no need for presentation. She gave them small papers with some instructions because each pair was going to look for something different. She said they could copy the information on sheets of paper or print it via the iPad if they knew how to do it. She also said they were allowed to help each other and even come up with alternative ways of registering information. She showed where to find extra material in her room: highlighters, markers, cartons and white sheets of paper. They could use anything they wanted.

One student got an iPad and pretended it was a pillow. 'It is so warm' he said whilst laying his head on the back of the iPad. Half of the class changed the way they were sitting after picking the iPads. Students crossed their legs in an informal way, not placing the iPads on the table, but on their laps. They seemed to be more relaxed. Perhaps it was because of the way the screen reflected the lights. I saw some students looking up and trying to adjust the position of the tablet in a way there was no reflection on the screen.

The teacher started walking around the room to check how the work was progressing. No student asked for help to find information. Some were copying the information on white sheets of paper, others were making notes on colourful cardboard. The teacher offered help and a few students answered they were fine. She stopped by a group at the back of the room and asked what they were doing. One student explained he was copying and pasting the information on a file in Google docs. He and his peer were doing the activity at the same time independently, looking for different sources, and when they found something interesting, they were copying, pasting and editing the same shared file. 'That is brilliant!' said the lovely lady with a smile. She went back to her table and started doing something on her papers. She seemed to be marking some activities.

At the other side of the room, one student at the front asked how those students at the back were doing that. The other student said they would need a Google account, log in and upload a file in Google Drive, then they could share the document. The student who asked seemed to be upset and frowned. He said he did not have a Google account. All students who had stopped to listen returned to their tasks. Some

continued copying on papers, other copied and paste in a Word processing file and another said he was going to send himself the information via e-mail. Some seemed to like this idea: they nodded and smiled indicating they would do the same.

Most of the students were talking while doing the activity. There was a pair at the front doing something suspicious. They were trying to hide their tablets, with a tricky smile on their faces, as if they were plotting something. A student at the centre of the room seemed to have activated 'Siri' because of the sound the iPad made. Miss listened to it, looked at the boys and said 'oops' with a lovely smile. Then, she continued with her papers. The boys looked at each other, left Siri to the side, and continued searching. One student of this group at the centre got his mobile and started looking at something. The other three boys who were near him got their phones as well. They were looking for something independently, but they were comparing something. I was wondering if they were still searching for the information the teacher asked them. Then, based on what the group started discussing, they were trying to make a Google account and download Google Drive to the tablets. The student beside me told them, 'you need to have an Itunes account as well'. Then, the group at the centre complained, huffed and put their mobiles back in their backpacks. They went back to their iPads, pens, and papers. Their enthusiasm disappeared.

Another boy at the centre started taking funny pictures with the iPad. He was making faces, taking the pictures and showing to his friends, who were laughing. Miss raised her head again and asked 'What are you doing?' with an impish smile, indicating she knew exactly what they were doing. Another boy from the group smiled back, looked at his feet and answered 'Sorry, Miss'. Then, they returned to their tasks. One

student at the back asked Miss if the task was to be finished on that day. She said

there was no need, as they would talk about it in the following day. Students seemed

to be a little bit more relaxed and they raised their voices a little while talking.

The teacher stood up and walked around the room to check how far they had gone.

She announced they would have 30 more minutes to finish the task, next class. Then

she went back to her papers. It was the last class of the day because on Thursdays

Year 12 did not have the last period. It was five minutes to the end of the lesson and

some students started playing on the iPad. The bell rang and the teacher announced

'wrap it up'. The students turned the iPads off and some collected them carefully to

put them back in the case."

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From this account, some elements were identified as components due to the actions they performed. As Bennett (2010) stated, some components in an assemblage might be more vibrant than others and this vibration and their actions were what made them be noticed by the researcher. They were presented according to the order of appearance in the account.

Table 1: Components and their actions in case study 1 – Mobile History

Components	Actions
6th-form building	Concentrated most of the lessons of the 6th-form students
Main building	Concentrated the majority of students of the school, including the 6th-form
History	Oriented the topic of the lesson to be taught

Miss Mills' room	Determined where the lesson was going to happen
Researcher	Observed the lesson
Miss Mills	Explained the Auschwitz trip
	Planned the lesson
	Apologised
	Explained and guided the task
	Offered help
	Pointed out disruptive actions and moments
	Praised students
	Paid attention on her papers
Students	Paid attention
	Talked
	Collaborate
	Helped each other
	Explained different ways of dealing with information
	Researched
	Recorded information
	Used Siri
	Took pictures
	Laughed
	Played
	Used their mobiles
iPads	Acted as pillow
	Acted as a camera

	Enabled Siri
	Enabled the access to different information to students
Tablets' case	Stored the iPads
	Recharged the iPads
	Did not allow the teacher to move around with the tablets and teach at the 6th form centre
Task/research	Guided which History topic students were supposed to know
School Material	Enabled students to record the information they were searching in a more conventional way
Google Account/Drive/Docs	Allowed students to store and share the information they were researching
Google Search Engine	Allowed students to look for the information they needed
Teacher's papers	Made the teacher busy while students were performing their tasks
E-mail	Allowed students to copy and paste the information they were researching and receive it
Siri	Signposted students were not doing the task
Mobiles	Tried to help students in doing a Google Account to share their files
Itunes account	Un/Enabled students to download apps to the tablets
Camera	Took pictures of students
	Disrupted students' tasks
Pictures	Stored funny poses of students

	Disrupted students' tasks
Conversation	Indicated that students were relaxed and they were in a more informal environment.
Timetable	Guided what students were supposed to be and study during the day Informed they had no more classes after History class.

Based on what these components did in the account, it was observed what was said or implied by them and by their acts. This is what is going to be provided in the next section.

4.2.1 WHAT WAS SAID…

In this section, it is going to be presented what has been said about the ICT topics in the account. The ICT topic chosen to be discussed is mobile learning. A brief literature review will show the up to date research regarding this topic. After, the discursive components of the account will be presented as statements and then discussed in relation to their meaning to what happened in the account.

4.2.1.1 … BY ACADEMIA: MOBILE LEARNING

According to Wu et al. (2012), mobile learning has been one of the key current trends of educational applications for new technologies. Although it has been described in numerous ways, Kearney et al. (2012) claimed that all these descriptions consider 'the process of learning mediated by a mobile device' (p. 02). For Kukulska-Hulme (2005) mobile learning or 'm-learning' enables learners to engage in tasks without being 'tightly-delimited' to a physical location. At the same time, Vavoula et al. (2004)

advocated that when a learner takes advantage of learning opportunities offered by mobile technology this can also be considered m-learning, not necessarily implying the state of being in movement.

A wide range of studies pointed out other aspects of m-learning. It is considered to enhance and promote: collaboration, access to information and deeper contextualisation of learning (Koole, 2009); portability, social interactivity, context sensitivity, connectivity and individuality (Klopfer, Squire, and Jenkins, 2002); and learners' engagement, presence (the awareness of their location) and flexibility (Danaher, Gururajan, and Hafeez-Baig, 2009). Pachler, Bachmair and Cook (2010) claimed that m-learning brings a 'mobile complex' composed of the interrelationship of learners with structures, agency and cultural practices. For Traxler (2009) m-learning results in a 'noisy' and 'problematic' environment in which the personal, the contextual and the situated are considered.

Wu et al. (2012) developed a meta-analysis of mobile learning studies from 2003 to 2010. After examining 164 studies, they concluded that most studies of m-learning focus on the effectiveness of the tool, followed by mobile learning systems design. According to the authors, 86% of the studies they reviewed showed positive results, regarding its effectiveness. From the total, 4% of the studies reported a neutral outcome and 1% a negative outcome. In formal educational contexts, higher education is the level which uses m-learning the most, followed by elementary schools. Postsecondary and secondary schools use m-learning the least. They believed that more studies should be developed in basic education regarding the outcomes of m-learning.

Traxler (2007) criticized the nature of studies regarding mobile learning. Most of them focus on the affordances of tools. For the author, rather than focusing on the tools, studies should examine pedagogies suitable for m-learning and investigate it from the perspective of the learner. This change in perspective would allow rethinking from the students' point of view. It might be that by the time when this study is released more research will be done focusing on different aspects of m-learning.

One challenge in developing studies about mobile technologies is that new gadgets have been emerging fast. Tablets have been associated with mobile learning and Wu et al. (2012) did not include these gadgets in their descriptions. Despite the fact that the Apple iPad was released in 2010[32] and other models came after it, there were no studies regarding them as part of the data, in Wu et al. (2012), even with these gadgets available for at least one year in the market when the study was developed. The fact that they were not included in the data might be because its use was too recent to have studies about it. Research about the use of mobile devices is still in the beginning and it is necessary to consider this kind of limitation.

Haβler, Major and Hennessy (2016) also criticized the nature of studies developed so far regarding the use of mobile devices. In their review of the use of tablets and their impact on learning outcomes, they asserted that the fragmented nature of the current knowledge base and the scarcity of rigorous studies make it difficult to draw firm conclusions about how tablets can viably support children's in completing different learning tasks. They believed that what makes it difficult to advocate it is that 'generalizability of evidence is limited, and detailed explanations as to how, or why,

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[32] Available from: http://www.telegraph.co.uk/technology/apple/11511922/Apples-iPad-turns-5-a-brief-history.html
[Accessed 15 December 2016]
Geyer and Felske (2011) in Haβler, Major and Hennessy (2016)

using tablets within certain activities can improve learning remain elusive' (Haβler, Major and Hennessy, 2016, p. 139).

The first research question Haβler, Major and Hennessy (2016) asked was if knowledge and skills of students improved by using tablets to support educational activities. From the 23 studies chosen, 16 reported positive learning outcomes, 5 reported no difference and 2 reported negative outcomes. The authors did not find any overarching explanation which could justify the neutral and negative outcomes. What the studies suggested was that these outcomes were not directly related to the nature of tablets. Moreover, some studies emphasized the positive attitude and motivation of students, their adaptability and the convenience of the tools. It implies that independently of the claim raised by these studies, for Haβler, Major, and Hennessy (2016) it is necessary to undertake a more substantial investigation into these outcomes and their relationships to the nature of the tool.

For the second research question, Haβler, Major and Hennessy (2016) identified four factors contributing to (un)successful use of tablets. They were: the affordances of tablet hardware; the implementation of tablet-based learning environments; tablet content and instructional design; and the interaction of pedagogy and technology. A wide range of applications and tools are integrated into one device. It results in a high usability of tablets in a diverse range of educational experiences. Because tablets are easily customizable they permit adaptations to be made according to students' individual needs. Their touchscreens and other resources enable inclusion of students with special needs. Visual and tactile features facilitate engagement, which is not usually found in typical classroom experiences. Its availability and portability

made tablets easy to manage and carry, creating immersive situations of anytime-anywhere learning experiences. Students who used tablets were also found to have strong awareness in organizing and self-regulating their learning (ibid).

In the data account above, students registered and stored the information collected in different ways, according to their individual preferences. The fact that most of them were not just reading, but copying, pasting, editing, organizing made them work in different tasks, resulting in a more dynamic situation. They were enabled to organize themselves and self-regulate what they were doing, judging what was good or not for them.

The second factor pointed by Haβler, Major and Hennessy (2016) related to (un)successful use of tablets was the content of the tablet and instructional design. This factor is problematic because it demonstrated elements associated with the success of its implementation and at the same time they also presented unsuccessful examples. In relation to successful examples, real-world situations can be simulated and repeated many times in tablets, allowing a safe environment. Their uses in conjunction with real objects in a physical environment have the potential to increase effectiveness and efficiency in learning. On one hand, it demands a rethink of pedagogical approaches due to the issues that might arise from multimodal interactions. On the other hand, novel lessons are restrained by the constraints of platforms and applications imposed by manufacturers. The design and structure of tablets were also alleged as a distraction for students, as they add layers of complexity during lessons, compared to conventional means of performing the same

task. It was argued that the entertaining features of the tool might not only increase the interest in a lesson but also distract these students (ibid).

Although students did not simulate and did not use the tablet with real objects in the account, they had the possibility to interact with multimodal sources. They were free to access any source and collect any kind of information related to their task. Nevertheless, the fact that students were supposed to have a Google account and an Itunes account to download the applications they needed, restricted their actions. Due to time and maybe the effort they were supposed to give to solve the situation, some students chose not to use these tools and had a different approach (sending via e-mail) or a conventional one (copying on a piece of paper). These restrictions acted as obstacles, but not as barriers that disabled students performing the task. Students also did not seem to be lost in different layers of the tablet. They knew what they had to do and the ones who did not know how to do it looked for a way to perform the task. They seemed to have an idea of how to perform it, at least. However, they were distracted by Siri, the camera and it might be argued that even the attempt with Google and Itunes accounts were distractions.

Interaction of pedagogy and technology was noticed when students from different gender participated more, evidencing the enhancement of collaboration, according to Haβler, Major and Hennessy (2016). Students shared more their work, offering opportunities for teachers to provide ongoing feedback and collect cumulative assessment data. However, these elements changed regarding the way the lesson was structured and the amount of tablets available per student. When sharing a tablet in a group, some students complained about using it less than others. Besides,

when tablets were the property of the students, they were reluctant about sharing with other students as well. In one-to-one settings, there was no competition for tablets among students. On the contrary, it increased group participation, improved communication, and interaction between students. As a result, participation was more equal in this setting compared to lessons in which group work was developed, but without this technology. A student-centred approach and the Technological Pedagogical Content Knowledge (Mishra and Koehler, 2006; 2008) were also demonstrated to be valid perspectives when using tablets for learning.

During the lesson, students talked more with each other and shared the way they were performing the task. The teacher had the opportunity to walk around, offer help and evaluate if students needed any kind of help. Because of it, she was able to evaluate and re-plan the activity, extending its deadline to fit students' needs. Although the teacher did not have the technological knowledge related to the task, she was aware of the possibilities of the tool and enabled students to share this knowledge with each other. She prioritised students by having a student-centred approach and let them act the way they needed and judged best for them.

In addition to these three factors, there is one more identified by Haβler, Major and Hennessy (2016) which can substantially influence how students and teachers will use these gadgets in lessons: the way tablets are implemented in schools. In order to provide a positive setting and an effective introduction, schools need to promote a supportive environment, with a technical team to help users. A robust infrastructure with the capacity to accommodate a lot of gadgets accessing the network at the same time is necessary. The model and operating system of the tablet must be taken

into account as they determine the kind of control the school will have regarding the content. New models and the demand to purchase supplementary technology must be also considered. These factors are usually beyond the power of decision of teachers and students. Sometimes these technologies are acquired according to the agenda of the school, with a limited budget and an infrastructure that restricts the possibilities of actions that might happen in lessons. This decision sometimes is made not based on pedagogical possibilities, but in financial and structural ones and it directly influences what happens inside classrooms. As Haβler, Major and Hennessy (2016) argued 'the choice of mobile devices (and corresponding software) is constrained by what is commercially available and financially feasible' (p. 147).

The researched school in the account provided had an IT department which managed the ICT tools the school had. It is not possible to say how they might influence the decisions inside the school. It is also not possible to say the teachers or the students had the opportunity to voice their opinions. However, the school agenda and budget might have been what oriented the acquisition of that type of trolley and that type of tablets. Considering the model they were not up-to-date iPads, reminding one of the first models released. The fact that they were iPads is another restrictive element. The fact that some students did not have an Itunes account might mean they did not have an Apple iPhone, which implies they might not be familiarised with the iPad operating system and Apps. However, another intriguing factor was that some students did not have a Google account as well, which leads to a different situation. Most of the non-Apple mobile phones are Android, which functions with a Google account. It raised some the questions: what if those students who did not have an Itunes or a Google account had no mobile phones? Which types of mobile

phones they had? If these students had mobile phones which were not smartphones it could evidence another factor regarding their social status that they might have wanted to avoid this kind of exposure. This situation is going to be discussed in the subjectivation section of this case.

Based on the account provided, it is not possible to conclude if the use of tablets improved learning. What evidence showed was a complex and rich environment, in which many noises were made and heard, in a mix of personal, contextual and situated themes, actions, emotions, and events. Tablets allowed students access to information, connectivity to different resources (if they wanted to print the information collected or send it via e-mail) and portability (not only of the tablet itself but the information they were collecting). It made students more flexible about which tools to use to collect and store information. The fact that students were in Miss Mills' room acknowledged their presence and how to manage the information they needed. As each student was given one gadget but they were supposed to work in pairs, their individuality had space to emerge as each student could be responsible for developing part of the task, the way they judged best for them. As a consequence, engagement, social interactivity and collaboration emerged naturally and increased as the lesson happened.

Considering that all these facts are recognizable as elements of mobile learning, it is possible to say that even with the lesson happening in a delimited place (Miss Mills' room) students took advantage of the learning opportunities offered by the situation as a whole. It was not the fact that the trolley with the tablets did not go to the 6th form building for students to have classes there that prevented them from having a mobile

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experience. It might be argued that the learning outcomes regarding the History subject were not substantial. However, it is not possible to deny that there was a meaningful learning experience regarding ICT and mobile devices use, with the purpose of accessing and storing information. In order to evaluate learning about the subject History, a longer and more detailed process would be necessary. However, ICT skills were developed in that lesson, even with the teacher not have planned that.

4.2.1.2 … BY THE COMPONENTS

The components that seemed to be saying things related to ICT were: Miss Mill's (voice tone, smile, and actions), the students, the tablets, the tablets' case, the school building, Google (search engine and apps), Year 12 timetable, Miss Mill's room. The discursive components related to the account evidenced implicit statements regarding what happened, which are presented below:

DC 1.1 "Students were supposed to have classes in specific places: the 6th form students were supposed to have classes at the 6th form building."

The researcher's timetable was elaborated by the ICT head of the department of the school. He checked the Year 12 schedule that day and printed it for the researcher to move around the school. All the teachers included in the timetable were supposed to know the researcher was coming and communicate if there was any change in the schedule or any problem in receiving her. Nothing was communicated, assuming everything was settled. The History teacher provided evidence she was aware the researcher was coming. However, it is not possible to say that the teacher had a last minute change of plan because just two students went to the 6th-form building. Most of the Y12 students were already in Miss Mills' room, waiting for the lesson to start.

The fact that one student quickly guessed the lesson would be in her room, reinforced that lessons in Miss Mills' room were not something out of the ordinary. It is also not possible to say that the other late students did not know about the lesson. They might have arrived late due to other reasons, not implying they were expecting to have lessons in the 6th form building. These students could have been talking to someone else or just been late. The fact that the teacher apologised for not teaching the Y12 group at the 6th form building indicated that she was supposed to be there. The reason why she apologised was not only because the group was supposed to have classes in their building. It was also because they were using tablets, which leads to the next statement.

DC 1.2 "ICT was supposed to be used in specific ways, under distinct circumstances. When it was not done in such way, this practice was considered inappropriate."

Teachers, students, schools staff, and researcher were aware they were supposed to have classes in the 6th form building. The teacher was apologetic for this fact and also for the fact that she knew what the use of tablets implied: a specific way of teaching in which tablets were supposed to move and not the students. Tablets were directly associated with mobile learning and not letting tablets *be* mobile was contradictory to this principle in this context.

Although it seemed the teacher blamed the tablets' case for the lack of mobility, she also attributed it to the building of the school in which her room was located. The 'old' building when constructed was not prepared for the mobility of that tablets' case. It was also not prepared to have that teacher move that case. The teacher demonstrated the awareness of her restricted capacity in moving the tablets around

by apologising for not doing that. She implied that moving around with the trolley would be the appropriated thing to be done, reinforcing the reason why she apologised.

DC 1.3 "ICT to be used demanded physical infrastructure from the place in which it was going to be used and from its users."

The use of tablets has been largely advocated as the most common way of approaching mobile learning. Schools have been investing in sets of tablets to enable this practice for students and teachers. However, to use tablets or any other technological gadget is not a matter of acquisition only. It is assumed that the first step in using ICT is having the gadget wanted, independently of whether the school is going to acquire it or the student. After having it, staff and students could learn how to use it and as soon as the network system is settled with wi-fi connection everything is going to happen smoothly. This assumption is a mistake made by schools which sometimes focuses only on the technical demands of ICT itself and forget to look at the physical structure of the building and the physical capacity of the ones who are going to use the gadgets.

For that teacher, it was impossible to carry that case of tablets. It was too heavy for that small and fragile lady. It might be that the trolley was not so heavy without the tablets inside. Miss Mills' physical structure did not enable her to move around the school with the trolley. The building was built in a way that meant there was no easy access for carts or trolleys. There was no ramp and the location of the teacher's room was another obstacle. The fact that it was on the first floor with just stairs increased the level of difficulty of moving around with the trolley. It might be that the trolley was

brought to her room during lunch time and someone was going to take them back to the ICT department. It might be that delivering the trolley to the 6th form building would demand more time to get it there and get them back. It would need the ICT department to give extra time and organisation, compared to delivery to Miss Mills' room. The ICT department and Miss Mills' room were located in the same building. It was also easier for Miss Mills to take care of the case inside her room. As she was the History teacher of the Secondary school, students from that educational phase were used to moving around, different from the 6th form students who had classes at the 6th form building.

DC 1.4 "ICT could not be used by everyone the same way as there were different demands, limitations, and requirements in different places for different users."

Miss Mills was not able to move around the school with the tablets' case. It was due to the location of her room, her physical constitution and the weight of the case. It might be that the Mr. McCallan, the English teacher, would not have the same limitations as hers: he could move everywhere with the tablets because his room was on the ground floor and he was not a 6th form teacher. He also had an athletic body composition that suggested that he could carry the trolley without a lot of effort. However, using the tablets for him might not be very appealing to him, as he might prefer students handwriting their tasks or using a specific application that was not installed in the gadgets, for example.

To use tablets in education, it is necessary to consider a range of factors that might affect differently teachers and students. However, it is not possible to take into account all the factors for all students, teachers and curriculum areas. What is

possible is to be flexible to adaptations and receptive to different possibilities which could allow students and teachers to work in different ways, according to their limitations and opportunities.

DC 1.5 "When dealing with ICT, it was necessary to consider health and safety of teachers."

There were a lot of different types of trolleys available in the market when this study was being developed. These trolleys or carts imply different actions from users, mainly from teachers because they are the ones responsible for taking care of them. If the tablets are stored in a cupboard which has no wheels, it suggests that only the tablets are supposed to move, not the cupboard. It would demand students coming to where the tablets are stored to use them there or at least to collect them there and then bring them back when they finish the activity. However, if it has wheels, it is implied that the entire cupboard moves, meaning the cupboard and the tablets were going to move to the place where they would be used.

Most of the sellers do not indicate how heavy these trolleys are or will become when they are full of different types and weights of the gadget. The advertisements mostly refer to their charge capacity and the number of gadgets that can be stored. Teachers' health and safety condition have not been regarded when the decision of acquisition of the tablet's case was made. In this case what was considered seemed to be the capacity of the case in relation to the gadgets' demand. The school's physical constitution was also an obstacle for the mobility of the tablets' case and increased the health and safety issues for teachers. The older the building, the

smaller is the possibility of moving inside of it, as these types of mobile devices were not taken into account when the building was designed and built.

DC 1.6 "When students were respected, supported with trust and allowed autonomy, they developed confidence and worked with independence to perform the tasks attributed to them."

Since the beginning of the lesson, the teacher demonstrated how well she knew her students and how much she trusted them, respecting them for that. She planned a task in which each pair would research different topics. It indicated they would do the same thing, with the same purpose, but with different content. Although they were working in pairs, they were allowed to help each other when needed. It was not only regarding content but also regarding the use of technology as well. There was no restriction from the way the information could be stored. She trusted their judgement and their abilities to do the way they wanted or knew how to do it. The format was not important for her: what was important was the information. She also trusted them to find the best source to get the information and to evaluate which would be important to copy and what they would not need. It seemed that the fact that the teacher implied to believe in them, resulted in students believing in themselves.

DC 1.7 "Collaboration happened naturally as a consequence of a student-centred approach with a supportive teacher in a competition-free and ranking-free environment."

Although each pair of student had a different topic to research and the task did not have a high level of difficulty, students were allowed to help each other. They seemed to not need to talk about the task itself. It allowed them space to collaborate

with each other regarding their ICT skills. By talking to each other, sharing various ways of storing information, they had space to learn different ICT elements that would enable them to improve their skills optimizing what they were doing.

The teacher allowed collaboration and sharing when she planned a lesson based on a student-centred approach. She was there to help regarding the content. She was receptive to any way of storage and presentation of information, being oriented to the best and most convenient way for the students, not for her. When saying 'brilliant' to the students who explained a way to store the information. She reassured her support about different ways of doing it and encouraged other students to do the same. By not restricting the format of storage, she also allowed them to learn with each other and be flexible.

DC 1.8 "When individuals were accepted as who they were, they become more tolerant and respectful."

Disruption was regarded as a natural thing accepted by the teacher in this environment. Instead of reprehending students and making them feel bad and guilty about it, the teacher acknowledged it happened, she considered it funny and guided students back to their tasks. She was aware they were young people and they were supposed to act that way. As a response from the respect and trust the teacher had for the students, every time disruption was pointed by her, students went back to the task, recognizing what happened. Both teacher and students built a more tolerant environment in which all accepted each other by who they were.

DC 1.9 "The combination of the teacher approach (student-centred), the use of tablets (mobile learning with collaboration) and the type of activity (independent peer research) enabled the environment to be more relaxed."

From the moment students were explained the task and given the tablets, they became relaxed. They understood there would be no competition among them as they all had the same purpose, just differing in the content. They were allowed to talk, to help each other as it would not affect their outcomes. The fact that the teacher was flexible regarding time, pace and way of working with students reinforced their trust and confidence on themselves. They had space to make mistakes and to ask for help if they needed as she demonstrated support for whatever they were doing. This combination of elements resulted in different feelings, emotions, and affects.

4.2.2 WHAT WAS FELT

From the account provided, it was possible to identify emotions and affects from the interaction of humans and non-humans components. There were no contradictory emotions, on the contrary, some emotions and affects emerged as a result of the action of components acting upon others, causing a smoother relationship between them.

The first component stated in the account was the teacher acting upon the researcher and the students. Miss Mills' body and identity made the researcher and the students feel comforted, cosy and safe as if they were being lulled. Her voice tone and her appearance, made the researcher associate her with the idea of lovely ladies, in who she could trust. It was not possible to say all students were affected the same way as the researcher. Each component reacts differently to affects and

human components are influenced by their experiences and emotions. However, the fact that one student pretended the tablet was a pillow confirmed that they felt they were being lulled as well. That student could have felt nothing when he got the tablet, having no response to it. On the other hand, his reaction from the flow of affects from the teacher and the tablet resulted in his feeling more comforted, laying his head on it.

These flows of affects contributed to the environment being calm and relaxed before the start of the task. When the teacher explained what students were supposed to do, the relaxation increased as students got the tablets. Moving from the conventional position occupied by students at their desks, they crossed legs, placed the tablets on their laps, turned to the side, turned to the back and started talking while performing the task. Their relaxation turned into confidence and trust as they recognized these flows of affects coming from the teacher. The student-centred approach adopted by the teacher seemed to make them feel independent, respected and mature enough to make judgements about the task and how to perform it.

Students also seemed to feel supported by the teacher who offered her help regarding the content. She also encouraged them to use their ICT knowledge and skills to enhance their experience, making it more convenient and effective for them in relation to the tools chosen. Students seemed to be accepted and it influenced in the way they treated each other. It might be that they felt respected by her and in return, they respected her and respected each other: the former was identified when she signposted their deviation from the activity and they promptly accepted it and returned to the lesson; the latter was the emergence of collaboration among each

other. There was no need for students to help each other during the task. The teacher said they could help each other to perform the task and they could also use any tool that best suited their needs to register information. They did not need to, but they chose to help each other and collaborate to their development of ICT skills. The affordances of the tool seemed to be recognised by students due to the fact they used them and showed others how to improve their practice. It was also their choice to use it or not. Their choice of not insisting on learning how to do it and choosing other ways (the conventional one on papers or sending the information via e-mail) to perform the task demonstrated how mature they were to recognize what would be best for them, being practical and not affecting their performance on the task.

Some students demonstrated to be excited about the fact they could learn something different to be done with the iPads to enhance their performance. It would not affect the outcome of the task itself, but it would improve their ICT skills, enhancing their knowledge about how to perform better research. Enthusiasm was noticed in students who tried a different approach from what they were doing. Their bodies were inclined over the tablets, they were talking with motivation in how to tackle this situation. They seemed disappointed by the fact it was more complicated than they realised. However, with a different idea and solution pointed by another student, they got enthusiastic again and chose a different way to register the information, by sending themselves via e-mail.

There was space for other emotions and affects. Students were allowed to feel as young people by playing, talking, taking funny pictures, doing something suspicious, and getting distracted by other things. Miss Mills accepted that behavior and had fun

with it. The way she reacted when students were getting distracted by other things and deviated from the task suggested she was not disapproving them. On the contrary, her smiles, expressions, and questions indicated she considered the students' behaviour as acceptable and just pointed out they would still have a task to do. Some of them seemed to feel a little bit guilty by being caught and returned to the task. It might be because they thought it would mean lack of respect in relation to the teacher.

Based on the flow of affects in the account, it seemed to be a productive environment, fulfilled with positive emotions. However, there was one fact that was negative and was exposed at the beginning of the account. It was not because the lesson had a change in the location, which made some students and the researcher feel surprised, disoriented, lost and in a hurry to find the correct place to go to. It was easily solved when one student quickly realised they were in the wrong place. The reason the lesson changed places was what had some negative aspects: the fact that Miss Mills was not capable of carrying the tablets' case.

It seemed Miss Mills felt bad, ashamed, guilty because she did not have the capacity to let the tablets be as mobile as they were supposed to be. The case had wheels, emphasizing the idea that they were supposed to go where students would be. It suggested the situation was inappropriate twice as much. She was contradicting the basic idea of using tablets when students had to move. It also suggested that mobile learning would not happen as there was 'no mobility' regarding the tools. Those students were also supposed to be at the 6th-form building, having History classes there. She knew that and that is why she was apologetic in the beginning of the

lesson. It was as if she was asking apologies for having that body composition which did not allow her to carry that case. It also implied another type of apology referring to who she was.

It made the researcher felt bad for her, upset, thinking about that situation was unfair. Negative emotions emerged from the researcher towards the tablets' case. She started calling the case as 'the thing', addressing all the damage it could do to the teacher. It was as if the case was not treating Miss Mills well, leading to an unfair situation. That 'lovely lady' as she was called could be regarded as incapable or even incompetent by not carrying a trolley around. However, these emotions and affects were not a result of the affective flow from the tablets' case alone: the case acted more as a reminder of other ideas that were already there. It was also an effect of the affective flow of the building, the mobile learning discourse and the school policy and regulations. The way the main building was constructed did not enable the mobility of the trolley and according to the teacher's needs. It was an obstacle for the teacher to move around with the case. In spite of these negative emotions, other positive ones happened and they both influenced in the constitution of the identity of the teacher and the students.

4.2.3 SUBJECTIVATION AND SUBJECTS

For this account, there were two main types of subjects: the teacher and the students. They had a peculiar relationship in this environment not only because of the use of ICT – tablets in this case – but because of the teacher's identity: Miss Mills. The teacher in this account was presented with a peculiar identity. She has a name - Miss Mills – and her hair, choice of clothes, type of glasses, the colour of hair and

haircut, the tone of voice, age, gender, weight, and height were clues of who she was. All these elements and her smiles contributed to the composition of an easy, likeable woman. It was the first time the researcher saw and talked to her. The fact that she was referred to as a 'lovely lady' without knowing her, demonstrated how these physical elements articulated her constitution of worked identity. This was the first impression of the researcher which was consolidated over the lesson.

The way Miss Mills acted inspired comfort and safety when she was speaking, addressed in the account by the impression of being lulled. This impression was shared by students and evidenced when one got a warm tablet and pretended it was a pillow, as an immediate reaction of being lulled. That student was just completing the act of being lulled and adding comfort to his experience in that room.

In addition to that warm, cosy and safe place, Miss Mills built a supportive and trustworthy environment. She planned a lesson in which tablets were used. It was student-centred and the students would have the responsibility of dealing with the iPads. The task was simple, just demanding a basic knowledge of locating the web browser in the iPad and using searching engines. They were regarded as independent students because they were supposed to work in pairs, researching for different contents. They were regarded as autonomous because they could make their own decisions in how to split the tasks, which sources to search, which information to copy and where and how to store the information collected. She also offered her help for students in need about the content and allowed them to help each other in relation to different needs. By doing this, she implied she was confident

about their capacities and respected them as individuals. They were allowed to have different knowledge and they would not be judged or ranked by her for it.

Miss Mills also allowed students to be young people. In her room, it was possible to make mistakes, to cause disruption, to have attention deviated to other things, to talk, to laugh and have fun. For every disruption or incident that happened that could be associated with a deviation of the task, she showed them she was there, paying attention to what was happening. She did not reprehend them, on the contrary, she answered with a funny expression in which she was acknowledging her presence and awareness that it was funny, but they were still in class with a task to be performed. Once more she was implying she cared about them, by pointing when they were deviating from the task and it could affect their outcomes. There was no pressure, no criticism or harsh disapproval, just a signpost of what was happening. Again students were autonomous to go back to their tasks or not and she trusted them they would use their judgement to do the most appropriate thing.

