



**The Effectiveness of a Computer Software Program for
Developing Phonemic Awareness and Decoding Skills for
Low-literate Adult Learners of English**

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الحمد لله

Alhamdulillah

Thank you Allah

Abstract

This study examined the effectiveness of technology-enhanced learning in the form of newly developed software, the Digital Literacy Instructor, which was designed in four languages (Dutch, English, Finnish, and German) to develop reading skills for low-educated second language learners just beginning to read for the first time, but in a second language. Second language learners in the Netherlands, Finland, Germany, and Austria were involved in the Digital Literacy (DigLin) Instructor project, and in the UK the present thesis also tracked 11 adult migrants (aged between 25 to 56 years) from a range of different language backgrounds (speakers of Arabic, Tigrinya, Punjab, Dari, and Russian) who spent seven months using this computer-assisted reading program. In addition to their regular teaching at a local further education college, they used the seven DigLin exercises in 15 sets to help them identify grapheme-phoneme correspondences to gain basic reading skills. An additional five adult migrant learners received no such extra tuition but attended only their regular classes. All 16 learners were at different sub-A1 and A1 reading levels of the Common European Framework of Reference for language, and some of the learners were low- or non-literate in their first language. Pre- and post-tests measured their development of reading with four tasks: the phonological awareness which included three tasks (phonemic awareness, rhyme awareness, and onset awareness) and the single word reading task.

The results showed that the 11 who used the DigLin software made significantly more gains in phonological awareness and word reading than those who did not use it. Moreover, those who were lower-level readers at the start gained more from the DigLin training than the higher-level readers. Qualitative data revealed further variations in their use of DigLin when its usage was not connected to their level of literacy at the start, or on whether they had existing native-language literacy.

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Chapter 1: Introduction

1.1 Overview of the study

Second language acquisition (SLA) is an active field with a range of topics which have been extensively researched over the last half century. This includes second language reading. However, when looking at reading development in the field of SLA, attention is mostly on learners who are educated and literate in their native language, particularly if they are older second language (L2) learners. There is also considerable attention paid to how children learn to read in their first language (L1). That is, the focus is on people who already have literacy – sometimes high literacy levels - in a language and are attempting to learn to read in a second language; (henceforth ‘second language’ and L2 refer to learning an additional language, not necessarily one’s second language). This means that such L2 readers are able to transfer reading skills they will have developed in their first language. However, one minority group of learners who have not had much attention in the field of SLA are adults who are learning to read in a new language for the first time in their lives because they are not literate in their own language. Not only do they have no literacy skills to transfer but they often have little or no knowledge of the second language in terms of the linguistic competence they are learning to read in. As a result, they are learning how to read and write for the first time in a language other than their mother tongue, and at the same time they have to acquire the phonology, morphosyntax, syntax, and vocabulary of that new language. Because of their lack of literacy in their first language and their lack of formal education, these learners struggle in so many ways to learn the language in order to become able to engage with others in their new country and to earn a living for themselves. Due to the limited awareness within the field of SLA of low-literate adults learning a second language, the majority of studies conducted on L2 acquisition and L2 reading are still on educated learners who have been educated in their L1 (Bigelow and Tarone 2004; Kurvers 2006; Young-Scholten 2015). Studies based on children’s reading can be a more reliable theoretical basis than studies on educated learners when we want to draw conclusions.

Although these adults differ greatly in their linguistic experience from young children learning to read, studies have shown that they share a certain degree of similarity in certain aspects of their reading development, including the phonological awareness they demonstrate before and after learning to read (Young-Scholten and Strom 2006). Additionally, they are similar to children learning to read in a Roman alphabetic script in the stages of their reading development (Kurvers, 2006).

Learners who are receiving literacy education and gaining oral proficiency (linguistic competence) in a second language at the same time, face many challenges when they are becoming literate. Some may face personal challenges such as encountering other people from different countries in their community. They may have never been with people other than people from their own country and hence can be faced with dealing with many cultural and educational differences and challenges to which they have not yet adapted and are not used to in the new country they are residing in. Some learners have not been in a classroom before and do not know how to deal with a range of expectations including interacting with their more educated peers from various other countries or with their teachers. Some may face the basic challenge of not knowing how to use a pen or pencil. Being in a digitalised developed society such as the UK, they will also need to know how to use a computer, which they have never used before.

Those without L1 literacy face difficulties in which they struggle during reading and writing due to not being able to recognise or write the letters or words that they encounter in their daily life in their new country. This is based on their difficulty in identifying how graphemes symbolise phonemes of their new language. According to previous research on illiterate and low-literate adult L2 learners, adult learners who have minimal formal schooling face the challenge of not having explicit and conscious awareness of linguistic units such as phonemes, morphemes, and words (Young-Scholten & Strom, 2006; Kurvers et al., 2006). Plenty of materials are available for children learning to read in their L1 and for younger and older educated and literate individuals learning to

read in L2. Are these appropriate for low-literate L2 adults? Seeking to find the right materials that would help them to learn the target language has been one of the unmet challenges. Many educators have tried searching for books or programs that would help these learners but because of the limited knowledge of these adults, they only find materials that are targeted for pre-school children. For these adult learners, using these pre-school materials would be demotivating, discouraging, and not meeting their needs. Materials for adult L2 migrants remain a surprisingly under-supported aspect of language learning (Hann et al., 2010; Masuhara et al., 2017).

Materials for adult L2 migrant learners, designed specifically for them, can motivate them and encourage them to learn. Learning how to ‘crack the code’, by developing grapheme-phoneme correspondences to be able to read, is indispensable for success and allowing the readers to increase their knowledge of language, develop their skills, and build information from being able to access written language (Adams 1990; Snow, Burns, and Griffin 1998).

1.2 Why do such learners exist?

The question is who are these learners and why do they exist? It will be useful first to define the terms being used in this thesis. The word ‘migrant’ differs from refugees. According to the All-Party Parliamentary Group (APPG), "the term ‘migrants’ is used to refer to economic migrants” which consists of those who are residing in the UK legally who have been granted the status of indefinite leave to remain (who are qualified to settle in the UK permanently) to enhance their economic and professional status but who do not have British citizenship (APPG, 2016). Asylum seekers are described as “someone who has applied for protection as a refugee and is awaiting the determination of his or her status. Refugee is the term used to describe a person who has already been granted protection. Asylum seekers can become refugees if the local immigration or refugee authority deems them as fitting the international definition of refugee” (UNESCO, 2017). I will henceforth use a neutral term - migrant - in the present thesis to refer to all these groups.

Let's take a step back now and consider why such adult learners exist in view of current political and economic pressures on funding for adult language learning, while facing increased need for social cohesion in multilingual societies. There are estimated to be, worldwide, 793 million without primary language literacy (UNESCO Institute for Statistics 2011); such learners are known to make slower progress than all other L2 learners (Condelli et al., 2003; Kurvers & van de Craats, 2008). Low literate learners in the UK comprise between 5-15% of the population for whom English is not the main language, and 10% of students on English for Speakers of Other Languages/ESOL programmes (Baynham et al. 2007). In a highly mobile but non-secure global community, these learners' deprivation of formal education in their home country, often associated with experiences of social or political trauma, leaves them with a crippling inability to read, write and converse in the wider community, in turn leading to social exclusion, lack of civic and economic participation and negative effects in the children's English (EAL) educational opportunities.

In the UK, for adults attending free ESOL classes, the lack of primary language literacy reduces the impact of any teacher-guided reading-based activities and creates a rarely surmounted barrier to gaining beginner-level national ESOL qualifications for employment, or to reach the low intermediate level (B1) of the Common European Framework of Reference, required for permanent UK residence. These difficulties may be attributed to lack of motivation, challenges in handling classroom instruction, and variation in quality and quantity of input. But we attribute it fundamentally to the double burden of acquiring linguistic competence in an L2 while learning to read for the very first time in that L2. Now according to the latest statistics for literacy rates from the United Nations Educational, Scientific, and Cultural Organisation (UNESCO), there are still 750 million individuals aged from 15 years and adults who cannot read worldwide (UIS, 2017). It is well known that UNESCO is a major advocate for advancing global efforts in reducing literacy worldwide and providing outstanding solutions in order to reach the Sustainable Development Goal number 4 which was put forward in the 2015 international summit that introduced these goals. The target of Goal 4 is to "[e]nsure inclusive and equitable quality education and promote

lifelong learning opportunities for all” (UN, 2015, p.18). To be more specific, it adds that “by 2030, ensure that all youth and substantial proportion of adults, both men and women, achieve literacy and numeracy” (p. 21). UNESCO is committed to providing literacy skills for every individual on the planet as an essential part of the basic human right to education. Hence, by providing the opportunity to become literate, every individual is able to participate fully in society, enrich their lives, and also produce economic benefits for the country in which they live in. Although there is striking advancement in literacy over the past decades, most countries have not had the chance to provide education for all. As a result, according to UIS (UNESCO Institute for Statistics) data between 2000 and 2015, most countries should have increased their literacy rates by 50%. However, this goal has not been achieved and at a global level, an estimate of only 4% growth was recorded in this period, resulting in the following map, showing levels of literacy worldwide (UIS, 2017).

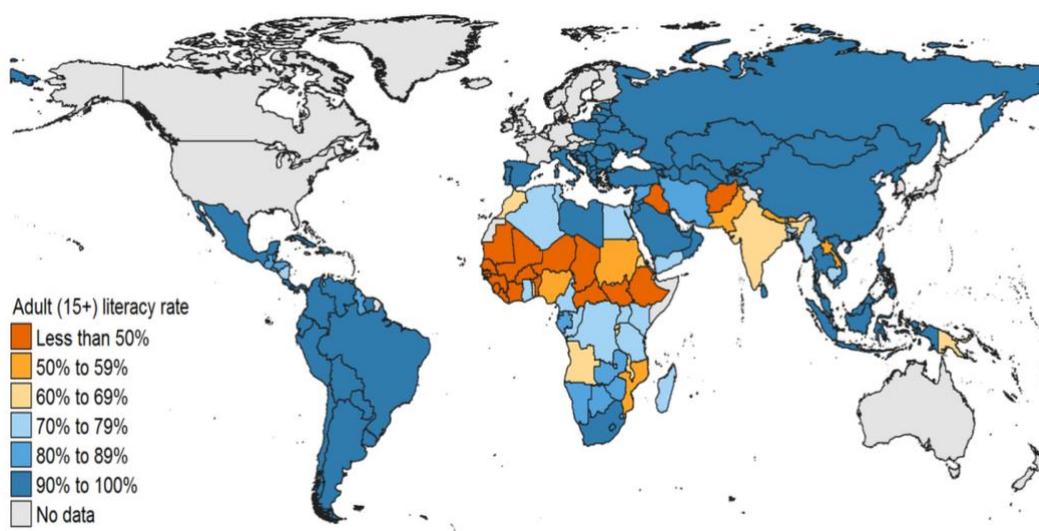


Figure 1-1: Adult Literacy Rates 2016 (UNESCO, 2017)

Figure 1-1: Adult Literacy Rates 2016 (UNESCO, 2017)

In Figure 1-1 depicts how literacy is lowest in least developed countries which are often also the most politically unstable ones. Due to economic, social, political, or environmental circumstances, a great deal of people migrate from one country to another. Low Literacy turns out to disproportionately affect migrants since many of them are refugees fleeing from unstable countries or trying in other ways to escape very difficult conditions. Consequently, renewed efforts

are required to reach the targets of the UN Sustainable Development Goals. According to the Fifteenth Coordination Meeting on International Migration, the migration numbers reached 244 million worldwide, which is a 49% increase compared to the data in 2000 (United Nations, 2017). In a recent report by the United Nations High Commissioner for Refugees (UNHCR), also known as the UN Refugee Agency, it was found that by the end of 2016, 65.6 million people were forcibly displaced, meaning that they were forced to flee from their homes because of the unrest, conflict, and/or human rights violations occurring in their country. Thus, the number has increased and to an estimate of 300,000 more than last year (Edwards, 2017). This is a substantial increase, revealing that the proportion of international migrants living in other countries from which they were born has escalated far greater than the world's population which increased only 3.3 percent (OECD, 2016). However, there are considerable differences among the large so-called receiving countries around the rest of the world. High-income countries in continents such as Europe, North America, and Australia have at least 10 percent of the total population of migrants. Nearly, 76 million migrants reside in Europe alone as seen below in Figure 1.2 below and 75 million in Asia, which almost accounts for two thirds of all international migrants as seen in the figure below (UN, 2016).

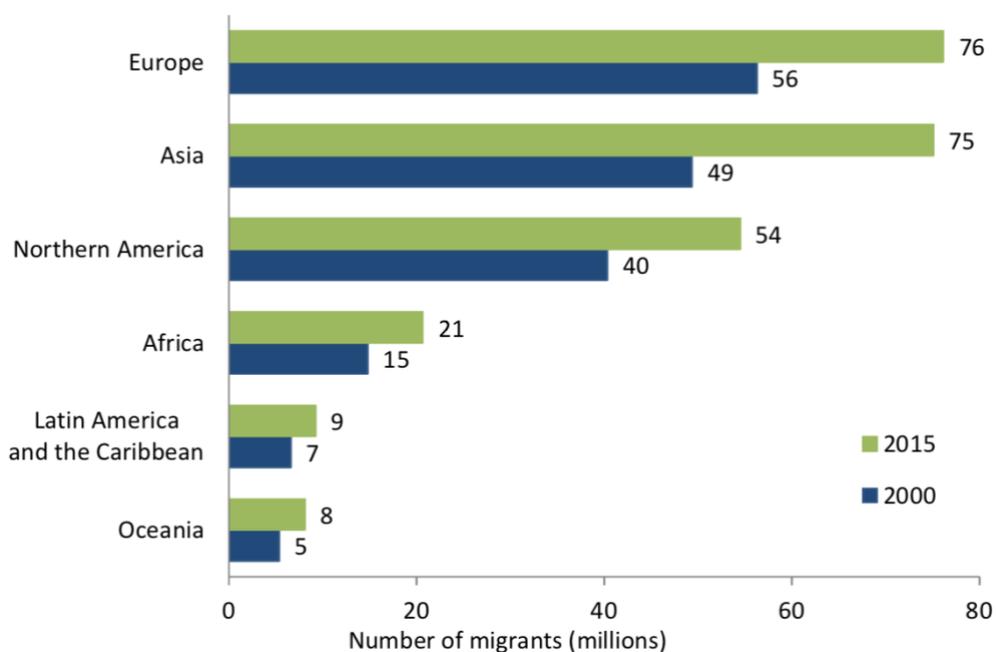


Figure 1-2: Number of international migrants by major area of destination, 2000 and 2015 (UN 2015)

United Kingdom was in fifth place among the 20 countries taking in the largest number of migrants, with an approximate population of nearly 9 million residing in the United Kingdom and Northern Ireland (UN, 2016, p.8). This vast number of refugees worldwide has reached its highest peak since the Second World War. Besides, in a more recent report confirming this, it has been stated that “more people are still coming to live in the UK than are leaving and therefore net migration is adding to the UK population” (ONS, 2017, p.3). According to the UNHCR, over fifty percent of the refugees come from three countries: the Syrian Arab Republic, Afghanistan, and Somalia (UN, 2016).

These ethnic minority adults living in the UK are expected to learn the language under programs providing “English for Speakers of Other Languages”. (A full description of ESOL will be provided in the next section.) For economic migrants, asylum seekers, and refugees, the All-Parliamentary Group established their policies on the basis that migrants should be able to fully integrate into society by expecting to have learned English before arriving in the UK and if not, then they are obligated to enrol on ESOL programs upon entering the country (APPG, 2016). The minority of adult learners who are migrants and have limited or no literacy in their L1 and lack the requirements of basic literacy but are beyond the age of compulsory schooling, have opportunities to enter classes in order to give them a chance to improve their lives. Yet, they face considerable challenges in various countries (Condelli & Wrigley, 2008). For example, in the UK they now face the challenge of finding free classes to develop their basic oral language and literacy skills in English (Simpson & Whiteside, 2015).

1.3 ESOL in the UK

For a much clearer picture, first the thesis will provide a description of who ESOL learners are and how ESOL has been developed. As mentioned earlier, these learners are adult migrants to the United Kingdom, who according to the Department for Education and Skills (DFES, 2001), are identified as adults who can be classified into four broad categories:

- Settled communities;
- Refugees: subdivided into asylum seekers and settled refugees;
- Migrant workers;
- Partners and spouses of people who are in the UK to study

Most of these learners vary in their need to learn English. For example, some may have already had professional jobs, and know English but due to war and unrest, they were forced to leave the country, and others have not gained any competence in English when they entered the country. Therefore, some migrants need to learn the language as beginner in order to resettle.

Britain has a long history of immigration, from the late 19th and early 20th century onwards. Many have therefore tried to provide suitable solutions to help migrant adults in either developing or improving their basic literacy skills. Rosenberg (2008) contributed to the discussion by giving an overview of a detailed history of the development of ESOL provision in the UK. In the beginning of the 20th century, England became a focal point of people from the Jewish settlements, refugees from Spanish Civil war, and Nazi Europe. Later, in the 1950s and 1960s, Language learning provisions were established by local practitioners which were voluntary and usually home-based. Then in the 1960s, new migrants arrived from the Commonwealth countries, such as the Caribbean and the Indian subcontinent (for example: India, Pakistan, and Bangladesh), and also there was forced migration of East African Asians from Uganda. As a result, the first Immigration Act allocated funding to local authorities which included provision for learning English. There was a high demand to mostly support the needs of English language training for both adults and children at the time. The funding then extended three decades until 1998 after more groups of migrants from other countries around the world arrived in the UK (Hamilton & Hillier, 2009). However, the government did not include the concerns of the least literate in their policy circles and their needs were neglected. Further down the line, there were many influences that had a significant impact on ESOL provision. Following the International Adult Literacy Survey in 1999, a report to the government titled, '*A Fresh Start-Improving Literacy and Numeracy*' highlighted the importance and the need for applying a national strategy to decrease the number of adults with low levels of basic

literacy skills. During that time, there was concern over the lack of an inclusive professional organisation that would bring together people that were interested in teaching English to speakers of other languages. Consequently, more organised professional associations were established, such as NATECLA, The National Association of Teachers of English and Community Languages to Adults (Hamilton and Hillier 2006). Therefore, in the 2000's, ESOL provision was incorporated as being a part of the national curriculum and the *Skills for Life* strategy which was established in England and Wales (Simpson, 2007; Hann et al., 2010). This curriculum includes basic literacy skills for ESOL adults but continued to neglect the very lowest level of learners, those with sub-A1 levels (of the Common European Framework of Reference) (See Table 1.1 below). Such learners may be referred to as 'Pre-entry' to indicate that they are below the lowest level where skills are tested in the UK, namely Entry 1. These learners are also labelled as 'LESLLA' learners, based on the organisation by the same name (Literacy Education and Second Language Learning for Adults) which was formed in 2005 to support the exchange of ideas between researchers and practitioners and has held an annual conference ever since (see e.g. van de Craats et al. 2006).

Proficient User	C2	<ul style="list-style-type: none"> • Can understand with ease virtually everything heard or read. • Can summarise information from different spoken and written sources, reconstructing arguments and accounts in a coherent presentation. • Can express him/herself spontaneously, very fluently and precisely, differentiating finer shades of meaning even in more complex situations.
	C1	<ul style="list-style-type: none"> • Can understand a wide range of demanding, longer texts, and recognize implicit meaning. • Can express him/herself fluently and spontaneously without much obvious searching for expressions. • Can use language flexibly and effectively for social, academic and professional purposes. • Can produce clear, well-structured, detailed text on complex subjects, showing controlled use of organizational patterns, connectors and cohesive devices.
Independent User	B2	<ol style="list-style-type: none"> 1. Can understand the main ideas of complex text on both concrete and abstract topics, including technical discussions in his/her field of specialization. 2. Can interact with a degree of fluency and spontaneity that makes regular interaction with native speakers quite possible without strain for either party. 3. Can produce clear, detailed text on a wide range of subjects and explain a viewpoint on a topical issue giving the advantages and disadvantages of various options.
	B1	<ul style="list-style-type: none"> • Can understand the main points of clear standard input on familiar matters regularly encountered in work, school, leisure, etc. • Can deal with most situations likely to arise whilst travelling in an area where the language is spoken. • Can produce simple connected text on topics which are familiar or of personal interest. • Can describe experiences and events, dreams, hopes & ambitions and briefly give reasons and explanations for opinions and plans.
Basic User	A2	<ul style="list-style-type: none"> • Can understand sentences and frequently used expressions related to areas of most immediate relevance (e.g. very basic personal and family information, shopping, local geography, employment). • Can communicate in simple and routine tasks requiring a simple and direct exchange of information on familiar and routine matters. • Can describe in simple terms aspects of his/her background, immediate environment and matters in areas of immediate need.

	A1	<ul style="list-style-type: none"> • Can understand and use familiar everyday expressions and very basic phrases aimed at the satisfaction of needs of a concrete type. • Can introduce him/herself and others and can ask and answer questions about personal details such as where he/she lives, people he/she knows and things he/she has. • Can interact in a simple way provided the other person talks slowly and clearly and is prepared to help.
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Table 1-1: Common Reference Levels: global scale (CEFR 3.3)

With this influx of non-native speakers of English, especially those with no literacy at all in their first language or any other language upon arrival in a new country, it would seem that providing basic ESOL would be flourishing. However, the opposite now seems to be true. A few years back, in the beginning of 2011, the British Government applied rules that were disheartening to anyone wanting to migrate to the UK. They announced a controversial policy that by the end of that year, they would be cutting back on public funding of ESOL regardless of how much at the same time politicians expressed high expectations for and stressed the need for learning English. They announced that they would only provide limited spaces for free English classes for those on Jobseekers' Allowance or employment support allowance, i.e. people who receive government benefits or who are actively seeking work (Foster & Bolton, 2017). Unfortunately six years onwards and after clearly stating that knowing the language is “the key to full participation in our society and economy” and that it is a “prerequisite for meaningful engagement with most British people” (APPG, 2016, p.18), migrants are still struggling to find places to learn or improve their English. Migrants may even have to wait for up to three years for free, government-funded English classes despite the government setting rules for learning the language to enter the country or for indefinite leave to remain (APPG, 2016). According to immigrant rules in the UK, migrants from other countries entering the UK are required to have sufficient knowledge of the English Language in order to be allowed to enter or remain in the UK (Immigration Rules Appendix KoLL - Immigration Rules - Guidance - GOV.UK, 2016). The rule states that a migrant is required to have “passed an English language test in speaking and listening, at a minimum level B1 of the Common European Framework of Reference for Languages” (op. cit., 2016). According to the Home Office rules, people migrating from different countries should be able to have an understanding of the language, be able to produce the language, and should have the ability to describe anything using

simple sentences. If a person (other than a refugee) fails to do so, he/she may be denied entry to the UK or forced to leave .

This has created a disarray among further education colleges and other government-supported centres in parts of the UK where there is a high demand for ESOL classes due to the high-density migrant populations and their increase as mentioned earlier. According to the research that has been put forward by Refugee Action, government's basic skills funding was cut approximately fifty percent from 2008 to 2015 despite the numbers of migrants increasing at this particular time (Refugees Action, 2016). This has led many practitioners, as well as researchers, to find alternative solutions in order to compensate for these political problems and to provide accessible ways for low-educated, pre-entry-level ESOL learners to have the possibility of learning the language of the country they are residing in and learning to read and write in that language. Currently, because of this lack of funding which has resulted in very limited opportunities for non-native speakers to enter these classes, there is increasing need in the UK for finding new ways of meeting the learning needs for this population of low-literate learners of English. Given that the United Kingdom is a highly literate, reading-intensive society which necessitates high-level literacy skills not only for survival but for advancement in various areas, there is scope for solutions which involve digital resources in our highly digitalised world.

The need for learning print and word recognition is indispensable for daily life, from applying for jobs to supporting children's schooling, filling medical forms, applying for social benefits, and to open possibilities for continued lifelong learning. However, some learners do not have the ability to enter existing classes because they did not receive any formal schooling in their L1 or any language and hence cannot read or write in any language. ESOL classes have been designed in such a way that practitioners expect to teach second language learners who have at least some sort of educational background. Even researchers have found difficulty in trying to find any research to base their studies upon; nonetheless very little research was found (see Young-Scholten

2015). As a result, another group of interest was established which has focused entirely on this particular neglected minority group of learners, seeking to provide them with solutions for Literacy Education and Second Language Learning by Adults (LESLLA). This international group is composed of academics, practitioners, and policy makers aiming to provide practical solutions and share research findings that would help these learners in improving their literacy development. In their website, LESLLA clearly states who they are and what their goals are:

Literacy Education and Second Language Learning for Adults (LESLLA) is an international forum of researchers who share an interest in research on the development of second language skills by adult immigrants with little or no schooling prior to entering the country of entry.

The goal of the LESLLA is to share empirical research and information to help inform and guide further research on second language acquisition for the low-educated adult population. This research in turn will provide guidance to education policy development in all those countries in which immigrants settle and most need educational support.

Given the vast majority of migrants who are entering the UK, some of whom have received very limited schooling in their own language and some of whom are even illiterate, attention needs to be paid to the difficulty of learning to read as an adult in a language other than one's mother tongue, which for the first time can be a difficult task. When learners are low-literate or illiterate in their own language, how do they acquire a second language? How do they learn to read? Can computer-assisted language tools be used to help provide an environment to improve aspects of their oral language, their literacy, and phonological awareness skills?

Some questions were raised in Murray and Christison's (2011) book about what English language teachers who work with such learners need to know; for example, "*What strategies can teachers use to help preliterate adults acquire literacy in English?*" and "*Why do you think that SLA research has not been conducted with this population?*". The present thesis will provide some answers to these questions and

others that have been raised and will look at how one solution regarding materials has or has not helped this under-researched population of L2 learners.

1.4 Adult literacy acquisition of English and other languages

Over the past decade, considerable interest has been growing regarding research on adult learners who are migrants, asylum seekers, or refugees who are learning a new language in a country or region in which they have resettled. This includes English, the focus of the present thesis, but also includes a range of other European languages as well, such as Spanish in Latin America and Arabic and Turkish in the Middle and Near East, Swahili in Africa, and Thai in the Far East. As I have already noted several times above, how these adult learners differ from other second language learners in that they are illiterate or low-literate in their first language. Let us now look more closely at the organisation that was established specifically to address the needs of these learners, namely LESLLA. A group of researchers, practitioners, and policy makers joined together in 2005 establishing an international research forum. All share an interest in the development of the oral and written second language skills of adult migrants with little or no schooling before entering the country they are resettling in (LESLLA, 2011).

The establishment of LESLLA involved the definition of terms which refer to literacy, as shown in the table below:

Native Language Literacy	Explanation
<i>Pre-literate</i>	L1 has no written form or is in the process of developing a written form (e.g., many American indigenous, African, Australian, and Pacific languages).
<i>Non-literate</i>	Learners have no access to literacy instruction.
<i>Semi-literate</i>	Learners have limited access to literacy instruction.

<i>Non-alphabet literate</i>	Learners are literate in a language written in a non-alphabetic script (e.g., Mandarin Chinese).
<i>Non-Roman alphabet literate</i>	Learners are literate in a language written in a non-Roman alphabet (e.g., Arabic, Greek, Korean, Russian, and Thai).
<i>Roman alphabet literate</i>	Learners are literate in a language written in a Roman alphabet script (e.g., French, German, and Spanish). They read from left to right and recognize letter shapes and fonts.