Another proof of her trust and confidence in her students was when she gave them 30 more minutes to finish the task in the following class. She walked around, verified the information collected by each pair and believed it was best for them. It might be it was not in the original plan and she adapted it based on their outcomes. She knew they were not being lazy. They did what was possible during that lesson. It might be argued that the students' interest in storing the information in digital and alternative ways they were not aware of could have influenced the amount of time spent on the task. However, this argument is not applicable as other three pair of students were

copying the information on papers and time was not enough for them to finish the task as well.

Although Miss Mills had built this collaborative and productive environment for the students, she had a very negative impression of herself. It was due to the tablet's characteristic of being mobile. She was aware they were supposed to move and because of her physical constitution, she was not able to deal with tablets the way she believed she was supposed to. Because of this, she was apologetic about the way she was using them. It sounded 'wrong' and inappropriate, which led the impression of her to be doing something contrary to the expected. It suggested she was not capable of dealing with the tablets effectively. It might be that she was looking for the researcher's approval when she tried to justify the use of tablets that way.

Despite the fact that she believed she was not using tablets appropriately, she demonstrated having the pedagogical and technological skills to deal with the tablets. She planned a lesson with one of the most recommended approaches of mobile learning, she enabled collaboration and respected each student knowledge and individuality. She acted as a guide and was there to help at any point, accepting also the students' faults and mistakes. She signposted when they were supposed to go back to the tasks, without judging them. She also demonstrated having some knowledge about the capacities of the gadget. She might not have known how to use all of their applications, but encouraged students to use them and share their knowledge to help other students who want to learn and use them. In addition, according to O'Malley et al. (2003), she was acting appropriately as mobile learning

also refers to the use of mobile technologies, not implied that students need to move to indicate their learning was mobile.

Because of the way she acted in relation to the students, they were able to construct their identities in a distinct way. First, she built a safe and cosy environment in which they would be comfortable. Then, proposed a possible task to be done in which they were treated as autonomous, independent, and reasonable. She was confident about their knowledge and capacity to perform the task. It seemed she was sure about the quality of the outcome and even if it did not come in what she was expecting, she seemed to believe they would have done their best. Her trust in them made them trust on themselves, becoming confident of what they were doing and use their judgement to make decisions.

Students were allowed to be individuals performing a different content search. They also had space to be young people by doing what they were expected to do: laugh, have fun and deviate their attention from the task. As they were allowed to have different knowledges for her, they allowed each other the same. They respected their different ICT skills and offered help and guidance regarding doing something different. They did not judge others for not knowing or doing something. Collaboration emerged as a natural consequence of the environment, as they could trust each other and there was no competition among them.

Their ability to use the tablets was recognized and reinforced by the teacher, first by trusting them this use, second by planning the activity the way it was and third by listening to their explanation of how to perform the task in a more effective way and emphasizing how good it was to their peers. The ones who were not aware of these

digital possibilities had the opportunity to become aware and learn it. They also had space to come up with other alternatives and use them if they wanted. The teacher approved it. Because of it, they became enthusiastic about other possibilities. Although they lost the interest when they noticed it would demand more time, they were aware of other possibilities of working and skills they could develop if they wanted to.

However, a situation that was intriguing was the fact that some students did not have a Google account or an Itunes account. It is understandable that one student might have one and not the other. It is because if one has an Apple mobile phone, it is necessary to have an Itunes account to have access and to download different applications for the phone (or any other Apple gadget). If you have a non-Apple mobile, you have a limited number of options which the most common one is a phone with an Android system, which enables the access to the Playstore, to download applications to the phone. However, if you do not have a Google account or an Itunes account, it is a curious fact as the mobile phones which do not need these kinds of account are not smartphones, implying a very simple model. It could raise questions of why those students had that type of mobile phones? Would it be because they do not have the budget to buy them? Would it be because they do not know how to use them? It is taken for granted the students would prefer to have the newest technological gadget and this account could be inferring that not all students really have the newest model, independently of the reason why. This fact deserves a deeper investigation.

4.3 CASE 2 – CLICKING GEOGRAPHY

Case study two took place in the Post-Secondary school. The school subject was Geography and students were part of Year 12 group. They were having classes in the 6th-form Centre, in which the Geography room was located.

"*I was going to observe a Geography lesson in Year 12. I arrived in the room before the group. Sir welcomed me with a sarcastic smile and said he was going to use technology 'just for me'. Although I felt a bit awkward and uncomfortable, I smiled back and sat at the back of the room. While the students were coming, he approached me to tell me what he was going to do: he was going to use clickers in a quiz as a review exercise. He showed me the case of clickers, explaining it had a software in which he inputs questions and multiple-choice answers. The students were supposed to choose one of the answers that would appear on the board. The software would automatically calculate the results and supposedly who 'won' the quiz.*

Due to the way the teacher welcomed me, I started wondering if it was really necessary for students to have a revision quiz at that point – it was June, so probably they would have already done their AS exams. Even if it was necessary, would the use of clickers be needed as well?

Sir recorded the attendance of students and announced they would do a quiz using the clickers. Immediately students cheered and from a group of sixteen girls that passively entered the room almost without talking, they became enthusiastic and talkative. While the teacher distributed the gadgets I heard a student declaring how much she loved it. I was not sure if she was referring to the quiz or to the clicker.

Then, Sir introduced me saying that I was there to see them using technology. Some girls looked at me and broke into a smile. Others did not bother taking their attention from the clickers. Sir tested which clickers were working. Each clicker had a number and just one was necessary to be changed. By the facility in which they got ready, I thought that that group had already used clickers in lessons before. Nobody was told what they were expected to do.

Before starting, Sir said that it was not a matter or answering fast, but answering correctly. The topic was Globalisation. The girls were still talkative and enthusiastic. It was even possible to feel how happy they were. The questions were projected and students had ten seconds to answer. As soon as all students answered, the software displayed the correct answer. Questions about OECD, trade blocs, countries in which the type of economy was in transition were made. Every time the correct answer was displayed, it also showed the rank of students: who got more correct questions. An animation of a race with colourful cars appeared in between questions to indicate which students were leading the race. Sounds of 'yes!' emerged when the correct answers were given. Girls also cheered regarding the dispute for the first place.

Sir had a clicker in which he was controlling the pace of the game. Only when he wanted it would display the next question or the ranking. Because of this, he had time to explain why some answers were appropriate or not. After the quiz finished, Sir gave some stickers to the three first places: three stickers for the first, two stickers for the second and one sticker for the third.

After finishing the quiz, Sir collected all the clickers and put them away again in their case. Sir moved on to the next topic: analysing economic trades. He connected his

laptop to the projector and a slide titled 'World Trade Organisation' appeared. While the teacher was explaining, students were silently making notes. They also had no expression on their faces. It is not possible to know if they were writing what the teacher was saying or copying the information projected. Maybe both.

Sir clicked on a link on his slide and a video opened on Youtube. Its title was 'The truth behind World Trade Organisation'. It was a short video of about 4 minutes. Some students made notes while others just watched it. After the video, Sir went back to the slides to establish the relationship between both.

When Sir was talking, suddenly, a very strong sound came from the classroom sound system. Students got surprised, looked at each other and started smiling. They recognized it was the trailer from the movie Mockingjay part 2. Taken by surprise, the teacher tried to work around the problem. He minimized his slides and then he saw the trailer running in the background of his laptop. The girls started smiling and talking again, demonstrating their enthusiasm about the movie that was going to be released in the following months. They pointed to the projection, mentioning names of the characters of the movie. In an attempt to catch students' attention again, the teacher complained about the change in Youtube. He said that if the 'stop' button was not pressed, Youtube would automatically generate a list of videos to be played, correlated to your first search and it does not stop. He said it was very annoying and that he kept forgetting to close Youtube, causing this kind of disruption.

Sir got a Globe to show some places and indicated where some trades happened. He also asked some questions to the students to think about it. Sir requested the students make some notes about World Trade Organisation, relating the slides and

the video. They were supposed to do it with their peers on their tables. They had ten

minutes to do it. As there was not enough time to talk about what they wrote, Sir told

them they would talk about it next class and he would send them the slides via e-

mail. Off you go."

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From the account provided, the first step was identifying the components of the ICT assemblage. They were identified not by their presence, but by what they did during that lesson. The components listed in the table below might not be the only ones present in the place, for example, pens, pencils, and many other things, but the criteria for recognizing such items were their actions, their effects and affects upon other components and in the trajectory of the ICT schooling assemblage. The order they were listed followed their 'appearance' sequence.

Table 2: Components and their actions in case study 2 – Clicking Geography

Components	Actions
Geography	Established the topic that was going to be taught (Globalisation and World Trade Organisation)
the teacher	Planned the lesson (selected the tools to be used, predicted the actions to be performed and the chose the topics to be covered) Talked about specific topics of Geography Controlled the use of clickers Used Slides and YouTube

	Gave stickers Smiled Used the Globe
the researcher	Imposed the use of technology in the lesson Restricted the actions of the teacher
Smiles	Evidenced contradicted information about the human components opinions and reasons
Technology/ICT	Made the researcher be in this lesson Limited the actions of the teacher
The group of students/ **16 girls**	Students: listened, copied, made notes 16 girls: talked, smiled, cheered, had fun
Clickers	Enabled the Quiz to happen with multiple-choice question and answers Made the girls get excited about the activity Provided evidence of students' answers Ranked the performance of students Evidenced that the Quiz was a competition between girls and students
Quiz	Determined the teaching technique of how clickers would be used
Review	Provided the pedagogical purpose for the clickers to be used
AS Geography exams	Questioned the validity of using clickers at that point of the year

Attendance list	Recorded the presence and absence of students
Racing cars	Evidenced the ranking of students
Teacher's control clicker	Controlled the transitions between questions/answers
Stickers	Showed who was the three students who got the biggest amount of right answers
Teacher's laptop	Made the clickers' software run Made the slides available Connected to the internet
Projector	Displayed the teacher's laptop information
White board	Displayed the teacher's laptop information
Slides	Displayed the essential information regarding World Trade Organisations
Students' notes	Registered what was important about the topic for the student
Youtube video	Provided information about World Trade Organisations
Youtube	Provided other options of videos and advertisement
Mockingjay Part II trailer	Showed what was going to happen in the next movie of the series
Globe	Helped the teacher to locate places related to World Trade Organisations Helped the teacher to grab students' attention.
E-mail	Allowed students to have access to the teacher's slides information.

From the previous list, the ICT gadget that was chosen to be discussed was the clickers. The fact that clickers were used in a Quiz could lead to the conclusion it was with the purpose of 'gamifying' the students' experience in the lesson. Because of this, 'gamification' is the second topic related to ICT that is going to be discussed. The next section is going to provide what was said in academia about the use of clickers and gamification and its influence on what happened in the account will be discussed.

4.3.1 WHAT WAS SAID…

Based on the account provided, the ICT topics that are going to be discussed are personal response systems, also known as clickers and gamification. Despite the fact that there were other ICT elements present in the account, the main focus of discussion of the literature review will be on the ICT components which have still been in discussion in academia. Because of this, the use of PowerPoint, projection, laptop, and YouTube will not be present in the review, but they will be part of the analysis.

4.3.1.1 … BY ACADEMIA: CLICKERS AND GAMIFICATION

Personal Response Systems[33] or 'clickers' have been increasingly used as a tool in Higher Education. Independently of the name, the tool works the same way: the devices transmit individual responses to the tutor's computer that instantly tabulates the data. The data can be displayed by the tutor according to his/her purposes

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[33] They are also referred in the literature as Individual Response Technology (Heden and Ahlstrom, 2016); Remote Response System (Millor et al., 2015); Group Response System, Audience Response System (Tlhoaele et al., 2014); Classroom Communication System (Tlhoaele et al., 2014; Han, 2014); Classroom Response System (de Gagne, 2011; Tlhoaele et al., 2014); Eletronic Voting System, Audience-paced feedback (Satheesh et al., 2013); Student Response Systems or Wireless Response System (Patterson et al., 2010)

(Patterson et al., 2010). Data can be numerical or text, depending on the system/device.

There are different types of devices available on the market. Most of these handheld remote controls are sold in a set with a USB receiver and the software to process the information sent. This is the case of Quizdom[34], TurningPoint[35], QuizzBox[36], Power Vote[37] and others[38]. There are also websites and applications that develop the same function of these gadgets and they are 'cost free'. This is the case of Socrative[39], Kahootit![40] and Textwall[41]. The difference between the 'remote control' and the use of the students' own gadgets (mobile phone, tablet or laptop) is that the tutor provides a code for the student subscribe to the poll. The remote controls are usually settled, having no need for students to do anything for them to work.

These gadgets allow different actions as recording the attendance, question and answer sessions, opinion polls, voting, quizzes, tests, and group decision-making activities (Patterson et al., 2010). Not all these possibilities are available for all gadgets. It will depend on the type of gadget available at the institution and the knowledge and skills from the tutor – pedagogical and technological.

Research has said that the use of clickers has a lot of advantages and challenges. Most of them were analysed according to large group settings (lectures) and just one

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[34] Available from: http://qwizdom.com/uk/solutions [Accessed 15 April 2016]

[35] Available from: http://www.turningtechnologies.co.uk/ [Accessed 15 April 2016]

[36] Available from: http://www.quizzbox.com/en/ [Accessed 15 April 2016]

[37] Available from: http://www.powervote.com/ [Accessed 15 April 2016]

[38] Turning Technologies also developed Responseware, which allows the student to use their own gadget or the clicker if available. Power Vote also released an app to be used with the same purpose.

[39] Available from: http://socrative.com/ [Accessed 15 April 2016]

[40] Available from: https://getkahoot.com/ [Accessed 15 April 2016]

[41] Textwall displays texts and not quantitative responses from students. Available from: http://www.learningapps.co.uk/solutions/textwall [Accessed 15 April 2016]

study (Smith et al., 2011) was based on a small group setting (seminar). Although there were differences in settings, the results were similar. Tutors and students pointed to the main advantage being the break in the traditional lecture style (Tlhoaele et al., 2014), which was achieved by interaction and feedback. The interaction between students and between students and tutor opened the possibility for: more communication (Heden and Ahlstrom, 2016) and equal participation for all (Satheesh et al., 2013). As a result, students alleged being more focused (Satheesh et al., 2013) and engaged (Patterson et al., 2010) during the activities, which were motivating and fun (Satheesh et al., 2013). They also liked the fact that anonymity was possible while answering (Satheesh et al., 2013), enabling sensitive topics to be present in the lesson (Heden and Ahlstrom, 2016). Feedback can be provided immediately (Tlhoaele et al., 2014), according to the way the tutor organises the activity. Students claimed it facilitated understanding when it was released fast and further discussion among peers was asked for as a way to clarify doubts (Patterson et al., 2010). It also enables the tutor to quick identify trouble points in the content which need more explanation, allowing him/her to make quick decisions about the direction of the lesson (de Gagne, 2011).

Although there are more advantages than challenges, the latter demands careful attention. They are malfunctioning, bad use, cost, time, training and the tutor's will. Students complained that some devices did not work well (Patterson et al., 2010), while tutors complained that some students sometimes did not bring the gadgets or lost them (Satheesh et al., 2013). Both facts influence the students' participation, not generating the data expected, but as the literature stated, there was no system that was 100% effective and malfunctioning might happen at some point, independently of

bad use. Cost is a factor that determines if the institution will invest in this type of technology or not (Chuang, 2015). Alternatively, there are cost-free systems which the tutor can test and check if it worth the investment. This leads to the last three challenges. Using clickers is time-consuming regarding training for users (Satheesh et al., 2013), demanding resilience. It also influences the time needed to elaborate the lessons, because the question-answer practice needs good questions to be motivating (Tlhoaele et al., 2014). However, the use of clickers is mainly dependent on the tutor's will, because if he/she does not want to use it, or does not have the pedagogical knowledge and technological skills to use them the experience might be traumatic for students and teacher, resulting in a poor practice (Han, 2014).

Despite the fact that most studies in the literature referred to different contexts (Higher Education and large group settings), most of the findings were recognized in the present account. It suggested that they can be used to reflect on what happened in the account. The clickers present in the account were remote controls purchased by the school. The teacher, who demonstrated he had the technological knowledge and skills to manage the system, used them in a Quiz. The purpose of the lesson was a revision and factual multiple-choice questions were asked to students which needed to identify the correct answer by reading and registering it, by clicking the control button. Although the lecture style is supposed to be mainly used in Higher Education it is possible to imply it has been used by the teacher regularly. The way students reacted to the use of clickers meant a break in the routine of the classroom: as students got happier, more talkative, enthusiast and 'declared their love'. While answering the quiz, students did not interact with each other, just after it, when they got their feedback. It is possible to say that interaction was limited, not related to the

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action of doing the quiz, but as a consequence of it. Equal participation was allowed for all students, who demonstrated to be motivated, engaged and having fun. Anonymity could have happened because names did not appear on the board, as they were exchanged for numbers and colourful cars. However, students wanted to show their status, and as a consequence, they revealed their undercover identity. The teacher could identify the trouble points and paused the transition between questions to explain what he considered necessary. However, there was no discussion about these topics among the students, they just passively listened to the teachers' clarification. As the questions were ready and there was only one pathway, it was not possible for the teacher to adapt or change what was happening or what would follow after the quiz. In fact, the topic and activity that followed were totally different, independent of the quiz, which leads to the conclusion that the quiz was an isolated activity.

Regarding the challenges, teacher and students knew how to use the clickers, they tested them in the beginning of the lesson and quickly changed the gadget that was not working. It also leads to the conclusion that time was not wasted and there was no bad use as all clickers were school's property and they were kept at it. Two factors could have influenced the lesson according to the literature: the teacher's will and his pedagogical knowledge.

Technological and pedagogical skills of tutors can be developed in two situations regarding the use of clickers: the training provided by the manufacturer of the system or via learning-by-doing. The pedagogical knowledge the tutor needs is related to the content of the subject taught and to the ways of teaching it, implying theoretical

positions and methodological techniques. As a tool, ICT has the capacity to be used in different settings reflecting different pedagogical beliefs (Fry et al., 1999). Clickers can be used according to traditional learning theories and progressive ones. It will depend on the purposes of the tutor with a particular topic, in a particular group to choose the most effective pedagogical approach. According to the literature, clickers have been used to promote interaction among students and tutors and to provide feedback for both. These two characteristics imply a social constructivist approach, which considers learning as a process of constructing knowledge via social interaction (Daniels, 2005). Meaning is created by the learner through engagement and participation. By choosing to use clickers to promote interaction and obtain feedback, the focus of the lesson becomes student-centred. The students become more responsible for constructing their own knowledge actively. However, if clickers are used individually in a factual question-answer process it reflects an objective practice. No discussion, reasoning, conceptualization and contextualized feedback are necessary as facts are related to each other and accepted as the truth of a topic. Thinking and arguing is not necessary, just memorization.

It is not possible to claim that in the account the teacher did not have the pedagogical knowledge to use clickers in a different way. What was evident was that the use of factual questions did not demand higher thinking skills from students as problem-solving questions could require. It is also not possible to say that the teacher did not have the appropriate content knowledge of his subject or that that technique reflected his theoretical position and beliefs. As ICT has the capacity to be used in different settings reflecting different pedagogical beliefs (Fry et al., 1999). It might be that the teacher believed that the appropriate way of teaching was via traditional approaches

and he used factual questions and answers to test the students' memory to rank their factual knowledge. Clickers can be used according to traditional learning theories and progressive ones. It will depend on the purposes of the tutor with a particular topic, in a particular group to choose the most effective pedagogical approach. If the teacher's purpose was to show to the researcher how clickers were used, without any kind of pedagogical purpose, he achieved it. It might be that clickers were not part of the original lesson plan of the teacher and the fact that clickers 'were supposed to be used' that day, he had to add it against his will. Maybe if the teacher could have chosen, he would not have used clickers. It explains why the questions used in the review were not related to the topic that followed.

Another way to provide evidence that clickers were not part of the original plan was the lack of relationship between contents of the review and of the next topic. The teacher showed he used ready-made questions from another lesson just to demonstrate clickers in use. Students did not give any kind of indication this was the case. As meaning in a socio-constructivist approach is built via interaction among peers, there was no kind of knowledge construction as students just interacted regarding their ranking positions, not about the content they had to know in order to answer the questions correctly. The lesson in a socio-constructivist approach is student-centred and whilst clickers were in use, they were the centre of the practice. However, it was just for part of the lesson, in which there was no social meaning making process. In most of the lesson, the teacher was the centre, echoing the lecture style, in which the teacher explains facts and students passively listen to and accept the information. It might be that the teacher did not want to spend more time

in the clickers' activity because he had other topics to teach and he was just following the ICT leader request about using them.

The use of clickers does not imply the gamification of the classroom experience. However, elements of gamification were identified while they were in use. According to Deterding et al. (2011), gamification involves the use of game design elements in non-game contexts. In a systematic mapping study, Dicheva et al. (2015) identified that there is not much agreement on a common classification of game design. In order to establish common elements, they reviewed some studies in which gamification was used in educational settings. Some characteristics were recognized as the most common for an education experience to be classified as gamified involved: design principles, game mechanics, types of applications, and implementation.

Design principles are related to goals/challenges; personalization; rapid feedback; visible status; unlocking content; freedom of choice; freedom of fail; storyline/new identities; onboarding; time restriction; social engagement. Students must have goals for each activity or set of activities to be performed. These activities can represent challenges or not and rapid feedback about the student's achievement should be provided. Students should have their status visible to identify their level of achievement. New goals or challenges are only available if the previous one is completed. After it, new goals and challenges are unlocked. The pathway is individualized, in other words, each student can follow different routes based on the decisions they make during the activities. It is possible to fail many times and continue 'playing', submitting new answers until getting the right one. There is no

punishment for doing wrong, there is only no progression. Students are able to assume different identities and become involved in a plot which guides and contextualize the goals and challenges. The more students play and achieve new goals, they develop more skills to improve their progress in the tasks. Because of it, they have a feeling of being part of the activity. Students also get more engaged with their peers, helping each other in achieving their goals, individually or in groups. Sometimes these experiences have time restriction and students have to focus on the completion of the task during that period.

According to the categories pointed by Dicheva et al. (2015), when clickers were used in the Geography account eight of the eleven elements listed were identified in the lesson. Students did not have freedom of choice on their pathways. There was a single road for the race even having four question, they had only one right, which led to the same route. Students also did not have freedom of fail, as they had only once chance to get the question right. Unlocking content was also partial for the students: they were supposed to answer, but the software would only register answers within ten seconds and the teacher was the one controlling the progression of the question. However, the teacher did not move on to the next question without students answering it.

Six elements were listed by Dicheva et al. (2015) as elements of game mechanics: points, badges, levels, leader board, virtual goods, and avatars. From these six items, five were identified in the lesson. Each student was a colourful car. Although only five appeared on the leader board, the others were assumed to be there, hidden. It is possible to assume that the cars were the students' avatars. According to the

number of corrected answers, students got points and based on the points they were classified as first, second and third, which could be interpreted as levels. When the activity finished, the teacher gave stickers to the students, which represented their reward in relation to their level of achievement.

Diecheva et al. (2015) also related gamification to five different types of applications: courses with or without online support; MOOCS and online courses; Blended learning courses; E-learning sites; Gamification support platform. The activity was an isolated experience, not being possible to claim it could be characterized as a course without online support. The activity developed was not online, it was based on an application. However, the school has a VLE used by teachers and students, which was not the case of this specific activity. Using gamification in Secondary or Post-secondary education was also found just in two studies[42] and there was no study relating gamification with Geography. Because of this, it is also difficult to classify the type of the application used.

Gamification was also implemented with some other elements, for Diecheva et al. (2015) as courses with or without online support; Plug-ins for Learning Management Systems or Platforms; gamified related platform used; gamification applications developed. Regarding the experience witnessed, the closest description that could fit would be the use of applications as the clickers had a software which managed the quiz.

The results presented by Diecheva et al. (2015) were that using gamification was considered positive, resulting in higher engagement of students, increased

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[42] These studies focused in K-12 education: Abramovich et al. (2013); Morrison and DiSalvo (2014)

attendance and participation, positive effect on the contribution of students in the lessons and increase in their progression numbers. The gap between lowest and top grade decreased. Badges affected positively the behaviour of students, even when they had no impact on their grading. Students also considered gamified lessons more motivating, interesting, and easier to learn compared to other courses. From these conclusions, what was possible to be identified in the account was an evident motivated and engaged environment. As there was no complaint about the fault in registering students' answers, it is assumed all participated in the activity and their answers were registered. Students who received badges had a positive reaction and probably influenced others in order to be the next to receive them.

Diecheva et al. (2015) pointed to the challenges in applying gamification in education. It demands ongoing monetary investment; the design of effective assignments demands strong staff, grading students quickly and interacting closely with students; badges must be included in order to motivate students. The teacher had the technological skills to manage the clickers in a gamified way. Even with factual questions which did not demand higher level thinking and reasoning of students, he managed the task. Pedagogical knowledge is still necessary for the teacher to develop better questions or problem-solving situations according to what was witnessed. The investment was done by the school and at some point, it will be necessary to be done again.

Based on negative experiences, Diecheva et al. (2015) suggested that gamification should be introduced slowly from traditional style classroom, not to be used for official assessment, and not to mask traditional practices, for example calling grades as

scores. The whole lesson was not gamified, just the revision, which was done via quiz, using clickers. From the evidence provided, the lesson was gamified. However, it was not gamified effectively because as the authors stated, 'technological infrastructure [should be] coupled with an appropriate instructional framework' (pp. 83-84). The teacher might have lacked a pedagogical support if he did not have the pedagogical knowledge to elaborate meaningful activities using clickers. It could have enhanced his own experience and the experience of students.

4.3.1.2 … BY THE COMPONENTS

According to the account provided, some components seemed to say things related to the use of ICT. The components who were identified were: the ICT school department, the teacher, the students, the clickers, the software of the clickers, the stickers, the teacher's laptop, the projector, the teacher's slides, YouTube, the Globe and the e-mail. These components of the assemblage indicated the presence of specific discursive components, implied in what is regarded as the rule of components and how they are supposed to behave in that setting. It is possible to identify implicit statements in the setting.

DC 2.1 "The use of clickers was forced in that lesson and as a consequence, it was used as a request, without a pedagogical rationale."

It is possible to claim it due to the way the teacher behaved and the lack of a link between the revision activity and the main theme of the lesson. It was also reinforced by the fake welcome the teacher gave to the researcher. However, there were other ICT gadgets used which were not forced into the lesson. As witnessed, the use of the teacher's laptop, his slides, the projector, and video seemed to be a recurrent

practice in the lesson. The way the students reacted to the clickers, by accepting it and not asking for guidance of what they were supposed to do, reinforced the fact that they were part of the classroom routine.

DC 2.2 "Clickers were used with multiple-choice factual questions. They were structured in a gamified way, transforming a revision that tested the students' memory into a ranking instrument. This practice stimulated individualism and competition among students."

Students had one chance that lasted ten seconds to record their answers. The possibility of not answering during the ten seconds would be the first indicator of being a failure. If they needed more than ten seconds to think about the question, would indicate that they were not good enough to be ranked and be part of the race. Because of this, these students were more worried in recording their answers as fast as they could, instead of answering correctly. The correct answer would be a consequence and a benefit that would affect their position positively. There was no need for collaboration to answer the questions due to the way they were presented and the purpose of the task. Students were on their own just using their memory to answer it. The colourful cars in the race represented each student individually. Although there were just five cars in the projections, all the students knew they were represented by cars and their progression would be displayed according to their rank. The fact that their rewards were stickers, contributed to their understanding the activity was a game as an opportunity to test their knowledge, but not to improve it critically. It leads to the next statement.

DC 2.3 "The best students of the group knew the content asked and were in the top five cars, the others were not important and not good enough to be there and to deserve a place."

The fact that eleven students were left 'in the dark', not knowing their position stimulated the competition and the will to have a better result. First to be part of the best five students/cars and second to have a better idea of how good (or bad) they were in relation to the other students. Being part of the best five meant they had the chance to be the winner, in other words, *the* best. Students who did not appear in the best five had less chance to be in the top three.

DC 2.4 "Revision focused on the factual memory of students, which was probably the focus of the original lesson."

A revision activity is supposed to assess what had already been taught and students are supposed to know that content. The factual questions and answers used in the revision did not demand any other kind of skills from students beyond memory. They needed only to identify the appropriate answer just by reading them. The ones with the best memory would do it faster than the other ones who had to think more. Reasoning and higher order thinking were not necessary. It also implied that during the original lesson, in which Globalisation was taught, higher order thinking and problem-solving were not necessary as well. It also suggested that students will be assessed the same way on their exams.

DC 2.5 "The use of clickers motivated students in a way one of them declared her love."

Independently of the reason why clickers were used, they effectively motivated the students, making them more enthusiastic, engaged and communicative. Although their communication could have been driven to do the task, discussing questions and answers with peers and thinking about possible solutions for a real problem, it did not happen. Students talked to each other to make comments about their position in the race. They expressed their feelings, satisfaction, and disappointment when they got an answer right or wrong, especially when it affected their position among the top five cars.

DC 2.6 "The teacher liked to be in control during lessons."

Different moments and actions confirmed this idea. The first one was when he expressed his discontentment about the fact that he was supposed to use clickers. By being requested to use clickers, he was not fully in control of his lesson plan. Another situation was when YouTube started playing something not related to the lesson. The teacher did not like the fact that he could not control YouTube when it played a video different from the lesson. It disrupted his plan, which made him act immediately to regain control. He also expressed his annoyance by explaining he was aware of this capacity of YouTube and not being able to remember it and take action to avoid it. The fact that his lesson was mainly teacher-centred also contributed to this conclusion. The teacher could have planned the lesson using clickers to guide the entire lesson. In order to do that, the lesson would be entirely student-centred, in which his contribution would be dependent on students' answers and needs. Considering the part of the lesson in which clickers were not used, it is believed the teacher planned it totally. All the activities were teacher-centred, with

him actively talking and students passively listening. In the end, there was no time for students to discuss and make notes about the topic presented. It might be argued that the clickers' activity used the time in which students could have discussed the topic. However, it might also be argued that if the teacher had had a student-centred lesson, students would have more time for discussion since the beginning.

DC 2.7 "Technology moved fast and even when people tried to control it, it sometimes made people lost track of it, causing disruption of what was considered the ordinary pace of the classroom setting. This disruption affected teachers and students in different ways, seeming to cause contrastive emotions."

Students demonstrated that they liked a messy place. It seemed that their bodies were waking up from an inertia state and they enjoyed this feeling, having fun. It might be because of what that disruption represented in this setting and the possibilities that opened with that. On the other hand, the teacher seemed to feel disturbed by the fact he could not entirely control technology and it made him angry as he noticed what he planned was interrupted. The fact that his plan could not be accomplished seemed to make him upset because it implied many other things, regarding his position as a teacher, which will be discussed in the subjectivation section.

DC 2.8 "The teacher went back to conventional and traditional teaching tools and techniques when ICT did something he did not like, even when these things were expected."

When the teacher got interrupted, the first thing he did after shutting YouTube was to leave the technology and get a Globe. The slides, the laptop, the projection were put

to the side and the Globe assumed the major spot in the lesson. The teacher held it as if that Globe represented all the knowledge he had and who he was. As a Geography teacher, the Globe could be considered as his main teaching instrument, as a dictionary for a Spanish teacher. By holding it, he would be trying to hold students as prior teachers would have done in a traditional classroom setting. It worked. It might have been because the Globe had all these meanings implicit or because it was a visual appeal to students who got interested in what the teacher would do with that.

4.3.2 WHAT WAS FELT

From the account provided some emotions and affects were identified in relation to the situations that happened in the account. Humans reacted differently to the actions and acts of components (human and non-human) upon them. These components are going to be analysed according to the events from the account in this section.

When ICT was in use, the teacher manifested more negative emotions in relation to the flow of affects coming from clickers compared to students. Since the beginning, the teacher showed the researcher he did not like that situation and because of it, her presence was not welcomed. He manifested it by welcoming her with a sarcastic smile, emphasizing ICT was going to be used just because she would be there. The researcher felt the intensity of his dissatisfaction because of her body reacted to his face, tone, words and smile. Instead of feeling welcome, she felt awkward and uncomfortable. At first, his actions could be interpreted as welcoming, but he had no intention to hide what he was feeling about her presence. It was effective because she felt that too due to the affective flows coming from him.

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The impression the researcher had was that ICT was not used as a tool for pedagogical purposes but as a request from the ICT department, which arranged the timetable of the researcher. Although the researcher made clear she was interested in observing random lessons with everyday use of ICT, it seemed the message that the teacher received was different. It might be that the ICT department requested them to show clickers in use and this could explain the way the teacher acted upon the researcher. Many other reasons could have led the teacher to act that way. Due to time restriction, the researcher had to leave the room fast to observe a different lesson. There was no opportunity for a chat or an interview with the teacher to further enquiry. On the other hand, the point was not identifying the reason why those feelings emerged but the fact that they emerged and it influenced the way the lesson happened.

In comparison to the teacher, students seemed to have reacted in a different way in relation to the presence of the researcher. Some students demonstrated indifference, by not interrupting what they were doing to look at her, acknowledging her presence and reacting to it. Others, for instance, looked at her and smiled, demonstrating acceptance of her presence in the classroom. Students demonstrated different reactions from the affective flow from ICT and the teacher: positive reactions when ICT was having a major role and some kind of apathy when they were not in use, or its use was not on focus.