*Table 1-2: Types of L1 literacy of English Language learners
(Adapted from Burt, Peyton, & Adams, 2003)*

In the proceedings from the inaugural conference in 2005, van de Craats, Kurvers and Young Scholten (2006) provided an overview of why research on LESLLA learners was required. They have stressed that the group of academics have united to expand fundamental and practical research for those non- and low-literate adult learners, focusing on their development of literacy in an L2. They gave many reasons but emphasised particularly three. First, LESLLA learners, who by definition arrive in their new country at a later age, often entirely missed the opportunity of receiving the formal education that children normally get and benefit from in an early age where they would have engaged in basic social interactions. This, in a way, supports the popular belief in SLA that the process of learning a second language in children is quicker and provides better outcomes. This view is supported by the well-known Critical Period hypothesis that children learn an L2 better than adults do (Lenneberg, 1967; Scovel, 2000). However, this hypothesis has been contested with some arguing that adults are actually capable of achieving high levels in another language, that they have the advantage in terms of faster rate of initial learning and that they acquire languages in the same way as children do (Bialystok 1997; Gass & Selinker 2008; Moyer 2004; Vainikka & Young-Scholten 1994). Bialystok (1997) has pointed out that when the optimal age is over, adults require a certain structure and she postulates that an important factor that causes differences in ultimate attainment between early and late starters is learning style. Additionally, some argue that, unlike children, who can easily absorb information, adults need to consciously learn the information which they are presented with and require much effort to store the skills of learning how to associate words with their meanings or learning how to apply grammatical rules

(see e.g. Gass and Selinker's (2008) review of the Noticing Hypothesis and research by Tarone and her colleagues). Adults may find this a very sensitive issue in the sense that they might feel diminished and feel afraid to make mistakes which renders the challenge of learning the new language even harder for them. The second reason is that a great deal of research has been focused on the development of L1 literacy by pre-school and school-age children and on educated second language learners' reading, as discussed above school-age (Goswami, 2006). This had led to the LESLLA population being misrepresented and neglected. The third reason was, given that an abundant amount of attention has been given to the development of L2 reading in adults, concentration has been mostly on educated adults with little attention on the minority of adult learners in the present study (van de Craats, Kurvers, and Young-Scholten 2006).

However, we cannot deny that this population of migrants has been mentioned in the past, particularly in the early 1970's and 1980's. Due to the rise of the Chomskyan theory at that time, Bailey, Madden and Krashen (1974) conducted an investigation where migrant adults were involved in a cross-sectional study to answer questions which were raised by Brown's (1973) longitudinal research of three children. One question was whether adults would use the same innate mechanisms when learning a second language similar to children; the participants in these and similar studies were known to be literate in their L1, but some had only some or very limited schooling in their mother tongue. This led to the question of whether adults' acquisition of linguistic competence is influenced by literacy, and Hawkins (2001) concludes it is not. This is still controversial, however. The present study investigated whether software especially designed for low-/non-literate adult beginners in the Digital Literacy Instructor project was effective in facilitating their literacy (decoding) in English.

The Digital Literacy Instructor (DigLin) was a European Union Grundtvig-funded Lifelong Learning Multilateral Project Learning which started in 2013 and ran until 2015. The main aim of this project was to advance a literacy training resource for low-/non-literate adult migrants

learning to read for the first time (Cucchiari et al. 2013; Overall 2013; van de Craats and Young-Scholten 2013). The project targeted the beginning second language reading of four languages: Finnish, Dutch, German, and English, listed here in order of their orthographic transparency. The main aim of the DigLin software was to provide an individualized solution for developing second language literacy learning material for low -/non - literate adult migrants learning to read for the first time and still, at the beginning level.¹ Data collected on the project as a whole was focused on determining whether DigLin users and their teachers found the software useful, and the author of the present thesis was responsible for collecting these data for English. Data also included log files which tracked individual users' behaviour and post-project, the author carried out comparative analysis of English and Finnish log files with one of the Finnish contributors to the project. The present thesis focuses on the English language with the researcher being involved as a research assistant in this project and with the other project languages as well. The software included as one of the exercises automatic speech recognition (which failed to work for English because of firewall problems not immediately recognised) and the author of the present thesis was involved in providing Arabic-English L2 phonology error data to 'train' the ASR tool. However, the project did not include measurement of phonological awareness of decoding progress, and this thesis reports on additional investigation of these, in terms of the efficacy of this innovative software to explore whether this software helped to improve the low-literate and non-literate adults' reading development and phonological awareness in English.

With the points made in the above discussion in mind, the questions that are addressed in the present thesis are as follows:

Research Questions:

- (1) What is the impact of the use of CALL tools on learners' ability to decode words?

¹ See <http://diglin.eu/> for an overview

- (2) Does phonological awareness in a second language correlate with reading development (decoding) in English as a second language?
- (3) Does literacy in L1 have a positive effect on the development of L2 decoding?
- (4) Does the use of a computer-based phonics software (DigLin), as a supplement to traditional instruction, more effective in increasing phonemic awareness and decoding than receiving traditional instruction solely?
- (5) Does length of residence in the target language country influence their ability to decode words?
- (6) Does the amount of input through using the computer software correlate with their development of decoding?
- (7) What are students' and teachers' attitudes towards the use of DigLin in terms of:
 - a. how they dealt with the software,
 - b. whether they succeeded in learning how to decode,
 - c. and whether they learned better when they worked independently?

The rest of the thesis is organised as follows. The next chapter is an overview of how children learn to read and includes what we know about how LESLLA learners learn to read. The chapter also includes how children and LESLLA learners are taught to read, specifically how they are taught to decode, particularly in English. Before describing the methodology used in the study, the chapter also includes a presentation of the aim of the Digital Literacy Instructor (DigLin) software used in this study, and a description of how it was developed will also be given. Chapter Three will provide the details of the methodology that was employed to answer the research questions. This will include detailed information of the participants involved in the study, and a description of the materials that were employed which include the procedures involved in the treatment and the testing materials. Chapter Four will then present the results of the quantitative data which includes the statistical analyses that were employed in the study and also the results of the qualitative data, including the results that were obtained from the log files. Chapter Five offers the discussion of the results in light of the literature review while revisiting the questions that were raised. Moreover, it presents the conclusion of the study and some suggestions for further research.

Finally, a set of appendices contain the tests that were used for the pre- and post-tests, samples of the Informed Consent forms that were used to obtain the ethical approval from the learners and teachers, a sample of the log files that were used as a database for the DigLin project, a sample of high expectation exercises for the learners, a sample of how the log files were tabulated, and the questionnaire results of the countries that were involved in the DigLin project. It also presents a sample of the interviews that were conducted and how it was analysed using the MAXQDA.

Chapter 2: Literature Review

2.1 Introduction

In the field of language learning, there are many challenges for researchers, policy makers, and teachers alike to provide methods and approaches that would support learners to become successful readers. One of the main issues that is related to the present study is the search for relevant materials contributing to the acquisition of reading skills, as this has been the target of many researchers. Before turning to these later on in the chapter and to the point that in living in a developing digitalized era, the concept of applying digital resources to language learning is basically an essential need for acquiring any language, we will consider what researchers in the field of linguistics, psychology, and education have discovered about the process of learning to read in an alphabetic script. For example, many (e.g. Ehri 1998; ; Koda and Zehler 2008; Perfetti et al. 1987; Goswami and Bryant 1990) have found that a series of oral language skills appear to have a strong relation to the acquisition of decoding and word recognition skills.

This chapter will therefore first present a literature review of the relevant research associated with the earliest steps in learning to read in an alphabetic orthography, that is decoding development. It will first discuss the relevant studies that are associated with children's decoding development, and how phonological awareness, more specifically phonemic awareness, plays an important role in the process of learning to read in an alphabetic orthography. A section will be devoted to second language learning research which is the framework that embodies the current study. Then I will turn to a review of the relevant literature of second language learning, focusing on adult literacy acquisition, and more specifically on learners who have little or no literacy in any language. Moreover, since the present thesis is an evaluation of the use of computer software in helping adults in learning to decode, the research will conclude with a review related to the use of computer assisted language learning in general, and for low literate learners in specific.

Since this study is about the development of decoding, before I turn to the research on children, this chapter will start by providing a theoretical background of reading in general, how reading develops, and the relevant terminology associated with the development of decoding and with reading. Thereafter, the results of some important studies concerned with the development of decoding and reading will be considered. In closing, the question of what research has to say regarding the development of different skills required in adult learning for reading purposes will be discussed.

2.2 Children's learning to read in an alphabetic script

Over many decades much has been written regarding the development of reading and different models have been proposed. The question of which model is best applied (Chall 1987; Chall 1983c; Ehri 1991; Ehri 1995; rith 1985), which method of instruction is better (in which there are many, but these can be categorised as exemplified by bottom-up models and top-down models), and which of these would benefit learners to develop literacy has been the topic of many researchers. Thus, it is important to acknowledge and recognise these different assumptions to provide a clear picture of how reading can be successfully acquired. (i.e. Goodman 1988; Grabe 1991; Segalowitz, Poulsen, and Komoda 1991).

The concept of learning to read is a very broad term. Many have discussed this in terms of how reading is developed. Others have attempted to explain it in terms of how it is taught. It should be made clear for further research that there is a major difference between both concepts of learning to read and how reading is taught. The first is explaining the process of learning to read before dwelling on how it is taught and what the different methods are to achieve this. There is a vast amount of literature on defining reading, but we will focus here on how it is developed and how print is processed in the mind.

Perfetti (1984) published an article where he identified a number of different approaches for defining reading. The first approach is the idea that reading is associated with the thinking process

and is known as the ‘psycholinguistic guessing game’ which takes a more cognitive perspective than some (Goodman, 1967). This approach highlights the concept of meaning and relates it to the thinking process. This approach claims that reading is the transformation of text into thought and meaning, which is simply done by combining letters into words, then combining them into sentences and finally into meaning. Perfetti pointed this out as the “thinking definition” in which he presents “*Definition 1: Reading is thinking guided by print.*” (1984: 40). This approach can be categorised as a “top-down” approach. However, later on, linguists and psycholinguists argued against this claim by providing a definition that is devised for a much more narrow and naturalistic stance (see below). Perfetti (1984) further suggested a second definition of reading based on decoding as he states, “*Definition 2: Reading is the translation of written elements into language*”. Here, he emphasized that the ability to learn reading is through the process of word identification, which is a “bottom-up approach”. This sort of skill involves starting with graphemes (individual letters) and making a link to language; in the case of alphabetic script reading, link is made to phonemes (grapheme-phoneme correspondence) in order to identify the words in print. Learners are required to identify the printed letters and be able to know which letter belongs to which sound. This is considered as one of the most important components of learning to read, as illustrated in the figure 2-1 below. Decoding is an essential process that is required in order to develop reading in any kind of script, and for learning to read in languages which use the Roman alphabet, decoding is argued to be the most important step, with bottom-up being the best approach (Share & Shalev, 2004). In other terms, it is a matter of mapping new, visual representations of a given language onto existing spoken representations of that language. Many have argued that for the acquisition of reading to be successful, the learner has to start by learning correspondences between graphemes with phonemes, as illustrated in the figure 2-1 below by Scarborough (2001) where each strand of the rope is woven together to end up as skilled reading. The figure 2-1 also shows the contribution of the reader’s knowledge of language and of knowledge beyond language, of the world.

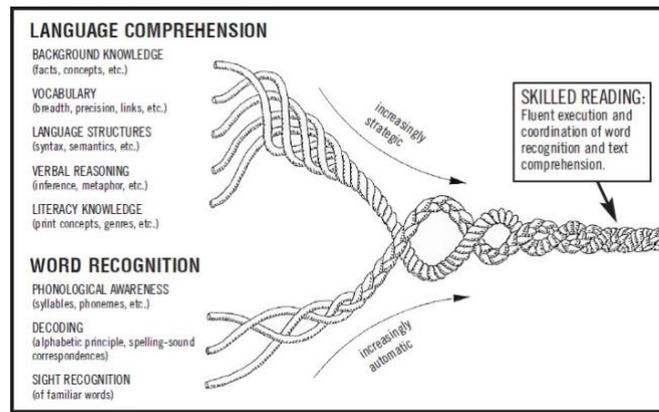


Figure 2-1: Strands of Early Literacy Development (Scarborough, 2001)

This illustration has been nicely interpreted by Perfetti (1985) where he asserts that decoding is the ability to transform the strings of printed letters into a phonetic code. Many scholars have discussed how decoding development is one of the basic requirements of learning to read, as seen in the illustration above, by indicating that reading will not take place if learners do not know how to decode or decipher the print of the language being learnt. For this to occur, learners are required to identify the alphabetic principle and map them with their associated phonemes that would enable learners to represent them into words (Ehri, 1995, 1998; Stanovich, 1993).

For over a century, scholars have investigated how the mind works when it comes to the development of reading by children and have come up with many ideas that can be applied to current research (Huey, 1908; Goodman, 1967; Ehri, 1987; Chall, 1983b; Frith, 1985; Perfetti, 1985). Importantly, unlike the acquisition of linguistic competence of oral language which occurs subconsciously in response to aural input, the development of reading involves much more conscious effort. We do not subconsciously map sounds to letters by being exposed to written text in a language we have linguistic competence in. There is therefore a consensus that learning to read follows a different process from learning to understand and produce one's own spoken language. It is not acquired naturally but requires teaching, as stated by Pinker "[c]hildren are wired for sound, but print is an optional accessory that must be painstakingly bolted on" and quoted in (McGuinness 1997, ix). As a result, much more effort is required for children (and for low/non-literate migrant

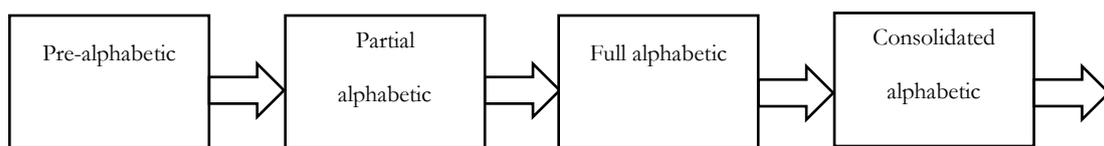
adults, as we will see) to develop reading. That is why reading cannot be acquired naturally, so it is regarded as a skill that requires explicit instruction, namely formal education. Chall provides us with a quote that simply supports this notion in that “literacy can be seen as dependent on instruction, with the corollary that quality of instruction is key. This view emphasizes the developmental nature of literacy — the passage of children through successive stages of literacy, in each of which the reading and writing tasks change qualitatively and the role of the instructor has to change accordingly.” (Chall 1996 as cited in Snow 2008, 275)

Chall mentions that children learning to read follow a number of successive stages, and that children do not all start to read at the same age but they follow a similar pattern of development (Chall, 1983c). Even though children may enter school at a similar age, not all children are in the same stages of reading development. Before children start school, they have acquired their phonology, their morphosyntax, and syntax. They have also developed a large collection of vocabulary. The pre-school child’s increasing conscious grasp of the concept of words and their knowledge of print has very important implications for beginning literacy instruction. Accordingly, the developmental process of reading has been widely researched, discussed, and debated by many scholars for decades, particularly given today’s importance of literacy in human development. Reading, as mentioned before, helps to guarantee a better life and allows any person to enhance his or her knowledge as well as their thinking.

Various researchers have offered a set of developmental stages to explain how children acquire reading (Chall, 1983c; Frith, 1985). For example, in 1967, Chall provided the results of an influential study that has had a great impact towards explaining this process. This developmental process was organised by claiming that children undergo a number of successive stages starting from ‘Stage 0’, or the ‘Pre-reading stage’ and ending with ‘Stage 5’, which represents the stage of fluency and being able to construct sentences from their own understanding. Thus, one of the most influential ideas that has been put forwarded regarding the development of reading is the model

which is based on the assumption that children follow a similar pattern and a sequence of reading behaviours as they learn how to read, from print awareness, to identifying alphabet letters, and to beginning reading. (Chall, 1983c; Ehri, 1995; Frith, 1985). There are a number of distinct stages of development across this continuum of learning to read. Each stage is identified by specific reading behaviours. Researchers have used various labels to identify the stages of reading development. For instance, Chall (1983c) has put forward six stages of development starting from the ‘Pre-reading stage’ to the sixth stage of ‘Construction and Reconstruction’ where the child is able to construct his/her own ideas.

Additional stages were further developed by Ehri (1995) who has redefined the stages that were developed by Frith² (1985), into four phases as illustrated below:



*Figure 2-2: A schematic representation of Ehri's phases of reading
(adapted from Beech 2005)*

Ehri stated that her reasons for just looking at the processes and not instruction was to lay down exactly what the target of instruction should be at a particular point for the child, where instruction should be aimed, and mostly importantly how any instruction could be measured in terms of its effectiveness. What Ehri stated which was even more important, was to notice “the behaviours that indicate whether students are progressing along the lines expected in learning to read” (1995, p.4). These stages and the ones provided by Chall therefore provide a model that can offer a good deal of assistance for teachers in order to focus on the needs of what the young child learners required at that certain stage.

² Frith's three-stage model consists of the 'logographic stage', 'the alphabetic stage' and 'the orthographic stage'

Unlike Frith, who suggested a three-stage model, Ehri's model consisted of four-stages. Ehri modified Frith's model by focusing on alphabetic processing which she suggests is appropriate for the reading process to take place. The four-stage model starts with the 'Pre-alphabetic stage'. According to Ehri, this is a stage where children make a connection and associate the words in a form of visual 'cues' as she calls it. Then, children progress into a phase where they have the ability to make grapheme-phoneme correspondences, which is called the 'Partial-alphabetic stage', before moving to the next stage of recognizing the words, which is referred to as the 'Full alphabetic stage'. The last stage is called the 'Consolidated alphabetic stage' and it is where children fully associate the graphemes with their phoneme counter parts and are then able to have the ability to respond in an automatic way which does not require thinking. These stages have allowed many researchers to focus on the concept of word recognition and how it may provide an understanding that in order for children to read, they should be able to recognise the individual letters in the words they are learning. It turns out that this only occurs if children are aware of the phonological representation of the language, as we shall shortly see. It is well known that reading in general is an interactive process which involves various components. Moreover, one of the main components of learning to read is the phonological awareness, most of which are a precursor to reading.

Ehri also mentions that learning to read involves two basic processes:

1. Learning to decipher the print
2. Comprehending the meaning of the print

The first process of learning to decipher the code is a very important development that would allow the learner to read any word he/she has not yet encountered. Without the grasp of the idea of grapheme – phoneme correspondence and knowledge of specific correspondences, learners will not be able to succeed in learning to read in an alphabetic script. The other process of comprehending text comes at a later stage under a bottom-up model.

Sosiński (2017) discusses the two dominant models in learning to read, starting with the definition that reading is a skill which can be obtained from interacting with written text. Novice readers have to acquire both *Lower-level* or *Bottom-up* skills, which relate to deciphering the written text and mapping the graphemes with their corresponding phonemes, as above, and the *Higher-level* or *top-down* skills, which relate to recognising the aims of the written text and starting with knowledge of language and real-world knowledge. This lower-level process, which is also referred to as decoding, focuses on how new readers are required to identify the graphical form and conceptualise it in the brain and afterwards integrate that information with the smallest units of language which would allow them to recognise words. This process would then move from low – level skills of identifying letters and sounds to larger unit levels comprising, syllables and higher levels, including phrases to then comprehend text/determine meaning (Burt, Peyton, and Adams 2003). Sosiński also notes that this process is highly dependent on phonological awareness, where the learner should be aware that the word consists of different parts (syllables) and even smaller parts which consist of both beginning part of a syllable (the ‘o onset’) and the end (the ‘rime’ or ‘rhyme’) as shown in the figure 2-3 below.

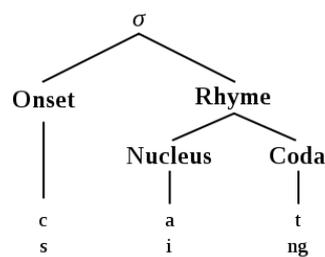


Figure 2-3: CVC Syllable structure

Once learners are aware of these distinctions and have the ability to map the phonemes with their corresponding graphemes, shown for example by their ability to manipulate phonemes through deleting them or substituting them and ability to segment words and blend phonemes, this results in them grasping the *alphabetic principle*.

At the other end of the spectrum is the high-level top-down model which is guided by the learner extracting information and forming predictions through making analogies with words they already might know, their prior experience, and their knowledge of the world in order to guess new words; hence the term 'the psycholinguistic guessing game' (Goodman 1967; Goodman 1988; see also Wang, Perfetti and Lui 2003). This is grounded on the basis that all language and specifically literacy learning is based on the experiences of human interaction and the background knowledge of the learner. This may be the case but gaining knowledge solely from experience will not guide them nor will it provide them with accurate information. On the other hand, experience does in fact play an important role in the development of phonemic awareness if conjoined with explicit instruction.

Juel (1988) also provided a framework which she called 'the simple view' for reading and writing. We will only focus on reading in this thesis. She notes that reading is composed of two basic components, decoding and comprehension, and then suggests that if a learner is a poor reader, it is because they either are poor decoders or poor listeners. To test her theoretical framework, she conducted a longitudinal study on 54 children starting from 1st grade (six to seven years old) until the end of 4th grade (nine to ten years old). The children were heterogeneous in terms of their origin, with 26% Anglo American, 31% African American, and 43% Hispanic. 31 were girls and 23 boys. All of the children received a program of instruction which involved a variety of methods which included blending from sight words, phonics, and word identification tasks. Throughout the study at different intervals, several measures were taken, and interviews were conducted. This included a phonemic awareness test (which measured phonemic segmentation, blending, deletion of first phoneme, deletion of last phoneme, substitution of first phoneme, and substitution on last phoneme), decoding (by reading 20 consonant-vowel-consonant pseudowords and another with more complex single-syllable words), word recognition (reading 10 new words in the beginning of first grade and then after every year), listening comprehension (matching the picture with the correct oral representation), reading comprehension, along with a number of other

measures which were related to their cognitive abilities. The test results were then calculated which showed that early writing skills did not determine later writing success, unlike reading where early reading did actually predict later reading success. Learners who started school with little phonemic awareness ended up still being poor readers by the end of 4th grade with very slow development of mapping phonemes and graphemes. In conclusion, Juel's results are consistent with her 'simple view'.

The thesis has briefly touched upon the notion of phonological awareness, and it now turns to a more detailed discussion. The next section provides an overview of the relevant literature covering studies which have been conducted to date.

2.3 Phonological awareness and first language reading

There is a growing consensus that there is a causal connection between phonological awareness and subsequently learning to read, particularly learning to decode. The connection between phonological awareness and reading was first established by Liberman in 1973. Importantly, the connection between phonological awareness, especially phonemic awareness, and reading is independent of children's general intelligence or their other analytical skills (Stanovich, 1993). Over 40 years later, this still is an important focus for research. It has long been and is now widely recognised by researchers that the various aspects of phonological awareness are essential determinants for the reading process to be successful in any language written using an alphabetic script (Adams 1990; Stanovich 1994). For moving from a pre-literate stage to a reading stage, children are required to acquire the ability to identify the individual sounds of the language they are learning, in our case English.

It is first essential that we define what phonological awareness is before providing a review of the relevant literature. Magloughlin (2010) describes phonological awareness as the individual's conscious understanding of language-specific sound patterns, including how phonemes are "combined and manipulated to form 'natural-sounding' syllables, rhymes, and words" (p. 39). This

refers to the learners' degree of sensitivity, and their explicit awareness of the sound structure of any given oral language (Anthony & Francis, 2005). Phonological awareness consists of a number of sound-related skills that assist the child in developing reading. For example, a learner who has good phonemic skills is aware that the word 'map' is different from the word 'nap' because s/he is able to isolate and identify the first sound in the word 'map', which is the phoneme /m/ and that the word 'nap' contains a different phoneme in English to distinguish this word from 'map'; that is these are the phonemes which are the smallest unit of meaning in spoken languages (see e.g. Ehri et al. 2001). The learner is also able to see that both words also consist of two additional phonemes /a/ and /p/, which are the same. By blending this string of phonemes, the child can create any word in his/her language, and by analysing the graphemes which in print represent the phonemes, the learner engages in the process of *decoding*. In the English language, combinations of the 41 phonemes can be assembled to form syllables and in turn words (Ehri et al., 2001). As a phonological unit is larger than the phoneme, syllables can be broken down into two smaller units, namely onset and rime (see Figure 2.4). The word *map* consists of these two syllabic units. The initial consonant /m/ is the syllable *onset* and the remaining two phonemes, the vowel and the consonant, are the *rime*. Learners who have not successfully developed phonological awareness do not have the ability to isolate, identify, or hear the nature of the difference as they automatically make in their spoken phonology between *map* and *nap*. This "ability to deal explicitly and segmentally with sound units smaller than the syllable" (Stanovich, 1993, p.13) is called *phonemic awareness*. Thus, the term *phonological awareness* acts as an umbrella term for several metalinguistic skills involving the word down to the phoneme. The skills the learner demonstrates may include rhyming, sound identification, sound deletion, or sound substitution; all of which require at least some explicit but sometimes more implicit awareness of the smallest units of spoken language. Once more, as already noted above, this ability has been of great interest in research over the decades as it has shown how we can identify what underlies the problems of weak readers; in

particular, they may not have the ability or have difficulty in manipulating these units, especially phonemes, and will therefore struggle in their ability to read (Anthony & Francis, 2005).

2.4 Phonemic awareness and the acquisition of reading in children

Most of the studies regarding the relationship between phonemic awareness and reading development have been conducted on children, and we will therefore continue to focus on children. This research has usually focused on several claims. First, children should be able to consciously recognise that graphemes represent single phonemes before being able to read in an alphabetic orthography (Adams 1990; Ball and Blachman 1991; Griffith and Olson 1992). This claim relates to the idea that before children learn how to decode the orthography of their language, they are required to be able to recognise individual sounds/phonemes and be able to crack the code (acquire the alphabetic principle) in order to learn the connections between them and their corresponding printed letters/graphemes. More specifically, children must know what each grapheme represents before learning to read (Ehri, 1998; Goswami, 2006; Liberman & Liberman, 1990; Liberman et al., 1989).

Second, phonemic awareness tasks are very useful for the prediction of reading success in terms of how well children are able to manipulate phonemes (Adams, 1990; Bradley & Bryant, 1983; Goswami & Bryant, 1990). The child's ability to manipulate (substitute, delete, etc.) the phonemes in a word predicts his/her future reading ability. A child who knows that "ice" is "nice" without the first sound will become a better reader than a child who does not understand this relationship.