When clickers were in use, students were cheering, demonstrating enthusiasm and excitement by talking and interacting with each other, by the tone and volume of their voices, and expressions on their faces. These reactions did not happen when they

were listening to the teacher, or when they were making notes or copying information from slides. When the teacher was speaking about the content, students had no expression, were not talking, moving and when they did, it was just to write, look and listen. Compared to the use of clickers in which students had to actively do something when the teacher was speaking, they had to do nothing. On the contrary, they were supposed to remain in silence. However, when clickers were present, the lesson was not dependent on the teacher's action, but mainly the students. The teacher controlled the progression of the quiz, but students had to click to choose one answer for the lesson to progress. The centre of actions in the lesson changed from the teacher to the students.

It is not possible to say that students had positive emotions and were more active just because of the clickers. Maybe it could be associated with the quiz. But the question is to what extent, by doing a quiz without the clickers, students would have reacted in an active way as they did with the clickers? Students were celebrating all the time they got right answers. They celebrated, even more, when their position in the rank changed for a better one. It is not possible to say that students were getting enthusiastic and excited by the fact that they were in a competition. It might be. Using clickers represented an opportunity for students to be more bodily active in the lesson. By answering questions and selecting the right answer with the gadgets they were working mind and body together actively. Different from when they were just listening and looking, in which their body would be on more of a rest state. When using clickers, their bodies needed to move for the lesson to continue. When the teacher was talking they needed to do nothing: even if they pretend they were listening or making notes, the lesson would carry on without them. Their importance

in participating was recognized by their bodies which also responded cheering or complaining when they got a right/wrong answer.

Clickers also enabled students to measure what they knew and show it to their peers, without the pressure of an official assessment. They were able to fail during the activity because there would be time to change their knowledge status and go well in the official exams. This fact might have affected the way they felt more relaxed in the lesson and in being evaluated unofficially.

A student was so happy with the situation that she declared her love. It was not clear if it was directed to the clicker or to the quiz. What is possible to say is that the opportunity of using clickers allowed her to experience something that made her 'love' that situation. It does not mean that she does not like the lesson when clickers are not in use, but it evidences that there are moments in class her emotions change due to the affective flows from other students, teacher, and ICT. It is implied that these situations are not frequent because if they were and students were used to this tool, they would not have reacted with such intensity as they did when the teacher announced clickers were going to be used. The emotions of happiness and joy were so strong that the researcher also felt them, not with the same intensity, but felt happy for them being happy and excited, even not knowing them or having any kind of previous relationship.

From the beginning of the lesson the teacher did not express positive emotions and as the quiz happened, he did not change his mood. He continued with the same dissatisfied face, demonstrating it with his tone of voice as well. The teacher warned the students to pay attention while reading and answering the questions. He was not

satisfied with students focusing on answering it fast, instead of answering it right. Although this was the teacher's intention, it was contradicted by the racing cars animation that appeared on the board every time the answers were released and students were ranked. As if students felt they were inside those cars, they started to read and answer faster. They noticed that the keys to winning 'the race' were answering right and fast. Students had just ten seconds to register their answer. If they did not register it within this time, it would not allow them answering and their scores would be affected negatively. In conclusion, if they did not know the answer, at least they had to guess.

There could have been students who were not genuinely celebrating. It might be that some of them were hiding their disappointment of not being the ones who won the race. However, just the first five students appeared in the animation and because of it, it was not possible to know the ranking of the other 11 students of the group. Maybe if there was no competition or ranking students would be less enthusiastic about the quiz.

On the other hand, during the moments in which the teacher was talking about the content using his slides projected, it seemed as if the affective flow from the teacher, ICT and the context resulted in a state of inertia. Teacher and students were active in different ways and levels. The teacher was speaking, changing slides, moving from one side to another, pointing to what was projected, moving his hands while students were looking at him, listening to him, making notes and copying. Regarding quantity and intensity, the teacher was more active than the students. The lesson to continue was dependent on the teacher, not on the students. The students' faces and body

movements did not indicate any specific feeling. It was more a passive state of students' bodies, being led by inertia.

The fact that YouTube acted independently of the teacher's command in the lesson affected students and teacher. Students' passive state was broken: they smiled, had fun and started talking again, becoming enthusiastic. The teacher got anxious, nervous, upset and annoyed about it: he frowned, acted more aggressively and started complaining about what happened. He tried to get rid of that sound and to stop YouTube fast. He also felt the need to explain what happened, maybe due to the presence of the researcher. It seemed that it was because YouTube did something he could not control: although he was aware it was going to happen, he had the possibility to prevent it, but forgot it. It was his fault; he let YouTube act that way and he felt angry and guilty about that. Not only did YouTube have the force to deviate students' attention from the topic of the lesson, but it was enhanced by the affective flow from the movie Mockingjay Part II. The students started talking and cheering about it, not about the teacher's or YouTube's fault. It is possible to attest it because students were mentioning names of the characters, were pointing to the video, talking about it. What YouTube did was just remind students of something that was happening outside the classroom environment that might have been important to them, maybe more important and meaningful than the topic of the lesson.

In an attempt to bring students' attention back to the classroom and to the topic, the teacher left the projection of the slides and got a Globe. It seemed that by just talking and using slides would not be enough to have them back. The teacher used the Globe to show different regions in which World Trade Organisation was located. The

pedagogical use of the Globe was not so relevant, once as a visual aid it just indicated the place and how far these places were from each other. However, it was very helpful for the teacher to get their attention back because students got quiet again and started looking at the Globe while the teacher was talking. The affective flow of the Globe and the teacher's voice acted together and he was able to get students' attention back. The dissatisfaction of the teacher started fading: his face expression and body started to relax whilst students' bodies were entering again in rest and in silence.

4.3.3 SUBJECTIVATION AND SUBJECTS

For this account, there were two main types of subjects: students and teacher. Although the former category does not refer to one component only, but sixteen different components. It seems that the teacher considered the students as one thing in which he interacted to the same way and so the category sometimes is addressed as only one thing, even when it is referred in plural. He acted, spoke, moved around as if he was speaking to only one component. Nothing was done by the teacher considering them as individuals with specific needs and doubts although they were individuated in the competition in the quiz. In response, students acted the same way. They listened, made notes and copied with a similar expression on their faces, with similar movements of their bodies.

When clickers were in use, students had the possibility to become individuals. They were not a mass of students who would not be treated the same way. Clickers allowed them to be different components when the possibility of becoming numbers and colourful cars was opened. Students could interact with clickers and interact with

the content. Because of it, they could test what they knew, being able to be classified as good or bad students. This fact allowed them to interact with each other showing who the top best students were by making it explicit in the racing animation. This recognition of being individuals made them cheer. They could see each other there, something that was not enabled in other moments. From this information, it would be possible for the teacher to take action individually, solving each student's doubts about the content. As the software only showed who were the best students and the answers chosen by the students, it was not possible for him to identify who the students in need were. It allowed the teacher to provide a general feedback.

Another moment in which students had the possibility of being individualized and becoming something else was when YouTube played the Mockingjay Part II trailer. When it happened students were not only students, they had space to be teenagers, girls with specific preferences that might differ from each other, who were waiting (or not) for the release of the movie, who had empathy (or not) for the heroin of the movie Katniss Everdeen, portrayed by Jennifer Lawrence. The girls could think about how the movie would end, if it would finish similarly to the book or not and who deserved her love: Gale Hawthorne or Peeta Mellark. A love triangle, with dispute, love and death competition contextualized by an oppressing government affected these girls' imagination and made them forget about where they were, who they were and what they were doing. They had the possibility to think about different identities in the plot, to think about feeling like the heroine and what could have been done if they were her. Girls were able to talk to each other, laugh, disagree, make jokes, giggle based on what they thought it was nice, cool, and right even if they were not appropriate. It was as if the teacher was not there anymore. As students, they were

supposed to perform specific actions: they had to think, talk, listen, be in silence, write, copy according to what was right in the books, in the exams, and for the teacher.

The teacher noticed he was losing his students. A teacher is only a teacher if he has students. He needed them back if he wanted to continue being who he was. He believed he was losing his students because of a mistake he made. If he hadn't forgotten what YouTube was capable of doing, his identity would not have been threatened. In an attempt to restore his students, he left ICT to the side and became the centre of the lesson again. He knew that by doing that he would gain students' attention. Instinctively, he grabbed the symbol of the Geography teacher, held it as a sword, ready to fight for his life as a teacher and pointed it to the students as if they were on different sides of a battle: a life or death battle. The teacher was sure that the Globe was not going to disappoint him and would not do anything undesired or unexpected. He could count with the Globe as an ally in this moment and it worked. Students left their identities as girls and individualities behind to pay attention to what the teacher was saying and maybe understand why he was holding a Globe. Seeing it worked, the teacher started to relax as his own identity was restored as well. If the teacher had not been able to do it, anything could have happened in that room, with many different identities interacting at the same time, expressing their opinions, maybe the point of the lesson would have been lost. In doing what was expected the teacher allowed them to talk with their tables, but about the content and give their personal opinion, about the topic explained during the lesson. In an act of mercy, he would also share his slides with them via e-mail. Students surrendered and what was considered as an ordinary ICT in this lesson was the projector/projection, slides,

video, the internet and the laptop. It is considered ordinary due to the way students reacted and felt in relation to its use.

However, some questions emerged: What was the point of the lesson, since the beginning? Would it be really lost if the teacher had not regained the control of the students? If no disruption had happened with the use of clickers and YouTube, would students learn what they were supposed to learn? What did they have to learn?

What can be concluded from this account is that the teacher was recognized as a good ICT teacher by the ICT department by using clickers effectively. He could not have used in the day the researcher appeared to see them in use, but he did not. He used them but made clear to the researcher he did not like the fact it was requested. Maybe, if it would have come from the teacher to invite the researcher to come and see when clickers were in use, it would have been different. Maybe the teacher would have shown his best lesson in which clickers were used for pedagogical purposes.

4.4 CASE 3 – WHISTLING CYBERBULLYING

Case study three took place in the Secondary School. The school subject was Personal, Social, Health and Economic Education (PSHE) and students were part of Year 8 group. They were having classes in the main building of the school in which most of the classes of Secondary School happens.

"It was period four and the subject was Personal, Social, Health, and Economic Education, or PSHE. I arrived earlier than Mr. Lewis to the room. He was the Deputy Head. When he arrived, I introduced myself. He said he was aware that I was coming and apologised because he would not use ICT in that lesson. However, he explained

he was going to talk about it at some point. I said it was ok as I was interested in the everyday use of ICT and smiled. He smiled back and pointed me a desk at the front of the room where I could sit.

He announced he wanted to recap the previous lesson.

'What is risk?' he started.

Most of the 28 students raised their hands to answer. Mr. Lewis picked some students to give examples of what risk was. He said that the focus of the lesson would be risks related to the internet.

'Who thinks going on the internet is risky?' he asked.

Eight students raised their hands. I had been following Year 8 all day long and they seemed to be eager to participate in this lesson. In the previous one, they were apathetic, not engaging and seemed not to be motivated or interested in the subject. Now they were talkative, enthusiastic, looking at Mr. Lewis with big shiny eyes and smile on their faces.

'Hands down. Who thinks that going on the internet is such a big risk that they don't go on the internet?'

Two students raised hands.

'Hands down. What are the risks when we go online?'

Mr. Lewis was also enthusiastic and energetic when articulating the discussion. He moved around approaching students when they were speaking. He asked students to

do a risk assessment of going online, based on the concept of risk they had already discussed. They would do it in pairs.

'What is the biggest risk?'

Different answers were offered by the students: giving away personal details; searching for or finding inappropriate things; becoming a target for cyberbullying; giving away somebody else's details; getting drawn into communication or conversation in which people could misinterpret what is said. For each statement presented, Mr. Lewis asked the group who agreed. For all answers, some students raised their hands. There was no statement that had a substantial amount of hands up. Mr. Lewis concluded that there was no agreement about the biggest risk.

'If there are so many risks, why do people still go online?' he asked.

'But there are a lot of good things you can do on the internet too' said a student.

Students fired him with many options and Mr. Lewis had to ask for silence.

'What is the only thing we can control?' asked Mr. Lewis.

'How we use it', a student said.

The teacher asked them to reflect for a moment, considering the risks they knew that exist. Mr. Lewis said it was easy to say 'to use it sensibly'. He advised the students to break down the meaning of this word to advise people correctly, as 'once you write something on the internet it's gone'.

Mr. Lewis asked them to talk in pairs and write three things they were concerned about while accessing the internet. As the discussion proceeded, shiny eyes disappeared being replaced by shaking legs, clicking pens, worried faces. The tone and level of their voices changed, indicating some tension in the classroom.

Mr. Lewis gave them a problem:

'Ali is a boy who received the following message on twitter at 11.37 PM saying: I hate you and I want to fight you at school tomorrow.'

He asked them to do a risk assessment of the situation and write three pieces of advice for Ali to deal with it. They were supposed to write a letter to him.

'An old fashion letter, you mean?' a student asked.

'Yes. People still write letters, don't they?' he replied frowning.

'Yes. Just because the English teacher said letters have a specific format' explained the student, almost apologising.

Silence in the room. Everybody is thinking and writing. Mr. Lewis wrote in red on the board – ALI IS BEING CYBERBULLIED.

Suddenly, out of nowhere, a very famous whistle ringtone was heard[43].

'What was that?' asked the inquisitive teacher.

'That's a Samsung! Who has a Samsung?' denounced a student laughing.

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[43] Available from: https://www.youtube.com/watch?v=Z5h411OcttA [Accessed 22 November 2015]

The situation got messy. Students raised their voices and started asking to each other who had that mobile phone. In a mixture of fun and worry, they wanted to find out the origin of the sound. One student took out his mobile from his jacket's pocket and said it was a Samsung but it did not do it. Students started accusing him as the responsible and he tried to defend himself. Regarding the position of the boy and the location of the sound probably it was not him, but he became the target of the discussion.

In order to control the situation, Mr. Lewis reminded them that early on that morning, the topic of the assembly was the internet, mobile phones, and the school mobile policy. Mr. Lewis asked the purpose of the mobile policy. One student said mobiles should be turned off. Mr. Lewis asked the boy who answered if his mobile was off and he said no. Mr. Lewis reinforced he was not accusing the boy, but he pointed out that that boy and someone else were not following the mobile phone policy because there were two mobile phones on in the class. He concluded that both of them were infringing the rules.

Mr. Lewis said that according to the policy, there should be an investigation to identify what happened and to punish the responsible. He said he was not interested in who did that. However, it was a good opportunity to identify that even being reminded by the head of the year during assembly, there were still people that infringe the rules, two at that room and he suspected that other might have done the same. While he was saying that some students were quietly switching off their phones.

'Why do we have those rules about mobile phones in school?' asked the teacher.

Some students listed different reasons: to keep them away from what was out there, to let them not be distracted, to make them focus on studies and to protect them. The teacher agreed to all of the answers and reinforced that the last one was the main reason why: to protect them from distractions and from a lot of different things as people who take photos in lessons and share it online, or who send messages in the wrong time. It brought the students back to Ali's problem. Then, he turned to that boy and asked him to turn off his mobile phone.

Mr. Lewis asked examples of cyberbullying. Students pointed: constant messages, threats in social media, and blackmail. He also asked students how cyberbullying could have an impact on a person: on behaviour, performance, learning, mood (angry, sad, worried), having nightmares.

He analysed the situation and the content of the message. He pointed out the time, the age of the boy and what he would do in the following day. He said that Ali (12) was not supposed to be awake and on the internet at 11.37 at night because he had classes the following day. He should be sleeping. A student said that although he should be sleeping, the fact of seeing the message only the next morning could have caused more panic, because maybe he would not have enough time to do something, as talking to his parents. A different student pointed that the message could be random and from a fake account, because there was no indication of which school the sender was referring to. He added that a person from school would have mentioned something that the student could identify. But other student argued that this could lead to some kind of suicidal tendency. Mr. Lewis said he made a very

good point because when a person received a message like that, we could not predict the person's reaction, maybe resulting in an extreme reaction.

'Who has access to social media (Twitter, Facebook, Instagram) at 11.37 pm?'

Some students raised their hands and other said they could not. Mr. Lewis said that the possibility for Ali to be using his phone as an alarm clock was high. It was something that was available and many people usually did it, he said.

The students analysed further the elements of the message, saying it was general and maybe there was no need for Ali to be worried. However, Mr. Lewis said that one reaction from Ali would be to avoid the problem and not go to school that day. While the discussion was happening, most of the students keep talking with their peers and raising their hands to participate. They were engaged and motivated again. However, there was a mixture of shiny eyes, shaking legs and not so confident smiles. Noticing the time, Mr. Lewis asked them to finish the letter at home because they would read it in the following lesson.

Before packing up, a student raised his hand. Mr. Lewis allowed him to speak.

'It is so easy to switch off the computer that cyberbullying should not be so important, but actual bullying is the real problem. You can turn it off, delete accounts and leave the internet, but you actually cannot do it from real life, from bullying, from school.'

Mr. Lewis said that the boy was right and they should not consider these things separately because cyberbullying was bullying."

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Although this lesson did not have the pedagogical intention to use ICT, it was a good example of a conventional lesson in which ICT was not used but was present. The ICT tools that were present were: mobile phones, internet access, iWB, network system, but the teacher chose not to use them. However, even by being avoided by the teacher, they forced their presence by escaping the teacher's control. This is what made this example interesting and this is what this account is about, besides cyberbullying.

To begin with, the components of the assemblage are illustrated in the table below.

Table 3: Components and their actions in case study 3 – Whistling Cyberbullying

Components	Actions
Risk	Oriented the view of the teacher and his argument about in relation to the internet.
Students' hands	Expressed their opinion Asked for permission to speak Asked for attention Provided feedback agreeing or disagreeing with something Contributed with their opinion
Students' voices	Expressed students' opinion Made comments Provided answers Analyzed and debated facts Built and explained their arguments

	Clarified doubts
	Gave examples
	Evaluated possibilities
	(Dis)agreed
Teachers' voice	Directed the discussion
	Allowed students to speak
	Asked questions
	Made claims and conclusions
	Provided feedback
	Recapped the content
	Delivered the content
	Asked questions
	Listened to student's opinions
	Made assumptions
	Assessed knowledge
	Reflected
	Assigned tasks
	Evaluated the problem
	Gave advice
	Addressed relevance to student's opinions or facts
	Raise awareness to specific topics or facts
	Interpreted ideas
	Mediated conflicting opinions
	Assigned homework

	Signposted what should be done
Pens and Notebooks	Registered the opinion of students
	Started registering the letter to Ali
Marker and Whiteboard	Registered the tweet for Ali
	Registered what happened to Ali
Letters	Advised Ali about what to do
Internet	Allowed cyberbullying to happen
	Allowed Social Network to send a message to Ali
Social Network (Twitter)	Allowed cyberbullying to happen
	Transmitted a threat to Ali
Mobile Phones	Were the audience of the lesson, some on and some off
Samsung Mobile	Whistled during the lesson, disrupting it
	Called the teacher and the students' attention
	Evidenced internet and technology was there, even when people try to avoid it
Mobile Policy	Imposed what was possible to be done in the school environment regarding the use of mobile phones and defined their punishment
Cyberbullying	Put students in risk
Bullying	Defined cyberbullying and out students in risk
Ali	Received a threat via message in a social media

At first, it seemed that there was no ICT use in this lesson to be discussed. However, the fact that ICT was not used in a lesson in which the proper use of ICT (the internet, social media, mobile phones and cyberbullying) was the focus made it

relevant to be examined. As an example of even when teacher plan to avoid its use, ICT showed it is going to be there and it cannot be controlled.

4.4.1 WHAT WAS SAID…

The ICT topic chosen to be discussed in the literature review was cyberbullying. As cyberbullying is also related to bullying, the review is going to discuss both terms and their peculiarities.

4.4.1.1 … BY ACADEMIA: CYBERBULLYING

When defining cyberbullying, literature has been referring to the concept of bullying, arguing that cyberbullying is 'bullying in the digital age' (Kowalski et al., 2012) or 'bullying transposed on a technological platform' (Langos, 2012). The term bullying was first proposed by Olweus (1993) advocating that bullying and victimization were synonyms. For the author, a student is bullied or victimized when 'exposed, repeatedly and over time, to negative actions on the part of one or more other students' (Olweus, 1993, p. 09). By 'negative actions' he meant when someone intentionally inflicts or attempts to inflict, injury or discomfort upon another. These actions are characterized by the author as aggressive behaviour (Olweus, 1973). There are three ways to perform these negative actions for Olweus (1993): by words (verbally), by threatening, taunting, teasing, and calling names; by physical contact when somebody hits, pushes, kicks, pinches, or restrains another; and by a third not so clear category in which people are bullied by making faces or dirty gestures, by being excluded from a group, or by refusing to comply with another person's wishes. For Olweus (1993) there is one more defining condition for bullying to be recognized between students: there should be an 'imbalance in strength', indicating asymmetric

power relations. Bullying can also be 'direct' when attacks on the victims are open, or 'indirect' when some kind of social exclusion or isolation from a group happens intentionally.

The framework to classify bullying from Olweus (1993) has been largely adopted by researchers in an attempt to understand the phenomenon, to define it and to come up with strategies to tackle it in a digital environment (See Grigg, 2010; König et al., 2010; Marczak and Coyne, 2010; Marées and Petermann, 2012; Nocentini et al., 2010; Paul, et al, 2010).; Rivers and Smith, 1994; Smith et al., 2008a; Smith et al., 2008b; Walrave and Heirman, 2011; Willard, 2005; 2007). However, the complexity involving cyberbullying has led to the development of a range of studies in which the main idea is still discussed. As a 'new form of bullying' (Marczak and Coyne, 2010) or as a 'special form of bullying' (Marées and Petermann, 2012) researchers have explained and characterised cyberbullying differently. This fact has been attributed to the diversity of the meaning of 'cyber' and 'bullying' in various languages and cultures (Slonje and Smith, 2008; Nocentini et al., 2010); typologies and categories used in studies (Spears et al., 2009; Smith et al., 2008a; Schultze-Krumbholz & Scheithauere, 2013; Nocentini et al., 2010, Jäger et al., 2010; Grigg, 2010); behaviours associated with the phenomenon (Willard, 2007); the understanding of what it is for different people – young people, adults, researchers, teachers, parents and others[44]. Building from the bullying framework of Olweus (1993) or not, what is agreed by scholars is that cyberbullying is bullying performed by students, at some moment during their school life and it connotes a school environment, not inside the school, using some kind of digital tool, device, and the internet. However, the scene

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[44] Available from: http://anti-bullyingalliance.org.uk/ [Accessed 22 February 2016]

is an oversimplification of a fuzzy, manifold and tortuous process in which many elements are involved such as class, race, gender, and sexuality, as pointed by Ringrose and Renold (2010) when researching about bullying.

Using a feminist post-structural approach, Ringrose and Renold (2010) critically traced the discursive production of how the ideas of 'bully' and 'victim' are implicated in 'normative cruelties' of performing and policing 'intelligible' heteronormative masculinities and femininities. By normative cruelties, they meant 'ways of performing normative gender subject positions [that] invoke exclusionary and injurious practices (for instance, being a tough, physically violent boy, or a mean girl) that are taken for granted' (p. 575). They argued that the bullying discourse operates to simplify and individualise complex gendered/classed/sexualised/racialised power relations embedded in children's school-based cultures. In the study, Ringrose and Renold (2010) concluded that bully discourses offer few symbolic resources and/or practical tools for addressing and coping with everyday school-based gender violence.

What makes cyberbullying more difficult to be researched and to come up with strategies to be tackled is the fact that it is even more complex. The ones involved, the context, the circumstance, and the space in which it happens are more problematic due to the characteristic of the cyberspace and to the tools used to perform the act. A single child can communicate with the victim using multiple identities and multiple e-mail addresses (Kowalski et al., 2012), for example. It also demands a specific and technical knowledge which could take some time to be discovered.

Children and young people, from Primary to Higher Education, males and females –

all have the possibility of being involved in cyberbullying. It is advocated that there is

an increase in the amount of cyberbullying experienced as students get older

(Walrave and Hereiman, 2011), but there is not enough studies to claim it is related

to a specific age group. There is no study which relates cyberbullying directly to a

specific cultural, ethnic or religious group. Although Ringrose and Renold (2010)

claimed that bullying is implicated in power relations of gender, class, sex and race, it

has not yet been explicitly researched regarding cyberbullying.

Once bullying is associated with students, it happens during the schooling process.

However, the idea of time needs to be understood not chronologically, but from the

cyberspace perspective. Time in cyberspace has a status of 'always present'.

Everything that is published, posted or uploaded on cyberspace is there, accessible

at any time. Every time it is accessed, it represents a different time and it is repeat.

This is one of the issues that make cyberbullying being complex to define. According

to Olweus (1993), bullying happens repeatedly over time. This characterization was

based on the idea of the present and physical act. In the cyberspace, one thing can

be accessed over and over and it does not necessarily mean repetition of the act.

In cyberbullying, this repetition takes different approaches because it can happen

because: once the victim is inside the environment, there is a constant feeling and

fear that it can happen at any time because the condition of being bullied is always

'present'; the act was recorded and cannot be erased from the cyberspace, being

'there' accessible at any time, by anyone who has internet access; there is an

audience who is aware of the act and repeats it by sending/forwarding to others or

making comments about it. Depending on the type of the act, it will be 'there', accessible and repeatable as many times as possible. Unless there is some kind of formal complaint to the media channel from the one who has been the target, anything will be done.

However, according to Nocentini et al. (2010), the categories and behaviour types used to define cyberbullying from bullying have become subject to controversy among experts and researchers. The question is whether the same categories and types of behaviour could be applicable. They believe that two more categories should be added to the original bullying: the intention of the act; the repetition of the act; the power imbalance between actants; anonymity of the cyberbully; publicity of the act of cyberbullying.

Nocentini et al. (2010) proposed some different types of behaviour recognized by young people to define when cyberbullying happens:

- written-verbal behaviour (phone calls, text messages, e-mails, instant messaging, chats, blogs, social networking communities, websites);
- visual behaviours (posting, sending or sharing compromising pictures and videos through mobile phone or the internet);
- exclusion (purposefully excluding someone from an online group);
- impersonation (stealing and revealing personal information, using another person's name and account).

Kowalski et al. (2012) defined different types of cyberbylling and methods employed in doing it. The types were related to behaviours and methods referred to the

communication modalities in which these behaviours happen. The behaviours are flaming, cyber harassment, denigration, impersonation, outing, exclusion/ostracism, cyberstalking, happy slapping, hopping, and sexting. The form of communication these behaviours happen are instant messaging, e-mail, text message, bash boards[45], and social networking sites. What is interesting to point out is that not all ways of communication are internet/cyberspace based. This is the case of text messages. All the other modalities could be avoided if the person is not online or does not have a smartphone. Text messages are messages sent via phones and they do not need the internet to be sent. It means that if the person wants to avoid text messages in an extreme case, he/she was not supposed to have a mobile phone, even a simple one.

Flaming is a 'brief, heated exchange between two or more individuals that occurs via any communication technology' (Kowalski et al., 2012, p. 62). It occurs in public settings in which a series of insulting exchanges is recognized as a 'flame war'. It might appear to observers that the discussion between two individuals is playful and balanced. However, because of an aggressive act, the imbalance happens and one becomes the target of insults. The definition of cyber harassment in the literature has been problematic as Kowalski et al. (2012) argued. This is because cyberbullying and harassment have been used interchangeably by some writers and because cyber harassment has already been used as electronic bullying among adults[46]. Cyber harassment is generally viewed as repetitive offensive messages sent to a target. It usually occurs via personal communication channels, such as e-mails, but they might

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[45] According to Kowalski et al. (2012) bash boards are like online bulletin boards where people can post any information that they want to about any person or any topic.
[46] Available from: http://www.wiredsafety.net/ [Accessed 5 January 2017]

occur in public settings as forums or chat rooms. It differs from flaming in duration and number of targets: harassment is longer and it is more one-sided, implying one offender and one single target[47].

Denigration happens when information of one person that is untrue and derogatory (Kowalski et al., 2012) is released. It is usually done via posts on websites or disseminated via e-mail or instant messages. Depending on the way it is posted, it is also possible for people to add comments about the target, which have the tendency to be nasty. In Impersonation, the perpetrator poses as the victim, most often by using the victim's password to gain access to his or her accounts, then the person communicates negative, cruel, or inappropriate to others as if the target himself or herself were voicing those thoughts' (Kowalski et al., 2012, p. 64). Depending on the level of the impersonation, the life of the victim can be put in danger. Outing is related to sharing embarrassing personal information. It is usually via e-mail or instant message in which private information is sent. Trickery occurs when some are tricked into revealing personal information about themselves and then sharing it with others (Kowalski et al., 2012).

For Kowalski et al. (2012), online exclusion can occur in any type of password-protected environment or by a target being knocked off of buddy lists. One example is when people are 'unfriended' on Facebook. Ostracism might also be identified when people do not respond promptly to instant messages or e-mails. According to the authors, people who were a target of ostracism usually join other groups faster than people who was not ostracized. These groups might be chat rooms, discussions groups and could even be designed to seek revenge on the original source.

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[47] There are also other types of offenders called griefers and cyber trolls. See Kowalski et al. (2012)

Cyberstalking is related to the use of electronic communication to stalk a person, repetitively harassing or annoying him/her. With the intent of provoking fear on the target, multiple e-mails and messages are sent (Kowalski et al., 2012). Happy slapping and hopping are similar types of assaults (Kowalski et al., 2012). In order to increase the humiliation experienced by the target, perpetrators digitally record the assault and upload these videos on the internet for a big audience to have access. It is usually committed by young people, who walk up, slap someone while another young person records the violence using a mobile phone. Hopping is a more direct assault in which violence is used against the target and it is also recorded. Sexting refers to text messages or pictures sent to the target with a sexual connotation. It might include sexually suggestive comments, nude or semi-nude pictures or videos which might also be via other electronic means.

There is also another modality of cyberbullying which is cyberbullying by proxy (Kowalski et al., 2012). It happens when someone hacks into the victim's account and sends out harassing, inappropriate and hateful messages to friends and family of the target. The cyberbully in this situation might be a person close to the victim, for example, a friend who had access to the username and password of the victim. The authors also pointed that in other instances, perpetrators may reset passwords of the victim, blocking him/her from accessing his/her account.

The nature of cyberbullying makes it more difficult to be tackled compared to bullying because it demands a technological knowledge to be identified, tracked and removed from the cyberspace. It also needs the cyberbully, after being identified to assume it was an act of cyberbullying because many times perpetrators could allege they were

'just teasing' the victim, denying the malicious intent and behaviour. It makes the target to be more exposed as he/she is going to be considered 'too sensitive' and not able to handle a joke (Kowalski et al., 2012).

In the account, the message sent in a social network to 'Ali' could be considered a threat. However, from the perspective of Kowalski et al. (2012), it was supposed to take longer to be classified as cyber harassment and not as a one-time thing. According to Nocentini et al. (2010), it could be considered as cyberbullying as the threat was identified in the cyberspace, using social media. On one hand, the teacher did not provide more information about the situation to ground his argument if it was cyberbullying or not. He made the claim based on his imagination making the discussion vague. On the other hand, cyberbullying is also difficult to be defined by researchers and scholars, which also did not provide effective tools for the teacher classify it as cyberbullying with certainty. Because of it, students were also in doubt about the definition of the situation proposed.

As there was not enough information about the situation and whether it was cyberbullying or not, the only way Mr. Lewis could deal with it was by suggesting avoiding the cyberspace, internet, and technology, because that was the way he knew how to handle the situation. This way was contested by the student who showed he was trying to tackle the wrong situation with the wrong tools and actions.

4.4.1.2 … BY THE COMPONENTS

On this account, the components that seemed to be saying something were: the teacher, the students, the Internet, mobile phones, Social Media (Twitter), Ali, PSHE curriculum, the mobile policy of the school, cyberbullying, and bullying. These

components of the assemblage evidenced the presence of specific discursive components, related to the role each component had and how they were supposed to behave. It was possible to identify some statements implied regarding what happened.

DC 3.1 "Life on the internet was more dangerous than offline life, which was regarded as normal for the teacher."

Mr. Lewis built the idea that the cyberspace was a place in which students choose to be. By having an option, he suggested that students have other places to be which would be more appropriate, as the internet is a dangerous one. The fact that he regarded 'real life' as less dangerous, he implied that by opting into accessing the internet was a wrong choice. It would not be 'normal' for a student to choose to be at risk or in danger. A 'normal' and 'appropriate' choice would be to stay out of the internet. Students had a different opinion about the internet and tried to point them out and justify themselves to Mr. Lewis, who did not listen to them or accept them. Two types of life were constructed within Mr. Lewis argument, in which one is dangerous and risky and the other one was safe. However, students and the teacher have different opinions about the internet.

DC 3.2 "Avoidance of using ICT and going online could protect students from risky and dangerous situations."

Since the beginning of the lesson, the teacher emphasized he was going to talk about risky situations. He focused on only one situation: going online. He concentrated in exposing and exploring issues related to this problem in an attempt

to convince students that using the internet and being in the cyberspace was dangerous, risky and bad things happen to students when they were there.