How does this relate to instruction? Before turning to methods of teaching reading, we will look in more detail at the research which has indicated that phonemic awareness predicts reading success (Adams 1990; Stanovich 1994) and that a strong relationship exists between phonemic awareness and reading ability (National Reading Panel 2000). This is a major review that has been widely cited and considered all the research up to their time, comprising 100,000 reading studies

from the year 1966 to examine which of the methods are most effective for teaching children to read. They concluded that the most effective approach was the use of explicit instruction of phonemic awareness. Based on this review, they found that there are a number of techniques that may be remarkably effective for acquiring reading, such as: phonemic awareness, phonics (knowledge of grapheme- phoneme correspondence and the ability to blend the sounds together to form words), fluency (automaticity, where children learn to read until they are able to recognise the words easily), guided oral reading (reading aloud and receiving feedback and guidance from better readers), teaching vocabulary words (introducing new words), and reading comprehension strategies (providing techniques to help the learners understand what they are reading). The review has found that the main agreement in all of the studies was that phonemic awareness with the knowledge of letter – sound knowledge is the most effective technique for the development of successful reading. Furthermore, without solid phonemic awareness, children may not succeed in reaching the critical goal of reading acquisition (Anthony and Francis 2005; Ehri et al. 2001; National Reading Panel 2000). The Panel (National reading Panel, 2000) reported several correlational studies that highlight the importance of phonemic awareness and grapheme-phoneme correspondence and assigned them as the two-best predictors that indicate how well children will learn in their first years in school. One of the first to provide evidence for this causal link is the study presented by Bradley & Bryant (1983). They combined two different methods initially on a number of 403 children (118 four-year-olds and 285 five-year-olds). The first was longitudinal to show the long-term effect over three years and the other was intensive training for a group of 65 children who were selected from the sample mentioned earlier. Their study concluded that there were high correlations between phonemic awareness skills and reading. Their comparison produced a constructive approach to helping children overcome their weaknesses and highlight their strengths.

Later, Ehri et. al (2001) confirmed these conclusions by narrowing the set of studies down to 52 experimental studies that were published only in peer-reviewed journals and specifically

focusing on phonemic instruction. They then compared the results of treatment and control groups mainly focusing on the impact of phonemic awareness instruction on reading acquisition. In a similar conclusion of the aforementioned review of considerably more studies, their analysis concluded that phonemic awareness instruction had a large, statistically significant impact on reading development. This shows an indication that strengthening the process of learning letter – sound correspondences may improve children’s ability to manipulate phonemes and to decode.

However, there have been debates as to whether phonemic awareness precedes the successful development of decoding/reading skills or whether phonemic awareness is a by-product of learning to read in an alphabetic script. One side points out that for children to be successful readers, they first need orthographic (grapheme-phoneme correspondence) knowledge, i.e. they need this before being able to succeed in phonemic awareness skills (Castles & Coltheart, 2004). Some researchers have tested this idea by proposing that children who do not learn to read in an alphabetic system do not succeed in developing phonemic awareness (Mann 1986; Morais et al. 1979; 1986). They speculate that children develop phonemic awareness only from the result of learning to read and gaining alphabetic knowledge in a given language. Others have argued that this causal link is not supported (Castles & Coltheart, 2004). Hulme, Snowling, Caravolas, and Carroll (2005) objected to this conclusion and provided strong evidence that their data does support the idea that phonemic awareness skills do actually have an influence on children’s success in learning to read. Their evidence is that the children in their study could recognise phonemes which they could not yet read, i.e. had no graphemic knowledge of. In a more recent study, Málková and Caravolas (2015) conducted a large-scale study on children in 11 schools in Prague to examine the effect of phonemic awareness and letter knowledge training in the classroom. Every school had approximately 15-30 children who had no literacy before entering school with a total of 205 monolingual Czech children. The experiment aimed at examining the effectiveness of three different training methods: a phonemic awareness intervention, a letter knowledge intervention, and a control group in which they had no intervention implemented in their classroom. Before and

after the training, pre- and post-tests were administered to all three groups. The study attempted to test assumptions, one of which was mentioned previously by Castles and Coltheart (2004) in that letter knowledge is the precursor of phonemic awareness and decoding is thereafter developed. Málková and Caravolas's study provides a valuable contribution to the idea that phonemic awareness acts as an independent skill that may be developed regardless of whether the learner has developed letter knowledge or not. Nonetheless, all these claims are still debated and controversial. However, the overall agreement is that training learners to decode and develop letter – sound knowledge is deemed to be related to the successful development of reading.

It also appears that phonemic awareness is not related to the child's maturation. Along the same lines, a number of experiments aimed at understanding the connection between phonemic awareness and reading ability have applied similar intervention studies to different populations to see whether this connection is viable and to prove that training would help develop their ability to read. Adult illiterates who were learning to read in their own language were examined (Barron 1991; Lukatela et al. 1995; Morais et al. 1979) . For example, Morais et al. (1979) conducted a study on 30 illiterate Portuguese-speaking adults to investigate whether phonemic awareness could be acquired spontaneously, without training, or whether adults needed to learn the alphabetic system – the orthography of Portuguese. They administered two tasks, a 'deletion task', where learners were required to delete phonemes from the words provided and another task, an 'addition task', which required them to add phonemes to the words they were given. The data showed that illiterate adults were not able to add or delete phonemes from the beginning of words, compared to adults who had learned to read. Interestingly though, the illiterate adults showed similar but often weaker results compared to results from a study of first grade (six year old) Belgian children in their performance. This study provided strong evidence by revealing a similar conclusion on the effectiveness of explicit training of decoding and phonemic awareness.

2.5 How reading is taught (in English)

When the orthography of a language is irregular, like English is, there is disagreement about how reading should be taught and even up to now there is no consensus on an established and clear-cut approach in teaching reading. Regardless of these disputes, it has long been agreed that word recognition skills are one of the most important requirements for the development of learning to read (Adams 1990; Perfetti 1985). However, even in this point of moderate accord, there is disagreement, particularly for English language.

In relation to the above and as mentioned, reading has been subject to much debate regarding which method of instruction is best when teaching children to read. In that way, it is problematic for teachers. Discussion and debate continue because finding an appropriate method means achieving better performance among learners. After surveying the literature, it is well known that there is an ongoing debate about the different methods of teaching reading. This controversy started even before the “Great Debate” in 1967 (Chall, 1983a), and continued later during the 1990s where the term “Reading Wars” was coined (Vacca et al., 2009). For example, in the early 1930’s some posited that reading would only be learnt if there was a degree of readiness, thus highlighting the importance of maturation where the child would be given formal reading instruction when they reached 6 years and 6 months (Morphett & Washburne, 1931). Educators have since reconsidered this conclusion and were not satisfied with postponing reading instruction to when children enter school. Teale and Sulzby (1986) for example, challenged the reading readiness perspective and argued against it, suggesting that children develop before this age and demonstrate *emergent literacy*. Moreover, educators have moved on to the idea of providing children with early experience, providing them with a set of prerequisite skills which may be highly beneficial, and in fact, may enhance their reading ability (Morrow, 2007); hence, moving towards an instructional perspective. Emergent literacy spells out how reading and writing develop simultaneously in the early years prior to schooling and are very crucial for literacy acquisition to take place.

The main question is how and with what instructional help learners develop the ability to consciously manipulate phonemes (=develop phonemic awareness) to underpin decoding. Málková & Caravolas (2015) explains this nicely by setting three assumptions: the first claim is reading as the precursor to phoneme awareness: that children become explicitly aware of the phonemes if they know how to read alphabetic orthography. So, here, the prerequisite to phonemic awareness, is the understanding of the alphabetic principle - that there are alphabetic letters which represent phonemes. This is supported by studies that include preliterate children or adults who are not literate in their native language (Morais et al. 1979 and 1986). These reveal that acquiring letter-sound knowledge in the process of learning to read will let learners know how to manipulate phonemes because they will already know how to manipulate the orthographic images of the word and in comparing children and adults, they indicate that this is not the result of age but the result of interaction with alphabetic writing. The second claim is that letter knowledge is the precursor to phonemic awareness and hence decoding is developed. The third assumption views phonemic awareness and letter knowledge as two separate precursors (or the dual foundation) of alphabetic literacy. This assumption seems to follow and it makes sense more than the rest of the claims. However, these claims are still debated and remain controversial. Overall, the above studies have shown and researchers have agreed that there exists a strong relationship between phonemic awareness and success in the development of reading by looking at learners' performance on phonemic awareness tasks. This consequently benefits researchers in identifying learners for whom an intervention would have a positive impact. Given this assumption, an ample amount of research supports the effectiveness of intervention aimed particularly on phonemic awareness as part of reading instruction (Snow, Burns, and Griffin 1998). We therefore now turn to the impact of phonemic awareness on reading development.

2.5.1 Intervention studies for phonemic awareness training

There is extensive research on the impact of phonemic awareness instruction on early reading (see Ehri et al. 2001; the National Reading Panel, 2000 for a full review). Intervention

studies have had a major role in the 1980s and 1990s in order to recognise the relative impact of alphabetic knowledge and phonemic awareness on reading acquisition. Empirical research has shown that training in these two skills simultaneously, has been highly beneficial in terms of developing reading (Ball & Blachman, 1991; Bradley & Bryant, 1983). To sum up this notion, a critical review was carried out on phonological awareness intervention studies and the results show this has proven to be highly effective in improving the performance of children's reading skills as result of the training (Troia, 1999). The author included 39 studies out of 68 which have been evaluated and assessed. This exclusion was based on following a set of criteria to allow for a more specific review. The first criterion was that it had to be published in a peer reviewed journal. Another crucial condition that was employed in this sample was the inclusion of control groups. He specifically stated that any intervention study that did not include a control group was not valid and described these studies as being "essentially uninterpretable because performance gains cannot be attributed solely to treatment-history, maturation, and testing are possible confounds." (1999, p.31). The third condition was to include studies which tested the production and perception, and whether it was combined with phonics training or not. Studies that solely examined phonics training were excluded from the review. The last condition incorporated in the study was the length of the intervention in which short periods of training (for example, including only one or two sessions) were rejected. One of the main findings in this critical review was that none of these studies have assessed whether phonological awareness training may be an effective source of treatment in a classroom-based setting. Regardless of the fact that this is an outdated review, the results show that phonological awareness intervention is important in the development of reading by children.

2.6 L2 reading by low-/non-literate adult migrants

Before we continue, and although this is beyond the scope of the present thesis, it is worth briefly noting ideas on how literacy might affect acquisition. To begin with, decades of research suggests that such learners possess the capacity for successful acquisition of linguistic competence

in a second language regardless of their level of education (Hawkins 2001; Vainikka & Young-Scholten 2007) The documented failure to fulfil that capacity may be due to many factors (see g.g. Herschensohn 2007; Piske & Young-Scholten 2009), but lack of literacy, some studies have claimed, is the primary cause (Tarone et al. 2007). According to Dawda (2006, p2), this goes back to ideas from the 1960s (Goody and Watt 1968; Havelock 1963; McLuhan 1964; Vygotsky 1934/1986) and their literacy hypothesis which traces the emergence of cultural and psychological phenomena including language/communication to alphabetic literacy. Kurvers (2006) takes up these ideas when she asks what illiterate adults and pre-literate children know about the structural features of the language they understand and speak. The literacy hypothesis predicts differences between readers and non-readers, irrespective of age.

Reading in an alphabetic script entails awareness of one's linguistic competence, and in an orthography such as English this includes awareness that letters/graphemes represent phonemes. Phonemic awareness can be developed across the lifespan (Kurvers 2002; Young-Scholten & Naeb 2010; Young-Scholten & Strom 2006) but is affected by lack of literacy (Tarone et al 2009). Lack of literacy naturally affects wider contextual engagement, but also fundamentally affects cognitive processes required in language and text decoding and comprehension, including working memory and non-verbal IQ. Low literacy entails less efficient processing of aural input (Mishra et al. 2007), thus further slowing acquisition of L2 competence. The dynamic relationship between reading and linguistic competence thus requires systematic and detailed study combining both elements together. It would be interesting to see whether literacy affects the developmental progress of acquiring second language acquisition, however, due to the limitations of the study and it is not the current topic in this thesis will not delve in this further.

As noted above, there are key studies that have investigated the phonological awareness of adults illiterate in their L1 and learning to read in their own language (Morais et al. 1979 and 1989). Few empirical studies have been conducted on the population being investigated in the present

study, i.e. migrant adults learning to read for the first time in their lives in a second language. These studies have based their research on children's L1 reading in the same way that Morais et al. did for adults learning to read in their L1.

One of the most influential studies that has formed the direction of the current research on first-time second language reading was carried out by Young-Scholten and Strom (2006).. One point in which this and another study at the time, on Dutch adults (Kurvers, 2006) have interestingly agreed was that low-/non-educated adults learning to read in a second language follow a similar pattern of how children acquire reading. Kurvers' study in the Netherlands aimed at testing the effect of literacy and specifically word-recognition courses on low-/non-literate adults. The study tested 12 illiterate adult women and observed them for six and ten months with regards to reading strategies, word recognition skills, spelling, and reading. She tested the learners with a set of 58 monosyllabic words; half of them of them were sight words that they had learned during the year and the other half were new words. Their test also included a spelling test. The main question that the study was investigating was whether adult illiterates who learn to read and write an alphabetic writing system in a second language follow the same stages as children. The results revealed that this is the case although there were individual differences between the learners which was highly likely. The study came to the conclusion that early skills in word recognition are required, essential and considered as a strong predictor of later reading comprehension ((Kurvers, 2006, p.40)

Lastly, one of the most important studies is one that has was carried out on instruction for low-/non-literate learners is the large-scale study conducted by Condelli and Cronen (2009) and further reported on in Condelli et al. (2010). Their research was designed to explore the effectiveness of a literacy textbook called *Sam and Pat* which addresses the needs of adult ESL literacy level learners. This was compared to standard ESL instruction. Their research addressed how effective *Sam and Pat* was in improving the English skills of reading and speaking of adult low-/non-literate learners. It also investigated if it was effective for a certain group of speakers,

such as, native speakers of Spanish. Finally, it also examined whether *Sam and Pat* in its design to provide a systematic approach that is direct and that follows a logical sequence from simple to more complex levels (Condelli & Cronen, 2009). The study took place in 10 adult educational programs which included 66 classes that consisted of 1,344 low-literate adult ESL learners. The experimental group and the control group were grouped into pairs in order to perform the intervention at the same time. The intention was that the learners should use the *Sam and Pat*-based instruction and receive feedback for a minimum of 60 hours. The control group should have received the same amount of time. However, the researchers were not able to identify how many hours the instruction took place and based their hours on how much time the groups met which was a total of 79 hours. The results have shown a significant difference in that The *Sam and Pat*-based instruction group spent more time on developing their reading skills more than the control group whereas the control group spent more on English language acquisition than the *Sam and Pat* group. They found that the results of the intervention being tested did not have statistically significant impact on reading (Condelli et al., 2010).

As noted in Chapter 1, since the 1980's, migrant adults and refugees in many countries have been attending ESOL classes. However, some of these learners are also developing reading and writing skills for their first time along with learning a second language. However, until recently not many studies have emphasised the need for research addressing non-literate adults learning to read for their first time in a language that is not their own (Kurvers, 2015). Consequently, the most influential studies that have been conducted on the acquisition of literacy for this specified population to date have based their research either on illiterate adults learning to read for their first time (Morais et al., 1979, 1986; Adrián et al., 1995), or research based on children as pointed out by those engaged in LESLLA research (Bigelow and Vinogradov 2011; Kurvers 2006; Tarone 2010; van de Craats, Kurvers, and Young-Scholten 2006;). The studies carried out by scholars who focused their studies on low-literate adults and first-time readers have shown that learners who did not have formal schooling in their first language indicated the lack of explicit conscious awareness

of linguistic units, such as phonemes, morphemes, and words. Nonetheless, such phonemic awareness can only be derived from alphabetic literacy (Tarone & Bigelow, 2011, p.12). As a result, the findings of these studies have concluded that the development of phonemic awareness is dependent not on the critical period for acquiring it, but rather on how much knowledge the learner has gained (Young-Scholten & Strom, 2006, p.49) and the instruction the adults' receive that would improve their phonemic awareness (Kruidenier, 2002). Second language acquisition studies with adult first time readers have shown similar results, indicating that instruction of explicit awareness is highly essential for the development of reading to take place.

The study by Young- Scholten and Strom (2006) aimed at answering the following question, 'Can adult immigrants without native language education or literacy learn to read in a second language?'. They conducted a partial replication of the study completed by Burt et al (1999). The research performed by Burt et al., had studied children in the UK in two separate age groups; specifically, 3 –4 years of age and investigated the development of their phonological awareness. Young-Scholten and Strom applied much of the same tasks in their research. The data was obtained from 17 adult immigrants living in Seattle who spoke Vietnamese and Somali, both of which use the Roman alphabet. Of these 17 individuals, eight learners had settled in the US with no formal schooling, while nine had received 1-5 years education. Additionally, it should be noted that each of the learners had resided in the US from 3-4 years to 20 years, their age range was from 26-70 years old, and they had been participating on ESL courses for two weeks to four years. The study explored their reading sub-skills and furthermore, measured phonological and morphosyntactic competence. Later on, Young-Scholten and Naeb (2010) conducted a follow-up study to Young-Scholten and Strom's work. This study was established to look at adults with no education or a minimum amount of schooling in a language that does not employ the Roman alphabet. The participants were adults from two pre-entry classes at two local ESL courses. In this case, similar tasks to the 2006 study's phonological awareness reading tasks were distributed, in addition to a vocabulary test and a test of words the learners were learning to

read. The phonological awareness tests were not undertaken in the participant's native languages. It should be mentioned that the participants were tested in June 2008 and March 2009.

Another study worth mentioning is the study by Kurvers, Vallen and van Hout (2006). They aimed to answer the following question: Are illiterate adults aware of the structural features of language compared to pre-school children and low-literate adults? This was conducted in the Netherlands; the target subjects were illiterate adults from various ethnic backgrounds, including Turks, Somalis, and Moroccans. The illiterate adults selected had less than two years of primary education and were unable to read straightforward monosyllabic words that they had not been taught previously. Moreover, the study also consisted of two reference groups specifically, children from similar ethnic and social backgrounds prior to entering first grade, in addition to literate adults who had no more than six years of primary education and were also from similar ethnic and social backgrounds.

Regarding both groups, the average age of the illiterates was 38, ranging from 15-57, whereas the mean age of the literates was 34 and ranged from 17-55. Both groups comprised women primarily (19 in each group). In relation to the illiterate adults, 19 had not received any formal education and 6 had attended primary school for less than two years. Regarding the literates, all had been to primary school for approximately four and a half years and had received from two to six years education. Both sample groups initially comprised 28 participants. However, due to various reasons, for instance childbirth, 3-5 subjects from each group left. The average age of the children was 6.4 years and ranged from 5-7. Each child had not been in pre-school for more than three years and was due to start in first grade the following academic year. It should be mentioned that several test sessions were employed in this research. Prior to the tests, the illiterate adults were interviewed, giving them a chance to discuss their lives and experience of writing and language. Several test instruments were used in this research to test the metalinguistic awareness of the illiterate adults. These included:

1. Rhyme Judgement/Rhyme Production
2. Word Judgement/Word Segmentation/Word-length-judgement/Word Referent
3. Progressive Segmentation
4. Syllogisms

It should be noted that each of the language awareness tests was conducted in the first or second languages of the participants. The results obtained from this specific study undertaken in the Netherlands corroborate the idea related to lack of literacy, as previously mentioned earlier, that literacy creates a change in what people recognise concerning the language they already speak and understand confidently. This also demonstrates that non-readers, both adults and children, are oblivious to the phoneme as a linguistic unit. It is worth pointing out that the rhyme-production responses of the adult illiterates were markedly distinct in comparison to those of the young children. Moreover, it was evident that the young children were extremely good at rhyming, which suggests that adults need to accomplish more analytic processing in relation to rhyming.

An aspect that is of significance here is that this result pertaining to the word concepts of the adult illiterates does not concur with research undertaken by Karmiloff-Smith et al. (1996), which suggests that even four-year-old children have a clear idea of words as linguistic units. Similarly, it does not agree with the study conducted by Scribner & Cole (1981) that there was no effect of literacy on the word concepts of adults who contributed to their investigations.

Trupke-Bastidas and Poulos' (2007) is a study similar to the present study. It was based on whether the whole-part-whole instructional method would benefit L1-non-literate learners in improving phonemic awareness and decoding skills. The researchers aimed at designing an instructional method for two types of learners: non-literate (L1-non-literate) and literate (L1-literate) in their first language. They aimed at answering the questions of whether whole-part-whole reading instruction intervention over ten weeks impacts phonemic awareness, word list decoding, and story text decoding, or learners with and without L1 literacy. In addition to, which of the phonemic awareness skills (initial sound, same sound, rhyme, blending, segmenting) and letter-sounds did the

learners show the most gains, following ten weeks of whole-part-whole instruction. Finally, they also investigated whether there were any qualitative differences that existed between learners who improved the most and the least after using this instruction for ten weeks. To answer these questions, they recruited 9 females from Somalia with the age ranging between 23-52 years-old. Trupke-Bastidas and Poulos administered a pre-test and post-test procedure with an intervention of 10 weeks between the two tests. The procedure of their study included three tests to measure the learners' development in improving literacy: a phonemic awareness test, decoding word list, and a reading test. The results have shown that using a whole-part-whole instructional method was effective and that there were gains in all measures of phonemic awareness, decoding of individual words, and decoding within a story. The study also indicated that the L1-literates have not benefited much from this particular method like the non-L1-literate.

Trupke-Bastidas and Poulos's study resembles the current study in terms of testing the development of their literacy. Similar tests were administered in testing their phonemic awareness. However, the intervention that was included in the current study is the use of a computer software to examine whether it has an impact on phonemic awareness, decoding, and reading monosyllabic words. The study also included a very low number of participants which is common when working with adult L1 non-literate learners (Smyser 2016). Furthermore, the study did not compare the results with a control group to see whether the intervention was successful or not, or whether it had a positive impact.

2.7 Alphabetic/Phonemic Orthography

One of the factors which cannot be ignored in working with the population of LESLLA learners is the learner's L1 writing system in situations where the learner has some L1 literacy. This can affect the process of learning to read in an orthography such as English (Katz & Frost, 1992) and how graphemes correspond to phonemes or other linguistic units in a language. When it comes to the Roman alphabet, languages differ in terms of the regularity and the variability of their

phonemic orthography. Some languages have a high degree of transparency in terms of mapping graphemes to phonemes. For example, languages such as Finnish, Spanish, Czech, Italian, and Turkish have a high degree of regularity in correspondence between the letters and sounds. That is, they have a direct, one-to-one relationship between the orthography's graphemes and the language's phonemes which then allows the learner to predict the pronunciation of letters straightforwardly on the basis of how words are spelled. On the other hand, deep (opaque) orthographies such as English, do not have a direct one-to-one relationship between the graphemes and the phonemes. English has a high degree of irregularity in its writing system and while it uses an alphabetic writing system, a good number of words do not apply one-to-one correspondences and therefore have to be learned by sight. Other languages such as Chinese and Japanese use different writing systems which represent entire morphemes (a logographic system and Japanese Kanji) or syllables (Japanese katakana and hiragana). We return to writing systems in the methodology chapter, when discussing the L1 writing systems of the participants in the present study.

Some studies have looked at the effect of transparency, opacity, and type of writing system on the process of learning to read. For example, Ellis et al., (2004) investigated the effects of orthographic depth on reading acquisition across five different languages that had different writing systems (alphabetic, syllabic, and logographic). Their study included a total of 277 children ranging between the ages 6- 15 years old. They aimed at answering the question of whether orthographic transparency would lead to a faster process of reading aloud. Their findings showed positive results, in that learners with the language that has the most transparent orthography were most successful in reading.

Another relevant study here was conducted by Hamada and Koda (2008) on second language reading in the United States explored the influence of first language (L1) orthographic experiences on decoding and semantic information retention of new words in a second language

(L2). In this case, the hypothesis provided by the researchers explains that similarity in L1 and L2, orthographic experiences determine L2 decoding efficiency, which in turn, influences semantic information encoding and retention. In their research experiment, Hamada and Koda selected a small sample group consisting of 18 Chinese and 17 Korean students registered on an intensive English course in the US. Each of the participants had received a formal education in their L1's, in their respective countries, by way of high school or attending college for 4 years. Additionally, most of the participants were studying ESL to prepare for undergraduate or graduate courses in the United States, although it should be noted that several participants were in fact exchange students who would be returning back to China and Korea to resume their studies. Both groups of participants were selected from higher-intermediate to advanced-level sections at the ESL institute. The reason for this was to guarantee that they were similar with respect to their English proficiency. Furthermore, participants who were fluent in any L2's other than English were omitted from the study. The researchers did not state the ages of the participants. Nevertheless, it is presumed, from the information provided, that they were young adults (late teens to early twenties). Moreover, the authors of this research did not specify gender in relation to each of the groups.

In their first experiment, they explored whether Korean ESL learners are more efficient in phonological decoding in contrast to their proficiency-matched Chinese counterparts. The experiment also investigated if both ESL groups perform better when processing regularly spelled L2 pseudowords than pseudowords that had been spelt irregularly. Prior to conducting the experiment, participants were asked to undertake a picture-naming task. This was completed to make sure they did not differ in regard to efficiency in accessing words' phonological information concerning the nature of the tasks. Their results showed that one of the reasons for conducting the first experiment was to evaluate the speed in phonological decoding of printed words between the Chinese and Korean participants. An additional reason for undertaking the experiment, accuracy of phonological decoding, was signified by pronunciation accuracy. This was determined by dividing the number of correct responses by the total number of responses. The results collected

in relation to the first experiment revealed that the Korean ESL learners were producing speech sounds considerably faster and more accurate pseudowords than the Chinese participants. It is important to state that the current study implies that adult ESL learners are sensitised to facilitative L2 input properties regardless of L1 orthographic background. Moreover, examination of the findings demonstrated no interaction between the L1 (orthographic background) and L2 (orthographic regularity) aspects.

In the case of the second experiment, it focused on the investigation of the correlation between decoding efficiency and word learning with regards to the same participants involved in Experiment 1. Experiment 2 was conducted on the same day, approximately 30 minutes after Experiment 1 was completed. This task was based on research undertaken by Papagno et al. (1991) as cited in Hamada & Koda (2008), in addition to a pilot study. Here, each of the participants conducted a paired association learning task before the recall test. The results obtained from Experiment 2 implied that congruent L1 orthographic experience produced greater decoding efficiency which consequently encouraged L2 word learning (encoding lexical information) and retaining newly encoded lexical information. Besides, if there are similarities from the L1 orthographic experience, this would have influenced L2 decoding efficiency. In conclusion, it is essential to emphasise that decoding plays a vital role in word learning and furthermore, direct training on decoding would assist in the development of word learning.

As previously mentioned, phonemic awareness training is thought to be beneficial in helping children learn to read, especially in the case of English orthography. Studies have shown that the writing system of a language can highly impact reading acquisition. More specifically, orthography is also a well-known factor that has a great influence on phonemic awareness. As seen in the study mentioned above by Kyritsi et al. (2008), orthographic influence can have a successful role in the development of reading. This study investigated whether there is a relationship between phonemic awareness and letter-sound knowledge. They investigated two groups of deaf children

(13 pre-school and 11 Key stage 1) and a comparison group of 30 hearing children in Greece. The experimental measures used to assess the relationship involved conducting three tasks which tested a) phonological awareness, b) letter-sound knowledge, and c) word recognition. This was done by examining the children's performance in two intervals, except word recognition which was tested only once at the end. For the phonological awareness task, there were 40 items in which the children were assessed on, syllable awareness by seeing whether they were able to identify if words had the same length, on rhyme awareness to see if the children could identify words ending in a similar way, and on phoneme awareness to see if the children could tell whether words had the same sound at the beginning. As for the letter knowledge-sound task, the test consisted of 22 items assessing, a) sound knowledge by mapping the letter the children saw with the corresponding sound; b) a sound discrimination task by presenting two illustrations where the child tried to point to the word that starts with the target sound which was given by the researcher; c) and a letter knowledge task by writing the letter that corresponds with what the child heard. For the word recognition task, researchers developed a task containing 46 items where children had to try to identify which of the four words (which were colour-coded for the deaf children) was the one that matched with the corresponding picture. The results showed that there was a relation between phonemic awareness and reading, but that letter-sound knowledge may be a prerequisite for developing phonological awareness in deaf children; although not necessarily in hearing children. One interesting outcome of the study was the indication that orthography plays an important role in the development of phonemic awareness. Because children were Greek and the Greek orthography is consistent in that there is a one-to-one relationship between its graphemes and phonemes, this helped facilitate the development of phonemic awareness in the deaf children unlike the English-speaking deaf children who have been studied (Sterne & Goswami, 2000).

2.8 Computer assisted language learning (CALL)

In light of the above studies, it has been shown that to succeed in developing decoding skills, LESLLA learners require a good amount of training in order to develop these basic reading skills.

For this to happen, these learners are advised to enter classes that are being taught in groups by teachers, which is the most common instructional setting around the world. However, research has shown that receiving one-to one instruction has proven to be better than traditional classroom instruction (on LESLLA learners, see e.g. Kurvers and van de Craats 2008). Yet, providing every learner to have his or her own well trained tutor is not possible and far too expensive. Given the many challenges these learners face to enhance their learning experience, the only solution is that this can only be possible through the use of computers (Strik, 2009). This section addresses the mode of learning in which the Digital Literacy Instructor (DigLin) software is involved, namely, computer-assisted language learning (CALL) or computer-assisted learning (CAL). In order to evaluate the effectiveness of any CALL tool, it is important to know the benefits for having learners practice language learning using a computer. This is emphasized by Dunkel (1991) in which he points out that “the issue of effectiveness is an important one, for unless student performance and skills improve, some might perceive that the millions of dollars invested in microcomputer hardware and software [for CAL] have been wasted” (1991, p.5). Thus, this section will provide a general overview and discuss some key studies before moving on to consider aspects relating to the present research.

Researchers in the field of second language learning have long encouraged the need for the incorporation of the use of computers in language learning (e.g. Beatty, 2003; Bodnar, Cucchiarini, Strik, & van Hout, 2014; Chappelle & Jamieson, 1986). However, evaluating their use may not be as simple as evaluating a textbook that teachers have used for many years (see e.g. Naeb (2015). Given that CALL applications are comparatively new to teachers and are a rapidly evolving alternative, evaluating CALL applications may be very challenging. To accommodate its changing nature, Beatty defines CALL as “any process in which a learner uses a computer and, as a result, improves his or her language” (2003, p.7). Nonetheless, how can the learning process be improved by using CALL?

A vast amount of literature has been put forward towards the benefits of integrating the use of CALL applications in language learning and its positive effects in improving language proficiency (Chapelle & Jamieson, 1986; Jafarian et al., 2012; Ma & Kelly, 2006; Blyth, 1999). For example, Dunkel (1990) in Liu, Moore, Graham, & Lee (2002) stressed the potentials of using CALL as a tool may highly increase the language learners' 1) self-esteem, 2) vocational preparedness, 3) language proficiency, and 4) and overall academic skills (2002, p.252). Moreover, computer-assisted instruction³ uses the computer as a tool to assist in providing individualised instruction which allows learners to learn any language at their own pace (Chapelle & Jamieson, 1986). This will help those who are slow learners to return to the lessons to revisit information and to follow-up what they have missed in the classroom at any time without having to interrupt the teachers in the classroom. It will also allow participation by those learners who have difficulty in communication or have family or work situations that do not allow them to attend or regularly attend classes.

Another advantage for using CALL is for keeping a track record of learners' activity (as will be mentioned in section **Error! Reference source not found.** below). This particular use of CALL can provide a source of collecting accurate data on, for example, how individual learners behave with a certain exercise to see whether they used it as instructed. A record can also show how teachers interact with and perceive these CALL applications in the classroom. The data can then be analysed to improve the software or for tracking the development of the learners. The evaluation of language materials is very important for increasing learners' language learning development through exploring the attitudes of both learners and teachers towards CALL tools. One example is a study conducted by Ayres (2002). In his study, he examined the learners' attitudes in terms of a total of 157 non-native speakers of English enrolled in undergraduate courses with an age ranging

³ Is another term for the use of computers as a method of teaching which is broadly used to refer to "virtually any kind of computer use in educational settings" (Cotton, 2008, p.514)

from 18 to 65. The students were distributed across 11 classes (9 classes studied English and 2 Japanese) for a total of 16 weeks. The learners in this study varied in terms of their nationalities, with a sample population of 27 different nationalities in which the Chinese and the Koreans formed the largest two groups. The amount of English language instruction which the learners received also differed in that almost half of the learners in the study received English language learning for over 5 years, 35% had been learning for 1- 5 years, and 13% received English language learning for less than a year. The study aimed to see how much value learners placed on using CALL applications. It should be noted that there was no specific application mentioned in the study because the aim of the research was not to evaluate the effectiveness of particular software but rather the overall attitude towards the use of computers in the process of language learning. To assess the learners' attitudes, 200 questionnaires were distributed to the learners and 157 were received, and then further analysed statistically. Learners were asked about their perceptions of CALL and the results showed outstandingly positive results in terms of learners' appreciation and the value of using computers for language learning. 80% of the learners thought that it was relevant to their needs, 77% thought it provided useful information for them, and 60% agreed that it should be used more often. The learners in the study who found CALL useful were also highly motivated, but there was no indication of whether there was a reciprocal relationship. Ayres concludes that CALL should not be replaced but should rather be used as a supplement to assist teachers in their classes. However, one of the main weaknesses of the study is that it was not clear from the study whether learners' improvement in specific areas of language skills, such as spelling, correlated with the type of software that was used.

2.8.1 Computer-assisted instruction for basic literacy skills

Research conducted over the last four decades suggests that computer-administered instruction has a positive impact on language learning and specifically for learning basic literacy skills. For example, the study conducted by Mitchel and Fox (2001) investigated the effectiveness of two computer programs that have been designed to develop young children's phonological

awareness, specifically, Daisy Quest and Daisy's Castle. Both programs are extremely interactive and comprise colourful speech and graphics. These specific programs deliver instruction and practice in five phonological awareness procedures which comprise:

1. Rhyme discrimination
2. Recognising words that have the same beginning, middle, or ending sounds.
3. Counting the sounds in words
4. Blending onsets and rhymes
5. Blending individual phonemes

In the last 20 years, technology has begun to play a more significant role with respect to educating learners in the classroom. Hence, this study investigated the influence of computer-administered instruction and teacher delivered instruction on the phonological awareness of pre-schoolers and first grade learners who are at-risk.

It should be indicated that this piece of research was focused on three distinct questions specifically:

1. Can phonological awareness be enhanced by thorough computer-administered instruction?
2. How effective is computer-administered phonological awareness instruction as compared with teacher-delivered instruction?
3. Is the effectiveness of these instructional methods influenced by children's grade level?

Their study was conducted over a four-week period; the researchers selected 36 pre-schoolers and 36 first grade students who were randomly placed in one of three experimental conditions. In this case, the participants who demonstrated below grade level performance in reading, participated in daily training sessions designed for small groups, which lasted for 20 minutes. Participants were from a middle class, suburban elementary school located in a south-eastern state in the US. Regarding the sample, 66 (91%) were white and 6 (9%) were African-American. The study consisted of 32 females and 40 males, ranging in age from 60 to 96 months, with an average age of 76.11 months. Additionally, pre- and post-tests were administered in relation

to segmentation, rhyming, blending, and phoneme isolation. They used the following test: The Literacy Initiative for Everyone (LIFE) (1996) which is an individually-administered, informal reading inventory used to test pre-schoolers and first grade pupils by means of evaluating phonological awareness, writing vocabulary, print concepts, letter knowledge, comprehension, sight word recognition, and text reading level. The LIFE was utilised in the sample selection process. A further test administered was the PPVT-III, referred to as the “Peabody Picture Vocabulary Test-Third Edition” (Dunn & Dunn, 1997), that examines receptive vocabulary which determines general verbal ability. The scores ascertained in this test were used in both the sample selection process and as covariates in the statistical analysis. Finally, the Phonological Awareness Test (PAT) (Robertson & Salter, 1997) was employed as a pre- and post-test measure of the phonological procedures targeted in the computer-administered and teacher-delivered phonological awareness instruction. The study employed an orally administered test which distinguishes between children who are making normal progress pertaining to their reading and those children who are at risk. For their treatment, phonological awareness instruction was demonstrated for each skill via a tutorial, where the skill is clarified and demonstrated for the benefit of the child. Once this is completed, the child is able to practice and subsequently, receives feedback by means of the program’s speech capabilities. It should be noted that other software was also used; namely, drawing and mathematics software and computer hardware. However, the focus of the research is only on phonological awareness; therefore, these tests were disregarded. Furthermore, learning activities were chosen from the Phonological Awareness Kit (Robertson & Salter, 1995) and the Phonological Awareness Intermediate Kit. The activities employed targeted the same phonological awareness methods used in the computer-administered programs. Each of the three treatment groups comprised 24 children with an equal number of pre-schoolers and first graders, who were placed in three separate experimental conditions. In each of the conditions, there were four groups in total consisting of six children, with two groups at each grade level. This study corroborates the notion that the phonological awareness of pre-schoolers who are at-risk,

together with first grade children, can be improved by means of computer-administered instruction, in addition to employing teacher delivered instruction. It must not be forgotten that the lack of a significant interaction effect between grade level and treatment assumes that computer-administered phonological awareness instruction maybe as effective for pre-schoolers as it is for learners in first grade. It is important to mention that even though the total phonological awareness scores of the computer-administered instruction and the teacher-delivered instruction group were documented to be greater than the technology control group, it must be pointed that the control group did reveal some growth in phonological awareness. Besides, although the teachers did not offer specific instruction in phonological awareness, it is apparent that this awareness has a tendency to develop as young children take part in reading and writing activities. The study was concluded by showing that the results gathered from this research are in agreement with studies conducted previously, which reveal that phonological awareness is improved by intervention. It is also essential that researchers, teachers, and software developers comprehend that employing technology with early and developing learners has distinct advantages and disadvantages for emergent and developing readers. While this specific research supports the application of computer-administered phonological awareness instruction, in fact, it raises several questions that need to be considered when technology-delivered instruction is delivered to pre-schoolers and first grade readers whose progress is observed to be protracted.

2.8.2 The use of computer assisted language learning tools for adult learners

There is great need for the implementation of software programs that can deliver a systematic, theoretically-based program of instruction to low-literate adult learners who are learning to be literate in a second language. Utilizing computer software in teaching adult literacy programs can potentially offer a valuable contribution to SLA research. However, Studies that have been conducted relating to the use of technology for adult learners are very scarce. India has a long history of employing various technologies with regards to adult literacy. In the past and even more recently, it has made use of radio, satellite televisions, and software to combat illiteracy.

Chimalakonda and Nori (2017) noted that there has been limited research undertaken on CALL, which they refer to as technology enhanced language learning (TELL) in relation to adult literacy. Consequently, their research focuses on applying TELL with the aim of improving adult literacy. In their research, the authors of this article interviewed 40 female adult learners whom they wished to encourage to become literate by means of using technology. Furthermore, they presented a 'multi-media-based solution' considered to be useful in promoting the learning of the 3Rs. This e-learning system is known as Computer Based Functional Literacy (CBFL) and is available in 9 different Indian languages. Chimalakonda and Nori wanted to improve the quality of teaching and learning using technology. Therefore, they suggested the GAMBLE framework, which models materials in the form of facts, cases, rules, models, and theories for educators. It must be emphasized that this is a framework which has assisted adult learners to perform competently. They go on to state that they employed software product lines in relation to the adult literacy case study. As a result, they managed to reduce the development effort from 5 to 6 person-years to 5-6 person-months, which can be seen as being reasonably significant. Nevertheless, the researchers point out that this software is based on a single instructional design with respect to e-learning. Hence, they recommend that varied instructional designs need to be produced, which are able to cater for learners with different educational requirements. In conclusion, as mentioned previously, India is confronted by an immense challenge pertaining to Adult Literacy. Therefore, this research, conducted over a seven-year period has endeavoured to examine and address numerous research challenges in relation to Educational Technologies and Software Engineering. For this purpose, the authors of this work have created several solutions and presented the opinions of numerous stakeholders in conjunction with their own experience of creating technologies and tools regarding Adult Literacy. They also identify areas that will need to be addressed concerning further research, including evaluating the influence of educational technologies with respect to improving students' learning.

2.9 The Digital Literacy Instructor: its assumptions and design

The Digital Literacy Instructor (DigLin) was a European Union Grundtvig-funded Lifelong Learning Multilateral Project Learning which started in 2013 and ran until 2015. The main aim of this project was to advance a literacy training resource for non-literate adult migrants learning to read for the first time (Cucchiaroni et al. 2013; Overall 2013; van de Craats and Young-Scholten 2013). The project targeted the beginning second language reading of four languages: Finnish, Dutch, German, and English, listed here in terms of their orthographic transparency. The main aim of the DigLin software was to provide an individualized solution for developing second language literacy learning material for low - or non - literate adult migrants learning to read for the first time and still, at the beginning level⁴. The present thesis focuses on the English language with the researcher being involved as a research assistant in this project and with the other project languages as well. Thus, with regards to these aims, this thesis will investigate the efficacy of this innovative software and explore whether this software helped to improve the low-literate and non-literate adults' reading development and phonological awareness in English. The project itself however, did not include an evaluation of how reading and phonological awareness developed in response to using the software for any other languages, i.e. Dutch, German, or Finnish. As a result, the current thesis is the only investigation focusing on whether those who used the software improved their reading and provides an additional evaluation of the software. The present thesis also discusses the overall project results for all four languages which involved tracking learners' reactions and responses to their use of software, involved observing the impact on the attitudes of the learners who used the software and on their teachers' attitudes towards the software, also tracked how the software was used in real time. Therefore, the present thesis aimed to build on the

⁴ See <http://diglin.eu/> for an overview

project results by investigating how low-educated adult beginners developed phonological awareness and learned to decode words in a language that is not their first.

2.9.1 Pedagogical guidelines for the role of the tutor in CALL and in DigLin

It is well known that learners can learn a great deal by using CALL materials. However, to understand the value of CALL and gain from its benefits, teachers must consider the important role they are situated in regarding helping the learners acquire the language and the strategies used to succeed in this process. This is where the role of the teacher comes in hand and the teacher's participation and roles should be taken into account in order to have a better impact in language teaching while using the computer. Teachers have a great responsibility whether it is in the form of guiding, facilitating, placing a set of strategies, and following the learners' progress. For this to succeed, teachers are required to find different ways to help maintain their pedagogy and strengthen it such as the assumptions that have been put forward by Chapelle and Jamieson (2008). They suggested three assumptions:

- 1) Learners need guidance in learning English,
- 2) There are many styles of English used for many different purposes
- 3) Teachers should provide guidance by selecting appropriate language and by structuring learning activities.

For the purpose of the present thesis, applying these assumptions will provide a better understanding for learners especially in the case of low-literate adult learners who have not had any or little experience. Before allowing learners to work autonomously, they require guidance in how and what to learn. Learners will not be able to engage in any CALL materials without having any help. Learners may be even bored if they do not have a set of activities and goals to follow. As a result, Deutkom (2014) has set a number of pedagogical guidelines for teachers to help the learners in the use of the DigLin software. According to the FC-Sprint² (Deutekom, 2014), the original software on which the Digital Literacy Instructor is based, the aim of DigLin is to get the learners to work in a self-directed way that enables them to discover and be creative. Once the learners are

informed by their teachers how the software works, and the instructions are understood, learners will then be able to explore the exercises and lessons freely and without any obligations. This concept is to allow the learners to perform behavioural actions that the teacher might predict, for example, by expecting them to ask questions that they find difficult. It also involves allowing the learners to come up with ways of how to explore the different exercises available that they may find useful for their own needs. This allows learners to focus on their drawbacks and encourage them to focus on a problem they have been struggling with and may have been embarrassed to ask. Another concept that FC-Sprint² is based on is learning by making mistakes. This occurs by the teacher setting high expectations that a learner may find difficult at first, but by trying harder, teachers may find that learners are doing things that they may not have ever done before and this may have a positive rather than a negative impact on them. High Expectations in educational research is a concept allowing teachers to set high behavioural standards for their learners in achieving challenging tasks. Research has shown that teachers who set high expectations of learners performance perform better results than teachers who set low expectations (Rosenthal & Jacobson, 1968). This is the concept of what FC-Sprint² is based on. Teachers who follow the FC-Sprint² concept avoid being cautious about what their learners can accomplish and allow them to make mistakes. Therefore, learning through setting high expectations will allow the teachers to avoid underestimating them and may even prove them wrong (Deutekom, 2014). So, on the basis of this pedagogical assumption which the DigLin software is based on, the project also aimed at achieving greater efficiency towards language learning, increasing learners' motivation by achieving results which this population and their teachers have thought they were not capable of achieving.

2.10 Creation of the DigLin word list

Relevant to these facts was the need for a systematic set of criteria was for the creation of the 300 words to be included in the DigLin materials (see the Methodology chapter for full information) given that learning to read in English is acknowledged to be complicated. That is, its irregular orthography in comparison to its syllable structure, which is similar to two of the other

project languages, German and Dutch. Due to the complexity of English phonology, and particularly to its irregular, opaque spelling system, the development of English literacy takes longer than in any other language (Ziegler & Goswami, 2006). As a result, the project process (as also noted in the Methodology chapter) followed a revised grapheme-phoneme correspondence regularity hierarchy for English monosyllabic words proposed by Vainikka (2013). It should be noted that relevance of the words for adult migrants and frequency of the chosen words were often of secondary importance when this method of word selection was employed. There are 43 rules in Vainikka's hierarchy for monosyllabic words in English and the DigLin word set of each exercise included only 10 rules. Table 2-1 was the result of having to choose from these 43 rules, those that would cover the highest number of monosyllabic content words (Young-Scholten & Naeb, 2013).

Exceptions to these are a small set of sight words.

Rule 1. <CC> = C. Two adjacent instances of a consonant are read as one

Rule 2. <b, g, h, k, l, s, w, and gh> can be silent

Rule 3. Uniform single letters: <b, d, f, k, l, m, n, p, r, t, v, z>

Rule 4. Uniform digrapheme <ch, ck, ng, ph, sh>

Rule 5. Uniform clusters/digraphs: bl-, br-, dr-, fl-, fr-, pl- pr-, shr-, tr-, -mp, -nd, -nk, -ft, -nt, -pt

Rule 6. <h, w, y, j, qu> are uniform in onsets, and <x> is uniform in codas

Rule 7. <th> has two uniform pronunciations, voiced and voiceless

Rule 8. <s> has two uniform pronunciations, voiced and voiceless

Rule 9: <c> is [s] and <g> is /dʒ/ before <e, I and y>; <c> is /k/ and <g> is /g/ elsewhere

Rule 10: words ending with vowel + <y> are uniform

Table 2-1: Vainikka's (2013) rules of the most regular English spellings

It was also recommended by the developers of the software to focus the lessons on the following four criteria:

1. CV(C)
2. 'Pure' sound words, where the phonemes are not heavily influenced in their pronunciation by preceding or following phonemes
3. Maximal difference: first cardinal vowels: /i/, /u/, /a/ occurring in most languages of the target group of learners, followed in the same syllable by consonants that are maximally different on the basis of other features (voiceless plosives and nasals)
4. No minimal consonant pairs in one word or series of words for reasons of auditory similarity (not: <pak> and <bak>) or visual similarity (not: <dak> and, bak>).

In relation to selection of words, complexity was considered, in addition to the fact that these words target adult low-/non-educated second language and learners at an early stage

concerning their reading. Furthermore, given that pictures (photographs) were employed to show meaning, words had to be concrete content words. Frequency was initially a consideration, but this was undertaken with a degree of caution in that frequent words are often function words which cannot be symbolised by means of images, and moreover, learners may not yet have acquired them. It is also important to mention that the frequency lists were not considered as vital as they often are because they are not based on what low-literate immigrant adults will encounter in their everyday lives. In Dutch, German, and Finnish, but not English, systematic stress variation in polysyllabic words was also considered.

Once these steps were achieved, the following steps were employed:

1. Vowels and consonants from maximally different (<aa>-<oe>-<ie>) to minimally different (<ie>-<ee> or <a>-<aa>), and from very common in other languages to language specific sounds (e.g. for Dutch <ui> in <huis> ('house')).
2. From CVC to CCVC or CVCC and more common consonant clusters
3. From monosyllabic to polysyllabic words (Dutch, German, and Finnish)
4. From concrete to abstract words
5. From noun to adjective to verb
6. From 'pure' sound to spelling conventions (e.g., Dutch for open and closed syllables: raam-ramen)

It is important to state that the above-mentioned criteria competed with each other and that the word structure of each of the four languages may create several and often different challenges for learners. So, given these rules that provides a set of systematicity not many studies have actually attested these rules. It would be helpful to see what research has been forward to help these learners succeed in learning to read.

2.11 Tracking learner behaviour

The use of log files is a highly efficient way to record learners' behaviour providing the researcher with precise information that would allow accurate results because of the continuous time-stamp that the log files provide (Bodnar et al., 2014). However, there has been little mention of how effectively log files can be for tracking LESLLA learners' activity for a better understanding of how they are learning language or developing literacy and how best they can improve it. Bodnar

and his colleagues state that these log files are “temporally accurate and can log at a detailed level and with consistency and objectiveness” (Bodnar et al., 2014, p.199). Malessa and Filimban (2017) provide an overview of how researchers, teachers, and practitioners may benefit from the use of the log-files. They reveal a number of revelations from its use. For example, it provides a reliable method to gain post-activity information such as movements of the mouse, preference of tasks, time spent on tasks, and correct and wrong responses. The amount of empirical data and information that log files can reveal is impeccable which can provide any researcher with practical evidence that can be analysed and facilitating to put practice into theory.

2.12 Learner autonomy

Learner autonomy is a fundamental topic in Second language learning. Learners who are capable of knowing what their responsibilities are when learning a language will allow them to succeed in acquiring a second language. Autonomous learning allows learners to engage in the developmental process. Sharle and Szabo (2000) define it as : “the freedom and ability to manage one`s own affairs, which entails the right to make decisions as well. Responsibility may also be understood as being in charge of something, but with the implication that one has to deal with the consequences of one`s own actions. Autonomy and responsibility both require active involvement, and they are apparently very much interrelated.” (p.4) Benson (2007, 2011) and Jones (2001) have noted that CALL can genuinely lead to autonomy, where learners are able to exercise as much as they possibly can with being less dependapable on teachers. For leaners to have the opportunity to achieve self-study through using computers will not guarantee autonomy. However, such programs that assist teachers in their learning process tend to provide learners with the need to take responsibility over managing the tasks of her or his leanreing. The use of such CALL programs “ can promote the development of learner autonomy to the extent that they can stimulate, mediate and extend the range and scope of the social and psychological interaction on which all learning depends” (Little, 1996, p.203)

For Learners to be more autonomous learners, learners need to consciously be aware of what they are learning, being motivated and engage in the learning process as much as possible whether it is getting involved in group discussions, asking questions or many more possible strategies. The FC-Sprint²-based the software on the idea of ‘high expectations’ as discussed above focusing on the same aim of supporting the learners in developing autonomous learning. By using high expectations, this will allow learners to focus on their own specific language needs within the heterogeneous groups of learners in typical classes for migrant adults, including ESOL classes in the UK. It will also promote active learning where students are expected to develop their own strategies for approaching the instructional materials.

High expectations also involves the teacher formulating tasks in a very open way whilst giving learners a time frame, but no limitations regarding the way of approach . Mainly, it is the teacher giving the learners the goals they would like them to try to achieve (such as the simple given in Appendix P), the time period in which they should be able to achieve these, and the resources through which they can achieve the results. Resources include the DigLin materials and also other learners and the teacher. The idea is to promote more active learning. The current study only mentions the use of high expectations because it has been used to guide the learners to the given exercises and give a sense of familiarity to them before they get used to using the software. A sample of one of the tasks can be seen in Appendix J involved in the DigLin project to help learners more in engaging with the software. .

2.13 Learner attitudes towards the use of CALL

CALL applications that are used for teaching purposes are focused on three basic aspects: learners, teachers, and the development of the software (Jamieson et al., 2005). When it comes to the learners, researchers highlight the importance of finding out about learners’ attitudes. Learner attitudes is an important notion overall in language learning and has been found to play an important role in learner success. Attitude, which is incorporated into motivation in language

learning, is a psychological factor that can affect the learner's ability to acquire the language, i.e. positive attitude increases motivation (Gardner & Lambert, 1972). Thus, attitude plays a prominent role in determining the behaviour of the learner. Therefore, it would be interesting to see whether improving the positive attitudes of the learners towards the use of the computers will result in increasing their desire to acquire the language.

Given that the technology has become the main support for the learners' learning development, the role of the learners, activities, attitudes has become more prominent to overlook the effectiveness of using CALL in instruction. It is important to include, in any CALL evaluation, what the benefits learners perceive when they are directly interacting during activities using the CALL materials (Jamieson et al., 2005, p.95). Thus, learners' engagement in using the software by themselves helps enhance the evaluation process and provide empirical evidence of their individual use. Wiebe & Kabata (2010) have emphasised that little attention has been given towards applying all three aspects when evaluating CALL applications. They compared the attitudes and perceptions of both teachers and learners, which they believe is essential to look at both for evaluating CALL for instructional purposes. Their study examined the effects of the use of technology enhanced materials on the attitudes of both the learners and the instructors.

In the first phase of their study, Wiebe & Kabata collected data from 156 learners and five teachers and in the second phase, they collected data from 27 learners and two teachers over the course of two semesters. The data collection method used was a set of questionnaires measuring the learners' and the teachers' perception of using CALL materials in the classroom and of other aspects of the materials such as time, frequency of words, the impact using the CALL materials had on their schedule, and what they could achieve when using it. In addition to the questionnaires, Wiebe & Kabata collected data in the second phase on the learners' actual use of the materials. This data was obtained via tracking using a tracking system, namely, WebCT and the data was then compared with the journals that teachers were asked to keep when learners discussed with them

their use of the CALL system. Wiebe & Kabata's questionnaire included open-ended questions, and in addition, they conducted interviews to a focus group for which two learners volunteered. The overall results indicated that there was a discrepancy between what the learners perceived to be the goals for using CALL materials and what the teachers believed the importance of CALL was for. Accordingly, since the present study also examined the effectiveness of a CALL application, it was worth investigating what both the learners' and teachers' attitudes and perceptions were towards their use in order to fully evaluate the DigLin software program.