The strategy the teacher used to convince students was ignoring the positive aspects. Instead of promoting a discussion with balanced arguments, Mr. Lewis did not let the positive aspects of ICT, the internet, and cyberspace be part of the lesson. The teacher wanted to emphasize the negative aspects of it and did not recognize when students fired him with positive possibilities. The teacher used their enthusiasm and the fact that students talked all at once to not recognize a single aspect of the internet. He silenced students' opinion and answers implying they were not worth to listen and were not important. For the teacher, he knew what was good for them, which leads to the next statement.

DC 3.3 "PSHE taught students what was good for them."

According to the National Curriculum the purpose of the subject Personal, Social, Health, and Economic Education is to develop: the understanding of risk, and the knowledge and skills necessary to make safe and informed decisions (DfE, 2013b)[48]. The teacher was supposed to ground his practice in the needs of pupils when defining what he/she is going to teach. For the PSHE association[49], the subject is supposed promoting spaces in which students will develop knowledge, skills, and attributes to manage critical opportunities, challenges and responsibilities they will face as they grow up and in adulthood. By enabling these situations, students were going to be taught how to 'stay safe and healthy'. It means that by the guidance of

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[48] Available from: https://www.gov.uk/government/publications/personal-social-health-and-economic-education-pshe/personal-social-health-and-economic-pshe-education [Accessed 3 January 2017]
[49] Available from: https://www.pshe-association.org.uk/curriculum-and-resources/curriculum [Accessed 3 January 2017]

the teacher, students were going to learn how to tackle these situations to become capable adults.

However, what was stated as the core of the subject was used by the teacher indirectly to advocate what he thought it was necessary for students to learn, not offering the tools to tackle risky issues. Risk management is, in fact, one of the purposes of the subject: its main focus is related to drug education, financial education, sex, and relationship education (SRE), physical activity and diet for a healthy lifestyle (DfE, 2013). These elements are the core of the subject and for the Department for Education what happens on the internet is considered as an extension of these problems. For example, the PSHE association has a supplementary guidance[50] related to online pornography and staying safe online, which is part of the Sex and Relationship Education. It means that what the teacher needs to work is sex and relationship education and not internet use. The lack of the appropriate skills and knowledge about sex and relationship might lead to inappropriate uses of the internet and inadequate behaviour in the cyberspace, not the other way round.

Actually, what might be argued based on the core of the subject was that the teacher was causing more harm to students than helping them in developing their skills regarding risks associated to the internet. The teacher was making students feel anxious about the situation which contributed negatively to their emotional health. The fact that going online was regarded as bad, it made students feel guilty and in

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[50] SRE for the 21st century. Available from: https://www.pshe-association.org.uk/curriculum-and-resources/resources/sex-and-relationship-education-sre-21st-century [Accessed 3 January 2017]

danger (see next section). No effective solution or tool was presented to tackle cyberbullying out of not going online.

DC 3.4 "Students were solely responsible for what happened to them on the internet. As they could control what they did, everything was intentional; there was no place for mistakes and what was done was not possible to be repaired."

Mr. Lewis built the argument that going online was risky and one of the dangers students might face by being on the internet was cyberbullying. The way he constructed the argument led to the idea that students were responsible for putting themselves in risk and danger as they were 'in control' of what they did. It implied that if students got involved in any kind of trouble they would be regarded as responsible for it, even when they did not provoke it, start it out.

By saying they were in control, the actions of students were regarded as intentional, as if students planned everything they did, not allowing any kind of mistake or misunderstanding. The chance of making mistakes and learn from them was ripped out from them. Students were supposed to act correctly all the time for everything and be aware of the risks on their surroundings. It resulted in students being labelled in only two possible ways: bullies or target/victims.

DC 3.5 "The school was a safe place if students did not go online. Otherwise, they would bring the outside risks and danger inside the school."

The internet was regarded as a risky and a dangerous place by the teacher. He made it clear that the mobile policy of the school was there to 'protect' students. It implied school was a safe place if the internet was kept 'out there'. If students did not

try to access it when at school they could keep it a safe, productive and not a distracting environment. Internet and mobile phone were regarded as disruptive. Disruption was not considered as an ordinary thing in school, but a bad thing caused by the students, who chose to let these dangers come inside the school. By accessing the internet, students were causing disruption, being responsible for putting themselves, their colleagues and the school in danger. Again, the idea of 'real life' being good and cyberspace being bad was reinforced. The school was implied to be part of 'real' life, which was a safe place.

DC 3.6 "Although the school mobile policy was elaborated to regulate mobile phones' use, teachers and students did not follow it, despite the punishments implied."

According to the mobile phone policy of the school, all the mobile phones were supposed to be switched off during teaching time. Putting the mobile phone in the silent mode was not allowed as well. In this case, the student whose phone whistled and all the others were infringing the school regulations. All the mobile phones which were on were supposed to be confiscated by the teacher, taken to the school office and they would be securely stored there. A record would be made of the incident and a letter would be sent to parents/carers to inform what happened. All the students would be able to collect their phones at the end of the school day. The question was, why did the teacher not do what he was supposed to?

In order to make the mobile policy effective, the teacher was supposed to have interrupted the lesson, have gotten all mobile phones that were on, have identified all of them, have taken them to the school office and have asked the secretary to write the letters and have sent to parents/carers. In the end of the day, all students would

have their phones back. According to that Year 8 group schedule, they had one more lesson only. It might be that the teacher preferred just to lecture the students about the policy and remind them the punishments instead of taking action. Moreover, he would have to investigate where the sound came from and if there was no squealer, the 'guilty' student would have to present himself.

It might be that the teacher thought that this incident would not worth wasting time. Maybe it would demand a lot of time and probably he would not be able to finish the lesson. Maybe the teacher himself made a quick risk assessment and concluded it would not be useful and productive to do that. What was intriguing was that, by being the Deputy Head, he was the one who signed the policy and one of the authors. It leads to another question about the effectiveness of the policy: as the person who was one of the authors of the policy, why he was not following it? If the students knew he was the author of the policy and he was not going to take action, why would the students follow it?

DC 3.7 "In order to prevent cyberbullying, bullying should be tackled in real life, and not by avoiding using ICT."

This argument was used by a student which emphasized what the real problem was. He identified the main issue in cyberbullying that it was bullying. He also recognized the attempt of Mr. Lewis to convince them to not go online and avoid the problem. He figured out that by avoiding the space in which it happens the problem was not going to be solved. On the contrary, the problem was going to be there and no useful tool was being provided by the teacher to neither tackle cyberbullying nor bullying.

This fact raises the question if bullying has been an issue for this school and what has been done to manage it. If bullying has been managed the same way as the Deputy Head demonstrated cyberbullying was, it might be that they were trying to avoid and hide the problems they have. It suggests that no effective measure has been taken nor any useful tool has been given to students to tackle it.

4.4.2 WHAT WAS FELT

It might be argued that because ICT was not part of the plan of the lesson and neither students nor teacher used it no emotions and affects in relation to it could be identified. On the contrary, a mixture of emotions emerged from human components just by the fact they were thinking about it. It was a result of affective flows from ICT upon teachers and students.

From the beginning of the lesson, a range of emotions was identified. First, because the researcher was following that group and she was able to identify different behaviours according to the lesson they were having, the teacher they were interacting with and the period in which the lesson happened. As they were having the fourth period, being tired could be a natural reaction of bodies which had been working since early in the morning. As stated, students seemed to be demotivated in the previous lesson because they were not engaging and were apathetic to what was happening. These types of behaviour were the opposite of what was witnessed in the lesson described. The students were talkative, enthusiastic, motivated, indicating they were happy and eager to participate in that lesson. This fact leads to the question of what happened from one lesson to the other that made students change their behaviour. What made them act in a different way? The teacher might be the

answer. Mr. Lewis was very energetic and enthusiastic. He seemed to be very motivated to discuss the topic of the lesson and while he was speaking, he moved from side to side in the room, spreading his energy in the classroom. Students might have been affected by his energy and answered by participating in the discussion and paying attention while it was happening.

However, as the discussion about risks associated with the internet proceeded, students and teacher started changing their behaviour. They seemed to be affected by the discussion. The teacher continued to be energetic, but his energy seemed to be driven to convince students and guide them to a specific pathway, in which he was trying to indirectly make a defined point regarding internet and risk. While the teacher was vehemently associating risk to internet access, students were trying to argue with him, advocating that good things could also be associated with it. In an attempt to not let students go that way, the teacher controlled a number of opinion students were giving by asking yes/no questions and by making statements that functioned as definite truths about going online was risky.

From sounding enthusiastic and energetic, the teacher started to sound cautious, worried and concerned about the fact that there were many risks about going online. Based on the students' answers he was not able to define the biggest risk. Instead of picturing this fact as a positive one, as if these types of risk did not imply a high level of danger, he did the opposite. He rephrased it as if the internet had so many risks that students would not be able to control them and to deal with them alone. From students who seemed to be eager, happy and motivated, they seemed to become anxious, worried and tense. They demonstrated it with their body movements of

shaking legs, frantic clicking pens and the tone of their voices while discussing on their tables. It seemed students were getting anxious as a result of the teacher pointing to negative aspects of internet and not proposing any solution on how to solve/tackle each of them. It seemed students were facing a dilemma in each table, trying to justify why they should go online.

'Ali's problem' increased the level of worry and the amount of justifications students provided. It seemed that for each element analysed in the situation as a whole, students were trying to focus on a positive aspect as if they were trying to calm them down. At the same time, the teacher seemed to do the opposite and show them other dangers and threats 'Ali' could be facing and they were ignoring. It seemed the teacher and the students were in a tug of war, in which Ali was the rope: students were trying to justify and assure their right to use the internet because it was good, while the teacher was showing why the internet was too risky for them.

The whistle was also used by the teacher to reinforce his point about the negative effects of the internet and the lack of control in using mobile phones. Although the whistle ringtone listened to in the class could have been regarded as a disruption, the teacher took advantage of it by pointing to many risk factors and how students could be in danger with them. By referring to the early morning assembly and to the mobile policy of the school, the teacher was claiming there were students who were infringing the regulations of the school. He was directly exposing two students and implying more would be doing something wrong. He illustrated it as a risky situation in which students would be better avoiding if they were following the rules. As Mr. Lewis was acting as an inquisitor, students started to seem to feel guilty, evidenced

by the question of who had a Samsung. That specific student started to justify why he was not responsible, but he had a phone on.

It seemed he wanted to show he had a mobile phone but it was not causing any harm to him by having one. Instead of backing him up and doing the same, students used him as a scapegoat to have the teacher's attention only on him and not on them, while they were turning off their phones.

By evoking the mobile policy of the school, Mr. Lewis made all the arguments about the good aspects of the internet disappear. Students were just focused on not being associated negatively with that risky and wrong behaviour and got involved in the discussion of Ali's problem again. Nevertheless, one student was brave enough to point out what he called the 'real problem': bullying. From that point, the teacher had no more argument about why the internet should be avoided because cyberbullying was bullying. By using this argument, it seemed that the teacher was defeated in this tug of war. Students brought Ali to their side because they seemed to understand Ali and the teacher seemed to not have really approached the problem in order to solve it, or at least it seemed to be the impression that student had and others agreed.

4.4.3 SUBJECTIVATION AND SUBJECTS

The topic discussed in the lesson had great influence in the subjectivation process of students in this account. However, it was influenced by the way the teacher articulated the topic and managed the discussion in the group. The topic of risks on the internet and cyberbullying opened the possibility for students to think about being in a risky position. From engaged and motivated students, they became young targets for bullying or bullies and it made them feel insecure and anxious. From the

internet, mobile phone and social media use, they were brought into a state of risk in which they started feeling and acting as if they were in danger. Their worry was visible in their actions.

As risk management is part of the content of PSHE, being at risk or taking risks is implied to be part of Secondary students' life. Students were believed to be in an age in which they would learn from the mistakes they made. The way students presented some risks were not directly related to the age of the person but by the fact of being inattentive to risks. For example giving away personal details could be a mistake made by anyone who is not paying attention or not being careful. It is not a matter of age, implied students. Being misinterpreted in conversations is an issue that might happen to anyone, anytime in anyplace, independently of age and if the person is communicating via online tools or not.

However, Mr. Lewis reinforced that students were entirely responsible for getting involved in these problems because they were in control of how they used the internet. From this point, students were not allowed to make mistakes anymore. They were not in an environment in which they could be young people and learn from it. They were supposed to be aware of the risks, be responsible and use it sensibly. By identifying what sensibly meant, they were naming the actions they were supposed to be doing and indirectly recognize what they did wrong. Moreover, Mr. Lewis warned that any wrong action they did online there would be no opportunity for fixing it as if they had no second chance. Putting things this way, Mr. Lewis made student afraid especially when he related cyberbullying as one of the biggest issues on the internet.

According to the literature review, in an attempt to deal with bullying, schools usually refer to students or as bullies or as victims. The way Mr. Lewis directed the discussion he was addressing students, not as bullies. It implied that if they were not bullies they would be a target for bullies and exposed them, reinforcing the fact that they were unsafe. When he analysed the situation, he pointed out what 'Ali' should be doing, as a reference to what students should be doing as well. If these students recognized they were not behaving like 'Ali', automatically there was only another option for them to be: the bullies. The discussion that followed from the idea seemed more to be a list of excuses from students to convince themselves there was nothing to be worried about and that tweet did not mean real danger. They also gave many reasons why to identify the origin of the message was difficult, being anyone specific that it did not worth identifying it.

The way Mr. Lewis guided the lesson, it seemed he was trying to convince students they were in danger by going online and they were the only responsible for any issue that might happen. Moreover, they could be involved in a cyberbullying episode in which they could be whether the target or the bullies. In addition, they were supposed to be punished if it was identified. This fact was exposed when the mobile phone whistled. By citing the assembly and the school policies, he was emphasizing students were against the regulations of the school. In other words, they were wrong and doing something bad. Mr. Lewis reminded the procedure when something wrong happens: there was an investigation and after the responsible was identified, he/she was punished. The fact that the teacher said that two people were infringing the policy, he made two students to become the target of the group. That group that was being threatened by the risks of the internet had the possibility to identify one student

who could be accused of doing something wrong. Students directed their focus on the boy who became the target of the accusation and started having fun with that. That fun seemed to be more like a release of worry than the fun itself as if the worry had a face and a name at that moment.

That student who wanted to justify the fact his mobile was on and was causing no harm was accused by the teacher of putting himself in that risky position. He chose to leave his mobile on and he was aware of the mobile policy. However, other students did the same, but they did not want to be identified the same way, switching off their mobiles quietly and making fun of that student. Mr. Lewis used the situation to point out that distractions were dangerous as well and it was caused by mobile phones. But the cause was not in the mobile phone itself or on the internet, but in the student who allowed this kind of situation to happen.

From engaged, motivated and talkative young people, students became guilty, wrong, unsafe and in danger targets for bullies or they could also become the bullies themselves. The students' perspectives of themselves changed due to the way the teacher related to risk and cyberbullying in the lesson, making students feel anxious and bad about that situation as a whole. The teacher, as the Deputy Head who wrote and signed the mobile policy, assumed a judgemental position who knew what was good for them, reinforced by the core of the subject. Students tried to argue with that position in an attempt to build an identity in which they would not be bullies or targets and were allowed to make mistakes. This possibility was not opened for discussions by the teacher. However, students also questioned his position and judgement when they stated the teacher was wrong by focusing on the wrong problem.

4.5 CASE 4 – CODING PHONICS

Case study four took place in the Primary School. There were two subjects being taught at the same time: Phonics and Coding. Students were part of Year 1 group. From this group, just eight students performed the task involving Coding and Phonics. The others were performing other tasks related to Phonics.

"It was my last day of observations in the Nursery/Infant School. The weather was lovely and it was after the break, I was going to Eagle Class (Year 1). The teacher took me from the staff room to her class. She informed me she was not going to stay in the class because she had some reports to write. The activity was going to be led by one of the teaching assistants. There were two assistants (TA1 and TA2) and twenty-five pupils. The first thing I noticed was that the class was ready to perform the tasks, no matter what they were.

There were some tables arranged into three main tables. There was one big table with some notebooks opened. TA1 was going to perform a writing activity. It seemed she was correcting the students' notebooks on a one-to-one basis with kids who were going to stay on this table. There was another table with some papers, glue, scissors and it seemed to be a list of words. This table was going to work independently selecting words and gluing them in a 'treasure trunk'. These words were supposed to have the same phonemes 'to be in the trunk'.

My focus was on the small table near me. TA2, who was going to lead the activity I was interested in, selected the students who were going to perform each task. TA1 explained what each table was going to do. There would be three activities done at the same time.

Considering the students had just returned from the break, all of them were really interested in the activities. They were not excited, dispersed, talking among themselves and playing. On the contrary, they were all in silence paying attention to everything that was said to them. Nothing made them take their eyes from TA1 while she was speaking.

TA2 waited for the students I would observe to take a seat. My table had four places with a blue cardboard sheet each. The students were going to work in pairs on each cardboard sheet. There was a two dimension labyrinth drawn with a marker pen on each sheet. Some flash cards of phonograms were placed in different positions inside the labyrinth. Each cardboard had a different labyrinth and an amount of different phonograms. Although the labyrinths were different, there was no difference in difficult levels, implying no progression. Students did not need to follow labyrinth one and after two, they could go on each labyrinth at any order.

It was said to me that the purpose of the activity was to use the Bee-bot® to 'walk through' or 'navigate' inside the labyrinth. The Bee-bot® is a robot in a bee shape. It has some buttons on the top which the person presses to program its actions. The commands are simple: forward, backward, turn right, turn left, go, clear and pause. The students need to press the buttons to make the Bee-bots® move inside the labyrinth. Each time the Bee-bot® reached the phonograms the pair was supposed to write a word in which the phonogram was present. Each student had a small white board, a marker, and an eraser. Although they were working in pairs, they were going to take notes individually, even if they would write the same word for both.

There were four pairs, one for each cardboard sheet. According to the teacher, the students had already dealt with the Bee-bot®, so they knew how it worked. TA2 reminded them what to do and asked them 'to have a go' at the activity. She let them do the activity and started taking pictures with her iPad.

The kids did not only seem to be engaged but really excited about the activity. However, most of them were having problems coding the Bee-bots®. They were supposed to press the buttons for the Bee-bot® to move. They had to think in a way to calculate how many times they should press a button to make the Bee-bot® move. Nevertheless, the Bees were not moving the way they wanted/needed. Some of them pressed the button once to see how far the Bee could go. Then they calculated how many times they had to press the button to reach 'the end of the corridor' in the labyrinth. But it was not enough. It seemed that the length of the pathway in the labyrinth did not match the distance that the Bees were moving. This was one of the reasons kids started getting upset about the task. Another reason was that most of them forgot that each time they wanted to make a different move with the Bee, they were supposed to press the 'clear' button. Every time they gave a new command to the Bee it was added to the previous one. It means that if the clear button is not pressed before introducing a new command, that new one would be added to what was stored in the memory of the Bee and the previous sequences plus the new one would be performed[51].

Within five minutes there were two tables on which it was possible to see bees 'moving round and round' and kids trying to solve the problem. It was funny at first.

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[51] If the Bee-bot® remains in stand-by mode for some time it erases the previous commands from its memory. But as kids were uninterruptedly trying many times to program it, it did not happen.

They started laughing but as time passes, their happiness turned into frustration. They started complaining to me because I was near. I kept just looking and did nothing. None of them requested the TA2's help. They were just expressing their disappointment and continued 'having a go'. TA2 came and did not notice what was happening. She asked the pairs to change places and have a go in a different labyrinth. She started helping TA1 and left them with me. Some of the pairs reached some phonograms and made some words. The pairs were supportive to each other, sharing ideas and helping in the task. The kids of pair 3 pretended they reached the place where the phonograms were. They looked at me, took the Bee and put it on the phonogram to make the words. They knew they were cheating. Pair 2 just gave up coding the Bee and made a huge list of words, with three or four words for each phonogram. This pair seemed very proud and satisfied with their list. Every time pair 1 changed the cardboard, they erased their words. Pair 4 was still stuck with the Bee and they had two words from the first phonogram.

It was the end of the lesson and kids would prepare to leave for lunch.TA1 asked them to write their names on the whiteboards and leave everything where they were. Pair 2 handed in two big lists of words. Pair 3 and 4 handed in one list, each student with an average of six words. Pair 1 erased all the words and just wrote their names on two blank white boards. It made me wonder what the purpose of the activity was and if the Teacher/TAs reached their goals."

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The account provided had many actions happening at the same time. Many of them were not related directly to the main focus of the account: the activity in which the

Bee-bots® were used. Components as scissors, glues and even the fact that the teacher needed to perform the one-to-one correction influenced the Bee-bot® activity. However, components were listed from the Bee-bots® activity as the table below:

Table 4: Components and their actions in case study 4 – Coding Phonics

Components	Actions
Lead teacher	Took the researcher to the classroom
	Planned the activity with the Bee-bots®
Reports	Made the teacher be out of the classroom
TA1	Organized all the activities
	Led the one-to-one correction
TA2	Organized the activities with the Bee-bots®
	Took photos
Students (not in the Bee-bot® activity)	Paid attention
	Corrected their notebooks
	Cut and paste letters and phonograms
	Talked
Students (in the Bee-bot® activity)	Pressed the Bee-bots® buttons
	Laughed
	Talked
	Discussed with each other
	Complained about the Bees
	Wrote some words

	Helped each other
	Cheated
	Shared ideas
	Changed places
	Changed the cardboards
	Erased words
	Wrote their names
Bee-bots®	Obeyed the commands from the students
	Moved to different directions
	Passed through walls in the labyrinth
	Escaped from the labyrinth
	Buzzed
Labyrinth	Guided the actions of bees
	Restricted the actions of students
Phonograms	Oriented possible words students were supposed to write
Small Whiteboard and marker	Registered the words students taught based on the Phonograms
Eraser	Erased the words students wrote

As stated previously, the ICT gadget chosen to be observed and analysed was the Bee-bots®. They were used for the purpose of working two topics: coding and phonics, both requirements from the National Curriculum for the Primary Education. The next section is going to discuss how this activity raises more questions and issues than it seems.

4.5.1 WHAT WAS SAID…

For this account, the ICT topics chosen to be explored in the literature review were Computational Thinking, Computer Science, Computing, and Coding. These topics were selected due to the fact that they were entangled and some have been used interchangeably, not only in academia but also in policy making and in the schooling setting.

4.5.1.1 … BY ACADEMIA: COMPUTATIONAL THINKING, COMPUTER SCIENCE, COMPUTING, AND CODING

Coding, Computational Thinking (CT), Computing and Algorithms are terms from Computer Science (CS) which have been used by educators, researchers and policy makers to refer to what the new National Curriculum in ICT in the UK is about. A lot of discussions has permeated the use of these terms which are sometimes used interchangeably and are surrounded by controversy. In order to understand the problematic that involves these terms, their definitions according to different scholars are going to be provided as well their issues and implications in education in the British context.

The first problematic about the terms is that one is related to the other but not necessarily implies the other. Most scholars start by explaining CT and after they draw on coding and algorithms as elements of CS (Grover and Pea, 2013) (Wing, 2006; 2011). Others have argued that CT would be the approach to teaching CS, which could be regarded as the subject (Voogt et al., 2015; Yadav, Hong and Stephenson, 2016). Others have used CS, CT, and Computing interchangeably as if they mean the same (Barr and Stephenson, 2011). Others have used the term

Computing only in an attempt to encompass all these terms (Manches and Plowman, 2017).

What is agreed between scholars is that the work of Wing (2006) was seminal and has been used as a reference for defining CT. For her CT 'involves solving problems, designing systems, and understanding human behaviour, by drawing on the concepts fundamental to computer science' (Wing, 2006, p. 33). Although she claims CT is a 'universal applicable attitude and skill' it demands specific concepts from CS in order to understand and apply CT. In other words, without knowing these concepts it is not possible to engage with CT before acquiring knowledge from CS. For her CT involves algorithms, abstraction, and automation. Yadav, Hong and Stephenson (2016) paraphrased her explaining that: algorithms are step-by-step series of instructions, like a recipe; abstraction involves generalizing and transferring the problem-solving process to similar problems, and automation employs the use of digital and simulation tools to mechanize problem and solution. Again, there is no direct reference to the eminent use of computers to work with these constructs.

According to the Oxford Dictionary of Computer Science, CS is 'the study of computers, their underlying principles and use'[52]. It might be argued that CS directly implicates the study of computers and their use. Because of this argument, many scholars have been advocating that by dealing with CT, it is necessary to deal with CS, and as a result using computers is implied in this thought and practice. However, CS also involves the principles of computers, which means that in order to understand how computers work, it is necessary to grasp their principles. Due to

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[52] Available from: http://www.oxfordreference.com/view/10.1093/acref/9780199688975.001.0001/acref-9780199688975-e-963?rskey=DSeeYI&result=1 [Accessed 3 January 2017]

these definitions, the idea of CT has been associated directly with the use of computers, as if the former was dependent of the latter to happen, which is not true. Another fact that strongly influenced this situation was what Hemmendinger (2010) alleged. For the author, computer scientists tend to claim that elements of computational thinking are their own, implying it is not possible to be developed or worked in other disciplines but only by CS. He believes this is more a territorial claim in which people should be aware of arrogance and overreach it by focusing on the ultimate goal of CT that was supposed to be not to think like a computer scientist, but to teach students to apply these common elements to solve problems and discover new questions that can be explored within and across all disciplines (Barr and Stephenson, 2011).

Later, Wing (2011) revised her own definition in which she explains that 'Computational Thinking is the thought processes involved in formulating problems and their solutions so that the solutions are represented in a form that can be effectively carried out by an information-processing agent' (p. 60). She did not explain who or what this agent could be, but it suggested it is not either human or non-human agents that could process information, not directly implying the use of computers. Following from this idea, other scholars have been defining CT detached from computers, emphasising the ability, skills, and knowledge of the principles of how computers work. Aho (2012) considered CT to be 'the thought processes involved in formulating problems so their solutions can be represented as computational steps and algorithms. An important part of this process is finding appropriate models of computation with which to formulate problem and derive its solutions' (p. 832). From his definition, problems and their solutions have the possibility to be represented by

CS concepts, but these concepts can or cannot be implemented via computers. However, by using terms as 'computational steps' and 'models of computation' it could lead to the interpretation that computers would be necessary to perform these actions.

Another definition of CT that does not mention the direct use of computers is from the Royal Society (2012). For them, CT is 'the process of recognising aspects of computation in the world that surrounds us, and applying tools and techniques from Computer Science to understand and reason about both natural and artificial systems and processes' (Royal Society, 2012, p. 29) It means that practical knowledge from CS is necessary to know, understand and apply CT, but they do not advocate that computers are the key to develop these skills. In an attempt to reinforce that CT does not imply the directly the use of a computer, CS Unplugged[53] has been providing examples of how to work with CS concepts without the use of computers. For them, by not using computers to teach CT the confusion between CS and programming or learning application software is avoided. They also argue that the barrier of learning to program before being able to explore ideas is skipped. They also advocate that by doing CS without using computers they are also doing 'real computer science' as fundamental concepts 'such as algorithms, artificial intelligence, graphics, information theory, Human Computer Interfaces, programming languages, and so on' are presented.

However, CS Unplugged brings another term to the discussion. Computing and CS have also been used interchangeably, which adds more doubt and confusion to the discussion of what CT, CS, coding, algorithms and now computing means. The

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[53] Available from: http://csunplugged.org/ [Accessed 2 January 2017]

question raised is in which extent one implies the other and how it is possible to not user computers if most of the terms directly refer to computers. Using Berry (2013)[54] definition, Manches and Plowman (2017) indicated that computing is concerned with 'how computers and computer systems work and how they are designed and programmed' (p. 192). As Manches and Plowman (2017) argued, this definition emphasizes programming and it is not clear what exactly is meant by the term programming and the extent in which computing requires procedural competence as opposed to a more conceptual understanding. For the Royal Society (2012) computing is concerned with both: 'computers and computer systems'; it is also concerned how they work, how they are designed, constructed and used, and with the 'science of information and computation' (p. 05). In the document from the Royal Science (2012), it is claimed that computing education encompasses computer science, although when referring to CT they did not explicitly refer to computers, bringing some level of confusion to what they mean in general.

Barr and Stephenson (2011) offered what they called an 'operational definition of CT'. Focusing in CT in K-12 education they made a checklist for teachers to recognise and enumerate core concepts and capabilities necessary for CT. The capabilities are: design solutions to problems (using abstraction, automation, creating algorithms, data collection and analysis); implement designs (programming as appropriate); test and debug; model, run simulations, do systems analysis; reflect on practice and communicating; use the vocabulary; recognize abstractions and move between levels of abstractions; innovation, exploration, and creativity across disciplines; group problem solving; and employ diverse learning strategies. Here there is no clear

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[54] Berry,M. (2013). *Computing in the national curriculum. A guide for primary teachers*. Computing at School and NAACE. Available from: www.computingatschool.org.uk/primary [Accessed 29 August 2015]

reference for CS or Computing, but the concept of an algorithm is part of the content as well as programming. The term coding has not been used so far.

According to Grover and Pea (2013), CT is also regarded as practice[55] based on seven 'big ideas'. They start by using the term 'computing' and explain: it is a creative human activity; abstraction reduces information and detail to focus on concepts relevant to understanding and solving problems; data and information facilitate the creation of knowledge; algorithms are tools for developing and expressing solutions to computational problems; programming is a creative process that produces computational artefacts; digital devices, systems, and the networks that interconnect them enable and foster computational approaches to solving problems; computing enables innovation in other fields, including science, social science, humanities, arts, medicine, engineering, and business. It suggests that computing is CT in practice. There is no reference again for coding.

There are many elements widely accepted compromising CT, forming the basis of a curricula according to Grover and Pea (2013): abstractions and pattern generalizations (including models and simulations); systematic processing of information; symbol systems and representations; algorithmic notions of flow of control; structured problem decomposition (modularizing); iterative, recursive, and parallel thinking; conditional logic; efficiency and performance constraints; debugging and systematic error detection. For Wing (2011) abstraction is the key element in Computational Thinking and the most important thing to deal with complexity. It means that coding or programming is not the fundamental skills of CT; it is a tool

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which could support the cognitive tasks involved in CT, as argued by Grover and Pea (2013).

What is proposed by Barr and Stephenson (2011) and Grover and Pea (2013) is that educators are supposed to create activities and use these checklists to verify if they are applying CS concepts and as a consequence, they could conclude they were developing CT. It is suggested that CS expert knowledge is not necessary if you follow the checklist. However, some of these checklists above are based on concepts from CS, suggesting some level of knowledge of CS and CT for the teacher to recognize them.

Grover and Pea (2013) pointed out that there has been much criticism of the lack of agreement and clarity among educators about the multiple definitions and interpretations of CT, which has been affecting CS as a school subject in education. The authors also said that there is also a lack of agreement on whether CT should be incorporated into education as a general subject, a discipline-specific topic, or a multidisciplinary topic. Because of these misunderstanding of concepts and lack of agreement on what to do, there are questions about what should drive the curriculum elaboration: Computational Thinking? Computer Science? Computing? Coding? As these terms have been used interchangeably, it seems educators and scholars have been argued about the same, using different concepts which mean different things, making the field even more messy and complex.

The National Curriculum for England refers to the new ICT curriculum as Computing (DfE, 2013). In the document, it is argued that 'computing education equips pupils to use computational thinking and creativity'. Its core is CS, in which 'pupils are taught

the principles of information and computation, how digital systems work, and how to put this knowledge to use through programming. Building on this knowledge and understanding, pupils are equipped to use information technology to create programs, systems and a range of content'. From this definition, it is difficult not to relate computing to the direct use of computers and programming. However, as some aims of the NC are: understanding and applying the fundamental principles of computer science and analysing problems in computational terms, it contributes to the difficulty in not relate them to the direct use of computers. This is what Manches and Plowman (2017) argues, as the first three subject content for KS1 make an explicit reference to programming.

Even with these problems of defining terms and approaches, Grover and Pea (2013) stated that scholars have shifted their attention from defining CT to question of how to promote and assess the development of CT. This leads to the first issue that refers to the lack of studies regarding CT in Primary and Secondary education. Most of the research in education is related to undergraduate courses. Although this kind of research can bring insights about teaching and learning, their outcomes are going to be limited to the higher education setting, leaving questions opened about approaches to children and their tools, which usually drastically differ for example in abstraction compared to undergraduate students.

Another issue in CT and CS is the recommendation for engaging girls. The common sense that job positions in CS are not usually fulfilled by women (see Durndell, 1991; Rainer et al., 2003; Lin et al., 2011), make them not think about following this kind of career pathway. This leads to the argument that the sooner CT is introduced in

education, this kind of biased view would be challenged. Cooper and Cunningham (2010) provided a rationale and tools to strive the gender gap in the computing field.

Grover and Pea (2013) pointed to the fact that the current computational tools 'vary in effectiveness in allowing engagement with various component elements of CT' (p. 41). As an example, they argued, based on Maloney et al. (2008), that Scratch lacks the means to abstract functionality into functions and procedures. Makerspaces, DIY movements and 'hackers' events for kids are still untapped for Grover and Pea (2013). For them, these are promising spaces with possibilities of developing the construction of tangible computational artefacts, for examples. For Fessakis, Gouli and Mavroudi (2013) it is not the lack of tools that hinders progress in computing education. The obstacle for developing appropriate designed learning activities and supporting material that which can be easily integrated in everyday school practice are done by 'well-informed teachers'. Without the appropriate background, teachers are not able to develop this kind of curriculum.