Chapter 3: Methodology

3.1 Introduction

The purpose of the study on which the present thesis reports was to evaluate the efficacy of a computer-assisted language software which provides phonics instruction training designed specifically for adults with little or no literacy in their first language who are learning to read in a second language, in English, for the first time. The software aims to develop decoding and word recognition in English and to further develop basic reading skills. Of central interest to the present thesis was whether this training had an impact on phonological awareness and reading skills. In order to test this hypothesis, the study on which the present thesis is based on was designed to evaluate the skills before and after the training program in two groups of adults. This comprised one group who received the DigLin phonics training in addition to their normal teaching and another group who served as a control group by receiving only their normal teaching. As discussed in Chapter 2, various intervention studies have been carried out with children and results have shown that interventions which promote phonological awareness have been very effective having provided great benefits for basic reading development (e.g. Bradley & Bryant, 1983; Málková & Caravolas, 2015).

The present study followed a mixed methods approach in order to compare the different perspectives that were drawn from both quantitative and qualitative data collected for the study (see e.g. Creswell, 2014). As this study adopts a mixed methods design, applying both qualitative and quantitative approaches, it is believed that pragmatism may provide a compatible theoretical methodology to mixing multi-strategies within the same project, allowing the qualitative constructionist approach and the quantitative positivist approach to be combined in order to answer the research questions (Creswell, 2014; Tashakkori & Teddlie, 2009). Pragmatism rejects the traditional dualism between research paradigms and 'truth' is derived from 'what works at the time' in order to answer the research questions under investigation (Creswell, 2014). Collecting

both quantitative and qualitative data allows the researcher to utilise both quantitative measures to gather information about the implementation, feasibility and effectiveness of treatment, and qualitative data to capture deeper exploration of participants' perspectives regarding the intervention.

This involved the following seven research questions, already mentioned in Chapter 1:

RQ1 What is the impact of the use of CALL tools on learners' ability to decode words?

RQ2 Does phonological awareness in a second language correlate with reading development (decoding) in English as a second language?

RQ3 Does literacy in L1 have a positive effect on the development of L2 decoding?

RQ4 Does the use of a computer-based phonics software (DigLin), as a supplement to traditional instruction, more effective in increasing phonemic awareness and decoding than receiving traditional instruction solely?

RQ5 Does length of residence in the target language country influence their ability to decode words?

RQ6 Does the amount of input through using the computer software correlate with their development of decoding?

RQ7 What are students' and teachers' attitudes towards the use of DigLin in terms of:

- a. how they dealt with the software,
- b. whether they succeeded in learning how to decode,
- c. and whether they learned better when they work independently?

In relation to these seven questions, this chapter provides detailed information of the data collection process, the participants involved in the study and a description of the materials that were employed which includes the procedures involved in the treatment and the testing materials.

3.2 Data collection

The greatest challenge was the recruitment of learners starting in the beginning of the semester of fall 2014. Adult immigrant learners who were enrolled in ESOL classes- at pre-entry level were recruited from two local further education colleges (Newcastle College and Gateshead College) in the North East of England. A formal request was sent to the coordinating manager via email to ask for permission to make the DigLin software available in their weekly schedule. This involved coordinating with the colleges' IT services and with Friesland College in the Netherlands where the software is based. After approval, a training session on how to use the software was presented to the teachers to provide an overview of DigLin and the requirements needed to undertake the treatment. These two colleges were chosen for the study because of the availability of the facilities for having a computer lab that could accommodate the learners during the training sessions. Learners had a weekly fixed time slot which consisted of two hours of training that was set throughout the academic year except in the holidays. The actual implementation of the software at the colleges started in the winter of 2014 and ran from December to May 2015. The mean length of the field study in the colleges were 16.6 weeks (holidays not included) during which the participants got the opportunity to work with DigLin in the classroom for two hours a week or more. This meant that learners should have had the opportunity to work on DigLin for up to 50 hours. During the intervention, teachers were present with the researcher to help them while working on the software. However, the researcher faced many difficulties which will be discussed later in the chapter. The pre-test data (see below) was collected by the researcher with the help of interpreters. From all the participants that received treatment, only three of them reached the needed number of hours for filling out at least the first questionnaire required for the main project (a detailed discussion in section 3.9.2 below).

3.3 Participants

In the beginning of the data-collection period, over 30 learners were recruited and agreed to participate in the project. However, due to various reasons only 11 in the experimental group participated in the whole study. Five additional learners participated in the control group. It is not unusual that basic adult literacy learners often tend to drop out of classes for various reasons (for example their wellbeing, travel costs/arrangements, seeking childcare, etc.) and research involving these learners is a common trait within this scope of research. For example, in an experimental study conducted in the USA with this population of learners by Smyser (2016), despite original recruitment of 80 participants with the full cooperation of teachers, slightly more than 1/3 of them were trained and then tested on their production and perception of English. By the end of her study, due to the sporadic attendance of the learners, she was left with less than half of the initial number that she originally recruited, with 28 participants for the production experiment and 29 for the perception experiment. Another study already mentioned which was carried by Kurvers (2006) in the Netherlands aimed at looking at how adult learners who are learning to read and write in a second language develop word recognition skills. Kurvers started with 24 illiterate women attending basic literacy classes and was left with only 12 who persisted in her study.

3.3.1 Experimental group

The 11 participants in this group had a mean age of 39 with an age range of 25 to 55 years of age. Their length of residence in the UK ranged from 1 to 35 years. As for their education, some learners had started their ESOL classes with no literacy in their first language and some had some but less than six years of formal schooling in their own language. None had literacy in any additional language. The group also came from different language backgrounds: Arabic, Farsi, Dari, Punjabi, Russian, Tigrinya. The learners were therefore not homogeneous in terms of their educational and linguistic backgrounds but rather heterogeneous. Ideally, such a group in an experimental study would be homogenous, but the composition of the typical ESOL class at pre-

entry level means this is simply not possible. For their educational background, due to the lack of funding (as mentioned in the previous chapter), learners were placed into one pre-entry class if they could not yet read in English, regardless of their level of education. As can be seen in the table below, learners with no literacy, whether in their first language or second, were all situated in the pre-entry class (sub- CEFR A1 level). Table 3-1 presents the demographic information of the participants of the study.

Name	Age	Gender	LOR in L2 Months	Literacy in L1	Former Schooling in L1	L2 Oral skills	L2 Literacy skills	Other L's	Amount of time on DigLin
Nadia	29	f	19	Arabic: literate	Yes	A1	A1		715 (11,91h)
Abid	35	m	33	Arabic: literate	Yes	< A1	A1		522 (8,70h)
Eyob	33	m	18	Tigrinya: words	Yes	< A1	<A1		756 (12,60h)
Hamdi	39	m	12	Arabic: literate	Yes	< A1	<A1		210 (3,50h)
Yodit	31	f	28	Tigrinya: words	No		<A1		290 (4,83h)
Ifikar	54	f	420	Punjabi: No	No	< A1	<A1		620 (10,33h)
Sabira	25	f	36	Punjabi: words	No	<A1	<A1	Urdu	581 (9,68h)
Aisha	51	f	360	Arabic: words	No	A1	<A1		382 (6,36h)
Esaf	36	m	24	Dari: words	No	A1	<A1	Urdu-Farsi	396 (6,60h)
Gabor	42	m	24	Farsi: words	No	<A1	<A1	Dari	436 (7,27h)
Victor	51	m	180	Russian: No	No	< A1	<A1		812 (13,51h)

Table 3-1: Experimental participants' demographics

Prior to starting their ESOL classes, the participants had been given a standardised diagnostic assessment to demonstrate their literacy performance in English in order to place them in the designated level - in the case of the 11 learners in the present study, they were placed at pre-entry level. These initial assessments aid the teachers and researchers by providing them with what is used to obtain information from all the learners. These indicate their strengths and weakness to enable teachers to making judgments on how best to solve learning problems that have been identified and will ideally therefore allow them to propose solutions to cater their individual needs (Alderson et al., 2015). Despite long-term residence by some, these learners still had limited knowledge of English language and were therefore placed in pre-entry classes on the basis of their

sub-A1 oral proficiency and literacy. Note again from the table above that learners were at different sub-A1 and A1 reading levels and some of the learners were low- or non-literate in their first language.

3.3.2 Control group

The learners involved in the treatment were compared with learners who were also enrolled in ESOL classes but were studying at another further education college. The control group consisted of five learners who were also enrolled in ESOL pre-entry classes and had similar backgrounds to the treatment group, including coming from different language backgrounds (Amharic, Arabic, and Somali). This group received the same normal teaching as the experimental groups and did not use any computer software training. The table below provides the demographic details of the control group.

Name	Age testing at	Gender	Country of Origin	Native language	LOR in L2 Months	Formal schooling in L1	Other languages
Adam	44	m	Syria	Arabic: words	2	No	Italian
Hani	27	f	Somalia	Somali	5	No	
Hamid	41	m	Yemen	Arabic: No	15	No	
Ayana	39	f	Ethiopia	Amharic: Words	7	No	
Yaminah	35	f	Pakistan	Urdu: No	25	No	

Table 3-2: Control group participants' demographics

3.4 Ethical considerations

As in any empirical study in natural sciences, the use of human subjects in research is a very critical issue. Although research in SLA is regarded as a “low risk for ethical catastrophe” compared to other fields (Thomas, 2009), ethical consent is importantly required for the sake of protecting participants and to avoid any deception towards them. Ethical issues in research are complex by nature, and there is not a single consensus on how researchers should address them (Mackey &

Gass, 2005). Having understood this, the researcher took several steps to ensure that the required ethical considerations are fully covered and considered in the context of the study. Accordingly, one of the main ethical practices in research, is obtaining informed consent form. Although, this issue does not appear to be high on the agenda regarding second language acquisition research, some researchers firmly believe that it should be the cornerstone of research into second language acquisition. Research highly recommends that research into L2 could be enhanced by raising awareness of debates surrounding the role of informed consent and its significance in this particular field. (See Thomas & Pettitt 2017; Dörnyei 2007.)

Consequently, the adult participants in the study were asked to sign consent forms before beginning the study which confirms their willingness to participate in the study. It was emphasized to them that the study was strictly voluntary, and they could withdraw at any point and were briefed on what the study involves and what they were required to do. (A copy of the Participant Consent Form is found in Appendix E.F and G). As Thomas (2009) has recommended ‘avoid deceiving participants while at the same time protecting participants’ capacity to respond without prejudice to the content of the study’ (P. 494)

Additionally, one of the requirements of consent forms is that the information given to the participants should be in a language that learners are able to understand (Mackey & Gass, 2005, p.32). Because the participants were low literate, and some were illiterate learners who knew very little English, they were provided with information about the project with consent forms that were translated into their L1s and interpreted for them. Then the learners were given a written description in their native language, which had to be signed at the end. In cases where translators were not present, recorded oral consent forms were presented to them in the participants’ own language. Confidentiality and anonymity were guaranteed, and participants were assured that all their data (the audio recordings, transcription, the questionnaire data, etc.) were saved in a secure place accessed only by the researcher. They were assured that the study would pose no risk to them

in their lives; also, all the information being collected would be confidential and would be used solely for research purposes by the thesis author. As a result, the names of the learners used in this research are pseudonyms in reporting the results in the thesis and any subsequent presentations. to protect their identities.

3.5 Materials

The materials described here were designed to collect quantitative data to answer these research questions:

RQ2: Does phonological awareness in a second language correlate with reading development (decoding) in English as a second language?

RQ3: Does literacy in L1 have a positive effect on the development of L2 decoding?

RQ5: Does length of residence in the target language country influence their ability to decode words? Or whether age plays an important role to their learning?

RQ6: Does the amount of input through using the computer software correlate with their development of decoding?

In order to determine if the use of DigLin was effective, a pre-test and a post-test were administered to the participants in order to measure their development of reading (see Table 3-3). There were four tasks: phonemic awareness, rhyme awareness, onset awareness, and word reading (full details below). The stimuli consisted of 20 CVC monosyllabic words for an oddity task, 12 deletion tasks (initial- medial – final), and 80 word reading items on that task which consisted of monosyllabic, bisyllabic, and trisyllabic (daily survival) words. All the words in the test battery were selected by the researcher, but were from words extracted from the DigLin software, i.e. these were words which they were expected to learn. A complete list of all stimuli is included in Appendices A through D.

The phonological awareness subtest used in the present study is a replication of the tasks used in the study conducted by Young-Scholten and Strom (2006) and in the follow up study by Young-Scholten and Naeb (2010), all of which were adapted from Burt, Holm & Dodd’s (1999) study of pre-school children. It was conducted orally except where noted.

Data collection Phase	Tasks
a. Pre-test phase	Rime awareness Onset awareness Phonemes awareness (Initial) Phoneme awareness (Medial) Phoneme awareness (Final) Monosyllabic Reading Bisyllabic 1 Reading Bisyllabic 2 Reading Bisyllabic (Survival daily) Reading Trisyllabic (Survival daily) Reading
b. Intervention (treatment) Phase	300 monosyllabic words High expectation tasks 7 exercises: 1. The Words 2. Drag the letters 3. Listen and drag the words 4. Form and drag the words 5. Listen and Type 6. Read the Words 7. Test yourself
c. Post test Phase (Same as the pre-test)	Rime awareness Onset awareness Phonemes awareness (Initial) Phoneme awareness (Medial) Phoneme awareness (Final) Monosyllabic Reading Bisyllabic 1 Reading Bisyllabic 2 Reading Bisyllabic (Survival daily) Reading Trisyllabic (Survival daily) Reading
d. Interview and Questionnaire	After the completion of 10 hours

Table 3-3: Phases of the data collection

3.6 Test battery

3.6.1 Rhyme awareness:

This task assessed learners’ sensitivity to the sub-syllabic unit of rime, and following the odd-one-out format described by Bradley and Bryant (1983). This was administered by asking individual learners to listen to three monosyllabic words with a CVC syllable structure. The learners

listened to three words, one of which ended with a different rime. They were then asked to choose which word was the odd one out. For example, two of the words kid and lid have the same rhyme, [i] /ɪd/ as illustrated in the example below. Once learners are aware of this connection between these intra-syllabic speech units, it would allow them to make connections between sounds and any sequence of letters (Bradley & Bryant, 1978; Goswami & Bryant, 1990; Hulme et al., 2002).

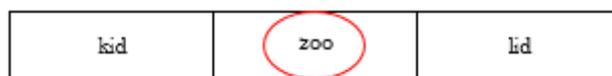


Figure 3-1: Example of rhyme awareness task

3.6.2 Onset awareness:

Similarly, as the task above, here the focus is on the onset. Two of the words below “knob” and “knit” start with the same phoneme, and the third word “light” does not. That is, the beginning of the two words “knob” and “knit” have the same onset phoneme /n/. If the learners were able to listen to and then sound out the onsets and isolate them, they would then realise that they share the same initial sound (onset phoneme) and that there is a difference with the last word “light”. As a result, when they were asked to choose the odd one out, they would have been able to identify it as illustrated in the example below.

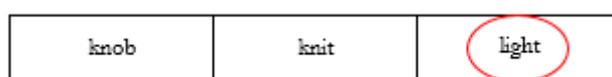


Figure 3-2: Example of onset awareness task

3.6.3 Phonemic awareness:

One of the most well-known tasks used to test phonemic awareness is the *Deletion Task* which was first initiated by Bruce in his 1964 study (as cited in Goswami and Bryant 1990), where the researcher asked the learner (the child) to delete the initial, middle, and then final sound (Goswami and Bryant 1990: 11). This included three sets of tasks, where the learners were asked to delete the initial sound from the word they heard and had to produce the outcome without the

initial sound (as seen below in the example in Table 3-4). The second and third exercise required the learner to delete the medial and final sounds as tent and turn it into ten, and lamp turned it into lap.

	What the learners hear	What the learners should produce
Initial	price	rice
Final	tent	ten
Medial	lamp	lap

Table 3-4: Example of phonemic awareness task

3.6.4 Word reading task:

The word reading task consisted of 60 English words which were chosen to include the words that were implemented in the DigLin software. In this task, the participants were asked to read aloud each word that was distributed in flash cards, and the researcher marked whether the words were correctly produced. The total number of correct responses determined their score on all measures. This task was chosen to highlight the phonological contribution in that it requires the participants to decode the items. This phonological task in particular focuses on the ability to see whether learners would be able to blend the phonemes with their associated grapheme and blend them together to produce the correct pronunciation (Greenberg et al., 2002).

3.7 The treatment

For the treatment, 11 of the learners were given the opportunity to use a computer assisted language tool, namely, the Digital Literacy Instructor (DigLin) software. Initially, learners involved in the DigLin project were supposed to use the software for 50 hours. However, due to several issues (which will be discussed later) only 10 hours were completed. Because the software is designed for individual use, the time of each learner spent using the software and how they used it varied. This was recorded through the software's log file database. The participants received training by practising a set of seven types of exercises designed to help them establish grapheme-

phoneme correspondences in English and develop their overall decoding skills to give them the basic ability helping them further develop reading. The software consists of 300 words grouped in 15 lists. Every list contains 20 words along with seven exercises to choose from. The following section will provide an overview of the DigLin software and the criteria used to select the words in it.

3.8 Implementation of the Digital Literacy Instructor (DigLin)

As mentioned earlier in Chapter 1, the initial aim of developing the software was to provide concrete solutions to allow more individualized learning. Although the software was developed to help non-literate migrants learn to develop decoding and further develop reading for the first time in a language that is not their mother tongue, it is also useful for beginning learners with literacy. As noted several times, the present thesis aims to share prospective results on the effectiveness of the software to help inform and guide further research on second language and literacy acquisition for the low-literate adult migrant population worldwide. Before we look at the software itself, it is important to know how the software tracked the progress of the learners and how learners were communicated.

3.8.1 Learner progress

Tracking learners' progress was directed in three ways: a) by log files (the database implemented in the software) which recorded their learning activity during their use of the software, b) by measuring learners' phonological awareness and basic reading skills before and after the use of the software, and c) through the researcher's and the teachers' observations as well as participants' attitudes towards the software. This data was then analysed to address these research questions:

RQ1: What is the impact of the use of CALL tools on learners' ability to decode words?

RQ4: Does the use of a computer-based phonics software (DigLin), as a supplement to traditional instruction, more effective in increasing phonemic awareness and decoding than receiving traditional instruction solely?

RQ7: What are students' and teachers' attitudes towards the use of DigLin in terms of:

- a. how they dealt with the software,
- b. whether they succeeded in learning how to decode,
- c. and whether they learned better when they work independently?

As mentioned in Chapter Two, the log files tracked the learners' behaviour and included a personal log file ID and language code '01ENG (272)' for each individual using the software. The tracking also included teachers for their ability to login the software and track the progress of the learner. The log files carried a time stamp of learners' start time, the date, and which exercise the learner performed. In the example below, the learner's log-in ID username was 01ENG272 and a separate password was given at the start of the field testing, which they were instructed to keep safe for further use. The details below also show the task "8b Drag the letters" which the learner started to work on in the session with the time and date. A full sample of the log files from one session during the day can be seen in Appendix H. Another sample can be seen from a log file that indicates one of the learner's activity for one minute in Appendix I.

User name	01ENG (272)
Exercise	8b Drag the letters
Timestamp	2015-03-24 15:48:22

Table 3-5: Sample of the Logfile heading

3.8.2 Communication with the learners

At the beginning of the training, a detailed description of the learners' role was presented and explained to them. In the first session, a demonstration was provided for the whole group and then they were asked if there were any questions. Due to their lack of knowledge in the L2, learners were unable to respond; however, during the demonstration learners were repeating the sounds of what they heard from the software. Teachers, who were sceptical about their learners' ability to use CALL software, found this very promising and some mentioned that the software could be a useful resource. Introduction of the software took place in the same colleges. Throughout the field testing, the researcher sat down with the learners to see whether they had any difficulties or questions they needed answered. After the learners got used to the software, and to the researcher, they were more comfortable asking questions, saying what they had difficulty with or needed support with.

Right before the beginning of the actual field testing, before the pre-test took place, the researcher asked the learners a few questions about themselves in the context of the DigLin project evaluations and analysis of learners' attitudes.

3.9 Technical guidelines

3.9.1 Software and login

Each learner received an individual login containing username and password. The teachers also received an overview of learners' login information in case the learners forgot to bring it or lost it. Keeping track of this information turned out to be one of the main problems that these learners had to struggle with because some had no experience in using a computer. This resulted in more effort on their behalf beyond mere use of the exercises. It should be noted that the software was initially integrated with an 'Automatic Speech Recognition' feature which allowed the learners to record themselves and then provide them with detailed feedback on their pronunciation of words read out loud. However, due to technical difficulties, which will be mentioned later in the limitations, this feature was disregarded in the current study.

3.9.2 Development of the software

The DigLin software was the treatment that the learners received. It is based on materials based on an existing pedagogical approach known as FC-Sprint². These materials were developed at Friesland College in Leeuwarden, The Netherlands, for teaching Dutch as an L2. As already discussed above, FC Sprint² is based on the rationale that learners should be required to work with resources independently and that this works best through giving them certain goals (or high expectations) and expecting them to achieve them on their own. In this approach, teachers are only required to help if the learners need it and ask for it (for a more detailed explanation, see Deutekom (2008)).

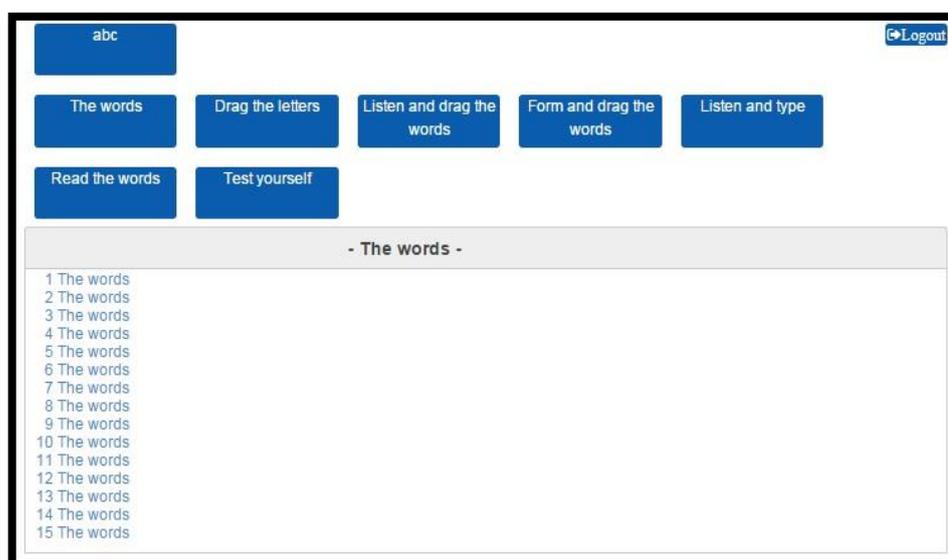


Figure 3-3: DigLin software platform

The exercises in the software included the following:

- a) **'The words'** contained a set of 20 monosyllabic words chosen according to Vainikka's (2013) revised Grapheme – Phoneme correspondence rules, which will be discussed further below in the next section (3.9.3). The learners were able to listen to each word, associate it with a picture, and listen to the word either as a whole or listen to each sound individually, by using the mouse.

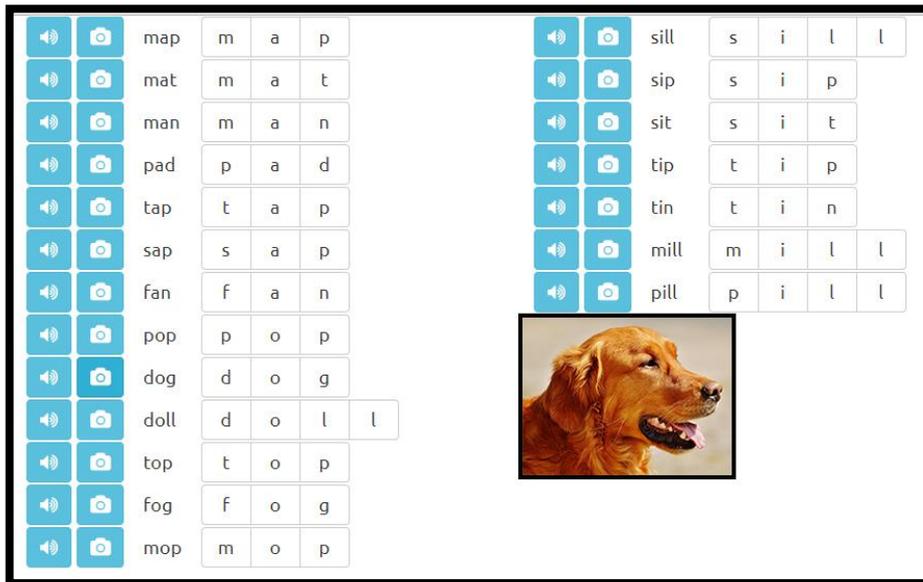
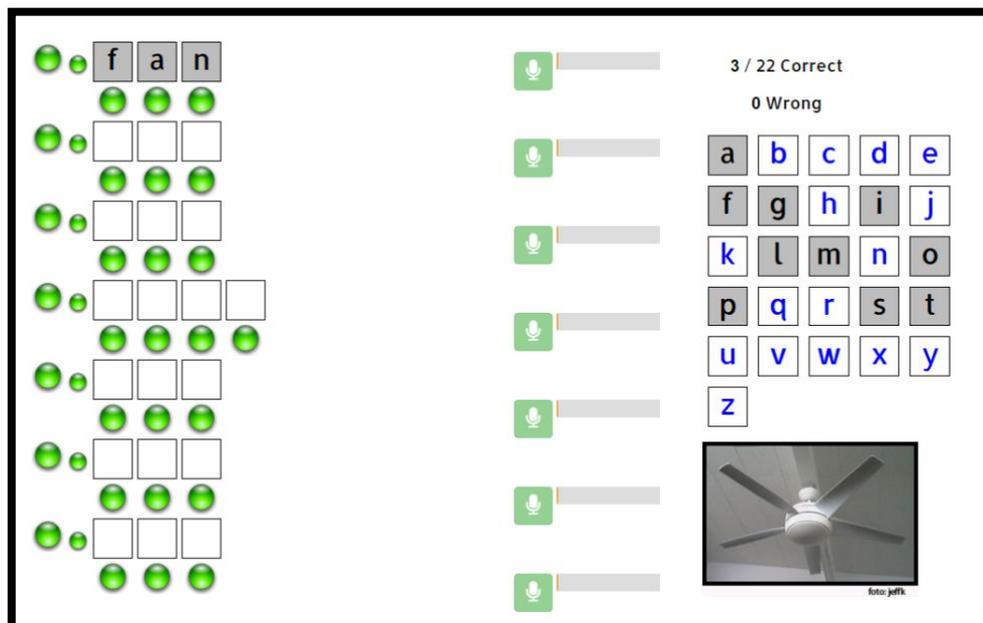


Figure 3-4: 'The words' exercise

b) **'Drag the letters'** is an exercise where learners were asked to choose only the highlighted letters from the list of the alphabet on the right (as seen in Figure 3-5), and by using the mouse move the letters in their designated places in the boxes as seen in the image below. The learners are required to listen to the sounds and see which sound corresponds with which grapheme. The letters shaded in grey indicate that the letters are not required for this set of exercise.



c)

Figure 3-5: 'Drag the Letter' exercise.

As discussed above, automatic speech recognition was developed for this project, and this exercise was enabled with it. The learners recorded their own voices and then received immediate feedback on their performance. The feedback they received was meant to be based on the level of accuracy and they would be given an indication shown as a bar highlighting their performance, seen in the image below. This feature, as stated above, was not used due to technical difficulties with the server at Friesland College in relation to the firewall at the further education colleges; a situation that was not accurately diagnosed until the learners had finished their use of the software.

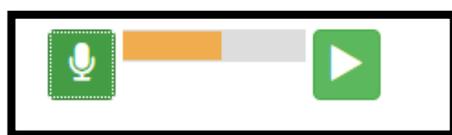


Figure 3-6: ASR bar for feedback

d) **'Listen and drag'**: is an exercise where learners were required to listen to the word associated with its picture and drag the correct one from a list of words. When the learner performs an incorrect task, an indication appears on the top of the page stating whether the answer there was a correct or wrong response. The correct and wrong instances are shown clearly in front of the learners to be aware of their performance.

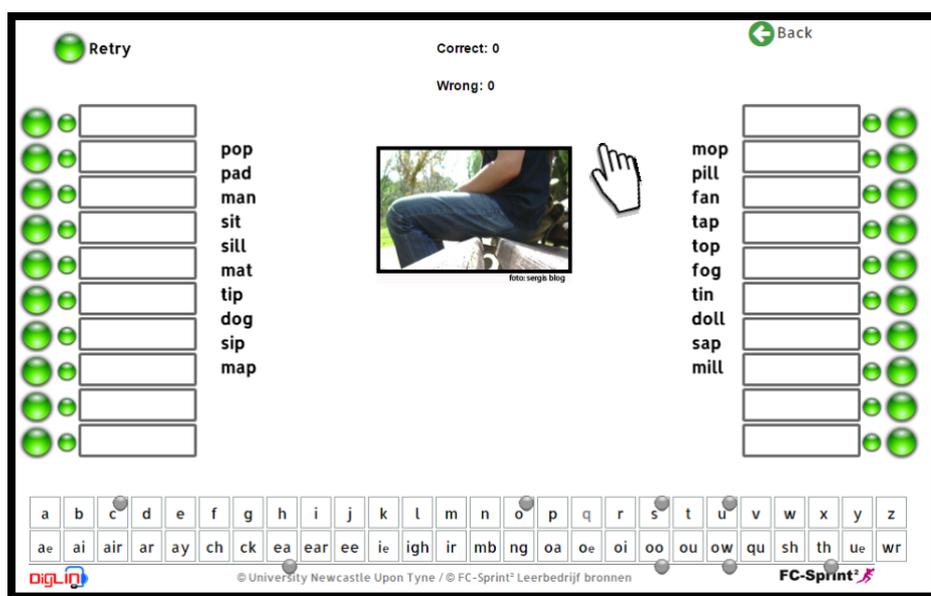


Figure 3-7: 'Listen and Drag' exercise

- e) **'Form and drag the words':** In this exercise, learners were asked to listen to the phonemes individually and then try to form them together to combine the correct word. Once they are able to identify the word, they drag the correct word, which is one of the words listed on the left side of the window, to the box. They were then also given immediate feedback on their performance.

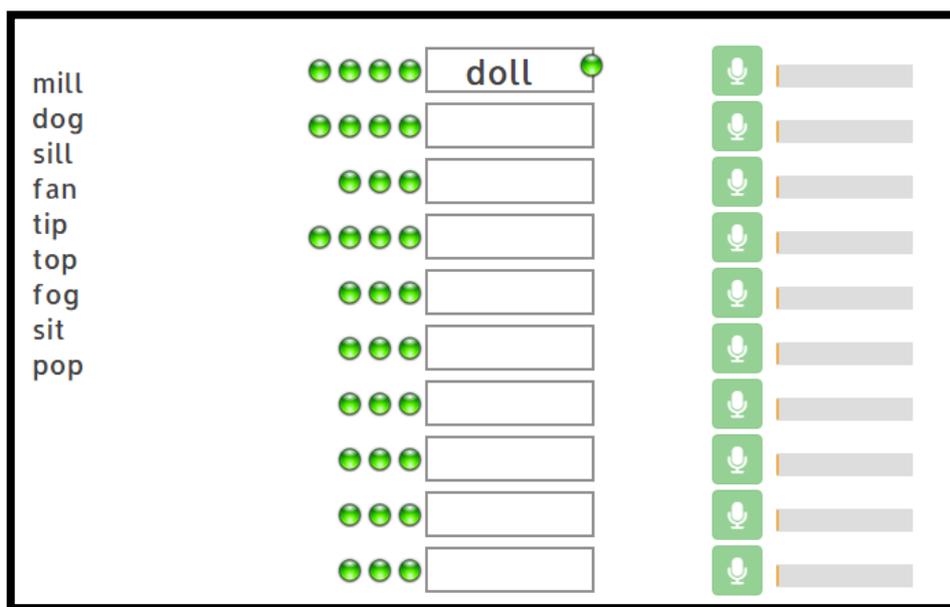


Figure 3-8: Form and Drag' exercise

- f) **'Listen and type':** For the very low beginning level of the learners in this study, this exercise was expected to be the most challenging. Learners were expected to listen to the word and then type in the correct spelling. In the example below, the participant hears the word *doll* by pointing the mouse on the large green circle and then pointing the mouse to the small green circle to see the picture associated with it. They then use their keyboard to spell out the word. After completing the spelling, feedback is given on whether the learner has successfully achieved the exercise correctly or not. This exercise was also facilitated with an automatic speech recognition button where learners were supposed to be provided with feedback of their own pronunciation.



Figure 3-9: 'Listen and type' exercise

g) **'Read the words'**: this set of exercises tests learners' reading. Learners are expected (after having practised the words in the previous exercises) to read the words accurately and are supposed to be given feedback on their performance as seen in the exercises 'Drag the Letters' and 'Listen and 'Type'.

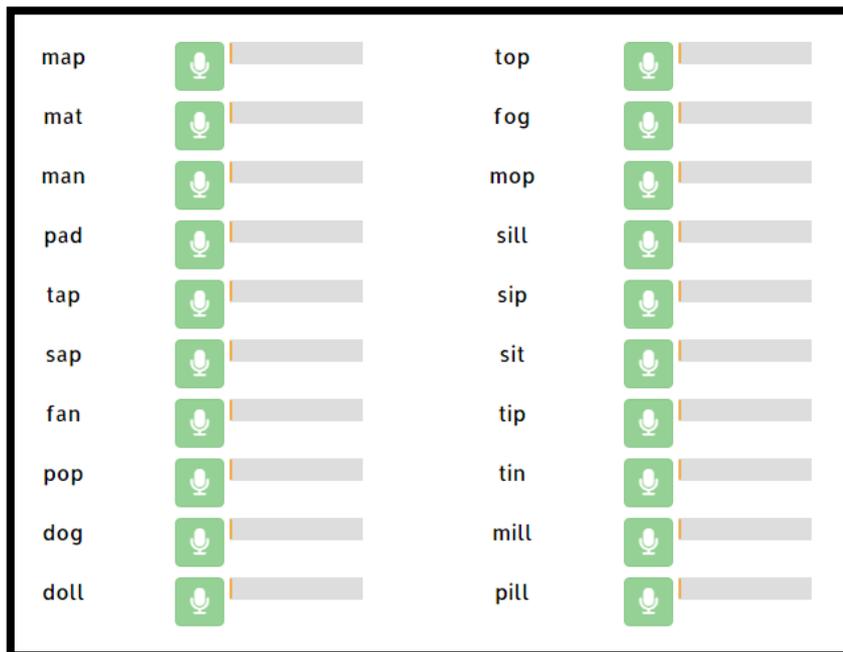


Figure 3-10: 'Test yourself' exercise

h) **'Test yourself'**: After completing this set of exercises, learners test themselves by recording their voices after pointing on the sound button (microphone icon) with the mouse. To assist the learners, they can move the cursor towards the camera icon and they can see the

picture associated with the word they hear. For example, the word *sit* can be seen in the picture. This exercise is timed to see how quickly they can perform. After completing reading the words, they are given an overall score of their performance.

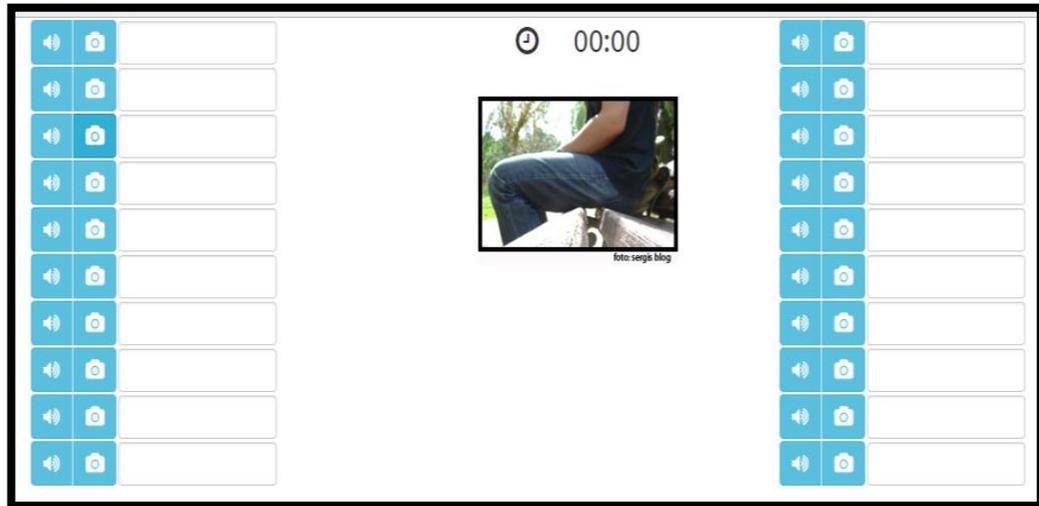


Figure 3-11: 'Test yourself' exercise

3.9.3 Word Selection

As mentioned in Chapter 2, the rules that were followed for the word selection was based on a subset of the 43 Vainikka's (2013) hierarchy. Below is a complete overview of how the process took place regarding the creation of the DigLin software.

There were 300 words across the 15 exercise sets which comprise the DigLin software for each of the four languages. The selection of these 300 words followed a laborious process in order to find systematic criteria for its implementation and to enable the learners to follow some sort of stages in their learning process. The method and the selection of words were basically determined by their effectiveness in relation to literacy instruction, but because there is so little research on this learner population, the project team operated under assumptions rather than on the basis of evidence regarding the learning of vocabulary. The project team, however, was committed to the use of real words and to words that were appropriate for adults rather than children.

As mentioned in chapter two, The DigLin word selection process followed a grapheme-phoneme correspondence regularity hierarchy for English monosyllabic words proposed by Vainikka. As noted in Chapter Two, the relevance of the word for adult migrants and frequency of the chosen words were often of secondary importance when this method was employed. Here I repeat the subset from the 43 rules.

-
- Exceptions to these are a small set of sight words.
- Rule 1. <CC> = C. Two adjacent instances of a consonant are read as one
- Rule 2. <b, g, h, k, l, s, w, and gh> can be silent
- Rule 3. Uniform single letters: <b, d, f, k, l, m, n, p, r, t, v, z>
- Rule 4. Uniform digrapheme <ch, ck, ng, ph, sh>
- Rule 5. Uniform clusters/digraphs: bl-, br-, dr-, fl-, fr-, pl- pr-, shr-, tr-, -mp, -nd, -nk, -ft, -nt, -pt
- Rule 6. <h, w, y, j, qu> are uniform in onsets, and <x> is uniform in codas
- Rule 7. <th> has two uniform pronunciations, voiced and voiceless
- Rule 8. <s> has two uniform pronunciations, voiced and voiceless
- Rule 9: <c> is [s] and <g> is </dʒ/ before <e, I and y>; <c> is /k/ and <g> is /g/ elsewhere
- Rule 10: words ending with vowel + <y> are uniform
-

Table 3-6: Vainikka's (2013) rules of the most regular English spellings

The English project team recommended lessons commence with (1) CV(C); (2) Phonemes which are not heavily influenced by their phonological environment; (3) maximal contrasts starting with the cardinal vowels: /i/, /u/, /a/ that occur in the L1s and L2s of the learners and in the same syllable by consonants that maximally contrast on the basis of other features (voiceless plosives and nasals); (4) no minimal consonant pairs in the same exercise set to reduce the challenges .

In relation to selection of words, complexity was considered, in addition to the fact that these words target low-/non-educated adults at an early stage concerning their reading. Photographs of concrete content words were used. As discussed in Chapter 2, frequency was not adopted because there are no corpora which generate frequency lists relevant to are low-literate immigrant adults. Finally, as mentioned earlier, in Dutch, German, and Finnish, but not English, systematic stress variation in polysyllabic words was also considered.

Once these steps were achieved, the following steps were employed:

1. Vowels and consonants from maximally different (<aa>-<oe>-<ie>) to minimally different (<ie>-<ee> or<a>-<aa>), and from very common in other languages to language specific sounds (e.g. for Dutch <ui> in <huis> ('house')).
2. From CVC to CCVC or CVCC and more common consonant clusters
3. From monosyllabic to polysyllabic words (Dutch, German, and Finnish)
4. From concrete to abstract words
5. From noun to adjective to verb
6. From 'pure' sound to spelling conventions (e.g., Dutch for open and closed syllables: raam-ramen)

The aim of the DigLin project was to make best use of the FC-Sprint² system by firstly providing the opportunity for feedback using the current system, and furthermore, ensuring that the method was appropriate for four new languages with different levels of transparency with respect to their orthographies and in different educational contexts in the four countries.

3.10 Qualitative data of the study

In addition to the pre-and post-tests, the DigLin project involved the collection of data which are qualitative in themselves (interviews, etc.) These data address research question (1) and (7) from the data sources listed below in Table 3-7 which includes observations, the log files stored in the software database for the DigLin project, and Interviews along with the questionnaires.

Qualitative data	Duration	What it will provide
1. Observations	Throughout the project from the start of the data collection and the treatment	<ol style="list-style-type: none"> 1. Detailed performance of the participants during the process of data collection 2. Actions of how they responded towards before and after the treatment.
2. Log files	From the start of the treatment	<ol style="list-style-type: none"> 1. Exercise preference 2. Number of correct and wrong responses 3. Actions of what they produced while working on software 4. Time stamps 5. Date stamps of when they used the software
3. Interviews and questionnaires	By the end of data collection	Questions about a) learning process, b) coping with the software and c) focus on motivation and autonomy

Table 3-7: Qualitative data used in the research

The first set of data that was collected throughout the field testing adopted the method of participant observation, a commonly used method that involves interacting with learners and being part of their learning community.

The second data source was the log files themselves. As noted already, these were stored as part of the DigLin software. The log files were initially assembled to provide the DigLin project with information that would allow project team members to track learner behaviour and to evaluate use of the software in order to improve it. Malessa & Filimban (2017) support the use of log files as evidence for software improvement and beyond. Their study, of Finnish and English log file data has shown that log files help by examining post-activity of learners' online movements while practising in a CALL context. Accordingly, tracking the learners' actions and behaviour allows a better understanding of how the process of learning takes place. It also allows the researcher to identify the relationship between learner's use of the software and their performance on other tasks.

The third method of data collections were interviews and questionnaires. These were conducted as part of the DigLin research project to receive feedback from the learners on the following aspects:

1. Learning process
2. Coping with the software
3. Focus on motivation and autonomy

In the case of the present thesis, the interviews provide additional information on whether learners' performance is relevant to what has been reported in the other data sources and, consequently, is confirmed by what the log files may reveal.

3.10.1 Observations

Participant observation is the process enabling researchers to learn about the activities of the people under study in the natural setting through observing and participating in those activities. According to Mackey and Gass (2005), researchers aim to provide a clear picture and a large

amount of rich data of participants' behaviour/activities. which will allow the researcher to obtain a great understanding of the participants and their context (2005, p. 176). In this current study, a combination of field notes was taken by the researcher during the intervention while learners were working on the software. The data obtained by using this method is useful for gaining further information about the learners' behaviour and actions. This allowed the researcher to develop a familiarity with the different aspects of learners' performance.

3.10.2 Log-files

According to Bodnar et al. (2016), tracking learners' behaviour through log files provides an accurate research tool for in-depth investigation of how learners behave during their interaction with any software having this facility (see also Chun 2013). This, in their opinion, provides a great deal of information (for example, time-stamp, action with mouse, types of exercises, etc.) of the learners in a "detailed level and with consistency and objectiveness" (Bodnar et al., 2014). Therefore, from this data, interesting results from the log files were extracted based on the following information:

- Time:
 - spent on each task
 - spent on total time
- Exercise:
 - Type of exercise
 - Repetition of exercises and preference
- Feedback: Right vs. wrong answers

Learners' interactions with the learning software were logged in the DigLin database throughout the whole field testing. The computer system documented all movements they made with the mouse and keyboard and also what they recorded through the microphone (if applicable). That information will be interpreted later on in order to find out how learners coped with the software and whether a development in their abilities could be observed. The log files were a sufficient source of data that allowed the researcher to explore, in depth, the learners' behaviours and provide additional evidence to support the statistical analysis. However, obtaining the

information and extracting the data from the log files was a very meticulous task. The log files in Figure 3-12 below show an extract of the Finnish dataset for only half a minute (Malessa & Filimban, 2017, p.153). The data tracks the learner's progress by showing the actions which the learners performed with the mouse, such as looking at a picture, listening to a sound, or dragging a letter. It also provides information (as mentioned previously in 3.8.1) such as the unique personal ID of the learner, the language of the learner, and the timestamp of when the learner worked on that exercise (Chun 2000; Malessa & Filimban 2017).

```
7632;["04FIN314"];FIN";"2014-10-30 09:21:20";"2014-10-30 09:23:58";"Drag the letters
4a";{"type":"play_word_sound" data:"sauna" timestamp:"2014-10-30
09:21:20" data_extra:""} {"type":"hide_word_picture" data:""
timestamp:"2014-10-30 09:21:21" data_extra:""}
{"type":"show_word_picture" data:"sauna" timestamp:"2014-10-30
09:21:21" data_extra:""} {"type":"letter_drag" data:"s"
timestamp:"2014-10-30 09:21:26" data_extra:""}
{"type":"letter_drag_right" data:"" timestamp:"2014-10-30 09:21:28"
data_extra:""} {"type":"letter_drag" data:"a"
timestamp:"2014-10-30 09:21:32" data_extra:""}
{"type":"letter_drag_right" data:"" timestamp:"2014-10-30 09:21:34"
data_extra:""} {"type":"letter_drag" data:"u"
timestamp:"2014-10-30 09:21:34" data_extra:""}
{"type":"letter_drag_right" data:"" timestamp:"2014-10-30 09:21:42"
data_extra:""} {"type":"letter_drag" data:"n"
timestamp:"2014-10-30 09:21:44" data_extra:""}
{"type":"letter_drag_right" data:"" timestamp:"2014-10-30 09:21:45"
data_extra:""} {"type":"letter_drag" data:"a"
timestamp:"2014-10-30 09:21:49" data_extra:""}
{"type":"letter_drag_right" data:"" timestamp:"2014-10-30 09:21:49"
data_extra:""} {"type":"play_word_sound" data:"päivä"
timestamp:"2014-10-30 09:21:52" data_extra:""}
{"type":"show_word_picture" data:"päivä" timestamp:"2014-10-30
09:21:54" data_extra:""}
```

Figure 3-12: Example of a DigLin log file extract in the dataset for half a minute

3.10.3 Questionnaires

In order to evaluate the developed DigLin system and its usefulness in the literacy classroom, all participants were asked to complete three questionnaires. The questionnaires were designed to be presented at different stages of the use of DigLin, when learners completed 10, 25, and 50 hours. (Note that the second and third stages were not relevant to English because no participants spent more than 10 hours on the software). After each completed set of hours, the exercises were supposed to stop, and learners would then listen to an audio message in their mother tongue, which explained to the learner why the learning activity had stopped, and which also informed them to consult the teacher. The teachers were then required to show the learners how

to proceed with the questionnaire and make sure they finished it. The questionnaire included the following questions:

I like working with these lessons on the computer.					
I find this exercise useful (Drag the letters)					
I find this exercise useful (Listen and drag the words).					
I find this exercise useful (Form and drag the words).					
I find this exercise useful (Listen and type).					
I find this exercise useful (The words).					
I find this exercise useful (Read the words).					
It is fun to work with these lessons on the computer.					
I would like to participate more with these lessons on the computer.					

Figure 3-13: Sample of questionnaire after completing 10 hours on DigLin

The questionnaires were designed to enable the learners to understand what the answers were by looking at the emoji characters. So, after listening to the recordings, the learner would then choose which emoji would describe their response. After 50% of the participating learners had completed their questionnaires, learners would be sent a link to the next questionnaire. They were then asked to fill it out as soon as they received the notification.

For the participants in the present study, only two of them completed 10 hours of using the software. Even though the number of questionnaires was so small, the study included in the qualitative analysis data from these two questionnaires. (The results of questionnaires for all the DigLin project languages can be seen in Appendix M.) The results of the two participants that completed the questionnaires are concluded in the learners' profile section.

3.10.4 Interviews

For gaining more insight into details of the learning process, short interviews with all participants followed after the field testing. Learners were interviewed face-to-face with the presence of an interpreter in their mother tongue. These interviews were semi-structured, which involved a less rigid set of questions as a guide (Mackey & Gass, 2005) and included generally open-

ended questions aiming at finding more specific information and eliciting views about why they used the software the way they did, whether the learning process was suitable, what goals they achieved, and what suggestions they may have had for improving the software (such as the sample interview of one of the participants seen in Appendix N). Teachers were also interviewed in a similar process with similar questions. The reason behind using interviews was to obtain information that may not have been discernible from the observations alone, such as the participants self-reported perceptions or attitudes (Mackey & Gass, 2005, p.173).

3.11 Qualitative data analysis:

The qualitative data used in this study, such as the interviews and the questionnaires for each learner in the study, was part of the DigLin project conducted to see how learners coped with the software and how they felt while they were learning. Questions were asked to see how the learners dealt with the software. When the interviews were complete, the researcher tallied the answers and analysed the results by using a Computer Assisted Qualitative Data Analysis (CAQDAS) software tool called **MAXQDA** (MAXQDA Plus - Version 11 [Computer software]. Berlin, Germany: VERBI GmbH) to analyse the responses. The results were then coded, retrieved, and then analysed following a thematic content analysis method in which the data was interpreted based on the themes mentioned above (A screen shot of the Qualitative analysis using the MAXQDA for the interviews can be seen in Appendix O).

The same applies to the data extracted from the log-files in Appendix L which is a sample of the data stored in the DigLin database. This data allowed the researcher to analyse the software to try to identify the strategies that the learners followed to develop grapheme-phoneme correspondence.

As mentioned earlier, the qualitative data was collected from three different sources: (a) log-files which are stored in the database software, (b) researcher's notes and journal of classroom observations, and (c) interviews of the participants. Because the data collected was from three

different sources, the analysis results of these different strands of data will be presented separately and then an overall presentation of the qualitative data will be discussed based on themes generated from the research questions.

Below is a table summary of the set of research questions and data collected to answer them.

<u>Research Questions</u>	<u>Data collected</u>
RQ1. What is the impact of the use of CALL tools on learners' ability to decode words?	Pre-test and post-test
RQ2 Does phonological awareness in a second language correlate with reading development (decoding) in English as a second language?	Pre-test and post-test
RQ3 Does literacy in L1 have a positive effect on the development of L2 decoding?	Pre-test and post-test along with biographic data about learners' educational backgrounds
RQ4 Does the use of a computer-based phonics software (DigLin), as a supplement to traditional instruction, more effective in increasing phonemic awareness and decoding than receiving traditional instruction solely?	Comparison of pre-test and the post-test results of control group and the experimental group
RQ5 Does length of residence in the target language country influence their ability to decode words?	Pre-test and post-test results along with biographic data about learners' LoR
RQ6 Does the amount of input through using the computer software correlate with their development of decoding?	Pre-test and post-test results along with information about amount of spent on Dig Lin
RQ7 What are students' and teachers' attitudes towards the use of DigLin in terms of: how they dealt with the software, whether they succeeded in learning how to decode, and whether they learned better when they work independently?	Observations, log-files and interviews.

Table 3-8: Summary of the research questions and relevant data

3.12 The intervention process and procedure

After providing a thorough description about the software and what it entails, it is important to provide the intervention process in much more detail. The whole intervention was conducted in four phases which are summarised earlier in Table 3-3 above. The intervention took place immediately after the pre-test phase. During the intervention period, the teachers and teaching assistants were available to help the learners if they were having difficulty. All pre-testing and post-testing were carried out in a quiet room in the colleges. The stimuli were presented by the researcher to each individual learner in a single session before and after they had used the software. This took

approximately 30 minutes after the instructions were clear for the learner. The researcher then presented the stimuli to the learners. Instructions were given prior to the test, individually to every learner, ethics was explained, and they signed consent forms. The process of testing the learners took around three days.

As explained earlier there are two groups that were tested: 1) a control group and 2) an experimental group. For the control group, the learners were briefly interviewed in order to have detailed information about their background. They were given the pre-test that was described earlier before they received any instruction that semester by their regular teacher. The method of teaching phonics to the control group to the learners was similar to the content of DigLin but it was not individualized or in CALL mode. This is the main reason why this particular group was chosen. In addition, the amount of time the learners received phonics instruction was roughly similar to what they could receive from DigLin (e.g. at least 30 hours). Control group learners received one hour of phonics instruction two days a week. The experimental group did not get phonological awareness training or phonics along the lines of DigLin or in the control group in their ESOL classrooms during the treatment period this can be seen in the syllabus provided in Appendix K .

During the intervention process, the researcher observed the learners and took field notes to track their behaviour and their attitudes and reactions towards the activities (the latter was also for the DigLin project itself, as noted earlier). The first session with the learners was mostly an introductory session to gather some data about their first and other languages and also their emergent literacy skills including environmental print recognition, grapheme knowledge and rhyme ability (Teale & Sulzby, 1986). This was done through one-to-one sessions that the researcher had with the learners to conduct the pre-test just before the learners started the treatment. It was difficult to communicate with the some of the learners because of the language barrier. Persistence was required and learners eventually figured out what was expected of them. Some of the learners

also did not have any experience with technology; that is, they were computer illiterate and not yet smart phone users. This was a challenge for the participants and researcher alike at the beginning of the study. Some of the others had smart phones, but were not familiar with using computers, e.g. with using a computer mouse or logging into sites requiring passwords.

The first two weeks of the intervention were not very successful as there were many technical issues that the software encountered whilst learners were in the process of familiarizing with the program. During these sessions the researcher continued providing the learners with tasks and handouts until the problem was resolved. One of the major issues that was not resolved was the use of automatic speech recognition, as mentioned before. Many teachers were most intrigued by this feature of DigLin, and as a result, some of the teachers thought that DigLin would not be useful for learners and may have been one of the reasons why the number of learners decreased during the study.

Before completing the intervention, learners were interviewed to answer several questions related to the research questions about how they found the software and how they coped with it. These interviews were translated from the native languages of the participants into English and this took a considerable amount of time when the language was not Arabic, the native language of the researcher. For the learners for whom no native language interpreter could be found, the researcher had to search for an alternative (Bengali, Dari, Russian and Urdu). Two of the learners whose first language was Tigrinya, also knew Arabic, and the interview was conducted in Arabic. A sample of the interview and how it was analysed can be seen in the Appendix N and O.