Yadav, Hong and Stephenson (2016) argue that CS has not been prioritised by school boards. They claimed there is an imbalance of how parents, students, teachers and school board see CS education. It makes school boards underestimate parental demand for CS areas, while schools focus on standardised test subject areas. They also identified that CS education has not been offered because there is a lack of qualified teachers, resources to train or hire, which makes it difficult. It is even more difficult for rural or small school districts in which school board administrators are less likely to support CS. Manches and Plowman (2017) emphasized the importance of the educator for pupils, mainly for children. For the authors, when

children are still developing as independent learners, it is important the teacher feels knowledgeable and confident. It suggested that if the teacher is not confident and does not know what he/she is going to teach it will affect the students' experiences.

Assessment has also been an issue for CT. This is because judging the effectiveness of the incorporation of CT in the curriculum is one of the strategies to fully introduce CT into the Primary and Secondary curriculum (Grover and Pea, 2013). In other words, evaluation has been used as a justification of the introduction of CT as part of the curriculum and not to mainly assess in which extent there are benefits for students. Measures should enable educators to assess what the child has learned despite the fact that they need to be validated. However, discussions about the best approaches to assess are related to the pedagogical approaches to teach and learn, which sometimes is the target of broad discussions of national assessment tools and their effectiveness. It implies being part of the clash of progressive versus traditional teaching methods and the discourses and discussions related to them.

Other questions have been raised about the CT. It has been also questioned in which extent CT is distinct enough of other forms of thinking that children are developing. It is argued that CT would develop skills in a unique way, different from mathematical or design thinking (Lee et al., 2011). However, for Grover and Pea (2013), some elements which have been argued as part of CT could also be developed in routine activities of Maths and Science. This raises the question if the skills which CT advocate being the only subject able to develop could be first worked by core subjects, having no need for CT be included in the curriculum.

Manches and Plowman (2017) raise questions if there is (or is not) an appropriate age to introduce children to computing. Although it is advocated that 'the sooner, the better' by some scholars, the next question is which type of concepts should be taught for each school year. One example of their criticism is the use of floor robots, as the Bee-bots®, with the purpose of introducing programming for the early years. They question in which manner the work with these tools would underpin later learning or simply foreshadow later school-based activities, with the risk of repetition of content.

In order to develop a curriculum, it is necessary for the subject to meet some demands. If the focus is developing CT, CS, or Computing using computers as the core tool, the first step is to have a 'computationally rich environment' (Grover and Pea, 2013). Students need different programming and coding tools which would enable them to perform different kinds of activity. Some popular examples are graphical coding tools (Scratch[56], Alice[57], Game Maker[58], Kodu[59], and Greenfoot[60]); web-based simulation authoring tools (Agentsheets[61] and Agentcubes[62]); and robotics kits and tangible media (Arduino[63], Gogo boards[64]).

CSUnplugged disagrees and believes it is possible to develop CT using concepts as algorithms without computers. Grover and Pea (2013) questioned if by exposing children to unplugged activities they would be kept away from the 'crucial

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[56] Available from: https://scratch.mit.edu/ [Accessed 15 April 2016]
[57] Available from: http://www.alice.org/index.php [Accessed 15 April 2016]
[58] Available from: http://gamemaker.info/en [Accessed 15 April 2016]
[59] Available from: https://www.kodugamelab.com/ [Accessed 15 April 2016]
[60] Available from: https://www.greenfoot.org/door [Accessed 15 April 2016]
[61] Available from: http://www.agentsheets.com/products/index.html [Accessed 15 April 2016]
[62] Available from: http://www.agentsheets.com/agentcubes/index.html [Accessed 15 April 2016]
[63] Available from: https://www.arduino.cc/ [Accessed 15 April 2016]
[64] Available from: http://gogoboard.org/ [Accessed 15 April 2016]

computational experiences involved in CT's common practice'. However, as there is no clear consensus about the meaning of computing education or the most appropriate pedagogy for the early years (Manches and Plowman, 2017), it is difficult to argue about the benefits and challenges. For Manches and Plowman (2017) tools need to be designed in such a way that they respect early years pedagogy, as many educators believe that play is an important medium for learning and they tend to adopt a cross-curriculum approach.

Some advantages are claimed for using graphical coding environments as Scratch. It is believed it allows early experiences of design and creation for students and as they are easy to use, issues of programming syntax are avoided (Grover and Pea, 2013). Although these types of programming have a visual appeal, they are more tangible for students: they serve to prepare students for more high-level programming languages as Python and Java, argued the authors. Game design and robotics have served as an iterative exploration of CT. As resilience is developed as a skill, at the same time students get motivated and engaged (Grover and Pea, 2013).

Serafini (2011) argues that learning how to program in the Primary school is beneficial for children. By programming in such early age children need to learn how to deal with variables as a consequence they will develop this concept from scratch. This means that when dealing with more abstract concepts in Maths, their programming skills will have fulfilled the basic ideas they need in order to manage higher level problems.

In broad terms working with CT can foster creativity by allowing students to not only be consumers of technology. Students would be able to build tools which might have

a significant impact on society (Mishra and Yadav, 2013). It would also enable students to be 'media information literates', understanding how information and data could be represented and convey different meanings (Yadav, Hong and Stephenson, 2016)

However, the most common argument to introduce CT in schools is that it will enable the possibility of generating interest in students who would not consider following careers in areas related to CS. It is argued that computing is one of the fastest-growing job markets through 2018[65], and policy makers have raised the urgency to prepare the UK workforce for the jobs to come[66]. However, this argument is challenged by those children who allege having no interest in pursuing CS careers (Grover and Pea, 2013).

From all these discussions regarding concepts, the ones which seem more appropriate because they are clearer in relation to the ideas implied in each are the ones proposed by Voogt et al. (2015). For them:

> 'Computational Thinking draws on concepts of Computer Science, but the two are not identical. While Computer Science is an academic discipline in his own right that studies computers and computational systems, Computational thinking refers to thought processes that are involved when solving complex problems and generalizing and transferring this problem solving complex problems.' (pp. 725-726)

They also added that programming is 'but one context for the practice of Computer Science and Computational Thinking' (p. 718) implying that CT is more than using computers to code a program and that the skills employed in CT can be found and applied in other disciplines. However, Voogt et al. (2015) refer to Computing as the

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[65] Available from: Bureau of Labour Statistics http://www.bls.gov/ooh/ [Accessed 2 January 2017]
[66] Gove (2012)

subject in which the curriculum should be elaborated. They build this argument under the ideas of the Royal Society (2012) report in which Computing would have principles from CS and IT, in which CT is part of. This means that Computing being the theme of the subject, CT processes and concepts and practices from CS would be implied. As in the UK Computing was stated as a subject in the National Curriculum (DfE, 2013) the use of computers is implied.

Besides listing core CT concepts and their capabilities, Barr and Stephenson (2011) proposed activities in which they could be embedded in activities across multiple disciplines. The idea of elaborating this chart was to facilitate CT in classrooms. They also proposed five actions of how educational policies could be included CT as part of everyday student's education:

- Present a single message at federal, state, and local levels about the importance of computational thinking in K-12 Education;

- Encourage computer science professional organizations to advocate at the federal and state levels and work with groups that are active on state K-12 standards;

- Incorporate computational thinking throughout the entire K-12 experience with outcomes that demonstrate incremental steps;

- Attach computational thinking, where possible, to existing policies. For example, it could be included as an explicit outcome of state-level technology tests;

- Include in all teacher pre-service preparation programs a class on computational thinking across disciplines.

For Barr and Stephenson (2011), it is also necessary to have a shared vision and a common language by:

- Improving the relationships and communication between K-12 educators (faculty and administrators), college CS faculty, computer science professionals, and others in industry;
- Developing a clear statement of computational thinking as a core competency in K-12;
- Demystifying terminology about computational thinking, give clear examples of ways it applies to and can be integrated into a range of curricular areas.

Schools and district level leadership should be inspired to change by providing 'materials that will help school administrators understand computational thinking so that they can see why this knowledge and skills are important for today's students. The larger the CS community the sooner it can help by providing suitable materials and taking advantage of opportunities to work with K-12 administrators' (Barr and Stephenson, 2011, p. 120).

As a last recommendation, Barr and Stephenson (2011) emphasized that teachers should be inspired and prepared to change by:

- Professional development is critical to successful educational change. CS faculty can help by providing summer institutes, demonstrating the role of computational thinking in non-CS disciplines and providing relevant curricular materials;

- Encourage school administrators to provide incentives for K-12 teachers to change courses and curricula. The NSF RET grants awarded to CPATH grantees are one model that provides incentives for K-12 teachers to adopt curricular or pedagogic changes that have been piloted first at the college level;

- Provide teachers with resources to support change, including curricular materials, models and simulations, model activities, and websites for independent student activities;

- Provide teachers with professional development and support in the form of learning communities, summer institutes, peer learning offered by teachers with computational thinking experience, exposure to industry applications where CT skills are utilized, and help to identify where computational thinking is already included in teaching;

- Make available to school districts open-source tools (blogs, wikis, forums) and web-based social networks and content delivery systems for use by teachers and students (vetted so that districts are not likely to block them);

- Encourage current professional education associations to show how computational thinking fits into their current standards/work;

- Ask professional education associations to include a focus on computational thinking in their conferences, workshops, and professional development events.

From what was proposed by Barr and Stephenson (2011) it would be possible to argue that in policy level some actions were achieved/ The ICT curriculum of Primary and Secondary was changed into Computing, encouraging computer scientists to

become teachers and be part of this change and the previous ICT teachers who were not computer scientists to become. As there is a curriculum subject of Computing, it is unlikely that CT would be integrated or used in other disciplines as other subjects areas have their own agendas. Many communities and Hubs have been formed enabling space (virtual and physical) for teachers to share, learn and search for information about it.

As coding was stated as part of the National Curriculum, the message that CT is a core competency in Primary and Secondary education is implied. However, it has not been demystified the terminology related to the area. There is still disagreement among scholars and educators about the definitions, what they mean and demand. Professional Development has been stimulated in national and local scale, with hubs, forums, discussions, courses and events for the ones who want or need to learn about CT, CS, and Computing[67]. As the change happened recently, time will be necessary for an effective implementation and analysis of what has been done, in order to identify issues and challenges still to be overcome.

From the account provided, what was possible to note was that the teacher chose to combine two topics in the activity: coding and literacy. She also took the advantage of that coding could be done as a tool to develop other skills, which in this case was writing. She elaborated an activity in which students were supposed to use their CT skills (problem-solving) and CS knowledge (algorithm) to program the Bee-bots® to walk inside the labyrinth. They were supposed to have the CT skills developed and acquired CS knowledge properly for them not to be an obstacle for the writing activity. As students did not have them fully developed, they became an obstacle for

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[67] See CAS community. Available from: http://www.computingatschool.org.uk/ [Accessed 29 August 2015]

kids to overcome. If they had them developed, they would be able to identify their fault of not pressing the 'clear' button before each new command and they would also have identified the teacher's fault and lack of awareness about the mismatch between the Bee-bot® walking range and the length of the corridors in the labyrinth.

It seemed the lesson was planned according to Year 1 curriculum that says what they are supposed to learn. However, the teacher did not consider what they needed to know in order to perform all the tasks. She ignored the fact that they did not have their CT and coding skills fully developed to manage the first task effectively and that it would affect the second task. The teacher was also following the recommendation of scholars to use CT and coding as a tool to teach other subjects and skills, but it did not work, because to do that, their skills regarding Computing were supposed to be fully developed.

It seemed also that by using the Bee-bots® as a tool, the teacher was 'ticking some boxes' of what she needed to do to make kids program. From her point of view, she was following the recommendations from experts of how she was supposed to work. If she looked at the words written on the whiteboards it might be that she would think she achieved her goals. However, the goals related to computing failed.

4.5.1.2 … BY THE COMPONENTS

For this account, the components which seemed to be saying different things were: parents' reports, lead teacher, teaching assistants, students, Bee-bots®, labyrinth, Computing Curriculum, and Ofsted. These components were identified due to the way they acted.

DC 4.1 "Reports to parents were prioritised over teaching by the lead teacher."

On that Primary school, each group had a lead teacher and two teaching assistants. The lead teacher prepared every lesson and in agreement with the TAs they split the tasks and decided who was going to perform each activity. The lead teacher is the responsible for what happens in each group. The lead teacher of that group decided the topic of the lesson (Phonics), the tools to develop the skills related to that topic and the procedures related to that skill. She also decided they would do three different activities at the same time. She also thought about the fact that the researcher was coming to observe a lesson in which the Bee-bots® were used. She conjugated her goals and came up with that activity.

She was also responsible for elaborating the reports of each child in that group. As the lead teacher, she was supposed to assess every child in that group and expose her evaluation in reports. The researcher was not aware when the parents' meeting would happen. What the researcher knew was that the teacher prioritised the reports over teaching her students. It might be that it was the guidance from the school, as she was not the only teacher in the staff room preparing reports instead of teaching. Her TAs were not supposed to write the reports too, that is why they were teaching instead of her.

DC 4.2 "Teaching Assistants were considered as capable as lead teachers and they were respected for that."

The fact that the lead teacher elaborated the lesson, left the room to write the reports and delegated the activities to the TAs indicated she trusted them to perform it. The

lead teacher planned the types of activities and how many students would perform each task. The decision of who was going to perform what was entirely the TAs.

According to the behaviour of the students, they were used to have their lead teacher absent and to be guided by the TAs. It seemed there was no difference in being guided by them and not by the lead. Students were quiet, attentive and acted naturally as if there was no change in the routine. Every time the TAs made a request, they promptly answered or took action.

DC 4.3 "Multiple activities were performed in Primary Schools and educators (lead teachers and TAs) were able to concentrate on some of them."

There were three activities happening at the same time in the classroom: the treasure trunk, notebook correction, and Bee-bots®. The main focus of the three activities was the same: phonics. TA1 was correcting the notebooks of students on a one-to-one basis. The table which was performing the 'treasure trunk' activity was doing it independently. Although the treasure trunk table was near to the 'notebook correction', the former had no immediate and close supervision. Students were using scissors, glue and talking at the same time and they seemed to be focused and happy while performing the task. The group doing the one-to-one correction was focused on their task and TA1 was sitting on the table with them. TA2 introduced the Bee-bots® activity to the table in which I was sitting, took some pictures with her tablet and then left them. She went to the big table and helped TA1, correcting notebooks as well.

It was clear the main focus of that period was correcting the notebooks. The fact that both TAs had all their attention to a group of students correcting books indicated they

were prioritising this task over the others. It was also reinforced that the other two groups were left unattended during this activity. It is not possible to claim that the TAs relied on the researcher to help the students when they were using the Bee-bots®. On some extent, the researcher had no knowledge about using the Bee-bot® and was there to observe how they were used by students. In addition, the way the TAs and the teacher treated the Bee-bots® activity seemed it was easy to be performed by the students and that is why it was associated with Phonics. Even so, the fact that any of the TAs were there to identify the problems of students to help them or to guide them to come up with a solution suggested that some activities were planned to make students busy while they focus and prioritise other activities.

DC 4.4 "Different activities were performed to teach Phonics to Primary students: coding was one of them."

As already said, the focus of the period was Phonics. The three activities performed at the same time were based on the same topic. The fact that Primary school does not have a clear division of subjects to be taught in definite periods of time allow teachers to conjugate topics and skills to teach more than one thing at a time. This is what happened with the Bee-bots® activity.

The Year 1 group observed had one main content to be taught: Phonics. The big group who was correcting their notebooks was focusing on literacy and developing fine motors. The treasure trunk group was also developing the same skills and content. However, the Bee-bots® group was working on Phonics and coding. The way the TA presented the activity it seemed that in order to be able to write the

words, you were supposed to code the Bees properly. However, it was not what happened.

Coding the Bee-bots® and writing the words were, in fact, two different tasks and independent from each other. Students did not need the Bees to write the words. Students knew the phonograms and just by looking at them they could think about different words to write. There is no immediate link to the Bees. The Bees were used to make the activity more interesting, funny and challenging. Nevertheless, it backfired as coding the Bee-bots® did not work accordingly. If students had not left the Bee-bots® to the side, they might have not been able to complete the task and achieve the main purpose. As students noticed they were independent tasks, they just ignored the Bee-bots® and wrote the words.

DC 4.5 "By being familiar with playing with Bee-bots®, the teacher assumed they knew how to code effectively."

Students in that school were used to Bee-bots® since Nursery. By 'used to' it is meant that Bee-bots® were available for students to play with. Teachers would usually show how it works and students would 'have a go' by pressing the buttons and seeing how far and where it goes. Bee-bots® are shared by six or seven students who wanted to see what happens when they press a lot of buttons. This activity is performed when other tasks are happening at the same time as the Nursery and Reception has a child-driven approach: students are offered a range of activities to do and they can have a go in whatever they want for the amount of time they want. As soon as they get bored they change the activity when something else grabs their attention. This was how students were used to managing the Bee-bot®.

When students reached Year 1, some knowledge and skills were assumed to have been developed. Coding was one of these skills. Although the Bee-bots® were manufactured with the purpose of teaching and learning how to code these purposes were not so straightforward. The Bees demonstrated having other affordances which children were more used to. Their smiley faces, their colours, the context in which they were presented created a situation in which students were used to handling them to have fun and play.

In order to use the Bee-bots® as a tool to achieve a different purpose (not having fun), students did not know exactly how to do it. Pressing the buttons was not enough. They needed different skills. It might be that these skills were not fully developed yet or they did not have them. When the teacher planned the activity, she took for granted students would know how to manage the situation and would achieve both goals: use the Bees effectively and write the list of words based on the phonograms offered.

DC 4.6 "In order to code effectively computational thinking and the knowledge of how algorithms operate were necessary."

The task students were presented was two-fold: they were supposed to code and write words based on the phonograms in the labyrinth. These two tasks were related, but they did not imply each other: students could perform one without the other. In order to write the words, they were supposed to reach each phonograms using the Bee-bot®. Bee-bots® needed to walk inside the labyrinth. For the Bees to walk, they had to be programmed by the kids.

Coding is part of the Primary National Curriculum and one way of teaching it is via other subjects. It is what the teacher thought she was doing. She was using coding as a tool to practice Phonics. For her teaching strategy to be successful, students were supposed to know coding, to know how the Bee-bots® operate and have the skills related to both of actions internalized. What was noticed in the account was the opposite: students knew the phonograms, they had some background to come up with more than one word related to that phonograms, but they did not have the coding skills developed.

Students were used to playing with the Bees, which is different from coding Bees-bots® effectively. Coding demands computational thinking and the knowledge of how algorithms work. Students knew what each button represented and what would happen every time they pressed them. What they were not aware was that the Bees were not behaving properly it meant the students were doing something wrong. Based on the principles of computational thinking, students were supposed to stop what they were doing and identify the problem they had (Bees not moving accordingly).This problem was supposed to be broken down into different steps and each step should be overcome. Students demonstrated they did not have the practice of doing putting both in practice: computational thinking and algorithms. It is not possible to say they did not know these ideas, but it might be that they were not used to, as most of the times spent with Bees was to play and not to code them.

DC 4.7 "Patience and resilience were basic emotional/attitudinal skills that Primary students need to have developed in order to code effectively."

In order to code effectively, students were supposed to be aware of computational thinking principles and algorithm. They were also supposed to apply these different types of knowledge effectively if they wanted to do exactly what the teacher said: code the Bee-bots® first to reach the phonemes inside the labyrinth and then write a word based on them. However, not only technical skills were necessary to code effectively, but emotional and attitudinal skills.

Coding those Bee-bots® demanded practice of how they worked and how coding was done. These different types of knowledge were not enough to handle coding and the Bee-bots® emotionally. The process of coding required the students to think carefully, coldly, and not lose their temper if things were not going right. Students needed to try many times with a lot of attention for the purpose of identifying which action or command was wrong and thinking about how to fix it. Children in Primary education are used to do things fast and they lose interest easily. The fact that the Bees were not doing what they were supposed to made them lose their interest on it. They were not patient and resilient enough to try again and identify that they were coding it wrong. It also suggested that students were not used to coding the Bees in a way these skills were developed. On the contrary, it just evidenced these attitudinal and emotional skills needed to be developed with more coding practice.

4.5.2 WHAT WAS FELT

The researcher started the observations of the lesson intrigued. The apparently easy way in which the teacher said she was not going to be there because she had reports to write, made the researcher wonder if it was a common practice at that school. The researcher had been observing classes for two months in that school and that

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teacher was used to having the researcher around. She said she planned the activity for the researcher to observe the Bee-bots® in use and wished everything 'goes right' with them. When she was saying that, she showed her hands with fingers crossed. Would that be because Bee-bots® usually do not work? She seemed not so confident about the performance of the Bees and she was hoping that a lesson could be observed in which 'everything goes right'. Curiosity about how many attempts they had to make those Bees to work 'properly' emerged. It was also possible to realise that that teacher trusted a lot her TAs to lead the work while she was out.

Another fact that made the researcher even more intrigued was that everything was ready to start in the room when she entered with the teacher. It is very common for pupils to spend their breaks playing outside. The lesson was after a moment in which kids could be tired because they spent some energy. Kids could also be excited because of the burst of energy and not able to remain quiet, in silence and paying attention. However, what happened was the opposite. Students were in silence, with no move, not interacting with each other, paying attention to the instruction of what would happen in the next period. The fact that they were ready to perform any task also called the researcher's attention. Were they expecting her? Maybe the teacher/TAs used the argument that the researcher was coming and they were supposed to behave. Maybe not. It is a huge effort for children to remain quiet when they are energetic. Maybe they were attentive because they wanted to know in which station they would be and which task they would perform. The fact that teachers chose students at random to perform the tasks at the beginning of the lesson might have made students anxious about their future: the actions they would perform and

where. Independently of the reason, that flow of affects from the room made the researcher more suspicious about what was going to happen next.

After being pointed where they would be for the next period, students started talking again. It did not seem there was some level of frustration from some being chosen to perform some tasks and others a different one. As soon as they were appointed a task, they moved to the table in which they would work. Although it seemed to be a very organised environment it was quite confusing to have so many things happening at the same time. The question raised was in which extend the teacher and the TAs were aware of everything happening in that room. From this point, the focus was on the pupils who were going to perform the task related to the Bee-bots®.

They seemed enthusiastic because of the Bee-bots®. When they sat at the table, they smiled to the Bee and to each other. They took the Bee in their hands and passed to their peers. Then, the TA explained what they were supposed to do. They were serious and attentive while listened and they seemed to have understood what they were supposed to do. They have no questions to the TA and as soon as she finished explaining, they started. They manipulated the Bees as if they were used to it. The way these kids handled the tablet in another lesson was totally different. They carried the tablet as if they were carrying something very fragile. They had a different approach to the Bees. They were confident and aware of the limits and capacities of the tool. Neither the TA explained what they needed to do with the Bees nor did they ask. The TA focused on explaining the purpose of the labyrinth and the Phonograms inside it. The students seemed confident also regarding the labyrinth and the phonograms. They had no problem in thinking about words in which those sounds

were part of. For each phonogram they came across, they read it out loud, and each student of the pair suggested a word. They were no phonogram that they struggled in thinking about a word. On the contrary, they always had more than one option for each phonogram. Most of the time, they agreed which word they would write and if they would write more than one. They also helped each other when they did know how to write it.

However, the problem was with the Bee-bots®. All their excitement and confidence started fading due to the silly situation of the Bee-bots®. The Bees started going to a 'different place' students programmed them, they argued. In order to program a Bee-bot®, it is necessary to push the (sequence of) button(s) on the top of the robot and press 'go'. Every command given to the Bee is stored in its memory for a period of time. If one want to program to perform a new sequence of commands as soon as it finishes the previous one, it is necessary to press 'clear' in order to start fresh the new sequence. Otherwise, the Bee is going to store the new sequence as the continuation of the older sequence stored. It will result in a longer sequence, in which the older and the new will be performed together at once as if it was only one sequence. Students seemed to have forgotten this fact and they interpreted the Bee was not 'behaving properly'. The fact that it was not obeying the commands, 'breaking the walls' or even 'escaping from the labyrinth' made them laugh. It was as if the Bees were flying freely according to their will. The researcher also smiled due to the fun time the students were having.

The same way the excitement and confidence came easily it disappeared. The funny and silly moment gave space to frustration and disappointment. The students were

focused on performing the task and they wanted to do what they were asked: walk inside the labyrinth and reach the phonemes. Because of the disobedient and naughty Bees they were not being able to do what they were supposed to do. The Bees kept refusing to obey and the labyrinth seemed to be metamorphosed into a trap in which they had almost no escape if they continued with the same strategy. They needed to write the list of words and they thought the Bees were not helping. On the contrary, they were obstacles for doing it.

It is possible to say that each pair responded differently from the flows of affects from the Bees because each pair came up with a different approach. Pair 4 persisted a little more and tried to understand what was wrong with the Bees. They repeated the task many times: from the entrance of the labyrinth to the first phonogram, they calculated, cleared and repeated the commands until identifying the length of the corridors was the problem. Their Bees would never walk properly and reach the phonogram the way it was supposed to. Because of this, they programmed their Bees in a way it could reach the phonogram the closest. They just ignored the walls of the labyrinth. Pair 2 left the Bee to the side and focused on the phonograms. They ignored the Bee and did not use it. By doing this, they pushed away the frustration and they seemed to become focused and confident again. Pair 3 and 1 cheated. They gave a simple command to the Bee, for example, pressing once one button, making it move to any place in the labyrinth and when it stopped moving they took the Bee and relocated it on the phonogram. They pretended the Bees were doing what they were supposed to do in order to accomplish the task. They knew what they were doing was not right because they looked at the researcher with guilty eyes, as if they were trying to explain why they were doing that and get the researcher's

approval. In the end, they were writing their lists, in spite of the fact that the way they were using the Bees was wrong.

All the four pairs seemed to be determined to accomplish the task and they behave differently. They also reacted differently due to the flows of affects from the Bees and Phonograms giving more or less attention to the fact they were doing what they were supposed to do. In the end, it seemed it did not matter that the Bees did not behave properly because they reached their main goal of writing the list of words (even with Pair 4 having erased all their words). It made me wonder if Bees not 'behaving accordingly' was a normal situation for the kids and that was why they just gave up in the end. Or if they could give up because they were 'just having a go' and in the end, they would leave for lunch anyway as they accomplished the writing task.

4.5.3 SUBJECTIVATION AND SUBJECTS

The subjects that were present in the account were the researcher, the lead teacher, TA1, TA2 and the students. Because of the main focus of the account was the Bee-bots® activity, only the ones directly related to it were considered in the analysis: the lead teacher, TA2, and the students in the table near the researcher.

The lead teacher planned the Bee-bots® activity to show the researcher how Bee-bots® were used in Year 1. She structured it in a way in which she created the labyrinth by drawing it in the cardboard. She made four different samples for students 'having a go' coding the Bees in different pathways. Together with this procedure, she combined phonograms in which they were supposed to make words based on them. By combining both, she assumed students were able to perform both and succeed in both. She took for granted they would need no help or that the TAs would

be there to help them in order to overcome their problems. However, she was not confident about the task. When she said she hoped everything to work, it implied things usually did not work when Bee-bots® were in use. She a lot of things to be managed at the same time: students, Bees, the content Phonics, the content coding, computational thinking skills, writing skills, problem-solving skills, the researcher that was coming to see that lesson, and Ofsted.

Although Ofsted was not directly part of the lesson and was not mentioned in the account it influenced the choice of the teacher combining Coding and Phonics. According to the last Ofsted report of that school, it did not get the 'outstanding stamp' because the teachers need to work more with Phonics with students. By working Coding and Phonics together, the teacher was doing two things at the same time. She probably thought that she could use Coding and the Bees as a tool to make Phonics more fun, as she was supposed to work with Phonics. She could also have worked just with Coding as it is part of the Primary National Curriculum. She could have planned an activity with Bee-bots® with all students, as the school had enough Bee-bots® to be used with the entire group. However, she did not. Phonics was prioritised over Coding and the students noticed it the way the activity was structured and the issues it had. By doing the way she did, she was being a considerate teacher, planning her activities to work with the content students needed. However, that need was being indicated by Ofsted, not students. For her, she would get an approval from Ofsted in two elements: working with Coding and Phonics.

The fact that the teacher and the TAs had not tested the length of the corridors in the labyrinth demonstrated both did not have the awareness for work with Bees demand.

They were supposed to have measured each corridor and checked if the Bees were going to be able to move properly inside the labyrinth and could reach every phonogram. As they did not, it was not appropriate for the students to perform the activity. Teacher and TAs suggested they also did not have the practice of working with Bee-bots® yet and they need to have more training. This fact explains why the teacher was not confident about the activity. Although she was creative in thinking about and planning an activity in which two contents were in the same lesson, being creative was not enough to manage the Bees. The fact that the teacher was not there to identify these faults and the TAs were not paying attention also demonstrated that Coding was also not important in comparison to Phonics. TA1 and TA2 were assuring Phonics had been done with students and the lead teacher was being responsible for writing the reports she was supposed to present in parents meeting.

TA2 also reinforced the fact that the lesson with Bee-bots® was not important. She just oriented the students in the beginning of the task reminding them what they were supposed to do, took some photos to register what they were doing and focused in the one-to-one correction of notebooks with the other TA. The group that was with the researcher was on their own and it seemed that as they were 'having a go', there would be no problem if it did not work.

Because of the way the activity was structured and the way the lead teacher and the TAs behaved, students were left on their own, to develop the activity and reach their goals. They had two goals, they chose one goal to achieve. The fact that students need to reprogram the Bee-bots® every time they were supposed to walk, made them frustrated as they were not aware of it while doing the task. As the length of

walking did not match with the corridor also made students frustrated and upset. Students did not attribute the fault to themselves as if they were doing something wrong. They believed the Bees were not behaving properly because they were doing. Students did not understand what was wrong with the Bee-bots® as they were doing what they knew what the teacher said and they realized the corridor was wrong after. However, they noticed the two tasks were independent and they could perform one without performing the other. They could succeed in one, even if the other the Bees were not collaborating.

The Bees were not helping the students, the teacher and TAs were not helping them, the researcher was not helping them. They had to come up with a solution to this problem, otherwise, they would fail in the other task as well. As they noticed they were independent, they did what the teacher wanted and prioritised: the list of words. From this perspective, they came up with a solution by solving the word list problem. However, they just ignored the Bee, as if it was not important. Regarding Coding, they failed. Regarding Phonics, they succeeded. Students focused on what they knew what to do. They seemed to feel good about their results or it might be because they would leave for lunch after the task.

4.6 CASE 5 – LOGGING IN ARTS

Case study five took place in a Secondary School. The school subject was Arts and the students were part of Year 9 group. They were having classes in the computer laboratory because they were working on a project in which they were making portraits using Photoshop.

"It was a very turbulent beginning of the Art class in Year 9. Students were in the computer lab to continue working on their portraits. It was the third period of the day and students were supposed to enter, sit at their places and log into their accounts on the desktop computers. Every student had a specific place to sit, which was ascribed by the teacher. As far as I understood, this practice was common in that school for two reasons: the first was for the teacher to memorise students' names; and the second was for students to work better, avoiding disruption by sitting beside their friends.

There were 29 students. They were messy, and chatty: a disorienting mass of individuals. As soon as they entered the room, they looked to their places and started logging in to continue their tasks. In the middle of that setting up, Student 9 realized her computer was not logging in. She said out loud to herself 'it is not working', crossed the room and sat beside Student 25 who seemed to be her friend. She decided to change places without asking or notifying the teacher. The seat she took was Student 6's place.

Student 6 got into the room with two other friends, Student 12 and Student 28. They were laughing and seemed to be happy. Student 6 was taken by surprise when she saw someone in her place. It clearly affected her: she was paralyzed in the middle of the room, in shock, lost. She looked around and noticed there was no place for her on that row. All places were taken. She frowned, looked to her friends who were already sat in different rows and searched for a place to stay. The expression on her face suggested she did not like it.

Student 6 asked Student 28 to sit by her. Then, Student 12 came and sat on her other side. Student 6 started crying while she was telling her friends what happened, she was speaking and looking to where her place was. All three were looking daggers at the Student 9 and Student 25 and quickly other girls came closer to ask why she was so upset and crying. The girl who took her place seemed to be aware of what was happening and just ignored it.

Miss noticed that something was going on. She took a deep breath and came to talk to the student. Student 9 saw that Miss was going to get involved and quickly left the seat she took, taking another seat on the other side of Student 25. Miss ignored the girl who took Student 6's place and tried to manage the situation. She allowed Student 6 to be there, with Student 28 only. Miss asked Student 12 to go back to her place. Student 12 complained her seat was taken. Then, Miss figured out how messy the situation was: one-third of the students had changed places because of that first girl, who decided not to sit on her place. It took Miss almost ten minutes to organise everything and then start the class. She returned all the students to their places; expect for Students 6 and 9.

Miss started over the lesson, explaining how they were supposed to continue the task: they had to treat their own photos using Photoshop, applying four specific techniques of double exposure: shadows, mid-tones, highlights and opacity. They had several classes to perform the tasks because they were part of a sequence of activities to be developed during the term.

Student 6 did not do it that day. She seemed not to be able to. She seemed to be so angry she could not concentrate on the task. After the explanation, she pretended

she was helping Student 28 when Miss was walking around. During the lesson, Student 6 was muttering under her breath, looking to her place and scrawling something on a paper. From time to time Student 28 asked her opinion about the portrait. When the bell rang, Student 6 was one of the first to leave the room sulky and in silence.