For a visual representation about the data collection process, see Figure 3-14 on the next page.. Details of the individual differences in the experimental group will be presented in the Results chapter.

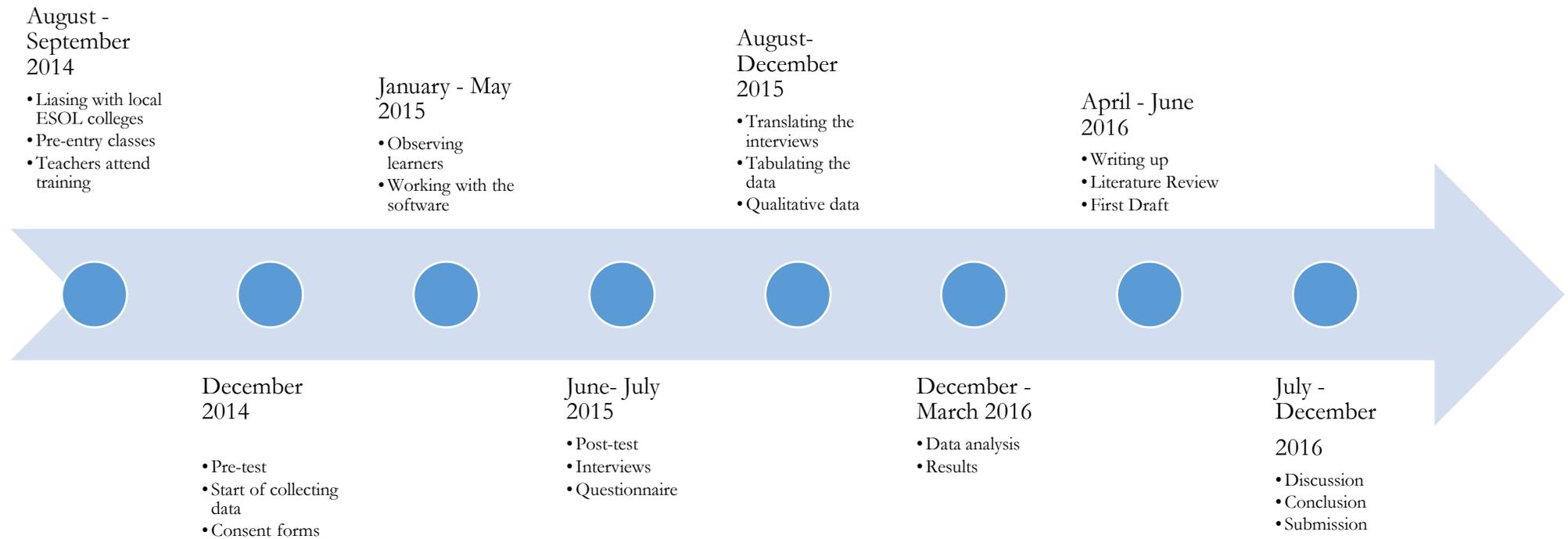


Figure 3-14: Timeline of the data collection process

Chapter 4: Results

4.1 Introduction

This chapter will present the results from the pre-test and post-test conducted to test the hypotheses of the study as well as the qualitative data discussed in the previous chapter. The structure of the chapter is divided according to the type of data and how the data was analysed. First, the quantitative data will be presented, which includes the descriptive statistics and results of the pre- and post-test tasks that were administered to both the experimental group and the additional control group. These data address the following research questions:

RQ1: What is the impact of the use of CALL tools on learners' ability to decode words?

RQ2: Does phonological awareness in a second language correlate with reading development (decoding) in English as a second language?

RQ3: Does literacy in L1 have a positive effect on the development of L2 decoding?

RQ4: Does the use of a computer-based phonics software (DigLin), as a supplement to traditional instruction, more effective in increasing phonemic awareness and decoding than receiving traditional instruction solely?

RQ5: Does length of residence in the target language country influence their ability to decode words?

RQ6: Does the amount of input through using the computer software correlate with their development of decoding?

The chapter will then present a descriptive analysis of the qualitative data to address these research questions:

RQ1: What is the impact of the use of CALL tools on learners' ability to decode words?

RQ7: What are students' and teachers' attitudes towards the use of DigLin in terms of:

- a. how they dealt with the software,

- b. whether they succeeded in learning how to decode,
- c. and whether they learned better when they work independently?

As described in the previous chapter, there were initially 30 learners who agreed to participate in the study. As is the case with studies of low- literate adult learners (see e.g. Smyser, 2016), the final number was smaller. Two-thirds of the learners had to be excluded (see Chapter Three for full details) because they were not available for both tests or for the other types of data collection. Only one-third were included. This left us with the following 11 learners. (Repeated below in Table 4-1 for ease of access). Prior to the treatment, these learners were administered a pre-test. These results were then compared with the results of the control group.

Name	Age	Gender	LOR in L2 Months	Literacy in L1	Former Schooling in L1	L2 Oral skills	L2 Literacy skills	Other L's	Amount of time on DigLin
Nadia	29	f	19	Arabic: literate	Yes	A1	A1		715 (11,91h)
Abid	35	m	33	Arabic: literate	Yes	< A1	A1		522 (8,70h)
Eyob	33	m	18	Tigrinya: words	Yes	< A1	<A1		756 (12,60h)
Hamdi	39	m	12	Arabic: literate	Yes	< A1	<A1		210 (3,50h)
Yodit	31	f	28	Tigrinya: words	No		<A1		290 (4,83h)
Iftikar	54	f	420	Punjabi: No	No	< A1	<A1		620 (10,33h)
Sabira	25	f	36	Punjabi: words	No	<A1	<A1	Urdu	581 (9,68h)
Aisha	51	f	360	Arabic: words	No	A1	<A1		382 (6,36h)
Esaf	36	m	24	Dari: words	No	A1	<A1	Urdu-Farsi	396 (6,60h)
Gabor	42	m	24	Farsi: words	No	<A1	<A1	Dari	436 (7,27h)
Victor	51	m	180	Russian: No	No	< A1	<A1		812 (13,51h)

Table 4-1: Biographical data of the experimental group (DigLin)

4.2 Development of phonemic awareness and decoding

4.2.1 Descriptive statistical analysis of the pre-test and post-test data

The primary question of interest was to determine the effectiveness of using DigLin to develop phonological awareness and decoding by these adult low-literate learners. The first

question was to see whether the intervention of using CALL (in our case using DigLin) had an impact on their ability to decode words for the experimental group. To answer this question, a paired t-test was considered to determine whether there is statistical evidence that the mean difference between the pre-test and post-test had any significance.

Before conducting the t-test, the main assumptions of Paired t-test were checked.

Assumption 1: The dependent variable should be metrics. This assumption was met by the data of this study. The dependent variables were pre and post-test scores that can be measured in the interval ratio level.

Assumption 2: Randomisation of the sample. It is assumed that each participant was randomly selected from the population.

Assumption 3: Normality of the dependent variables. The difference between the dependent variables was approximately normally distributed as shown in Figure 4-1 and Figure 4-2. In addition, no outliers were observed as shown in Figure 4-3.

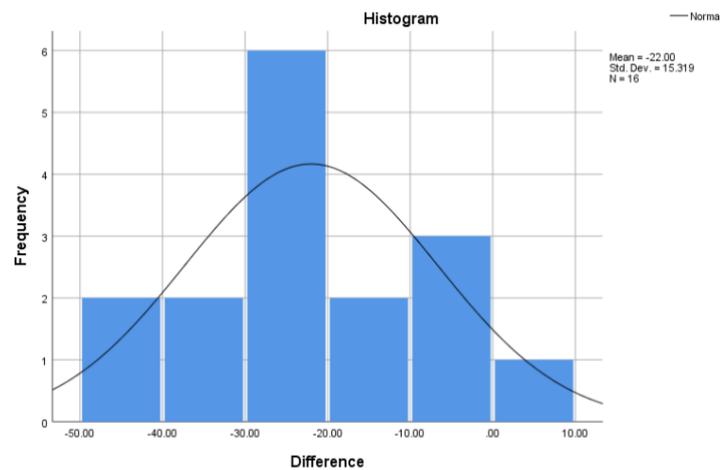


Figure 4-1: Normality by Histogram

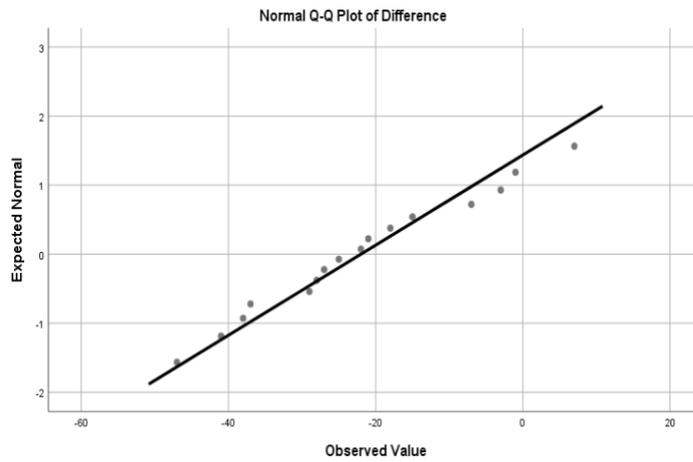


Figure 4-2: Normality by P-P plot

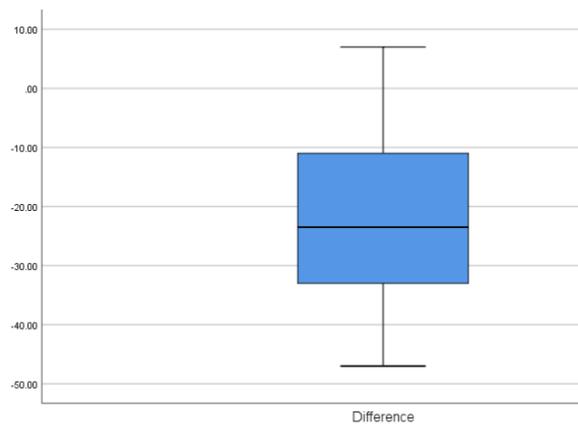


Figure 4-3: Box plot to examine outliers

Therefore, the results of testing the assumptions of Paired t-test showed that the data is fit to conduct the test. Accordingly, pre- and post-test responses were grouped and coded using SPSS [IBM Statistical Package for Social sciences, for Windows, version 22.0] (IBM Corp., Armonk, N.Y., USA) for all phonological awareness measures presented in table Table 4-2 below:

Phonological awareness tasks	N	Minimum	Maximum	Mean	Std. Deviation
Rime awareness Pre	16	3	8	6.06	1.731
Rime awareness Post	16	4	10	8.06	1.914
Onset awareness Pre	16	4	8	6.06	1.436
Onset awareness Post	16	3	10	7.56	2.159
Phoneme Awareness (Initial) Pre	16	0	3	2.19	.981
Phoneme Awareness (Initial) Post	16	1	4	3.13	1.088
Phoneme Awareness (Medial) Pre	16	0	3	1.81	1.047
Phoneme Awareness (Medial) Post	16	2	4	3.06	.854
Phoneme Awareness (Final) Pre	16	0	3	1.13	.957
Phoneme Awareness (Final) Post	16	0	4	2.25	1.183
Monosyllabic Reading Pre	16	0	8	3.81	3.103
Monosyllabic Reading Post	16	0	15	9.75	4.235
Bisyllabic1 Reading Pre	16	0	8	2.44	2.732
Bisyllabic1 Reading Post	16	0	14	8.63	5.227
Bisyllabic2 Reading Pre	16	0	6	1.81	2.316
Bisyllabic2 Reading Post	16	0	9	5.63	3.324
Bisyllabic (Survival daily) Reading Pre	16	0	6	1.81	2.167
Bisyllabic (Survival daily) Reading Post	16	0	9	5.31	3.321
Trisyllabic (Survival daily) Reading Pre	16	0	6	1.63	1.962
Trisyllabic (Survival daily) Reading Post	16	0	9	4.19	3.468
Valid N (listwise)	16				

Table 4-2: Means, standard deviations per task

Learners who received training using the computer-assisted learning tool 'DigLin' are predicted to show more progress in developing decoding. This addresses the research questions which asked whether learners who received training by using DigLin would have positive results than learners who received normal traditional teaching. For this, a t-test was administered to compare the means of the experimental group and the control group in the pre-test and the post-test. Table 4-3 below indicates the responses of the experimental group and the control group

which were compared and are reported according to the statistical significance level which is set at a $p \leq 0.05$ level in line with social sciences conventions (Larson-Hall, 2010).

The data show that there was significant difference in all the 10 measures for the experimental group who received training by using DigLin. As mentioned above, by applying a paired sample t-test, the results revealed that the DigLin group significantly outperformed the control group in their performance, especially in the reading tasks where the mean difference was ≥ 3 . For the control group, only the phoneme awareness task appeared to be significant. Therefore, this answers the question about whether training with the software improves the phonological ability that underlies readers' decoding, whether it improves their decoding, and hence develops basic reading skills.

Groups	Tasks	Mean	Std. Deviation	t	df	Sig. (2-tailed)
Experimental Group	Rime awareness	-2.364	1.502	-5.221	10	.000*
	Onset awareness	-1.909	2.343	-2.702	10	.022
	Phoneme Awareness (Initial)	-.909	.944	-3.194	10	.010*
	Phoneme Awareness (Medial)	-1.364	.924	-4.892	10	.001*
	Phoneme Awareness (Final)	-1.364	.924	-4.892	10	.001*
	Monosyllabic Reading	-8.091	2.343	-11.452	10	.000*
	Bisyllabic1 Reading	-7.636	3.443	-7.356	10	.000*
	Bisyllabic2 Reading	-5.182	2.040	-8.423	10	.000*
	Bisyllabic (Survival daily) Reading	-5.000	1.897	-8.740	10	.000*
	Trisyllabic (Survival daily) Reading	-3.818	2.483	-5.101	10	.000*
Control Group	Rime awareness	-1.200	1.095	-2.449	4	.070
	Onset awareness	-.600	1.817	-.739	4	.501
	Phoneme Awareness (Initial)	-1.000	.707	-3.162	4	.034*
	Phoneme Awareness (Medial)	-1.000	1.000	-2.236	4	.089

Phoneme Awareness (Final)	-.600	.548	-2.449	4	.070
Monosyllabic Reading	-1.200	5.404	-.497	4	.646
Bisyllabic1 Reading	-3.000	3.937	-1.704	4	.164
Bisyllabic2 Reading	-.800	1.924	-.930	4	.405
Bisyllabic (Survival daily) Reading	-.200	.447	-1.000	4	.374
Trisyllabic (Survival daily) Reading	.200	.447	1.000	4	.374

Table 4-3: Paired sample t-test between the experimental group (DigLin) and the control group

4.3 Task performance

By providing a basic descriptive analysis of the tasks that were administered to the learners, analysis of the data has shown that there was a significant variation in the performance of the pre-test and the post-test of the experimental group but not the control group. In addition, the scores of the above subtasks were combined as such: ‘rime and onset awareness’ together, phoneme awareness tasks combined, and all the reading tasks were grouped into one. The figures below have clearly indicated that the participants in both groups had achieved higher scores in the post-test compared to their performance in the pre-test. Figure 4-4 below illustrates the results of the mean scores of their performance for rime/onset awareness tasks before training on the software and by comparing it with Figure 4 2, indicating that the progress was mostly evident in the single- word reading tasks. The five learners *Hamdi, Iftikar, Sabira, Gabor and, Aisha* from the DigLin group scored zero or one in reading on the pre-test, and in the post-test, they have achieved higher results.

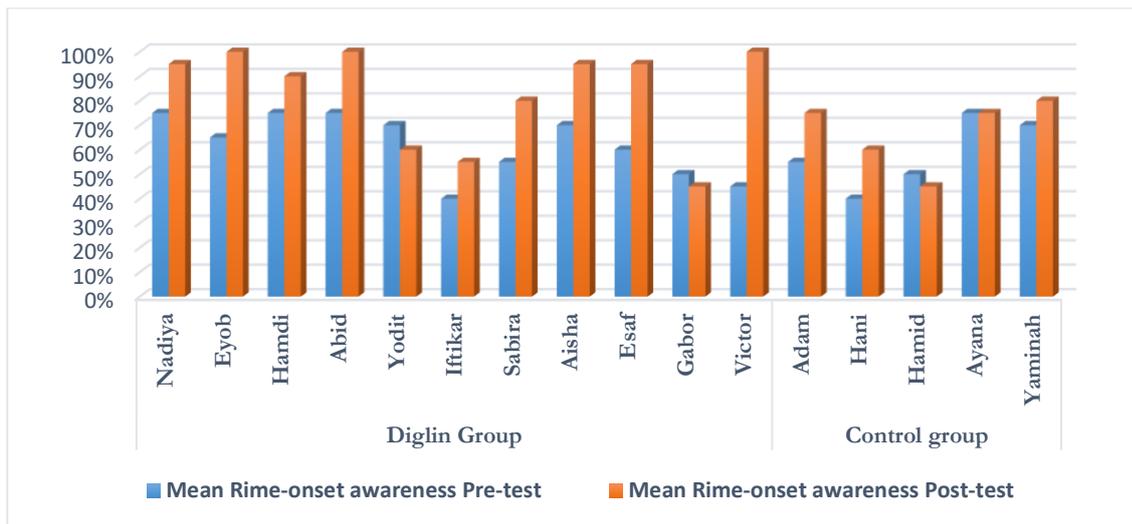


Figure 4-4: Pre-test and post-test mean scores for rime/onset awareness task

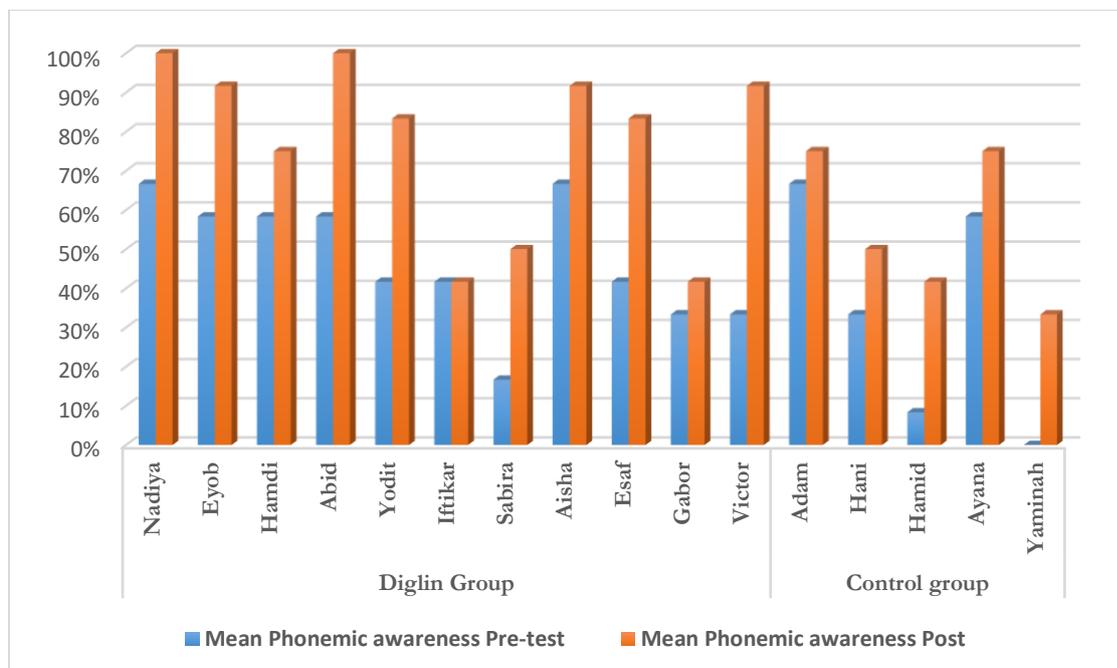


Figure 4-5: Comparison between the performance of phonemic awareness task of the DigLin group

By comparing results of other tasks on the pre-test vs. the post-test, three learners (*Eyob*, *Abid*, and *Victor*) in the DigLin group have performed at ceiling on the rime and onset awareness tasks after training with DigLin. The control group also improved slightly – but not significantly

better - except *Wage* who did not show any progress compared to her performance in the pre-test. The figures show that the rime and onset awareness tasks were the highest compared to the phoneme and reading tasks.

	Participant	Rime/Onset Pre	Rime/Onset Post	Phonemic awareness Pre	Phonemic awareness Post	Reading Pre	Reading Post
DigLin Group	Nadiya	75.00%	95.00%	100.00%	100.00%	50.67%	89.33%
	Eyob	65.00%	100.00%	75.00%	91.67%	30.00%	76.67%
	Hamdi	85.00%	90.00%	66.67%	75.00%	0.00%	44.67%
	Abid	90.00%	100.00%	83.33%	100.00%	20.67%	87.33%
	Yodit	85.00%	60.00%	66.67%	83.33%	46.00%	82.00%
	Iftikar	40.00%	55.00%	58.33%	50.00%	0.00%	28.00%
	Sabira	55.00%	80.00%	16.67%	50.00%	0.00%	23.33%
	Aisha	85.00%	95.00%	100.00%	100.00%	1.33%	81.33%
	Esaf	75.00%	95.00%	41.67%	91.67%	20.00%	84.00%
	Gabor	50.00%	45.00%	33.33%	50.00%	0.00%	67.33%
Victor	55.00%	100.00%	33.33%	100.00%	28.00%	76.67%	
Control Group	Ahmad	75.00%	85.00%	91.67%	83.33%	75.33%	79.33%
	Habiba	50.00%	75.00%	41.67%	66.67%	9.33%	0.00%
	Mohammad	50.00%	65.00%	8.33%	41.67%	2.67%	12.67%
	Wage	80.00%	75.00%	75.00%	75.00%	42.00%	42.00%
	Yasmin	70.00%	90.00%	0.00%	33.33%	5.33%	9.33%

Table 4-4: Overview learner performance on subtests

The table above shows, that almost all the learners except *Iftikar* performed a score of above 50% in the Rhyme and Onset awareness tasks even before they started the intervention. All of the learners achieved higher results later in the post-test except two learners (*Yodit and Gabor*) who achieved lower scores after the intervention. In the phonemic awareness tasks, despite all the

other learners who all showed improvement in the post-test, *Nadiya* and *Aisha* were able to achieve perfect scores in these tasks.

Moreover, as mentioned previously, the most compelling performance achieved from all of the tasks was the single-word reading in both groups. Most of the learners were not able to read any of the words presented to them. However, after training with DigLin, learners were able to attain better results in the post-test.

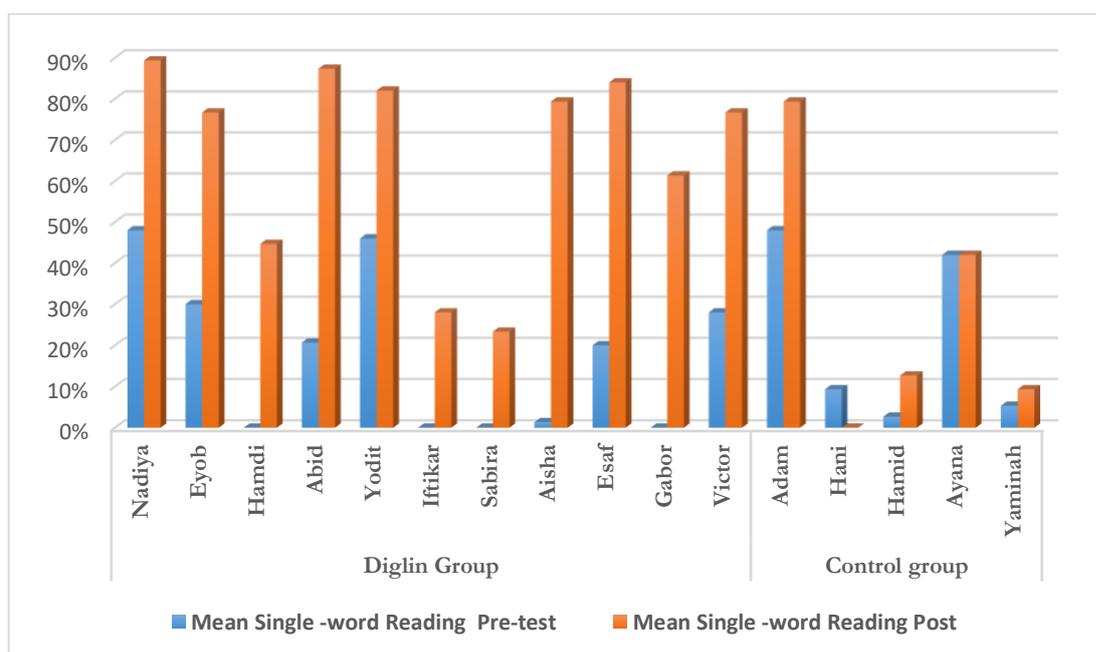


Figure 4-6: Comparison between the performance of Single-word reading of the DigLin group

4.3.1 Exercise tracking

Now we turn to how the experimental group learners made this progress in relation to what they did with the DigLin materials. An analysis of the log files for the 11 learners, as a group, shows that for the duration of the training, learners undertook a variety of exercises, but particular ones were favoured compared to others. From the log files, for example, the data shows that the learners mostly preferred the exercise ‘The words’, as illustrated in Figure 4-7below. This was the exercise which allowed them to listen to the words and also each sound of that word individually. The

reason for choosing this exercise could be for a number of reasons. First, there is a need for learners to know what the sounds are and what their corresponding graphemes are, and therefore learners practice more to gain a firm foothold with these words. Second, learners are required to only listen to the words and also the picture associated with it and this requires less effort than the other exercises. Finally, the number of tokens in this specific exercise was greater compared to the other exercises with a total number of 1013 instances.

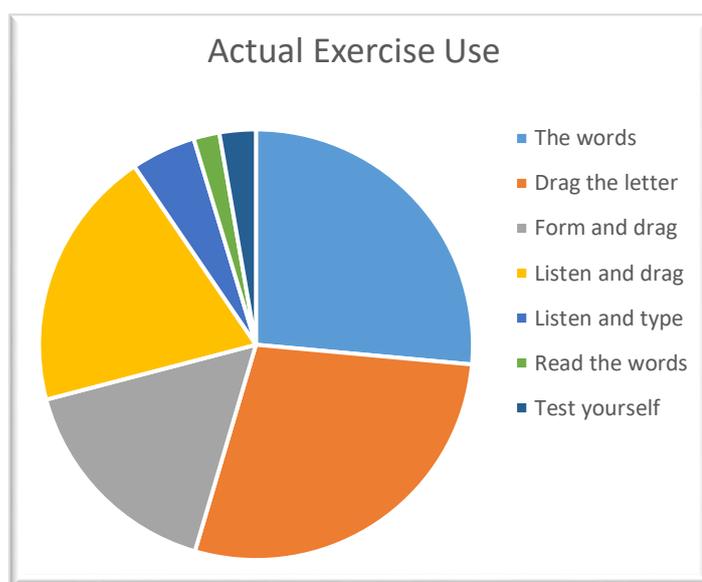


Figure 4-7: Task preference among learners

When we look at individual learners, we see great variation. However, for the entire group, the least preferred exercise was ‘Read the words’; but this was due to the technical difficulties described in Chapter Three. It should be noted, as already stated in Chapter Three, that none of the participants achieved the expected training time of 50 hours set by the DigLin project. The log files revealed that the users were tested by the software that was part of the program on a regular basis, for example twice a week, sometimes even more often.