In the following lesson, Student 6 showed she did not forget what had happened. Her name was Maya and she was one of the first students to enter the computer lab. While she was walking in the middle of the room, she said loudly to anyone listening: 'today I am going to sit in MY place'. Then, she approached her seat and stayed there. Student 9, the one who took Maya's place did not even try to come closer. She arrived and went directly to her place. She did not complain or anything. She just logged in and started her work.

Maya logged in and opened Photoshop. A beautiful picture of her emerged. She had long black hair, which was falling on her chest. She was looking down as if she was thinking about something. It seemed there was a smile starting to come up, those types of smiles which emerge when someone is up to something.

Students were supposed to find four backgrounds to work with double-exposure, one for each technique. She still had time, because the deadline would be the following week. She looked very determined to do the activity. She decided to change the picture she was going to use as a background. Instead of using a wallpaper of the animated television series Adventure Time, she looked for something different. She found a picture of two different colours of flames of fire, one blue and the other red as

if they were clashing. The second picture she chose was the picture of Angelina Jolie

in the movie 'Maleficent'.

Students could use their creativity to place the background on their bodies. Maya

chose to place hers all over her hair. After some trials with both backgrounds, Maya

chose Maleficent. She placed Maleficent's figure, above her forefront. The result was

an intriguing portrait: while Maya was gently looking down, with a shy smile,

Maleficent was at the centre of her head, staring at anyone who dared to look at her,

as an imminent threat."

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Based on what happened in the two lessons observed, described in the account,

some components were identified according to their actions.

Table 5: Components and their actions in case study 5 – Logging in Arts

Components	Actions
Computer Lab	Made students sit in specific places
	Made them use the desktop computers to log into their accounts
Miss	Ascribed which place each student would take
	Elaborated the tasks students were going to perform
	Negotiated students' seating
School practice /	Enabled students' names to be memorised

Mapping places	Avoided disruption
Students	Logged in Changed places Used Photoshop
Student 9	Tried to log in Changed places
Student 6/Maya	Laughed, talked, made faces, cried, muttered, scrawled Changed places Arrived early Used Photoshop – treated her portrait with Maleficent
Student 25	Talked to Student 9
Student 28	Laughed, talked Acted like a shield protecting Student 6
Student 12	Came and sat with Student 6 and 28 Acted like a shield protecting Student 6 Complained her seat was taken.
Photoshop	Enabled students to treat their portraits
Students accounts	Enabled students to access the network system
Network system	Enabled students to access Photoshop and their files Enabled students to store their work

As stated previously, the ICT gadget chosen to be observed was the Bee-bots®. They were used for the purpose of working with two topics: Coding and Phonics, both requirements from Year 1 National Curriculum. The next section is going to demonstrate how this lesson raised more questions than it seemed.

4.6.1 WHAT WAS SAID…

The ICT topic chosen to be discussed in the literature review was learning spaces. The concept of spaces involves different ideas which are going to be discussed and how they influence the learning process.

4.6.1.1 … BY ACADEMIA: LEARNING SPACES

The first basic assumption about the concept of learning space is that it refers to a space in which learning happens. As Kraftl (2015a) argues, it has been assumed historically that the term 'space' delimits something that is 'static, bounded and restrictive' (p. 119). As Thomas (2010) explained, because learning takes place in venues that were custom-designed for this purpose, learning is 'defined as something that is married to a "place"' (p. 502). By place, it is understood as a delimited geographical location. As a consequence, the image of the classroom comes to mind. However, this is the idea that researchers are contesting: learning spaces does not necessarily mean a physical place, restricted in time and location (Kraftl, 2015a; Jung and Latchem, 2011). With this is mind, researchers from different areas have been investigating what constitutes a learning space, practices related to it, the benefits, demands, and challenges.

The first challenge faced by researchers has been defining what a learning space is. Because of this problematic between the concepts of space and place, literature has been based on establishing the differences between spaces in which the starting point is the classroom: a closed space located in a definite time and space. The consequence of this strategy is the emergence of dualisms in which the advantages, challenges, and setbacks are investigated in comparative studies. With this intention,

learning spaces have been defined as traditional against innovative (Brooks, 2012b). Research about these spaces has the focus on the practices of students and teachers, mainly advocating the use of progressive pedagogies and the use of technology, in a space in which furniture enables more movement of people, and as a consequence collaboration.

Other concepts of learning spaces were also identified based on the dualities stated above. These dualities emphasize the differences between what is experienced in a classroom/lecture theatre with traditional practices and the experiences in next generation learning spaces (Sharpe, 2014); smart learning spaces (Scott and Benlamri, 2010); and contemporary learning spaces (Holley and Dobson, 2008). The main argument contained in these studies is explained by Thomas (2010). According to him, classrooms and lecture halls are integrally linked to specific teaching, learning and management strategies, which are considered to be traditional learning spaces. The author adds that classrooms and lecture halls are not just the embodiment of specific definitions of learning and specific learning strategies. He argues that physical learning spaces have a life span that 'easily outlasts the definitions and learning theories of which they are an embodiment' (p. 503). He emphasizes that the way classrooms and lecture rooms are composed they contribute to the inertia of the students by 'actively constraining the kinds of learning that they make possible via the limited affordances that characterise them'. (p. 503)

Another issue pointed to in relation to traditional and innovative learning spaces is that students get used to the 'broadcast model' of learning in traditional spaces. Graetz (2006) argues that this model is coupled with sensory memories and powerful

emotional responses, which affect them cognitively and behaviourally (Graetz, 2006, p. 62). It means that the way students are going to feel in these places is going to affect their learning experiences. Graetz (2006) believes that the perceptions of the traditional learning spaces might not be negative, but they involve positive emotional responses, leading to 'enhanced learning' and a 'powerful emotional attachment to the particular learning space' (p. 02). As a result, the physical learning environment becomes an integral part of the learning process and is capable of influencing students in powerful ways (Thomas, 2010).

For Thomas (2010), traditional learning spaces restrain the possibility of students' learning because they do 'not provide the affordances that encourage engaged learning' (p. 503). It does not mean that engaged learning does not happen in these places, he adds. Engaged learning is an emergent property of places that are designed for the purpose of providing affordances that actively encourage such engagement. What he is suggesting is that students would have more possibilities in different places in which their affordances would be higher.

Learning spaces have also been characterised as physical against virtual (Thomas, 2010) (Volkmann and Stang (2015). Although these studies also reinforce the idea of traditional versus innovative spaces, their purpose remains in claiming the benefits of virtual learning environments (VLE) or learning management systems (LMS) as an extension of possibilities which the classroom (or lecture theatre) cannot offer. These affordances characterise them as digital environments which may or may not be on the internet. On the other hand, Thomas (2010) argues that some campus learning management system or campus portals are structured electronic environments that

resemble traditional learning environments, not offering all the possibilities they could for students. What is undeniable is that virtual learning spaces are open and accessible anywhere, anytime via ICT. However, it demands users to have access to digital technologies and be digitally literate (White et al., 2016).

Thomas (2010) also discusses environments such as social networks e.g. Facebook which could be somewhere between virtual and physical[68] and also could be used to enhance students' experiences. The difference between social spaces to learning management systems is the affordances offered by the Internet. Weller (2007) argues that the technological topology of the internet as decentralised and enabling networking became social features of these LMS. It means that, although these places are digital they became social spaces. By being digital social spaces, they enable the conception of social constructivist practice, collaborative learning and engaged learning (Thomas, 2010).

In her introduction to *Learning Spaces*, Oblinger (2006) stresses that the important question is whether learning spaces encourage collaboration and discussion or 'carrying a message of silence and disconnectedness' (p. 1). Her point is that what is necessary to focus on are the possibilities afforded by the space and the consequences it has for learning.

Oblinger (2006) advocates that learning space design should be oriented by three elements: changes in students, information technology and the understanding of learning. She believes learning spaces reflect the people and the learning approach of the current time. This is because today students have attitudes, expectations, and

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[68] By physical it is implied that although social networks are located online, when taking a picture of a place or when 'checking in' on Facebook, the user marks when he/she is located in the world.

constraints which are different from students of 10 years ago and it influences the spaces where learning happens. Students also demonstrate no fear of technology, according to her. Mobile phones are one of their tools of learning and they are browsing, downloading and messaging anytime, anywhere. They are also highly social, being connected to different people and using technology to enable this connection. What is known about how people learn also has influenced learning spaces. Informal conversations, active learning with hands-on tasks, discussion, and immediate support have proven valuable.

Thomas (2010) believes that boundaries between different types of spaces will blur, raising questions of the confinement of learning in physical spaces and the proposition of reshaping the design of these spaces, with the purpose of 'liberating learning from a form of physical imprisonment' (p. 503). Some researchers have been contesting this confinement by looking for physical, mental and metaphorical spaces (Savin-Baden et al., 2008), alternative learning spaces (Kraftl, 2015a), or even going against the duality between space and pedagogy as a causal relation (Mulcahy, 2015; Mulcahy et al. 2015).

Savin-Baden et al. (2008) indicated the composition of learning spaces is beyond the simple duality between physical/virtual, traditional/innovative. They are complex and they extend further than schooling spaces.

> 'Learning spaces captures the idea that there are diverse forms of spaces within the life and life world of the academic where opportunities to reflect and critique their own unique learning position occur. The kinds of spaces being referred to, whilst also physical, are largely seen as mental and metaphorical. In such spaces, staff and students often recognise that their perceptions of learning, teaching, knowledge and learner identity are being challenged and realise that they have to make

a decision about their own responses to such challenges. Spaces for learning offer tutors and students opportunities to examine their cultural context.' (p. 221)

The reflection offered by Savin-Baden et al. (2008) considers not only restricted places in which learning happens. In non-conventional spaces in which learning happens, teachers and learners have had not only the opportunity to learn in a different way but also to challenge their perceptions and conceptions. These ideas are not restricted to teaching and learning, but they offer opportunities to for the ones involved to examine their cultural context resulting in a more critical environment and process. It means that a different mindset is necessary from learners and teachers.

For Thomas (2010) 'learnings' are emergent properties of learning spaces and because of this, the position of learning spaces planners is unique. Learning spaces have to be planned on the strength that different kinds of learning will emerge once these spaces are used by students. However, the author points out that in the past, planning learning environments was done with the embodiment of traditional conceptions of learning rather than being open to possibilities to contemplate the demands of planning for complex adaptive learning ecologies. It implies that the planning process of learning spaces also needs to be open to the emergent possibilities it might offer.

Kraftl (2015a) believes that there are social and spatial processes that are productive. He works with the notion of spatiality, a term borrowed from Pile and Keith (1993) in which he intends to capture ways in which the social and the spatial are inextricably realised in one another. For him, 'in the production of spatialities, society and space are constantly being remade together, in dynamic ways' (Kraftl, 2015a, p. 199). These ways are related to the way thinking, feeling and doing

individuals are realised and experienced. It means that, in studying spaces, it necessary to focus on how humans think in those spaces, their emotions and what they do in these places.

Both Mulcahy (2015), Mulcahy et al. (2015) and Kraftl (2015a) advocate that spaces are not static places in which learning happens as a consequence of the interaction between humans and the place where they are. For Kraftl (2015a) and Mulcahy et al. (2015) is in an ongoing process in which different kinds of effects are produced. It is a 'network making' (Mulcahy et al., 2015, p. 581) where the relationship among components of that environment are supposed to be observed because all of them has their parcel of contribution to the result. For Mulcahy et al. (2015), there is no point in planning spaces because they are not 'prior to people or objects and their relations does not take a fixed form' (p. 581). The authors believe that these relations are constructed via interactions and actions of agents in the context.

4.6.1.2 … BY THE COMPONENTS

Based on the account, some components from table 5 seemed to be saying things. The components were: Students, the desktop computers, the network system, the seats, the teacher, Photoshop, the portraits, the IT department. The discursive components identified from the actions of the components stated were:

DC 5.1"Students have specific guidelines for the computer laboratory, in addition to the ones they have in their conventional rooms."

For each room in which students had classes, they had a specific set of rules and procedures to follow. These procedures and guidelines were given by different

teachers and most of them were similar. When students entered the room, they were supposed to sit in specific places, take off their coats, put their bags under the tables and open their notebooks. When students are in the computer lab some procedures are similar, but others are added to the basic ones. If students are going to start a new project, they are supposed to sit on the main tables, in the places assigned by the teacher, take off their coats, put their bags under the tables and wait for the teacher's directions. The teacher explains what students are supposed to do and how. Miss (in this particular situation) usually shows the students how to do it in a kind of tutorial session and then they are asked to go to the desktop computers. When they go to the desktops, they also have a specific place to sit, they have to turn on the computers, log into their accounts to use the computer, having access to all the software available and their files.

The teacher usually provides all the information and guidance students would need at the beginning of the lesson. If students are in the middle of a project, they just enter the room, go to the desktops, log in, and start their work. When they are working, the teacher walks around, making comments and offering help to the students. If she needs to give some more information to the group when students are working, she usually asks them to stop, turn around and pay attention to what she is saying. If there is any student who is not paying attention when she is speaking, she asks that student to turn off the screen of the computer and then turn around. When the lesson is about to finish, the teacher asks students to save their work in a specific drive in the computer. This drive is just for storing students' files. After this, they quit all software they were using and log off.

DC 5.2 "Students were supposed to sit in specific places, chosen by the teacher, with the purpose of memorising their names, minimising disruption and enhancing their learning experience."

The practice of assigning students a place is common in that school. All teachers make a visual plan of the room with the pictures of all students in each place. According to the teacher, this practice is motivated by two reasons, the first one is to memorise the students' names. The teacher said it was necessary, at least in the beginning of the year because each group had at least 20 students, with a maximum of 28. The groups were not usually the same for all subjects. For example, Year 10 had a total of 80 students which were split into groups (Y10a, Y10b …) to have classes for different subjects. However, not all students had the same classes. Some students chose to have Computing instead of ICT, others are awarded the possibility of studying a second and a third language. As each student had a different timetable according to their choices, the teacher does not have the same group of students when the school year changes. Having a plan of the room with students sitting in specific places in which their pictures were located helps the teacher memorising their names.

Another reason the teacher alleged to choose specific places for the students to sit was to make students be away from their friends. The teacher usually placed students far from their friends to avoid conversations, disruption and games. For the teacher, when students sit near their friends, they have the tendency of not concentrating as much as they should, having off-top conversations or playing with things not related to the task. She believed that when students were placed with

other students who they did not get along with so well, their chances of disrupting or being disrupted by off-topic conversations were diminished. However, the teacher recognised that there was a possibility of the student developing some kind of friendship with their neighbours, resulting in off-top conversations anyway. But she also said that disruptions were less frequent and students had the tendency to talk about work, asking for help or orientation, instead of having off-topic conversations.

By avoiding disruption, the teacher claimed she was offering the students the possibility of making the most of their learning experience. Without having their friends around, students could focus on their work only. The time spent with off-topic conversations and games would be diminished as probably they would prefer to focus on their work, instead of developing some kind of relationship with someone they were not friends with. However, what was noticed was that most of the students were having some kind of interaction and conversation with their neighbours. It is not possible to say the nature of their conversations, but most of the group was not in silence.

DC 5.3 "ICT fault was used as an excuse for Student 9 to sit where she wanted."

In order to change seats, students were supposed to ask for the teacher's permission. They were not allowed to do that without her consent. However, Student 9 did not ask for the teacher's permission. The fact that something did not permit her to work on her computer was used as an excuse for her to change seats. Student 9 announced it loudly, for anyone to listen to. She seemed to be trying to get approval by the fact that no one opposed what she said. She did not say it in a way to confront the teacher nor to get the teacher's approval. The teacher was far away from the

student, and it was not possible for her to listen and give some orientation about it. The only ones who were able to listen to what Student 9 said were the researcher and some students who were near her. It might be that those students were not paying attention as well. Because of this, it is not possible to say they heard what she said. If they heard, they seemed not to care.

The fact that the student did not emphasize the ICT fault as something out of ordinary indicates how used students were to these kinds of problems. There had been a lot of different faults on ICT in the previous lessons: problems with the operation system, log in problems, network problems, connection problems, user account problems and many others. Student 9 used this fact as an excuse to allege her computer was not working and changed places. Indirectly she was saying it was not possible for her to work as the basic tool she was supposed to use was not properly ready to be used. She justified her action due to the (lack) of action of ICT.

DC 5.4 "When trying to solve the problem, the teacher ignored the ICT fault, avoiding dealing with ICT and the IT department, focusing only on the seat exchange, solving the problem partially."

In order to solve the ICT fault, the type of problem would be necessary to be identified, which would demand a set of actions. The first would be the teacher to check if there had been a connection problem with that desktop computer. The second would be if there was a problem with the user account of the student, in case she had forgotten her password or misspelled it. The next step would be notifying the IT department to try to solve it remotely or if they would choose to come and solve it in the Computer room.

The student used the problem to change places as if the problem was unsolvable. The fact that the teacher also ignored the ICT fault and focused only in the changed seats reinforced the idea of unsolvability of ICT problems. It also raised the question of the role of the IT department. According to this department, there were procedures students and teachers needed to follow in order to check if there was a problem, to check the type of problem and then decide if this was a case which required them to ask the IT department to take action.

After many lessons, having different types of problems coming and going, the teacher decided not to follow the instructions and just ignored the problem. It might be the teacher was going to make a report later. However, as many students were having the same problem, maybe the teacher and students were going to wait until the problem solved itself. The teacher was aware that maybe this problem would continue to happen in the following lesson, and she was aware that different problems might emerge in the following lesson as well. She chose not to worry about it as she had worried in the previous lessons and it had made little difference, as other faults continued to happen in her lesson.

DC 5.5 "When many students were out of their place and they were together, it indicated that something was wrong and the teacher had to take action."

The teacher did not notice that something was happening in the class when students changed places. She noticed that something was wrong when many students were out of their places, and they were at the same place, at the same time, looking at something. Students' faces were also showing some concern. They seemed to be worried and probably this was what the teacher saw from her place.

Noticing something was out of the ordinary, the teacher approached the group of students to identify why they were there. Because of this, she identified there was a student crying. She took action sending students back. One student said she could not go back to her place as someone else was there. In a chain reaction, the teacher requested everybody to go back to their places, except for Maya and Student 9.

DC 5.6 "Students pretended to have worked according to the teacher's orientation to not have problems."

The teacher allowed Maya and Student 9 to be where they were. It seemed it was with the idea that they would contribute to their friends' works. Maya was supposed to help Student 28 and Student 9 was supposed to help Student 25. If they were not doing that, they would not be behaving according to the teacher's orientation. It seemed both students were aware of it.

Student 9 was aware that she was supposed to behave as the teacher determined. This is possible to be claimed for two reasons. The first one was when she identified the teacher was talking to Maya and the teacher could notice that she was in an inappropriate place. The second was when she did not ask for the teacher's permission. She interrupted her action as soon as the teacher turned her back. Student 9 seemed to know she was behaving in a wrong way for these two reasons. As a result, when she noticed the teacher was going to get involved in the situation, she took Maya's stool and moved to the other side of Student 25. Student 9 tried to cover her faults in relation to her behaviour. Maya also had the same behaviour. She pretended she was helping Student 28 when the teacher was approaching her. It is possible to say she was pretending.

DC 5.7 "When students were emotional, they were not able to work until the situation was solved, from the students' perspective."

Although the teacher seemed to believe she solved the exchange of seat problem, for Maya, she did not. Maya did not go back to her place. The way Maya looked to her seat during the lesson and muttered under her breath indicated she was not satisfied. She did not forget the problem and did not do anything other than scrawling on a piece of paper and looking to where she was supposed to be.

It might be that the teacher had asked her to continue sitting near Student 28 as a strategy for Maya not to get involved in an argument with Student 9. Maybe the teacher asked Maya to help Student 28 while she was calming down. It might be that the teacher was trying to avoid some kind of confrontation between Maya and Student 9 (and Student 25 as well). By keeping Maya away from her place the teacher avoided arguments, but Maya was not able to work.

Maya was only able to focus when she was in her place in the following lesson. When she entered the room and announced she was going to sit in her place, putting emphasis on the fact that the place belonged to her and it was her right to be there, she was also trying to get the other students and teacher's approval. It was the same strategy used by Student 9 when she first moved. Student 25 did not notice or pretended she did not notice what Maya said. Student 25 approached her place and continued working. The entire lesson Maya focused on her work and did not talk to anyone.

DC 5.8 "Emotions and affects were present in the student's work of Art."

The change in seats affected Maya. She exposed her emotions and the effect of other bodies on her in her work of Art. Previously, Maya had chosen a picture of the animated television series Adventure Time to be the background of her portrait. In the previous lessons, Maya was talkative and smiling. She seemed to be happy when doing her work of Art.

A different attitude was observed during the changing seat event: Maya cried, frowned, scrawled a paper and muttered under her breath. When the lesson ended, she left the room as quickly as possible. She seemed not to be satisfied and happy with the situation. In the following lesson, Maya was different. She seemed to be determined to sit on her place to do her Art work.

The first thing Maya did was to change her background. Instead of using a funny, childish and happy picture, Maya chose two pictures: one with two flames of fire clashing against each other and another one with Angelina Jolie in the movie Maleficent. Why would Maya suddenly change the picture she was already working on? She quickly found the pictures and tried both to see which one would be better. She did not ask anyone's opinion about the backgrounds. She tried both and decided by herself that Maleficent would be the best choice. Why would Maleficent fit best into the purpose of the task?

In her orientation about the criteria for selection of the background, Miss said it should be something colourful and something that they liked. Nothing more was said to students. It might be that for Maya, Maleficent represented what she was feeling. She was not feeling that Adventure Time was the best background to be in her head.

Maleficent was. Would Maya have changed her portrait background if her seat had not been taken? Maybe not.

4.6.2 WHAT WAS FELT

From the account provided, a lot of emotions and affects were identified. It seemed it all started with the log in fault. It is not possible to say that this fault really happened. There was no evidence that the student tried to log in with her appropriate details, nor did the teacher check or ask for the IT department to come and check. Although there had been genuine problems that occurred in more than one lesson, in more than one computer for different reasons, the teacher chose not to go to the computer and verify it. The teacher was affected by something that changed the way she planned the lesson and based on it, she decided to take action. Instead of focusing on the ICT fault, she focused on what was causing disturbance of the organisation of the room and enhancing the emotions of students: the change in seats.

As an evidence of avoidance of the ICT fault, the teacher did not ask the student go to the IT department to check what was happening to her account details or ask IT to come and solve the problem in that desktop computer. It seemed she did not want the IT department to get involved on that. Maybe because after five lessons in which a different problem had happened, she just gave up asking for help and solved the situation herself based on her needs and limitations. For each lesson in the sequence that I observed, something had gone wrong: day one – the IT department updated the operation system (Windows 7 to Windows 10) of all computers and neither the teacher nor the students knew how to use it; day two – the projection of her laptop was upside down and she did not know how to undo it; day three – students could

not access the tutorial video she uploaded on the virtual learning environment of the year group because Youtube was blocked for the students; day four – most of the desktop computers froze at the end of the lesson when students were saving their portraits. According to the IT department, the servers went down and all the students lost their work. Because of this most of them were supposed to start over.

After so many problems, the teacher told the researcher she was frustrated; she seemed to be tired of having so many problems and reporting them to the IT department, and next lesson a new problem happened. The teacher seemed to avoid getting involved in the ICT problem and avoid the IT department coming to disrupt the lesson even more. The focus was in organising the room and making students go back to their work. She thought she would achieve that by solving the change in seat problem.

She believed she solved the problem for that lesson by asking students to go back and allowing Student 9 and Maya to stay in different places. Miss knew she was allowing two students to be out of their places and it was against the school guidelines. Miss probably knew that and she might have thought that having two students sitting with their friends would be less disruptive than one student crying or two students discussing, or one-third of the group out of their seats, or the IT department coming to check the computers. The teacher might have been annoyed by the fact that the flow of actions from students was not happening the way she was expecting. She had to act quickly, in a way that meant disturbance would be minimized and the flow of actions from students would return to what she planned.

However, what is interesting is that all students who were in different places were already working: all the desktops were on, logged in, with Photoshop opened. The students who were checking what happened with Maya were out of their places, but they had already started working, which leads to the conclusion that they would have worked independently of the place they were sitting.

After placing all students back to their correct seats and explaining the task again, Miss seemed relieved and started approaching different students to offer help. Student 25 continued working on her portrait and Student 9 looked at what she was doing. They were talking, but not causing major disruption. Student 12 was doing the same with Maya. However, Maya seemed not to be doing what she was supposed to. When the teacher approached them, she seemed to pretend she was paying attention to what Student 12 was doing; she pointed to things and showed things to Student 12. As soon as the teacher left, she stopped doing that, her expression of interest changed to one of dissatisfaction; looking down, scrawling on the paper and looking at her place and to Students 9 and 25.

For the teacher, everything was right, happening accordingly. For Student 9, it seemed she was satisfied with not doing her work as she was not sitting at a desktop computer but on the edge of the row beside her friend. Student 25 seemed not to care as she was in her place, doing her portrait. Student 12 seemed to care about Maya, asking her opinions about the work. For Maya everything was not right – her body and location demonstrating how angry, upset and unsatisfied she was with the situation. The change in places affected her in a way that meant she could not do what she was supposed to. She had no desktop computer to use, she could not

access her portrait and continue working on it. She did what the teacher suggested, but she did not accept that.

Maya did not forget what happened to her as we can see by the way she entered the computer lab the following lesson. She walked determinedly to get her place back. While heading to her place, almost marching, she announced loudly for all students and the teacher to listen. She sat there, did not look to the sides and logged in to her account. It is possible to say she was obstinate due to the way she performed the task; her speed was fast, she was assertive and focused, not being distracted by anything. She seemed to know exactly what she wanted. It did not take a lot of time to change the background she had chosen.

Maya's choice of different backgrounds evidenced the way she was feeling at that moment. Adventure Time was not appropriate regarding what had happened in the previous lesson and her emotions. She allowed the way she was feeling to be represented by her choice of background. Her first choice was two flames of fire clashing against each other. The only difference between the flames was the colours. They seemed to be equally strong as the clash was located in the middle of the picture. It was not enough for Maya. It seems she needed something more than that clash of flames. This may be the reason why she chose Maleficent.

The Maleficent portrayed by Angeline Jolie in the movie released in 2014 is the story from the perspective of the antagonist, different from the most common tale Sleeping Beauty. According to the movie, Maleficent is a good and powerful fairy that was betrayed by her love. The man she loved drugged her, cut off her wings and gave them to the king in order to marry his daughter and become the future king.

Overwhelmed by the betrayal, she declared herself Queen, forming a dark kingdom. From the perspective of the story, the betrayal that happened from an unexpected person caused the change in Maleficent. It made her change from a good fairy to someone evil who was going to use her power according to her will.

For Maya, Maleficent was the most appropriate figure to be the background of her portrait maybe because she was feeling betrayed. It might be she was not expecting someone taking her place, the teacher not giving her place back, the students not giving as much attention as she gave to the importance of her place. The location in which she placed Angelina Jolie's face, right above her forehead worked as if Maleficent was looking directly at the viewer. It seemed Maleficent was staring at the viewer's eyes, threatening anyone who wanted to mess with Maya.

It seemed there were two messages sent from the same portrait: one from Maya and another from Maleficent. This is going to be discussed in the next section.

4.6.3 SUBJECTIVATION AND SUBJECTS

Although there were two basic types of subjects in this account - the teacher and the students - the majority of actions that happened mainly referred to the students. The teacher manifested her presence in two key moments. The first one was when she noticed there was something out of ordinary in the classroom and the second one was when she explained the tasks students were supposed to do. The tasks students had to perform were part of a project which would last a term. It meant they had eight classes to do all the portraits according to the teacher's orientation. As this account happened on day five of the project, it might be she assumed there was no need for

explanation; students could enter the room, log in and do what they were supposed to do.

From an outsider perspective, there was almost one student per seat/desktop computer. When the student started crying and other students came nearer her, it was possible to notice many empty places and many students around one place. Maybe this is what called the teacher's attention. It happened very fast and contrary to what she was expecting; she noticed something was not happening according to her expectations. As one student was crying, she had to take action and manage the situation. By talking to the students, she identified that what was out of the ordinary was the fact that students were not in their assigned places, disregarding the fact that they were already working.

As discussed in relation to feelings, with the purpose of making things right again, the teacher sent students back to their places. She did not notice students had already logged in in different places and had already started working. Before going back, students were supposed to save their work, quit all the software and log off. When they reached their appropriate place, they had to log in again, open the software they were using, locate the file of their work and continue doing what they had to. Miss just sent students back to where they were supposed to be. Students did not argue with the teacher nor justified their movement due to a fault from the desktop computer or the network; they attributed their action to other students who had taken their seats in a chain reaction. The teacher managed this problem by sending almost all students to their places.

As one-third of the students moved at the same time, the class became noisy and messy again, as if the lesson was starting over. In an attempt to regain the attention and focus of the students, the teacher explained again what they were supposed to do. By reassigning students' places and reminding them what they had to do Miss was performing the actions students expect her to do. Students and teacher were performing their 'appropriate' actions and reinforce their subject position. Miss believed things were going back to the way they were supposed to be in the lesson. As a response, most of the students came back to their tasks as if nothing had happened, except for two students.

Student 9 decided she was not going to occupy the place she was assigned to. She chose to occupy someone else's place due to the fact that she was not able to access the network with her user account on that computer. This is what she alleged loudly when she was moving from a different place. By saying it loudly she seemed to be looking for her colleagues' consent. As neither students nor the teacher said anything, she considered she could move. She did not ask for permission from the teacher. It might be that the teacher would ask her to try again on that computer and it could work. It might be that she was lying just to change places and sit beside her friend. It might be that Student 9 did not want to work that day. Her reason might have been genuine. In the last two classes, students were having problems to log in into the network. Even with the correct username and password, sometimes the computers did not access the school server. Sometimes it happened on the same desktop computer, sometimes it was the student's account that had a problem. Regardless the reason, the teacher was aware that this problem could still be happening.

Student 9 acted as if it was a problem in the desktop computer assigned to her and changed places. She logged in in Student 6's desktop computer. While she was opening Photoshop, she was happily talking to Student 25. However, when she noticed Miss was getting involved in the situation, she quickly logged off and changed places. She took Student 6's stool and placed it on the other side of Student 25, leaving the place empty. She interrupted what she was doing in order to allow Student 6 go back to her place. It indicates she recognised she was doing something she was not supposed to, without teacher's permission and the teacher could intervene in a way.

However, the teacher also seemed to avoid the situation. Instead of asking Student 6 to go to her place because it was empty, she allowed Student 6 to be with Student 28. Student 6 was supposed to help Student 28 as there was not another computer available. Miss did not look to the empty place of Student 6. It might be that she wanted to avoid more problems placing these students together. It might be that Miss decided to let these students be beside their friends for them to calm down, talk about other things, and probably forget what happened. It might be that students would be more satisfied by sitting beside their friends during that lesson.

Student 9 and 25 seemed to have forgotten the situation as they were talking to each other and not looking around. Maya did not. It was her right to sit there as the teacher had assigned her. Student 9 did not do anything about it, just ignored as if nothing had happened. So did Student 25. On one hand, those seats were part of the constitution of identity for those students. It was due to those places that students were recognised as who they were. As it was the beginning of the school year, Maya

would be recognised as Maya by being sat on that specific stool, using that specific desktop computer. She was deprived of that when another student took her place. The fact that it was without her permission or without the teacher's consent took her by surprise and she was not able to deal with that and accept it. It was possible to notice the influence of this fact while Maya was working on her portrait.

On the other hand, as students could log into their accounts on any desktop computer, they had the possibility of being anywhere they wanted, because it would make no difference to their work. They could have access to their files and programs and the physical place was not important. The change in seats appeared to affect other students much less than Maya.

The fact that Maya changed her background seemed to be affected by what she experienced. Instead of using the background she had chosen in the previous lessons, she decided to change it. She did not need to, but she wanted to. It seemed she was looking for the most appropriate picture that could represent her. Adventure Time was not appropriate anymore. Adventure was not what Maya wanted to be in her head. Neither was the image of two flames of fire clashing against each other. She chose Maleficent. Maleficent had what she wanted to represent what was in her head and probably in her mind.

By choosing Maleficent, Maya exposed two sides of herself. The first one was a sweet, happy and beautiful girl who was a student. This student was the talkative and popular Prefect of Year 9. The other was a powerful fairy that became evil because of a betrayal from someone she trusted. Maybe it was the message Maya wanted to send to her friends, to the teacher and to herself.

CHAPTER 5 – CONCLUSION

A pen is a pen. It is a tool whose basic function is writing. There are numerous types of pens. Some are ancient as the reed pens, quill pens, dip pens. Some are considered modern as ballpoint pens, rollerball pens, fountain pens[69]. All these pens differ in the material they are made. There are also markers and highlighters, which have a slight difference in use from the previous types of pens. Highlighters are used to put emphasis in something written while markers are used to add colour to something written. Independently of the material and specificity of the pen it is a tool related to writing.

However, pens can be used for other purposes as well. A pen can become: a hair stick and hold up long hair; a character in a story in which the storyteller is using different resources to represent the ones involved in the story; a drumstick used to make rhythm. In other words, pens are not only pens; they can become something else based on the use made of it and the context in which it is used. These uses can be different according to the way the pen's affordances are noticed by the one using it.

Independently of the type and use of the pen, a pen is not judged for doing 'good' or 'bad' when a death penalty is signed. The pen itself is not responsible for this act. Pens are judged by the quality of the material and how the person felt using it: if the writing was smooth if the ink was strong, and if it was comfortable when writing. What is written is not judged by the type of the pen and its material; the writing is analysed according to the content of the message, the outcome and the consequences of that

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[69] Available from: https://en.wikipedia.org/wiki/Pen [Accessed 31 January 2017]

message. Any peace treaty is not considered beneficial according to the colour of the pen it was written in and the way the signature was made, but in regard to the content, the message, what will imply for the parts to make peace. There is no point in analysing and judging the pen which was used to write it or sign it. The point is not if the pen was good or bad, but if the message of the text written was beneficial and to whom, the intentions implied in it, what would be done with that text, and what that text might make happen.

If there is a problem with the message of the piece, changing the pen is not going to solve it. It is necessary to write the piece in a different way. Banishing the use of the pen is not going to solve the problem. On the contrary, it will cause another problem because it will be necessary to find another tool to write the text. It is unlikely that the problem was related to the way the person was holding the pen or the colour of the pen.

Now, substitute the pen for Information and Communication Technology. Independently of material and the characteristic of ICT, it can be used for a variety of purposes, including teaching and learning. As with a pen, ICT has the capacity to evidence issues related to the basic and higher order skills of teachers and learners. These skills might or might not be related to ICT use, but related to literacy and numeracy, for example. The first claim that this thesis is suggesting is that there is a strong tendency for ICT to be judged in the schooling process by its characteristics in relation to its use. However what this use implies and demands is sometimes ignored. Most of those making these judgments are directly or indirectly involved in the schooling process and influence the decisions made regarding these uses. This

thesis argues that the situation is not so simple because many factors can affect the use of ICT for educational purposes. Judging ICT as being good or bad feeds a tug of war between the ones who advocate its use and the ones who are against it, diverting attention from other problems of the schooling process which also deserve attention and need to be tackled. As a result, claims about how ICT has not been contributing to better outcomes in teaching and learning have gained space in the media. However, many issues raised were not caused directly by the use of ICT, but they were already issues embedded in the current schooling system in the UK. ICT has only shown these problems.

Lack of basic digital skills, lack of teaching expertise, lack of specific subject knowledge, policy-driven practice, teaching for the assessment are some of the issues pointed by ICT that this thesis have demonstrated. By banishing the use of ICT, these problems are not going to be solved. On the contrary, not using ICT will be neglecting the use of a tool which is already part of everyday life. This tool might not be part of the life of some deprived groups, but by not offering the possibility of using it will neglect even more the opportunity of these students to be in touch with ICT.

Considering the complexity of the schooling process the first step is to understand what ICT has evidenced. There are different variables involved in teaching, learning, assessing, policy implementation, curriculum development; ICT has been present in all these processes. Despite the fact that ICT is a tool, it has acquired different characteristics, depending on the setting and on its use. These uses have shown many issues in the schooling process, how discourse has influenced these problems,

how subjects have their identities constructed and how subjects have emotional and affective responses entangled to ICT.

After 20 years of ICT being in use in education in the UK, research has still focused on answering if it is 'good' or 'bad' for education. By 'good', it is meant whether teachers have been able to prepare students to achieve high marks in exams and students have achieved these grades. Research about ICT use in basic education (Primary, Secondary and Post-secondary) is still limited, and have not yet been able to convince teachers, students, parents, head teachers, or policy makers that ICT should not be seen as 'good' OR 'bad', but can do 'good' AND 'bad', depending on many factors. In a response to this lack of research, examples of failure have been used to justify why ICT is doing more bad than good, producing discourses for teachers and students to give up using it, head teachers not invest on it, not opening a space in schools budgets and on school agendas.

Again, banishing the pen is not going to solve bad writing; it is going to hide the problem of underdeveloped writing skills. Additionally, a pen can be used as a tool to tackle the problem, but it will demand appropriate guidance and preparation. Without the necessary preparation and guidance, ICT will make any problem worse because more variables will be added to the problem. This raises the question of which problems have been exposed by ICT that are not directly related to this tool. This would be the same if schools were advocating not using pens with the excuse that it cannot improve students writing skills. This thesis is not trying to suggest that ICT in education has no problems. On the contrary, as a technological gadget, it has many functional problems. There are pens that do not work. The ink simply does not come

out. Sometimes the pen stops working with no reason. People do not stop using pens because of these situations, they just change the pen, but they do not stop using pens to write. There are problems of malfunctioning ICT and sometimes it is necessary to substitute the tool. That is why it is necessary to have an open mind and be attentive to all the issues ICT is manifesting. The situation is complex and this is what this thesis wanted to demonstrate.

The purpose of this thesis was to investigate the productivity of ICT in various school and classroom settings in the UK. Different levels of education (Primary, Secondary and Post-secondary) were investigated and some ethnographic accounts were provided and analysed according to discourse (Selwyn, 2013; 2015a; 2015b); emotions and affects (Kraftl and Adey, 2008; Blazek and Kraftl, 2015; Kraftl and Blazek, 2015); and subjects and the subjectivation process (Youdell, 2011).

The first productive force of ICT identified was to evidence issues related to the schooling process, which might not be directly related to ICT, as cause or consequence. Again, this thesis is not stating that ICT is exempt from problems; the intention of this study is to suggest that there are many other issues in education which should be taken care. These issues might or might not affect the use of ICT and ICT might or might not affect these issues. What is necessary to keep in mind is that ICT is not causing these problems, but evidencing them. Maybe ICT has made them look worse as they have been uncovered and because tensions have been intensified (a topic that will be discussed in the second productive force). Undoubtedly these issues have been influencing how ICT has been used and perceived and ICT has also influenced and been influenced by these issues.

The nature of these issues is not new. Some of them have been discussed by practitioners, policy makers, and scholars for a long time. It seems it is not a matter of further investigation of these problems in an attempt to try to identify ways to tackle them. On the contrary, there is extensive literature about these issues, which has already provided tools for reflection and strategies to tackle them. What ICT has shown is that these tools and strategies have not been put into practice yet by the ones involved in education.

The main issue pointed to by ICT was the multiplicity of assessing and ranking schemes in which education in the UK is grounded. These schemes come from different types of sources, based on different criteria with the purpose of evaluating teachers and students as 'good' or 'bad'. These sources are composed by the Government, represented by Ofsted, by think tanks, by curriculum; academia; peers; civil society; media; examining boards; and international organizations such as OECD and Unesco. Each source has specific criteria that might or might not be the same. All of these criteria serve as a list of elements which teachers and students are supposed to do and behave in accordance with in order to be classified as 'good'. By doing what is considered to be good practice, it is believed that the processes of teaching and learning will happen effectively. Any kind of behaviour or action that goes differently than what is prescribed by these sources is regarded as bad and will not result in effective teaching and learning.

Despite the fact that these criteria serve as checklists which circulate within educational and popular discourse and against which teachers and students verify if what they are doing is appropriate or not, these criteria become unclear, ambiguous

and contradictory. This is because they serve different agendas, which are based on different motivations, needs, and interests. It means that what is considered 'good' for students according to academia might not be considered by the Government, for example. This situation is even more complicated because the disagreement does not happen only within the same type of sources, but among them as well. As a result, teachers and students have multiple criteria, based on different ideas, interests, and agendas and they are going to be classified as good or bad according to conflicting principles.

The fact that some researchers have not come to an agreement over terms, concepts, way to approach and develop practice, has formed a complex space in which many versions of the same concept are competing. However, these versions are also possible due to the difference in the context in which research was developed. This was the case of concepts as mobile learning, coding, and computing, which involved not only the definition of what it is but what represents a 'good' use of these concepts. Moreover, many of these contexts are not based on basic education: some of them are related to higher education, due to how more approachable these institutions are, compared to schools. It is suggested by literature that some of the ideas and conclusions could be applicable or transferable to the basic education scenario. Although many useful insights are provided, most cannot be applicable due to the specificity of basic education, for example, each year group and its profile. In other words, many variables are still necessary to be taken into account before trying to apply what is suggested by academia.

Based on the literature, think tanks have developed independent research. These studies are, arguably, developed to serve their own agenda or the agenda of private interests, which might or might not reflect the Government interests. What they have said might or might not be the same as what is said in academia, contributing to the multiplicity of ideas related to the schooling process and the use of ICT. This thesis is not suggesting that this kind of research is not valid. However, these specific agendas sometimes just ask questions which will be solved by specific products from specific providers, not serving the broad needs and interest of teachers and students. This was the case of The Royal Society and Computing at School and which influenced, and the change in the ICT curriculum to Computing. For this change and implementation to happen the use of the specific material was required, for example, the Bee-bots®. Because of this need, these tools became largely recommended and afforded by schools. Another fact was that the Computer Science A-levels award was elaborated just by OCR (Oxford, Cambridge, and RSA), being the only award board with preparation books and able to assess students.

Both types of research have been informing policy making and curriculum development. Because of this, ICT has been implemented in a top-down way from the Government. Although it has been argued that the new ICT curriculum was motivated by and elaborated through a bottom-up approach, it was done by specific groups, with specific interests which did not necessarily represent the opinion of the majority of ICT teachers. On the contrary, it represented the interests of computer scientists with specific demands in relation to the school subject ICT. This thesis is not suggesting that this change was neither necessary nor beneficial. What it is claiming is that, contrary to what was claimed from the change in the curriculum, it

might have been inspired by a bottom-up approach in which different representatives were involved in the process. However, its implementation was top-down and reflected the interests of specific groups, with their own agendas and specific products to be used, with specific practice to be developed.

Another fact that has strongly influenced the practice of teachers and students and reinforced the 'good' vs 'bad' evaluation of ICT is the curriculum-assessment regime on which education in the UK is based. As Yang (2012) has already demonstrated, this kind of regime stimulates practices of students and teachers grounded in limited actions in which the purpose is succeeding in exams. Teaching and learning became summarised in techniques to achieve marks on exams undermining the educational process which exams would be a reflect of schooling and not the only purpose. Schooling becomes limited, restrictive and these characteristics affect students and teachers emotionally, which leads to the next force that will be discussed later on.

Irrespective of the agenda underpinning the change in the ICT/Computing curriculum, teachers are still in need of support. This is not a need of ICT teachers only but encompasses all teachers. They still need pedagogical, content and knowledge development opportunities to feel confident about what they are supposed to do in their lessons. Teachers and students working conditions should offer different possibilities for them to develop their skills and knowledge, not being restricted to specific agendas and with the purpose of succeeding in exams.

According to Government, parts of academia and think tanks, schooling needs to be focusing on the development of 21st-century skills, preparing students for the jobs to come. It demands that ICT becomes an integral part of the daily practice of students

and teachers. However, there is no guarantee that if a school acquires the most up to date ICT gadget available in the market, teaching and learning will be effective. Besides, having an IT department able to manage the most up to date technological advancements is not going to transform the effectiveness expected from teachers and students. Unless the agenda of this department serves teachers and students and their communication becomes efficient, having a strong IT department could even compromise teaching and learning.

The second productive force of ICT identified was to make different emotions emerge or enhance the emotions felt by subjects. By using ICT, subjects sensed the affects of the environment acting upon them as if they were being intensified. These sensations resulted in different emotions from different subjects influencing what happened in each setting.

Flows of affects from ICT were felt by subjects. Independently if they were teachers or students, it was not their position as schooling subjects that influenced the way they sensed these affects. Some affects seemed to be sensed in the same way by teachers, students, and researcher in some situations. In other situations, the same subjects sensed differently the action of ICT upon them. This is because it was not only the action of ICT these subjects were sensing. The action of other components in the setting also composed the flows of affectivity felt. As Kraftl (2015) indicated, flows of affects are entangled and it is not possible to separate each affect and determine how much each of them were responsible for the way these subjects sensed in the accounts provided. Some affects could be identified as shared by human components because of their actions and emotions. However, it is not

because they sensed the action of other components on them that subjects are going to respond the same way. Different emotions were identified from the same type of subjects. This is because previous experiences with or without ICT also influenced how they felt.

Positive emotions had the tendency to emerge from those whose capacity to act was expanded or enhanced by the use of ICT. For instance, when students had the possibility to store the information the way they wanted, they were able to act the way they preferred. Some of them were aware of other tools the tablet had that could help them perform the task. Some chose to do it, others chose to learn how to do it, and others chose to use paper. The fact that they were allowed to choose what they wanted showed there was space for them to have opinions and that their opinions would be considered and respected. Although the primary teacher was not so confident, she was positive about the outcome of her lesson. This is because ICT (Bee-bots®) was enabling her to work with two sets of content at the same time (Phonics and Coding), both of which were required by the curriculum. Although it could be argued that it did not happen according to her plan, she was enthusiastic about the possibility of solving two problems at the same time.

These positive emotions were stronger when flows of affects from ICT enabled other actions to happen not related to the subject positions of the setting (teacher and student). When students had the possibility to act like girls, boys, young people and children, they became more interactive and noisy, as if they were excited, enthusiastic and happier. However, these emotions affected some teachers in the opposite way. On one hand, when students were becoming something else in their

lessons, it seemed teachers were losing control of the students and they made the most effort to interrupt that flow of affects and make those subjects be students again. This was the case for the Geography teacher, the PSHE teacher, and the Arts teacher. Teachers reacted this way, it seems, because by being something else, students were not doing what they were supposed to do; it implies that teachers were allowing that situation and not doing what they were expected to do – be teachers. On the other hand, the History teacher was not affected the same way. She had fun when students were doing things not related to the lesson and accepted it when they tried to teach her how to use some features of the tablet. She was affected positively by these emotions and had her possibilities to act opened as well. These facts lead to the third productive force.

The third productive force of ICT identified was the opening up of possibilities for subjects to perform different activities other than the ones related to the schooling environment, which enabled teachers and students to become something else. This process made space for subjects to be young people, boys, girls, children, fighters, fairies, and many other sorts of subjects that usually do not belong to the school environment.

When ICT was used and humans actions (related or not to their subject position) were restricted or prohibited, subjects had the tendency to have negative emotions. When teachers and students were not able to perform their tasks as they were supposed to, they became upset, angry, and frustrated. This was the case of the Arts teacher, the PSHE teacher, Maya, and the Bee-bots® students. There was some kind of impediment to these subjects acting as they were expected to. They had a

task, they thought they would be able to do that and for different reasons they could not. These negative emotions were even more intense when subjects were aware they had the capacity to do something and they could not. This was the case of the Arts teacher. She was a competent teacher who was leading that project for the third year. Because of the malfunctioning of the ICT and the lack or insufficient assistance from the IT department she was prevented from doing her job. People got anxious when they noticed their possibilities being restricted. This was the case for students from Year 8 group in the PSHE lesson. From enthusiastic young boys, they were turned into potential bullies or victims by the teacher, who wanted to convince them that going online was too risky.

The actions that ICT open the possibility to happen might or might not have resulted in the development of different learning skills, beyond the ones predicted in the lesson. In the case of the History lesson, it opened the possibility for ICT skills to be developed. Maybe not all students were interested in it, but they had space to think about it and take the opportunity. This was also the case of clickers in the Geography lesson. Beyond the fact that students were probably revising a topic, nothing different was learnt.

It suggests that ICT is not limited to perform specific or assigned tasks. ICT gadgets have many affordances and they are not limited to the tasks that are usually asked by teachers. As a consequence, the skills that are necessary to perform a task are not going to be only ones developed during that task. For example, if students are going to write a text on a tablet, she/he might develop not only writing skills, but ICT skills and higher order thinking skills to perform that task. Many skills and knowledge are

necessary to use different gadgets and when one feature is in use, others are still there also available for students and teachers. This was the case for the tablet. When students were using it to collect information, they had a range of other apps to use to store information. Some chose to use them. Students also had the camera, Siri and many other apps installed on the tablet. They were also available to be used. The most appropriate gadget should be chosen according to the task to be performed, having in mind all these other possibilities which will be available for students. The same way pens are used for specific purposes, different gadgets can be used to acquire specific content and develop specific skills. It is not because colourful gel pens are pens that they are going to be used to teach a child how to write. Other pens might be more appropriate to do that. But, without the tool, how would a child learn and practice writing?

However, when ICT was used and the only actions that were allowed to happen were the ones related to the schooling subject position, students had the tendency to perform these actions in an emotionless state, in a kind of inertia. This was the case of students during the Geography lesson when the projector was projecting a PowerPoint presentation from the teacher's laptop. Students did not react emotionally to that and to the teacher's lecture style; they just listened, made notes, and copied information in a mechanical way.

Although these three main types of productive forces are part of the schooling setting, regardless of the education level, subjects had the tendency to try to control these forces in an attempt to restrain them. This need to control and restrain happened when subjects would be judged or classified poorly in relation to their

practice. This was the case of the Geography teacher who stopped using the slides he prepared after the interruption of YouTube and the Arts teacher when she came to the researcher to say she was giving up doing the portraits project. If these teachers were in a situation where they would be evaluated, it might be that their practice would be considered reckless or that they were not able to handle technology.

In an attempt to keep the student-teacher subject positions well-defined and with boundaries in the classroom environments, teachers have the tendency to try to control the emotions of students, by controlling ICT: the type of gadget, the amount of time used, the type of activity, the role of each student, the pedagogical approach used. This was the case of the PSHE teacher and the Geography teacher. Both teachers wanted to keep their status as the teacher who knows and who leads what happens in the class. The Geography teacher specified the amount of time, the gadget, the content, and what would be done with the gadget. Every time something was going out of control, the teacher took action to regain it. This happened when he changed the clickers to slides presentation and in a more radical situation when he stopped using ICT in order to have students' silence and attention. Teachers also wanted to reinforce that they are the ones allowed to decide what is going to happen, due to their subject position and knowledge. This was the case of the PSHE teacher. Because he (or the official school discourse) considered the internet and the use of mobile phones dangerous, he wanted to convince students that this was the only side of ICT. Although it seemed most of the students disagreed with the teacher, students were not capable of convincing him; on the contrary, the teacher silenced their voices to impose his opinion.

Nevertheless, it was not the case for the History teacher. She changed the time of the activity due to students' needs, she was interested in how students knew how to manage Google Docs and manage the information they were supposed to collect and store. There were boundaries and the positions were defined, but it was possible to identify a fluid environment in which it was possible for the transitions between positions to happen in a smooth way.

In the schooling environment, there is a tendency for the identity of teachers and students to be constructed in relation to each other. However, this relation is a single-multiple relationship (one teacher to many students). In this relationship, students were treated as a single mass, in which the same content is delivered the same way to all, at the same time, being assessed the same way, with the same instruments, receiving general feedback. The teacher is the source of knowledge and power, responsible for saying what is going to be learnt, how, when and what students were supposed to do and behave. However, ICT enabled students not only to be observed and assessed individually but also opened enough space for them to produce other identities. They became individual students to be ranked in an assessment system and they could also become young people, boys, girls, fairies, cars, characters in a movie and more.

Despite the fact that these subjects had the possibility to become something else in the education ICT assemblage, they also became neoliberal subjects. Not only students but also teachers were inserted in what Davies and Bansel (2007) called neoliberal management technologies. These technologies were installed to increase the exposure to competition, accountability of measures and performance goals.

Teachers and students see themselves and see each other responsible for their own outcomes, embedded in practices in which they have no other option than being productive and successful.

Building on this argument, ICT has an essential role and force on this process because teachers and students are assessed by the use they made of ICT. What they do or do not with ICT is going to characterise if they are 'good' or not, resulting in their productive to be guided by its use. In other words, particular practices of teachers and students are guided by the use of ICT in order to be recognised as 21st-century teachers and 21st-century students.

What is possible to conclude with this study is that education Information and Communication Technology assemblage is composed of human subjects, practices, discourses, emotions, affects, policy making, curriculum, school subjects. It is not possible to say that schooling is better due to the use of ICT. What ICT has evidenced as a productive force is that old problems related to education still need to be solved. It also evidenced that the use of ICT is emotional and the affects produced by all these encounters have the capacity to stretch the boundaries of the education assemblage, making spaces in which subjects have their capacity to act enhanced, and the possibility to produce other identities, becoming something else.

By looking at the education ICT assemblage in basic education in the UK, this study is situated in place and time. It might be that the findings, discussion, and insights are not applicable for different contexts in which ICT has not had the same penetration in education as in the UK. In making use of the content of this thesis it is necessary to bear in mind the context of the research and how it was developed. The data

collected was based in schools in the West Midlands for a limited amount of time. As this region has a specific profile, it would be beneficial if further studies were concentrated in different regions of the UK and for a longer period of time in each school level.

The fact that it was difficult to find schools interested in participating in the study affected the time spent in each school. It was not possible to stay longer in each school, although there is a recommendation for ethnographic studies to be developed in longer periods of time. Another issue was faced regarding the participants of the study during the data collection process. The researcher had as aim to find mixed-gender schools not to have gender as a question to be raised in relation to the data collection. Although the literature has engaged with questions of gender and ICT, this was not the purpose of this study as the data collected might not have been appropriate for this.

Further research should focus on other ICT topics which were not possible to be investigated in this study. Maker spaces, Virtual Reality, and Augmented Reality are some examples of such topics. It would also be relevant to develop a similar investigation in different countries in an attempt to identify other components of the education ICT assemblage, how it varies from context to context and if the nature of their productive forces varies as well. It would also be useful if education ICT assemblages were investigated in Higher Education, with the purpose of examining if the productive forces are the same as basic education if they vary, and if yes, the reasons why it varies.

Education ICT assemblage has enabled the researcher to pursue new, expanded lines of analysis and offered additional insight that the existing ICT literature – focused on ICT efficacy – has not been able to offer. The education ICT assemblage mapped here is partial, with only some productive forces and components explored. This mapping may well be of use for thinking about and understanding ICT elsewhere, but the intention is not to suggest that the thesis offers a picture of a static thing. Furthermore, such a mapping cannot be exhaustive, assemblage is movement, not object and the point is not to fix something as assemblage – rather assemblage is temporal and spatial and multi-scalar, and so this thesis details education ICT assemblage as it happened. It is important that we remember this next time we try to use ICT gadgets to pin up our long hair.

5.1 MAIN CONTRIBUTIONS OF THE THESIS

Based on the conclusions of this thesis it is believed that the main contributions of this study are in four aspects: theory, methodology, structure and practice.

In relation to theory, this thesis is onto-epistemologically grounded on Assemblage Theory. Literature has been growing in which this theory is used in Social Sciences and this thesis is one of the few studies in education that uses it. With this in mind, it enabled the researcher to critically engage with questions in which the multiplicity and complexity of the field are considered and the productive forces of the components of the assemblage are examined.

In relation to methodology, this is the third study in which Assemblage Ethnography is used. It is believed that this methodology opens the possibility for social scientists to put together different analytical tools to investigate the complexity and multiplicity of

the social environment. This thesis is an example of this methodology in practice and it can inspire another researcher to follow alternative pathways to investigate multiple and complex aspects of the field, not trying to impose methods that might not contemplate different components of the social environment.

In relation to structure, this thesis is written in an alternative format. It is largely known that doctoral studies in social sciences follow specifically written formats and this format is easily recognised by academia. A thesis that is grounded in an alternative onto-epistemological perspective and uses an alternative methodology is supposed to reflect these elements in its format. The complexity and multiplicity of the field are reflected in the way the thesis is written, presenting the historical and policy context, in the beginning, the onto-epistemological framework and analytical tools after, linking to the research design and methodology. The analysis acquired an alternative presentation as different components of the assemblage were pieced together in five case studies. Each case study is associated with a brief literature review and then analytical tools are used to scrutinise each ethnographic account. Finally, the conclusions are presented.

In relation to practice, this thesis offers alternative ways for practitioners, staff, head teachers, policy makers, think tanks, students, parents, developers, and any other people related to education to reflect on the multiplicity and complexity of the classroom environment. The classroom is not just a place in which lessons take place the teacher's plan is in practice and learning happens. The classroom environment is a complex space where discourses, emotions, affects and subjectivities flow, entangled with flows of money, curriculum, policymaking and many other components. All these components affect and are affected by each other

exposing the productive forces of the education ICT assemblage. By exposing these components and their productive forces it is believed that this thesis is offering an alternative view of the environment, showing to people that are many other components to take into account when referring to ICT in education.

5.2 RECOMMENDATIONS FOR PRACTICE

The recommendations for practice are oriented by the productive forces encountered in the education ICT assemblage. These forces evidenced specific characteristics of the assemblage and its components and it is suggested that being attentive to them is the first step to critically reflect and to deal with them. This thesis is not arguing that these productive forces are issues and that these issues need to be solved. On the contrary, the intention of this thesis is to present the productive forces encountered in the education ICT assemblage specific to some contexts which might differ in other environments. These forces are elements that should be considered by people when dealing with ICT.

i) Issues and problems are going to happen:

This issues and problems might or might not be related to ICT. People need to be aware that by avoiding using or not using ICT the problems that might emerge are not going to be solved. People might think they will disappear or they will be avoided by not using ICT. The problem might be hidden, but they will not be forgotten or solved. People need to face the problems that come up and dig deep into their causes. By doing these, these issues and problems will have the chance to be minimised.

ii) Emotions and affects are going to be an integral part of lessons:

The classroom is an emotional and affective environment. With determined practices adopted by schools and teachers, these emotions and affects were regarded as bad, inappropriate and were tried to be silenced. When ICT is in use these components have the possibility to emerge and evidence that emotions and affects are an integral part of these spaces in which teaching and learning happen. People should not try to repress these emotions and affects, but embrace them and work with them as they are part of teaching and learning.

iii) Other subjectivities are going to be part of lessons:

The relationship between teachers and students are going to be expanded. The place in which these identities were restricted they will become open to specific practices and other identities will have space to enter, constitute and be constituted by other identities. When ICT is in use the binary teacher-student is not the only one in the environment. Teachers and students need to be opened for these other identities which might emerge and embrace them as they are becoming part of who they are or who they will become.

APPENDICES

1. LIST OF DOCUMENTS INCLUDED IN DOCUMENTARY ANALYSIS

#	Name	Type	Source/Author	Website	Year
1	Higher Education Student Enrolments and Qualifications Obtained at Higher Education Providers in the United Kingdom 2013/14	Statistical Release	Higher Education of Statistical Agency (HESA)	https://tinyurl.com/kqupuft	2013/2014
2	Destinations of leavers from higher education in the united Kingdom for the academic year 2013/14	Statistical Release	Higher Education of Statistical Agency (HESA)	https://tinyurl.com/lrtvxjg	2013/2014
3	Factors affecting participation in Understanding Society: Qualitative study with panel members	Qualitative Study	NatCen Social Research	https://tinyurl.com/mejqw5p	08/07/2015
4	Research using Social Media; Users' Views	Survey	NatCen Social Research	https://tinyurl.com/lvj2e3l	20/02/2014
5	Skills for Life Survey (Doc A, B, C, D)	Survey	Department for Business, Innovation & Skills	https://tinyurl.com/kp82sn5	13/12/2012
6	Internet Access – Households and Individuals 2014	Survey	Office for National Statistics	https://tinyurl.com/khzpalw	2014
7	Regional Profiles – Summary West Midlands	Summary	Office for National Statistics	https://tinyurl.com/low4x8m	08/06/2011
8	Measuring National well-being – Exploring the well-being of Young People in the UK 2014	Summary	Office for National Statistics	https://tinyurl.com/l6lhrtd	03/12/2014
9	Measuring National well-being – Exploring the well-being of Young Children in the UK 2014	Summary	Office for National Statistics	https://tinyurl.com/k7ehw4h	08/10/2014
10	Public Service Productivity Estimates: Education 2014	Article	Office for National Statistics	https://tinyurl.com/k5fwvua	25/09/2014
11	Measuring National Well-being, Education and Skills	Article	Office for National Statistics	https://tinyurl.com/lpmwrxg	05/07/2012
12	Quality Adjustment for Public Service Education: Triangulation	Article	Office for National Statistics	https://tinyurl.com/mo7f7nd	29/03/2015
13	Human Capital Estimates	Article	Office for National Statistics	https://tinyurl.com/k4jjq5z	20/08/2014
14	Highest Levels of qualification across England and Wales	Infographic	Office for National Statistics	https://tinyurl.com/k7cg8ul	07/03/2014
15	Over 4 in 10 People Aged 25 to 34 had a Degree Level or Above Qualification	Census Analysis	Office for National Statistics	https://tinyurl.com/lgeoyq9	07/03/2015
16	Measuring National Well-being: Life in the UK, 2015	Summary	Office for National Statistics	https://tinyurl.com/kpa2h5w	25/03/2015

1 7	Qualifications and Labour Market Participation in England and Wales	Census Analysis	Office for National Statistics	https://tinyurl.com /mtnnpyk	08/06/ 2014
1 8	Local Area Analysis of Qualifications Across England and Wales	Census Analysis	Office for National Statistics	https://tinyurl.com /od2vg9t	07/03/ 2014
1 9	E-commerce and ICT Activity, 2013	Statistical Bulletin	Office for National Statistics	https://tinyurl.com /mzklws2	28/11/ 2014
2 0	Monitoring E-commerce	Release	Office for National Statistics	https://tinyurl.com /n4acpen	07/08/ 2014
2 1	Business use of social media	Release	Office for National Statistics	https://tinyurl.com /o6awy3w	04/12/ 2013
2 2	ICT Activity in Uk Business	Release	Office for National Statistics	https://tinyurl.com /lgpppq5	30/12/ 2012
2 3	ICT Activity in UK Businesses, 2011	Release	Office for National Statistics	https://tin yurl.com/mjwag93	30/11/ 2012
2 4	Poverty and Employment Transitions in the UK and EU 2007-2012	Release	Office for National Statistics	https://tinyurl.com /os94dfh	10/03/ 2015
2 5	Census 2011 UK	Spreadshe et	Office for National Statistics	https://tinyurl.com /llobohp	02/07/ 2015
2 6	Skills at Work in Britain (Skills and Employment Survey 2012)	Mini-Report	ESRC, UKCES, WISERD	https://tinyurl.com /m797y9o	2012
2 7	Training in Britain (Skills and Employment Survey 2012)	Mini-Report	ESRC, UKCES, WISERD	https://tinyurl.com /luu2kfp	2012
2 8	Job Control in Britain (Skills and Employment Survey 2012)	Mini-Report	ESRC, UKCES, WISERD	https://tinyurl.com /k7gszmw	2012
2 9	Fear at Work (Skills and Employment Survey 2012)	Mini-Report	ESRC, UKCES, WISERD	https://tinyurl.com /lylwl96	2012
3 0	Work Intensification (Skills and Employment Survey 2012)	Mini-Report	ESRC, UKCES, WISERD	https://tinyurl.com /mdw4use	2012
3 1	Job-related well-being in Britain	Mini-Report	ESRC, UKCES, WISERD	https://tinyurl.com /lg73cvl	2012
3 2	Survey of Teachers	Survey	National Foundation for Educational Research	https://tinyurl.com /lnxmldb	11/ 2010
3 3	Family Resources Survey	Survey	Department for Work and Pensions	https://tinyurl.com /kehvrke	06/ 2015
3 4	Five Generations of 25-32 years old	Report	NatCen Social Research	https://tinyurl.com /jwpzc5w	09/ 2014
3 5	Influences on post-16 participation	Report	NatCen Social Research Institute for Fiscal Studies IOE London	https://tinyurl.com /mop8elt	05/ 2013
3	Insights 2014	Findings	Understanding Society	https://tinyurl.com	03/11/

			ESRC	/ljzdc6m	2014
6					
3 7	British Social Attitudes 32	Report	NatCen Social Research	https://tinyurl.com /kd7dqq6	2015
3 8	British Social Attitudes 31	Report	NatCen Social Research	https://tinyurl.com /mek4u8d	2014
3 9	Skills and Employment Survey 2012: Technical Briefing	Briefing	ESRC, UKCES, WISERD	https://tinyurl.com /jw8owfd	05/ 2014
4 0	Mental health in context: the national study of work-sear5ch and wellbeing	Report	Department for Work and Pensions	https://tinyurl.com /lo2rfsq	2012
4 1	TIMSS and PIRLS 2011: relationships, among reading, mathematics and science achievement at the fourth grade – implications for early learning.	Report	Martin, M.O. & Mullis, I.V.S. (Eds.). (2013). Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Boston College.	https://tinyurl.com /katga8z	2013
4 2	Pisa in focus 52 – how have schools changed over the past decade?	Report	PISA	https://tinyurl.com /m7h99zt	06/ 2015
4 3	Pisa in focus 51 – what do parents look for in their child's school?	Report	PISA	https://tinyurl.com /kp66sj7	05/ 2015
4 4	Pisa results 2012 – UK key findings	Report	PISA	https://tinyurl.com /nrune6p	2012
4 5	Pisa results 2012 – Ready to Learn student's engagement, drive, and self-beliefs (Vol III)	Report	PISA	https://tinyurl.com /lgpte5y	2012
4 6	Pisa 2012 results in focus – What 15-year-olds know and what they can do with what they know	Report	PISA	https://tinyurl.com /pkrxgbh	2012
4 7	PISA 2012 Results: What Makes Schools Successful? Resources, Policies, and Practices (Volume IV)	Report	PISA	https://tinyurl.com /ncdh55y	2012
4 8	PISA 2012 Results: Creative Problem-Solving Students' skills in tackling real-life problems Volume V	Report	PISA	https://tinyurl.com /kpsecyo	2012
4 9	PISA 2012 Results: Students and Money (Volume VI)	Report	PISA	https://tinyurl.com /po5epol	2012
5 0	Evolution and prospects for the use of mobile technologies to improve education access and learning outcomes	Backgroun d Paper	Tim Unwin Unesco	https://tinyurl.com /mulgh9s	2015
5 1	Qingdao declaration international conference on ICT and post-2015 education	Declaratio n	Unesco	https://tinyurl.com /n95n4zt	2015
5 2	A Journey through digital society	Book	Unesco	https://tinyurl.com /m4kvh3e	2013
5	ICTs in Global Learning /	Policy Brief	Unesco	https://tinyurl.com	02/

5 3	Teaching / Training			/lex3c6n	2012
5 4	Unesco ICT competency framework for teachers	Framewor k	Unesco	https://tinyurl.com /7w7mshf	2011
5 5	ICTs for curriculum change	Policy Brief	Unesco	https://tinyurl.com /moeqplb	04/ 2012
5 6	Guidelines on adaptation of the Unesco ICT competency framework for teachers	Guidelines	Unesco	https://tinyurl.com /mwx5xnt	2013
5 7	ICT in Primary Education Analytical Survey. Volume 2	Survey	Unesco	https://tinyurl.com /lha9srv	2014
5 8	Evolution of policies towards equitable access to information and communication technology skills for youth and adults	Paper	Nancy Law Unesco	https://tinyurl.com /mdpxml8	2015
5 9	Reading in the mobile era	Report	Unesco	https://tinyurl.com /pld4m3u	2015
6 0	Measuring ICT and gender: an assessment	Report	Unesco Unctad	https://tinyurl.com /kjc22pv	2014
6 1	Labour Market Profile Birmingham	Report	NOMIS	https://tinyurl.com /l3rz8bn	2014
6 2	Reforms: Qualification reform around the UK A level reform – England AS reform – England Vocational Qualification reform – England GCSE reform – England	Video	UCAS	https://tinyurl.com /jbpts5o	2015
6 3	Qualification Reform: a guide to what is happening around the UK	Guide	UCAS	https://tinyurl.com /lvwk76q	02/ 2015
6 4	A level reform: the essentials	Guide	DfE	https://tinyurl.com /lg7neuw	----
6 5	As and A Level Co-teaching guide	Guide	OCR	https://tinyurl.com /krlvxpj	02/ 2015
6 6	New GCSE Grading Structure	Guide	Ofqual/ DfE	https://tinyurl.com /kxp74z5	06/ 2015
6 7	Unpacking Qualification Reform: results of the UCAS survey in A level reform	Report	UCAS	https://tinyurl.com /mrvdr5z	01/ 2015
6 8	Director's Report & Consolidated Accounts for the year ended 31 July 2014	Report	UCAS	https://tinyurl.com /lhp3k2n	----
7 0	End of Cycle Report	Report	UCAS	https://tinyurl.com /mjdqzwd	12/ 2014
7 1	End of Cycle Report – teacher training	Report	UCAS	https://tinyurl.com /meaqnrl	03/ 2015
7 2	The Conservative Party Manifesto 2015	Manifesto	Conservative Party	https://tinyurl.com /prjyn2w	04/ 2015
7 3	The Education Act 2011	Act	Government	https://tinyurl.com /cd2wwe7	15/11/ 2011
7 4	The Education System in the UK	Explanatio n	Government	https://tinyurl.com /l9bjchl	2012

7 5	Further Education and Skills	Statistical Release	DfE	https://tinyurl.com /pj6zfv4	30/01/ 2014
7 6	2010 to 2015 government policy: childcare and early education	Policy Paper	DfE	https://tinyurl.com /q5aelfj	01/06/ 2015
7 7	How Government Works	Explanatio n	Government	https://tinyurl.com /nb2gvbs	---
7 8	Keeping Children Safe in Education	Statutory Guidance	DfE	https://tinyurl.com /p9cxb7e	22/07/ 2015
7 9	PSHE education: a review of impact and effective practice	Review	DfE	https://tinyurl.com /ohbp5my	13/03/ 2015
8 0	2010 to 2015 government policy: children outside mainstream education	Policy Paper	DfEdu	https://tinyurl.com /hlolfvk	07/05/ 2015
8 1	2010 to 2015 government policy: education of disadvantaged children	Policy Paper	DfE	https://tinyurl.com /mlrnz7p	07/05/ 2015
8 2	2010 to 2015 government policy: special educational needs and disability (SEND)	Policy Paper	DfE	https://tinyurl.com /jnsgnfy	07/05/ 2015
8 3	Young People Not in Education, Employment or Training (NEET), May 2015	Statistical Bulletin	Office for National Statistics	https://tinyurl.com /m3xzt7w	21/05/ 2015
8 4	GCE AS and A level subject content for computer science	Subject Content	DfE	https://tinyurl.com /mt2x2ae	09/04/ 2014
8 5	Computing programmes of study: key stages 1 and 2	National Curriculum In England	DfE	https://tinyurl.com /lsstpz3	11/09/ 2013
8 6	Computing programmes of study: key stages 3 and 4	National Curriculum In England	DfE	https://tinyurl.com /pmk8h9n	11/09 /2013
8 7	Computer science GCSE subject content	National Curriculum	DfE	https://tinyurl.com /hcp6f5d	26/01/ 2015
8 8	The National Curriculum in England: KS 3 and KS 4	National Curriculum	DfE	https://tinyurl.com /mlshfq5	12/ 2014
8 9	The National Curriculum in England: KS 1 and KS 2	National Curriculum	DfE	https://tinyurl.com /papx2wx	09/ 2013
9 0 a	National curriculum and assessment from September 2014: information for schools And its changes	National Curriculum	DfE	https://tinyurl.com /m4xwlba	21/08/ 2014
9 0 b	Timetable for the primary national curriculum changes	National Curriculum	DfE	https://tinyurl.com /m4xwlba	21/08/ 2014
9 1	ICT in Primary Education – KS1 and KS2	National Curriculum	National Archives DfE	https://tinyurl.com /mq7ytbf	02/08/ 2013
9 2	ICT in Secondary Education – KS3 and KS4	National Curriculum	National Archives DfE	https://tinyurl.com /n5hpsxd	05/08/ 2013
9 3	National Curriculum list	National Curriculum	DfE	https://tinyurl.com /pt2jc2b	16/07/ 2014
9 4	GCSE Consultation Guidance to apply Computing	Guidance	Ofqual	https://tinyurl.com /mctkb4d	02/ 2015

9 5	GCSE Subject Level Conditions and Requirements for Computer Science	Guidance	Ofqual	https://tinyurl.com /lg55zlp	05/ 2015
9 6	Ofsted Inspection Handbook	Handbook/ Guidance	Ofsted	https://tinyurl.com /gsqcfsw	15/06/ 2015
9 7	Ofsted Clarification for Schools about the Inspections	Clarificatio n	Ofsted	https://tinyurl.com /n726x54	15/06/ 2015
9 8	Returns to ICT Skills	Working Paper	OECD	https://tinyurl.com /m85zcsz	20/04/ 2016
9 9	Teacher's Standards	Guidance	DfE	https://tinyurl.com /o7hkwwo	06/ 2013
1 0 0	Are students ready for a Technology-Rich World?	Report	OECD/Pisa	https://tinyurl.com /lnn279q	2005
1 0 1	Integrating Information and Communication Technology in Teaching and Learning	Report	OECD/Pisa	https://tinyurl.com /lc2atgl graphs: https://tinyurl.com /m3k83ad	2015
1 0 2	Teaching in Focus: Teaching with Technology	Report	Talis/OECD	https://tinyurl.com /mfu2t3a	07/ 2015
1 0 3	Raising standards, improving lives	Strategic Plan	Ofsted	https://tinyurl.com /nx5gkkr	2007- 2010
1 0 4	ICT for Education Programme	Handbook/ Guidance?	Unesco	https://tinyurl.com /kbem9fk	2002
1 0 5	Supporting supply side reform: technology in English state education	Report	Reform	https://tinyurl.com /lqzm9ey	2006
1 0 6	BESA: ICT use in school 1991-2015	Report	BESA	https://tinyurl.com /n5hpsxd	01/ 2015
1 0 7	Harnessing Technology: Next Generation Learning	Report	BECTA	https://tinyurl.com /kewfhsh	07/ 2008
1 0 8	CAS white paper	Report	CAS	https://tinyurl.com /m5tfwbt	08/ 2010
1 0 9	Michael Gove announcement change in the ICT cur to Computing	Speech	DfE	https://tinyurl.com /mehhdy4	11/01/ 2012
1 1 0	Computing in the national curriculum	Guide For Secondary Teachers	CAS Naace	https://tinyurl.com /pkm3t7g	2014
1 1 1	Horizon Report Internet access – households and individuals: 2016	Report	NMC	https://tinyurl.com /hjwnvyg	2016
1 1 2	Internet access – households and individuals: 2016	Statistical Bulletin	ONS	https://tinyurl.com /hpxjjcf	06/ 2016

2. SEMI-STRUCTURED INTERVIEW SCHEDULES

Semi-structured Interview Guide (General participants: Teachers, TAs, Experts, and Scholars)

Date: ___/___/___

School:_____   Interviewee: _____

Video: (   ) YES (   ) NO Number: _____   Audio: (   ) YES (   ) NO Number: _____

In Loco (   ) Skype (   ) Other (   ):_____

1. I would like you to introduce yourself saying your name, your age and your position in this school.
2. Why are you interested in ICT?
3. Can you describe ways that ICT is used in your school?
4. Would you say that the use of ICT have been effective? Why?
5. Would you say that the use of ICT have been appropriate? Why?
6. Why do you think it works or does not work?
7. Are there some subject areas at school that are more likely to use ICT? Why?
8. Do you think the use of ICT open up possibilities? Which ones?
9. Do you think the use of ICT restrict actions? Which ones?
10. Do you think ICT is related to emotions? How? Can you explain?
11. How do teachers and children feel about using ICT?
12. How do you feel about the using ICT? Is there anything you would like to change?
13. Can you tell me a story that happened with you involving ICT in education?
14. What is supposed to be the role of ICT in schooling?
15. What does ICT demand?
16. What do you understand by the use of ICT in schooling in general?
17. Can you summarise the use of ICT in schooling in three words?
18. Are there any other comments you want to make? Feel free.

Semi-structured Interview Guide (Head teachers)

Date: ___/___/___

School:_____   Interviewee: _____

Video: (   ) YES (   ) NO Number: _____   Audio: (   ) YES (   ) NO Number: _____

In Loco (   ) Skype (   ) Other (   ):_____

1. I would like you to introduce yourself saying your name, your age and your position in this school.
2. Why are you interested in ICT?
3. Can you describe ways that ICT is used in your school?
4. Would you say that the use of ICT have been effective? Why?
5. Would you say that the use of ICT have been appropriate? Why?
6. Why do you think it works or does not work?
7. Are there some subject areas at school that are more likely to use ICT? Why?
8. Do you think the use of ICT open up possibilities? Which ones?
9. Do you think the use of ICT restrict actions? Which ones?
10. Do you think ICT is related to emotions? How? Can you explain?
11. How do teachers and children feel about using ICT?
12. How do you feel about the using ICT? Is there anything you would like to change?
13. Can you tell me a story that happened with you involving ICT in education?
14. What is supposed to be the role of ICT in schooling?
15. What does ICT demand?
16. What do you understand by the use of ICT in schooling in general?
17. Can you summarise the use of ICT in schooling in three words?
18. Are there any other comments you want to make? Feel free.

Semi-structured Interview Guide (ICT Leaders/IT Department)

Date: ___/___/___

School:_____   Interviewee: _____

Video: (   ) YES (   ) NO Number: _____   Audio: (   ) YES (   ) NO Number: _____

In Loco (   ) Skype (   ) Other (   ):_____

1. I would like you to introduce yourself saying your name, your age and your position in this school.
2. What is your background, your formation? How long have you been in this job and position? What did you use to work in before?
3. Describe your responsibility, based on your position. What do you usually do?
4. What is your relation to all groups in the school? What do you know about them, how do you get to know what they are doing and how do you figure out how to help them?
5. Do you have feedback about what and how they did?
6. What do you have to do to keep things working?
7. What are the most common problems school has?
8. Are they related to ICT? Do they used to be the same? What do you have to do with them? Who else needs to deal with these problems?
9. What do teachers usually complain about? And what about cheering?
10. What about the achievements? What would you say the school achieved?
11. Suppose I am in a school that there's no digital technology. What would be your recommendation to become a digital technology school?
12. Based on the condition of the material (laptops, boards, tablets), would you say they have been used well?
13. Why are you interested in ICT?
14. Can you describe ways that ICT is used in your school?
15. Would you say that the use of ICT have been effective? Why?
16. Would you say that the use of ICT have been appropriate? Why?
17. Why do you think it works or does not work?
18. Are there some subject areas at school that are more likely to use ICT? Why?
19. Do you think the use of ICT open up possibilities? Which ones?
20. Do you think the use of ICT restrict actions? Which ones?
21. Do you think ICT is related to emotions? How? Can you explain?

22. How do teachers and children feel about using ICT?

23. How do you feel about the using ICT? Is there anything you would like to change?

24. Can you tell me a story that happened with you involving ICT in education?

25. What is supposed to be the role of ICT in schooling?

26. What does ICT demand?

27. What do you understand by the use of ICT in schooling in general?

28. Can you summarise the use of ICT in schooling in three words?

29. Are there any other comments you want to make? Feel free.

Semi-structured Interview Guide (Primary Students)

Date: ___/___/___

School:_____   Year Group: _____

Interviewee: _____

Video: (   ) YES (   ) NO Number: _____   Audio: (   ) YES (   ) NO Number: _____

In Loco (   ) Skype (   ) Other (   ):_____

Topic: _____

Event: _____

Date of the event: ___/___/___   Involvement: Direct (   ) Indirect (   )

1. Do you use any computers, tablets or things related to technology in your house? For what purposes?
2. Do you use any computers, tablets or things related to technology in your classroom? What?
3. Does your teacher use these things? When? Can you describe me?
4. Can you tell me a day you used technology in classroom?
5. Was it nice? Why?
6. If it was not nice, can you tell me why?
7. In which activities do you usually use more technology?
8. Which teacher uses more technology?
9. How do you feel about this use? Do you like it, or not? Why?
10. Are there any other comments you want to make? Feel free.

Semi-structured Interview Guide (Secondary and Post-Secondary Students)

Date: ___/___/___

School:_____   Year Group: _____

Interviewee: _____

Video: (   ) YES (   ) NO Number: _____   Audio: (   ) YES (   ) NO Number: _____

In Loco (   ) Skype (   ) Other (   ):_____

Topic: _____

Event: _____

Date of the event: ___/___/___   Involvement: Direct (   ) Indirect (   )

1. What technological gadgets do you usually use at home? For what purposes?
2. What do you understand by the use of technology in classroom?
3. Can you say that the use of technology was appropriately? Why?
4. If not, can you give me an example of an appropriately use of technology?
5. Why do you think it did not work?
6. Do you think there are some subjects at school that are more likely to use technology? Why?
7. How do you feel about the use of technology? Is there anything you would like to change?
8. Are there any other comments you want to make? Feel free.

3. LETTERS AND CONSENT FORMS

INFORMED CONSENT/PRESENTATION LETTER

Study Title: "An investigation of the uses, functions and effects of technology in education."

Principal Investigator: Paula Lameu

Sponsor: Brazilian Government – Cooperation Nottingham-Birmingham / CAPES

Dear Participant,

My name is Paula Lameu and I am a PhD student in the doctoral research program, in the School of Education, in the College of Social Sciences at University of Birmingham I am asking you to participate in my research. This consent form will give you the information you will need to understand why this study is being done and why you are being invited to participate. It will also describe what you will need to do to participate as well as any known risks, inconveniences or discomforts that you may have while participating. I encourage you to ask questions at any time. If you decide to participate, you will be asked to sign this form and it will be a record of your agreement to participate.

➢ **PURPOSE AND BACKGROUND**

There has been an enormous expansion in the uses of new technologies in recent years. This has been inside schools and classrooms but also in children and young people's wider social and home lives. There is ongoing debate about the merits and potential pitfalls of children and young people's engagement with new technology, yet in formal educational settings there is often an assumption that employing technology will enhance teaching and learning. This research intends to intervene in this set of debates by exploring in detail the range of ways that new technology is used by teachers and students and identifying the range of effects that these uses have. However, as education is not composed just by what happens in classroom I would like to have access to organizations, institutions and people who are (in)directly related to what happens in classroom, as an example software developers and publishers.

➢ **PROCEDURES**

The research that I propose to do in some schools will comprise a series of observations of students and staff members' engagement in their daily learning and teaching activities, their interaction with each other, as well as analysis of the events that happened during these processes. Depending on what happens during the classes, other people that are connected directly or indirectly to the events of the classroom will be requested to be interviewed to make comments about the event or their influence of educational activities, e.g. the author of a book used in a particular group or a software developer whose app has been used by a specific teacher in a school. There will be no risks for you to take part in this study. You are able to leave the study and there will be no consequences for it. It is

my hope that the information gained from this research will help education professionals better understand the potentials of technology in education.

➤ **EXTENT OF CONFIDENTIALITY**

All efforts will be made to keep the personal information private and confidential. Any identifiable information obtained in connection with this study will remain confidential and will be disclosed only with your permission or as required by law. The members of the research team may access the data. The Ethics Committee from University of Birmingham monitors research studies to protect the rights and welfare of research participants. Your name and your company's name will not be used in any written reports or publications which result from this research. Data will be kept for ten years (per university regulations) after the study is complete and then destroyed.

➤ **QUESTIONS**

If you have any questions or concerns about participation in this study, you should first talk with the investigator Paula Lameu ▮▮▮▮▮▮▮▮▮▮▮▮ or her advisor Dr. Deborah Youdell ▮▮▮▮▮▮▮▮▮

DOCUMENTATION OF CONSENT

I have read this form and decided that I will participate in the project described above. Its general purposes, the particulars of involvement and possible risks have been explained to my satisfaction. I understand I can withdraw it until June, 2016.

_____

Printed name of the Organization / position held

_____   _____

Printed Name of Interviewee   **Signature** of Interviewee   Date

_____ _____

Signature of Person Obtaining Consent   Date

If you like to receive further information about theoretical background and/or the results of the research, write your e-mail: _____

Data Collection Acknowledgement (Head Teacher)

Paula Lameu

February, 24th, 2015

Dear Paula Lameu,

Based on my review of your proposed research, I give permission for you to conduct the study entitled "An investigation of the uses, functions and effects of technology in education" within the _____. As part of this study, I authorize you to observe the group _____, their teachers and other employees. I also allow you to make notes describing what happens during the period these participants are in school and approach them, inviting for an interview via skype, which will also be recorded. Individuals' participation will be voluntary and at their own discretion.

We understand that our organization's responsibilities include: allow the use of a digital device (a laptop or a tablet) to take notes during the observation and record the audio of the ongoing activities. The researcher will bring her own material. We reserve the right to withdraw from the study at any time if our circumstances change.

The research will include the observation of the routine of the group – teacher's explanations; exercises and practical activities; laboratory classes; PE classes; tests; celebrations; presentations and any other event that is part of the constitution of the group's day.

I confirm that I am authorized to approve research in this setting.

I understand that the data collected will remain entirely confidential and may not be provided to anyone without the permission of any participant, Brazilian Government and University of Birmingham.

Sincerely,

_____

Head Teacher

0121 XXXXXXXXX

Data Collection Acknowledgement (Teacher)
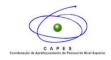
September, 21st, 2015

Dear Teacher,

I have obtained the principal's support to collect data for my research project entitled "An investigation of the uses, functions and effects of technology in education."

I am requesting your cooperation in the data collection process. I propose to collect data during this term. I will coordinate the exact times of data collection with you in order to minimize disruption to your activities.

If you agree to be part of this research project, I would ask to observe you teaching at group _____ in _____, your practice and how you deal with these students. My focus is not only observe the use of technology in your teaching practice, but identify other elements that can be part of educational practice, as an example, specific softwares used to teach your subject. Depending on what happens in the classroom, I might need to talk to you about it. This talk is going to be an interview that be via skype or not and it will also be video/audio recorded.

If you prefer not to be involved in this study, that is not a problem at all.

If circumstances change, please contact me via e-mail

Thank you for your consideration. I would be pleased to share the results of this study with you if you are interested.

I am requesting your signature to document that I have cleared this data collection with you.

Sincerely,

Paula Lameu

Teacher Name: _____

I agree: _____
                    Signature

If you like to receive further information about theoretical background and/or the results of the research, write your e-mail: _____

INFORMED CONSENT

Study Title: "An investigation of the uses, functions and effects of technology in education."

Principal Investigator: Paula Lameu

Sponsor: Brazilian Government – Cooperation Nottingham-Birmingham / CAPES

Dear Parent/Guardian:

My name is Paula Lameu and I am a PhD student in the doctoral research program, in the School of Education, in the College of Social Sciences at University of Birmingham I am asking for your permission to include your child in my research. This consent form will give you the information you will need to understand why this study is being done and why your child is being invited to participate. It will also describe what your child will need to do to participate as well as any known risks, inconveniences or discomforts that your child may have while participating. I encourage you to ask questions at any time. If you decide to allow your child to participate, you will be asked to sign this form and it will be a record of your agreement to participate. You will be given a copy of this form to keep.

➢ PURPOSE AND BACKGROUND
The purpose of this study is to observe the uses of technology in classroom, by teachers, staff and students of _____ , which your child is part of. These uses can cause different actions and reactions which will lead to different effects. Different events can influence the development of these processes, affecting it. Regardless the nature of these effects they will not be judged, but cannot be ignored, once they constitute part of practice developed.

➢ PROCEDURES
The research that I propose to do in the school of your child will comprise a series of observations of students and staff members' engagement in their daily learning and teaching activities, their interaction with each other, as well as analysis of the events that happened during these processes. Depending on what happens during the classes, your child will be requested to be interviewed to make further comments about the event. There will be no risks for your child to take part in this study. You are able to remove him/her from the study and there will be no consequences for it. It is my hope that the information gained from this research will help education professionals better understand the potentials of technology in education. If you choose not to allow your child to participate, s/he will remain in their classroom and s/he will not be requested to participate in the interview. It is estimated that the research study will take approximately a term to be complete. At no time will your child be separated from peers or the teachers.

➢ EXTENT OF CONFIDENTIALITY
Reasonable efforts will be made to keep the personal information in your research record private

and confidential. Any identifiable information obtained in connection with this study will remain confidential and will be disclosed only with your permission or as required by law. The members of the research team may access the data. The Ethics Committee from University of Birmingham monitors research studies to protect the rights and welfare of research participants. Your name and your child's name will not be used in any written reports or publications which result from this research. Data will be kept for five years (per university regulations) after the study is complete and then destroyed.

➢ **QUESTIONS**

If you have any questions or concerns about participation in this study, you should first talk with the investigator Paula Lameu ▮▮▮▮▮▮▮▮▮▮ or her advisor Dr. Deborah Youdell ▮▮▮▮▮▮▮▮▮▮ .

DOCUMENTATION OF CONSENT

I have read this form and decided that my child will participate in the project described above. Its general purposes, the particulars of involvement and possible risks have been explained to my satisfaction. I will discuss this research study with my child and explain the procedures that will take place. I understand I can withdraw my child until June 2016.

[   ] *Yes, I want to be part of this study.*   [   ] *No, I do not want to be part of this study.*

[   ] *Yes, I want to be video recorded.*   [   ] *No, I do not want to be video recorded.*

Printed Name of Child

Printed Name of
Parent/Guardian   **Signature** of Parent/Guardian   Date

Signature of Person Obtaining Consent   Date

If you like to receive further information about theoretical background and/or the results of the research, write your e-mail: _____

Study Title: "An investigation of the uses, functions and effects of technology in education."

Principal Investigator: Paula Lameu

Sponsor: Brazilian Government – Cooperation Nottingham-Birmingham / CAPES

VERBAL ASSENT SCRIPT

My name is Paula Lameu and I am a PhD student in the doctoral research program, in the School of Education, in the College of Social Sciences at University of Birmingham. I am doing a study because I am trying to understand how technology can influence the way students learn and teachers teach. I am asking you to take part in the study because you are a student at _____. I'm going to tell you a little bit about the study so you can decide if you want to be in it or not.

If you want to be in this study, I will observe you during classes. Depending on what happens during your classes, I might ask you some questions to listen to your opinion about these events. If you do not want to answer the questions that is fine. There will be no problem and nobody is going to be mad at you. If you do not want to be in this study I will not ask you to participate in the interview.

I talked to your parents about this study and they said you could do it if you wanted to. But you can still say "No" if you don't want to be in the study or you can start and then if you want to stop being in the study at some point, that's okay. No one will be mad at you.

Do you have any questions for me?

[   ] Yes, I want to be part of this study.   *[   ] No, I do not want to be part of this study.*

[   ] Yes, I want to be video recorded.   *[   ] No, I do not want to be video recorded.*

Student Name: _____

ASSENT FORM

Study Title: "An investigation of the uses, functions and effects of technology in education."

Principal Investigator: Paula Lameu

Sponsor: Brazilian Government – Cooperation Nottingham-Birmingham / CAPES

My name is Paula Lameu and I am a PhD student in the doctoral research program, in the School of Education, in the College of Social Sciences at University of Birmingham. I am conducting a research study titled "An investigation of the uses, functions and effects of technology in education." I am doing this study because I am trying to understand how different elements from inside and outside classroom can influence the way _____. This form will tell you a little bit about the study so you can decide if you want to be in the study or not.

I will be sitting in some of your classes and other activities around school and observing what happens. If you want to be in this study I will include you in my observations. Depending on what happens during classes, I might ask to interview you as well. The purpose of the interview is to listen your opinion about an event, for example, the use of specific software in a specific subject. The intention is not to judge anyone, but I want to understand how you saw that event and how it affected you. If you don't want to answer any question you don't want to. If you decide that you don't want to be in this study, you won't be included in my observations or asked to be in an interview. You can also stop being in this study at any time.

You can ask me any questions about this study the next time you see me or you can send me an e-mail at any time ▮▮▮▮▮▮▮▮▮▮▮▮. You can also talk to my supervisor Dr. Deborah Youdell ▮▮▮▮▮▮▮▮▮ about this study. After all your questions have been answered, you can decide if you want to be in this study or not.

_____

[   ] Yes, I want to be part of this study.   *[   ] No, I do not want to be part of this study.*

_____   _____
PRINT your name   Date

_____   _____
SIGN your name   Date

_____   _____
Signature of Person Obtaining Consent   Date

ASSENT FORM

Study Title: "An investigation of the uses, functions and effects of technology in education."

Principal Investigator: Paula Lameu

Sponsor: Brazilian Government – Cooperation Nottingham-Birmingham / CAPES

My name is Paula Lameu and I am a PhD student in the doctoral research program, in the School of Education, in the College of Social Sciences at University of Birmingham. I am conducting a research project for my thesis. This form will give you the information you will need to understand why this study is being done and why you are being invited to participate. It will also describe what you will need to do to participate as well as any known risks, inconveniences or discomforts that you may have while participating. I encourage you to ask questions at any time. If you decide to participate, you will be asked to sign this form and it will be a record of your agreement to participate.

➢ **PURPOSE AND BACKGROUND**

The purpose of this study is to observe the uses of technology in classroom, by your teachers, staff and you and your peers. These uses can cause different actions and reactions which will lead to different effects. Different events can influence the development of these processes, affecting it. Regardless the nature of these effects they will not be judged, but cannot be ignored, once they constitute part of practice developed.

➢ **PROCEDURES**

This study will compromise a series of observations of your engagement in your daily learning activities, the interaction with your teachers and peers, as well as an analysis of the events that happened during these processes. Further comments about what occurred during these processes may be necessary, so you might be requested to an interview to share your thoughts. If you choose not to participate, you will remain in your classroom and you will not be required to an interview. There will be no risks for you to take part in this study. You may also stop your participation in the study at any time.

➢ **EXTENT OF CONFIDENTIALITY**

All efforts will be made to keep the personal information in your research record private and confidential. Any identifiable information obtained in connection with this study will remain confidential and will be disclosed only with your permission or as required by law. The members of the research team may access the data. The Ethics Committee from University of Birmingham monitors research studies to protect the rights and welfare of research participants. Your name will not be used in any written reports or publications which result from this research. Data will be kept for five years (per university regulations) after the study is complete and then destroyed.

➢ **QUESTIONS**

If you have any questions or concerns about participation in this study, you should first talk with the investigator Paula Lameu   or her advisor Dr. Deborah Youdell

            .

DOCUMENTATION OF CONSENT

I have read this form and decided that I will participate in the project described above. Its general purposes, the particulars of involvement and possible risks have been explained to my satisfaction. I understand I can withdraw it until June, 2016.

I understand that I can choose not to participate in this study, or to withdraw from participating at any time. Declining participation will not interfere with my learning experiences in my classroom. I understand that by not participating in this study, I will be provided with the same activities and experiences as all other students.

[   ] Yes, I want to be part of this study.   *[   ] No, I do not want to be part of this study.*

_____   _____

Printed Name of Study Participant   **Signature** of Study Participant   Date

_____   _____

   Signature of Person Obtaining Consent   Date

If you like to receive further information about theoretical background and/or the results of the research, write your e-mail: _____

4. DATA SAMPLE

FIRST ROUND OF DATA ANALYSIS – IDENTYFYING THEMES

CH: The new boards are really good, that's like a bit of massive. The board I had before was tiny and didn't work properly. Now I've got a new board that obviously doesn't work at the moment, but when it does work it is really good.

PL: What do you mean by 'doesn't work properly' about your old one?

CH: When I used the pen to write on it and you would write, so it takes sort of ten seconds for your writing to appear. The calibration was always out, so when you'd go and write somewhere it appeared somewhere else in the board. They were just very slow and it was a small screen, so for twenty-eight children to be able to look at the screen it was quite difficult. But now is bigger and any children could write with their fingers which is so much easier.

PL: Would you say that the use of ICT has been effective?

CH: Yeah, I'd say so. It is good.

PL: Would you say that the use of ICT has been appropriate?

CH: Yeah, and you can use it for everything we do. There's always something we can do on ICT. So I did a lot of different arts and sort of by-yourself art at computers and they can choose paint to recreate something. There is always stuff that you can recreate.

PL: Are there some subject areas at school that you think that are more likely to use ICT?

CH: Anything. I use a lot for literacy, sort of for speaking and listening, so videoing and recording and that kind of thing. I can set arts we do tend to use it. In phonics I use it a lot, that sort of games and consolidate our learning. As a class we've looked like Google Maps, we've looked where school is and we've walked around like on the street views and things like that. So, I wouldn't say that it is easy at Maths, so there wasn't many areas I don't use it.

PL: Do you think the use of ICT open up possibilities?

CH: Yeah, definitely. And children go home and also like when we have parents in for sort of we have ▮▮▮▮▮▮ when they can come in and they see the children using them and it encourages them to if they can afford to and get laptops and Ipads and things outside school. That's good.

Coding Density

3 words

Change in curriculum
Interest in ICT

Effectiveness

Appropriateness
To do such … and things

Open Possibilities

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SECOND ROUND OF DATA ANALYSIS – CODING

<u><Internals\\General Data\\Interviews\\Examining Board\\Laura AQA></u> - § 2 references coded [8.87% Coverage]

Reference 1 - 3.84% Coverage

Emotions: I do not know how to respond to it, really.
It depends on the context where you are using ICT for. I need to have a break from the screen at work; I need to print material and see on paper because it is more comfortable. Whether if is arousing emotions, it depends on what you are using it for. Often, if you have a look on Facebook, it can affect your mood. But it is specific, not really ICT in general.

Reference 2 - 5.04% Coverage

Teachers and children feel: I do not have a straightforward answer to that. I think there is a pressure from students to embrace the changes and technology and we have to acknowledge that anyone who was born in this side of the millennium may use an Iphone from a very young age. My generation is older, who did not have the same access to mobile phones as the kids have today. And I see as potentially damaging. It is different sides of the same argument. There will be some reluctant. I make this assumption based on my department. It can be used too much, bring a shadow or rely too much on it. It is about expectations as well. It is difficult to speak for the students, but I thin they expect a level of visual appeal in the lessons today as an accepted standard.

<u><Internals\\General Data\\Interviews\\Ofsted\\jesvir></u> - § 2 references coded [12.98% Coverage]

Reference 1 - 4.08% Coverage

Emotions:
Yes, it could be, because sometimes it pushes emotions due to the way it is used and the purpose.

Reference 2 - 8.91% Coverage

Story.
I saw a student being touched because of the way ICT was in use. This student got involved by the video shown by a teacher, in relation to a sensitive topic and for a while I forgot why I was there, due to the emotions related to that video. I got involved because she got involved. Definitely the teacher achieved her purpose with the video.

<u><Internals\\General Data\\KECHB\\KECH observations></u> - § 62 references coded [12.41% Coverage]

Reference 1 - 0.13% Coverage

The boys 'wowed' for what they were going to talk about: geoalgebra, as if it was something unusual (and in Maths unusual seems to be difficult and challenging).

Reference 2 - 0.24% Coverage

 He shows one animation of the circle, in which the circle is undone and other geometrical forms could emerge, depending on what you do. Every time the teacher makes the circle unfold, the students 'wow'. He does it using the animation program he has. It seems to be linked to the book they use.

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