The log file data also indicate problems with availability of both CALL tasks and the hardware which supports it. The tested CALL application ran only online on desktop or laptop computer systems. Its availability, and thus its usage, should be increased with off-line versions

and/or applications for other electronic devices such as tablets or smartphones.⁵ It is also possible that the participants in the study were not able to see the connection between the CALL tasks and their tasks outside the classroom and did not attempt to use it on desktop or laptop computers which may have been available to them outside the classroom.

4.3.2 Feedback (correct vs. incorrect responses)

Feedback according to Hattie and Timperley (2007) is defined as “information provided by an agent (e.g., teacher, peer, book, parent, self, experience) regarding aspects of one’s performance or understanding” (p. 81). The importance of providing feedback through computer based instruction has shown to be effective in increasing learners’ learning progress (see Hattie & Gan (2011) for a full discussion). Provision of immediate and individualized feedback was in particular one of the aims of the DigLin project. Learners’ use of the software should be at their current level and then its difficulty should increase simultaneously with their development. This sort of input can best be provided by “an artificial instructor” which is ideally one that can accompany the learner, whether in or outside of the classroom. Unlike traditional group-based teaching settings, CALL applications such as DigLin provide learners with individualised learning with feedback at a convenient time and place (van de Craats & Young-Scholten, 2013).

From the log file data, the dataset shows that learners differed in their feedback responses. For example, *Nadia*, a learner who from the log file data and later in the interviews, showed that feedback had motivated her to learn more and to try her best until she achieved the correct response. This was also observed in the behaviour of *Victor* whose actions showed his disappointment when there was an incorrect response and who then allowed himself to make

⁵ The software has since been developed in this direction by Jan Deutekom at Friesland College.

several attempts to complete the exercise until he reached an amount of correct answers he was satisfied with.

4.4 The effect of the amount of input on the development of decoding

With regards to Research Question 6 which probed whether the amount of input through using the computer software correlated with its development of decoding, both quantitative and qualitative data were used to answer the question. During the course of the treatment, it was posited that once the learners were able to familiarise themselves with the software, they would then use the software at their convenience. This was based on one of the main aims of the DigLin project which was to promote autonomy and self-directed learning where learners would use the software at their own pace and in their own ways. The assumption was that if the learners worked on the software for more hours, then they would improve in their development in decoding. The log-files provided the number of hours through the timestamps. These showed that learners greatly varied in terms of the time spent on the software. Although there was a designated time for them during their class, they were told that it was possible that they work at home if they had access to a computer. After the 11 learners had, as a group, completed the treatment, analysis of the log files showed that the learners, as a group, worked on the DigLin exercises an average of 539 minutes or 13 days across the 6 months of the treatment. This results in an average of 41 ½ minutes per day.

Average of total minutes	Average number of days	Average of time spent per day
539.2727273	13.81818182	41.55545455

Table 4-5: Mean number of minutes, days and time per day spent on DigLin

In Table 4-6 below, the time spent for each individual is shown. However, from the log files it is indicated that there is great variation in the amount of time worked on the software among

learners. The log files also showed that for example, Nadia, worked on the software from home after she became familiar with the software in class. Time spent on the software was also related to the technical difficulties faced at the further education colleges which were not diagnosed sufficiently quick.

Name	Total min	Number of days	Average per day
Nadia	733	12	61
Eyob	734	20	36.7
Hamdi	590	19	31.05
Hamdi	159	3	53
Yodit	329	7	47
Aisha	295	12	24.5
Iftikar	599	16	37.43
Sabira	598	19	31.47
Gabor	559	12	46.58
Esaf	590	19	31
Victor	746	13	57.38

Table 4-6: Average amount of time spent on the software per day

A further statistical analysis was carried out to address Research Question 6 which asked whether the performance of low-literate adult learners who received training with DigLin would increase over time. For this, a Pearson's correlation calculation was conducted to determine whether there was any correlation between time and their performance after receiving the training. Prior to conducting the analysis, the assumption of normally distributed difference scores was examined.

group		Amount of time spent (min)	Mean rime/onset Pre-test	Mean Phoneme awareness Pre-test	Mean Reading Pre-test	Mean rime/onset Post-test	Mean Phoneme awareness Post-test	Mean Reading Post-test
Amount of time spent_min	Pearson Correlation	1	-.403	-.097	.311	.290	.146	.051
	Sig. (2-tailed)		.219	.777	.353	.386	.668	.882
	N	11	11	11	11	11	11	11

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

c. Cannot be computed because at least one of the variables is constant.

Table 4-7: Pearson's correlation between time and learners' performance after training

The results show that although there were no significant differences among the experimental learners and the amount of time, they spent on DigLin, there was clearly a positive correlation compared to before they started training where it indicates there was a negative correlation. That is, learners who spent more time on the DigLin software had significantly better results in their post-test. Nevertheless, it should be noted that the time spent on DigLin was indicated by the learner's continuous activity and his/her interaction with the mouse. In the software, once a learner stops using the mouse for a period of time, for example, writing on a piece of paper, or doing any other task, the program becomes idle and stops. Learners were sometimes given tasks to perform such as, the 'high expectation' tasks that would allow the learner to stay on the exercise but not use the mouse. For example, if the learners were asked to search for sounds that began with the letter 's', they would remain on the same exercise and working, still, with the software searching in the list of words without the use of the mouse. Therefore, learners may have had more actual time than what was actually shown in the log files.

4.5 Learner/ Participant Profiles

With respect to Research Question 7 was regarding what the learners' attitudes are towards the use of DigLin in terms of how they had used a computer before, which method of teaching they preferred, and whether they enjoyed working on their own. Because there were a number of differences among learners in this small group, a case study style report is appropriate. This will start with discussion of the literate learners in the study and then will proceed to the least literate. As noted in earlier chapters, prior to entering the ESOL classes, learners are required to take placement tests in order to place them in the appropriate class based on the level of their assessment. All the learners that were tested in the study were considered "pre-entry" learners, which is the level below the lowest Common European Framework of Reference for languages (CEFR). On all the tables thus far showing their biographic data, they are categorized as A1. However, some learners in the pre-entry classes from which the study participants came, had attended school and were literate in their native language; these learners are categorized as A1. The information in this section adds to the sort of detailed qualitative data on learners' reading skills and education which we find for example in Bigelow & King (2015), Pettit & Tarone (2015), and Tammelin-Laine & Martin (2015).

1. Nadia:

Nadia, who is Sudanese, arrived in the UK 19 months before the start of the study. She attended primary and secondary school in her L1. During her schooling, she also received very basic lessons in English. She reported that she was not able to speak the language very well. She only knew very few words and some letters but didn't know how to spell or read them properly. In the beginning of the project, Nadia was a bit shy and did not speak a lot. Nonetheless, she was one of the quickest to learn how to log in to the program which most of the others found difficult. She started listening to the words and learning how to pronounce them. She found the exercises

really challenging, but this encouraged her to study even more. Interestingly, Nadia was one of the learners who worked on her own. She completed 10 hours of learning with the software autonomously. After completing these 10 hours of DigLin exercises, Nadia showed progress in decoding and also learned a number of new words with their meanings. She reported that she found the exercise very useful and helpful in that every word is associated with a picture that lets her know immediately what that word means. She emphasised that DigLin for her was a relief because she was able to practice the words at home when her child fell asleep and listen to the words as if she had a tutor with her. She said it was very useful for her in terms of allowing her to be with her child and learn in the comfort of her home.

2. Abid:

Abid, was one of the participants who received schooling in their L1, but despite the fact that he had been in the UK for two years when the study started, he knew very little English. He had difficulty with letters that he found similar in his L1 Arabic, for example, /b/ and /p/. These two sounds were particularly difficult in that he could not differentiate between them, whether it was its spelling or its pronunciation. He also had difficulty understanding and interacting in English. By the end of the project, Abid was able to differentiate between the sounds and knew how to pronounce them accurately. To him, the two most helpful features of DigLin were that the software provided the correct pronunciation of the word and he knew that he was also able to receive feedback regarding his pronunciation as well. The other feature was that each and every word was associated with a picture. He found that compelling, saying “The best thing I see, is the translation of the words with its pictures. Pictures are a language that everyone understands.” Abid also was one of the students who worked autonomously as well as in the classes that were held in the college. However, by the end of the project, it seemed that Abid felt a bit uninterested and wanted more challenging exercises. He wanted to be taught how to form sentences and learn more complex

structures. Because this software was for beginning-level learners, he found it very simple after achieving 8 hours⁶.

3. Eyob:

Eyob, who came from Eretria, arrived in the UK a year and a half before the start of the project. Eyob attended only primary schooling but did not complete it. Given the fact that Eyob had some background in literacy, one would think that he would not have difficulties. However, one of the main issues that Eyob mentioned during the interview is that he had difficulty when logging in to the computer and also logging in to the DigLin program. This may have been linked to my observation that he was very quiet in the beginning of the program. He had gradually become more engaged by the end of the training and was able to freely ask questions about the exercises. However, Eyob was another learner who just before the end of the project, similarly as Abid, felt that the software was not getting him further. In his interview, he asked if there would be more advanced words or exercises that would help him form sentences. Although he said that the software helped him a lot, he was thirsting for more challenging exercises and said that if there were sentence-forming exercises that would teach him grammar and more complex sentences, the program would be ideal.

4. Hamdi:

Hamdi entered the course a bit later than his classmates. He enrolled after he had arrived from Syria, a year before starting the course. He had been engaged in several jobs but had not succeeded to settle in any of them because the level of his language was too low. When he first started the study, he only knew a few letters in English but did not know the exact pronunciation of them. He

⁶The DigLin team is now in the process of developing software that includes shorter and longer sentences and paragraphs.

found it difficult in the beginning, but as he mentioned, it got easier every day. He said he learned many words and their pronunciation from using the software. He stated that he didn't know anything before starting and noticed a big difference from the start. One of the most important points he mentioned was the benefit attained from using DigLin through listening to the words to hear the right pronunciation.

5. Iftikar:

She was one of the most interesting learners I came across with and the oldest one amongst her peers. Iftikar had no literacy in her L1 as well as being computer illiterate. To her, this was very challenging and tough in the beginning, but she was very keen in trying to proceed with this challenge. Although she had been in the UK for 35 years, she had not learned English. She was busy raising her children and her only contacts were with other Urdu speakers in her community. In the beginning of the course, she took a longer time in accommodating herself in how to use the mouse and clicking it. At the start, she did not recognise letters and did not know which sound was which. She was intimidated by the computer and was afraid that she might damage parts of it. However, despite all these challenges, she persisted on doing her best. However, she was still afraid to do something wrong and always wanted someone (a tutor or assistance teacher) to guide her or tell her what to do next. Later in the interview, by the end of the training, she expressed her enjoyment in working with the software, was pleased to listen to the words, and to learn each sound individually. She mentioned in the interview that she felt that she was able to learn how to read but she was still struggling with speaking. She highlighted the fact that learning how to use the computer was harder than learning how to read. During the interview, I asked her how DigLin helped her in reading. She said that, before, when she was given hand-outs prior to the beginning of a lesson, she used to look at the letters, but she could not identify which sounds were associated with them. However, after working with DigLin, she was able to differentiate between the sounds and attach them to letters and as a result, this has helped her to begin reading.

6. Sabira:

Sabira was the youngest learner involved in the study. She was also the most enthusiastic of them all. In the beginning she was shy and very quiet but once she got used to how the software worked, she started asking questions, such as how to go from one exercise to another. Sabira was eager to learn English and was willing to try anything new from the beginning of the training. Further in the training, Sabira always had questions to ask and usually participated in the discussions, such as answering high expectation questions. Although she did not know how to read and write in her L1 like Iftikar, Sabira did have a phone and was easily engaged with technology. So, she was keen on learning how to use the computer. She even brought an iPad once, which she wanted configured to be able to work on the software at home. Like the other learners discussed so far, she said she mostly enjoyed listening to the words and the sounds of the letters. One important observation that the teachers pointed out was that Sabira attempted to write the words down in her notebook. She said that activity enabled her to practice and memorise later; something that teachers have said they had never seen the learners do before.

7. Yodit

She was one of the quietest learners in the entire group. Her L1 was Tigrinya and had very limited literacy in it. Although there were many difficulties for completing the training time for her, she managed to continue and come for the training after classes. She started with no knowledge of English in the beginning and gradually improved. Yodit showed more potential when working alone. In the beginning of the training when working in groups to understand the instructions of how to use the software, Yodit appeared to be somehow distracted. Once every learner started working on their own, she enjoyed working on DigLin and said she did not realise how time had passed.

8. Aisha

Aisha was been the helper of the class because she spoke English very well and had good communication skills with the whole group. She also had a very good understanding of English orally due to the length of time she had remained in the UK at the time of the study (30 years). Although her length of UK residence was similar to Iftikar, Aisha had been in contact with native-speaking locals when she had the chance to work part-time in different places during this period. Despite this, she still did not know how to read and write in English and had little literacy in her L1, namely, Arabic. In the interview, she mentioned that she first learned English when her children came back from school and later when she was in contact with people at her workplace. She learned how to speak from them. The only thing that was not allowing her to progress or find a suitable job was that she did not know how to read and write. The most difficulty that Aisha found when she first started to work with DigLin was how to differentiate between the vowels. After using the software for over ten weeks, she mentioned in her interview that she thought she was never going to learn to read, and that it would never be possible. But by listening to the words through the software, she was able to discriminate between the vowels. She also found it useful that in some words, such as *lamb*, she realised that the last letter was silent and that the software helped her to discover this.

9. Gabor

Gabor was one of those learners who wanted to learn English very fast and thought that he could learn without any effort. Yet one interesting thing about him was his mention (several times) that he forgot very fast. He said that he started in the beginning of every class with good enthusiasm and by the end of the day, he got very bored. When using the DigLin exercises, the researcher would notice that he would move from one exercise to another without completing one whole exercise. Even in the exercises where he needed to match the sound with the letters, he would only drag without listening to the sounds. He would pick any letter randomly until he found

the right one. He was one of the learners that did not make much progress in the training, although he did occasionally ask what the differences between some of the letters and their sounds were.

10. Esaf

After working on DigLin for more than six hours over the ten weeks using DigLin, Esaf has found that he benefited from reading and spelling (which was the purpose of using the software) but he did not find it useful for listening. The major point that he emphasized was that he now recognises words when he sees them. He also said that nothing much had changed in what he already knew in terms of vocabulary. He did know some words but did not know what phonics were, (i.e. the idea of grapheme-phoneme correspondences) and the exercises helped him with how to pronounce the words. However, he said that he was still struggling with spelling, and said it may be because he was not able to remember all the words. He was also one of the learners who by end of the training, found it boring and asked whether there were more exercises for him to work on, other than the ones he already worked on.

11. Victor

Last but not least, we turn to Victor. He was the most dedicated learner in the group. As mentioned above with Yodit, he also had difficulty in finding time to use the software when at the college. Regardless, both have tried their best to find a time and continue working on DigLin on their own. Victor completed thirteen hours on the software, which was the minimum requirement for a learner to complete the first questionnaire within the context of the DigLin project. Victor was one of the most hard-working learners who worked on the software independently and went over all of exercise sets in the software. In the interview and through my observations of him, he found it very useful listening to the words and practiced saying them out loud to himself. However, he said that he needed more time to read them through to memorise them. Although it was not required for them to memorise the words, he found it more useful to do so.

Chapter 5: Discussion and Conclusion

5.1 General purpose of the study and preliminary implications

The general purpose of the study was to examine the effectiveness of using the computer software program DigLin in developing decoding skills by adult learners who were non- or low-literate in their own language and learning to read English for the first time. The study tested the effect of using the computer software as an intervention and used a test before and after the intervention. In this chapter, the study will address the research questions that the study set out to answer.

5.2 Impact of using CALL for developing decoding

The first question of this study (Research Question 1) was to examine what the overall impact of using CALL tools on learners' development of decoding. Self-directed technology-based learning tools have been an essential part of education, including in second or foreign language learning where it has shown potential, as discussed in Chapter Two. The present study has shown positive results towards the use of computer assisted language learning tools in improving decoding skills and word recognition regarding low-literate adult learners learning English as a second language. All the 11 learners have shown increasing improvement from their pre-test scores and the evidence has shown from the results that most of them maintained or improved their scores after using the software for over the 10 weeks of the intervention. According to Young-Scholten & Strom (2006), Trupke-Bastidas & Poulos (2007), and Young-Scholten and Naeb (2010), participants who are non-literate often show more gains with interventions showing more impact on them compared to participants who start out with some native language literacy skills. However, the paired t-test results did not show clear consistency in the learners' improvement in relation to their phonological awareness and the overall results of the study

showed some variation in terms of the learners' development on all tasks. However, on some measures of their reading and awareness, the learners in the experimental group showed significant improvement when compared to the control group who significantly improved in only the phoneme deletion task. Therefore, the study supports this assumption in that learners who were the least literate (in the present study Iftkar, Victor, and Sabira) were the learners who received the most gains from using CALL for developing decoding. Moreover, the interviews with them also show additional support for their improvement. For example, *Iftkar*, who was the least literate, has shown improvement in single word decoding when compared between the results of the pre-test and post-test. Furthermore, during the interview, *Iftkar* said (as interpreted by the interpreter): *“when I was given hand-outs and books, I didn't know what ABC was. But through this, it is much easier because that program speaks to me.”* This is a clear indication that software which supports individuals in learning how to decode plays a key role for LESLLA learners. This is done in a way that it opens doors for them which have been previously closed, and with basic literacy skills, allows them to start working towards fully engaging with the literate society around them.

In addition to the study participants' development in decoding, they were able to produce other important outcomes. Learners for whom their improvement was deemed impossible, as noted by their teachers, were observed to be keen on asking questions. Some were even spontaneously (without prompting by me or the teacher) trying to write what they have learned, which teachers found very impressive. The learners were generally highly motivated and keen to come for the training and hence improved their overall attendance in classes. In the beginning of the study, most of these beginning -level adults were unable to identify any of the words that were presented to them on the pre-test. The low scores in the paired t-test of the phonemic awareness tasks were strong evidence that learners had not yet developed what we know is essential for learning to decode in an alphabetic script such as English. Moreover, the performance of the

learners in the pre-test has shown that learners who were the least literate had the most difficulty in identifying the sounds and words, performing very low on the single word reading task. These results are consistent with the results obtained from various studies including the study by Young-Scholten and Strom (2006). Those non-literate in their native language in their study, who were adult migrants living in the US and spoke Vietnamese and Somali, also had similar results in that their performance in the phonemic awareness tasks which were considerably lower compared to the other tasks. They also found that there exists a strong relationship between phonemic awareness and single word decoding. Later, in a follow up study, Young – Scholten and Naeb, stated that: “there were no adults in the study who were able to decode / read words in isolation without manifesting phonemic awareness” (Young-Scholten & Naeb, 2010, p.83)

When considering some individual participants, for example, *Iftikar*, who performed very poorly on the pre-test, has shown very good progress after her use of the DigLin software. One of the teachers made the following statement: “I was really impressed by what happened with certain particularly weak students, whom you know, and I actually thought would never learn, but they did learn”. Although *Iftikar* did not seem to improve much in the phonemic awareness tasks, she did however, make gains in reading as shown by her results on the decoding task.

The data from the interviews also revealed that most learners were able to perform better when working by themselves. *Hamdi*, for example, enjoyed his time working on DigLin when listening to the words and comparing them together to closely see the difference between the phonemes. In addition, whenever he had a question, he would then point out what his question was. One of the questions he asked was: “*What is the difference between /a/ and /e/?*”. Interestingly, on his first day, although he started with no English language background and had very limited schooling in his L1, he was able to write down the graphemes for these two phonemes in his notebook. At the end of the training, *Hamdi* made very positive remarks about the software saying

that *“the software was a good program that helped us sound out words alongside the teacher. It helped us as students in the college and at home. To tell you the truth, my idea, this coming from an adult student, and you know how it is difficult to learn at this age. And, also, the class is 45 minutes and there are many students with me, so the teacher won’t be able to revise with you all the words that you’ve learned and can’t check whether the student is pronouncing the right sound or not. So, working with the program has helped a lot in this case. I can now go back and listen to the words again, practice at home. I can hear the words, I can repeat the pronunciation and the correct sounds, and I can even check my own pronunciation.”*

Another example comes from the learner *Sabira*, who stated in the interview with her that the best thing about this program was that she could use it anywhere. Especially in her case, where she was able to open DigLin at home after her son fell asleep and was able to practice the sounds and letters. This response was similar to *Nadia’s* case.

However, in other cases, there were fewer positive remarks by two of the other learners. There were learners such as *Ifikar* who had no literacy at all and still did not feel confident to work independently. She was one of the few learners who was not comfortable working alone. Every now and then she would ask someone to be beside her to assure her that she was doing the right thing. She confirmed this in the interview when she stated she was afraid that she would break something in the computer. It should be kept in mind that CALL materials enable learners to work independently but they do not require learners to do so. This is also true of the DigLin materials. If an individual student needs help from others, the teacher or other students should be prepared to provide this help.

5.3 Phonological awareness as a precursor for reading development

The second question of interest in the present study (Research Question 2) is whether phonological awareness in a second language correlated with reading development (decoding) in

English. This was evaluated by testing the learners in decoding single words from flash cards that they were presented with. The DigLin group showed significant improvement in their decoding scores following their treatment, while the control group showed no significant results in this measure. Thus, these results appear to show that learners can develop skills related alphabetic literacy (i.e. phonemic awareness, use of phonics–based training) through the use of the DigLin computer program. These results are consistent with the results by Caravolas, Volín, & Hulme (2005) and Málková & Caravolas (2015).

Another question that was probed is whether literacy in L1 has a positive effect (or negative influence) on the development of L2 decoding. Given that the language being learnt was English, learners who have a different writing system or even different Roman alphabetic orthography may have experienced a negative impact of this on their learning to decode. As discussed in Chapter 2, English orthography is highly irregular and almost half of the English words do not have a consistent grapheme-phoneme correspondence (Cucchiariini et al., 2015)

Learners who are trying to break the code are required to figure out how to connect graphemes with their associated phonemes. These associations, though systematic, also vary cross-linguistically, especially in the case of those whose first language writing system is not the Roman alphabet (Bassetti, 2009; Koda & Zehler, 2008) such as Arabic, Dari, Farsi, and Urdu in the present study. The same letters may symbolize more than one phoneme, and single phonemes may be represented by alternative graphemes. In the writing systems for these languages, the vowels are especially variable. This lack of transparency makes it harder for beginners who have some literacy in their native language to figure out the system of English without help.

5.4 Students' attitudes toward the use of DigLin⁷

Based on what has been put forward in Chapter 2 by Jamieson et al. (2005) and Wiebe & Kabata (2010), the present thesis examined the effectiveness of using the DigLin software by focusing on what both the learners and teachers perceived when interacting with the program during and outside of their classes. This, according to Jamieson et al. (2005), provides a more comprehensive picture of the reasons behind the effectiveness of CALL software.

As noted in previous chapters, current teaching tends not to include individualised CALL basic literacy software for low-literate adult immigrant learners. Therefore, the majority of the research has focused mainly on searching for appropriate teaching methods in normal teaching settings (Trupke-Bastidas & Poulos, 2007; Sosiński, 2017) It was interesting to see how learners achieved what they did when looking at answers to Research Question 7, namely, what the learners' and teachers' attitudes were towards the use of DigLin in terms of a) how they dealt with the computer software which was new to them, b) whether they succeeded in learning to decode, and c) whether they worked better when they worked independently.

For the first part, the interviews have shown in the responses related to what their attitudes were when dealing with the software, most of the learners had difficulty when they first started using the software especially in the case of logging in to the program. However, the learners gradually became used to the program by the end of the training. Nevertheless, one case in particular was of great interest. For example, one learner in particular, *Iftikar* who was the least literate, was very intimidated by holding the mouse and using the computer as a whole because she

⁷ A version of this section was presented at LESLLA's 11th annual conference which was held in St. Augustine, Florida, USA, November 11-13, 2015. Titled "What researchers, teachers, and learners believe about working with DigLin", it was presented by Marta Dawidowicz, Taina Tammelin-Laine, Enas Filimban, and Ineke van de Craats.

had never used a computer before. Despite all of the challenges, *Iftikar* has shown great determination in completing the tasks and insisted on trying her best to learn. She found that the most compelling feature of the software was being able to see her scores immediately. For her, she mentioned she was happy that she was achieving something.

The teachers have also expressed their thoughts on how the learners dealt with the software. One of the teachers quoted: “I was really impressed by how they were afraid in the beginning, for example, how to even open the computer and log in. Yes, we need to assist some of them, but overall, it helped them in many levels.”

The main aim of the DigLin software was to promote learners to work autonomously and on the level in which they found suitable. However, because it was promoted to be used by learners in the ESOL colleges, not many have had the chance to use it outside the learning centres.

5.5 Conclusion

The experimental study held in this one semester period illustrated the effectiveness of the DigLin software on the development of phonemic awareness and decoding skills. The hypothesis that the use of the software in teaching English phonics as a foreign language would enhance the students' motivation hence their performance in phonemic awareness and decoding was confirmed statistics have shown that the learners have gained the ability to decode words resulting from the intervention of using DigLin. The difference in the gains between the two groups was obvious and the result of the t-test / post-test data for the experimental group was statistically significant. Students developed their performance in the onset awareness and phoneme tasks. From the data obtained and their analysis it would be daring to draw conclusions. Because even if the results were significant, one should bear in mind that the study was conducted with a small sample size and over a short period of time. The program of the instruction provides a slight portion of what

decoding instruction can provide. Nevertheless, many criteria revealed that progress was achieved and more significantly in the group that received phonics instruction using DigLin.

Also, students generally have a favourable attitude towards using the software. They enjoyed working with the software and were looking forward to the lessons. Thus, there was a positive attitude which reflected in their achievement in the end of the intervention. All the reflections about the study which is learners' perception towards using DiLin, concluded that they using the software gave them much more confidence and that it had a positive effect on their learning process. In addition to this, reseach results displayed high percentages of positive attitudes towards using Diglin as a tool that helped them in developing reading skills which was also depicted in the statistical results.

The rest of the chapter will provide an overall conclusion that includes the contribution of the study, the limitations that study revealed and finally, implications and suggestions for future research.

5.5.1 Contribution of the research

The study has made a worthwhile contribution to expand the breadth of knowledge in the field of second language learning by taking a rare look at the reading development of non-literate adults in the vast population of second language learners. This has important implications for society as the world moves from the industrial towards an age of technology. The present study has provided an evaluation of one of the innovative technology-based language learning tools that may shape how non-literate adults gain literacy skills in their second language. Additionally, through applying theory to practice, we can provide better results in improving the development of English for migrant adults with no or low literacy in their native language. However, the strongest conclusion that can be drawn from this study is that developing phonemic awareness through the

use of DigLin seems to show much quicker gains than the normal classroom teaching for decoding and reading development. Although the task of learning to read in English is difficult due to the complexity of its orthography, after only ten weeks and not many hours for most of them, the learners in the experimental group were able for the first time to establish the relationship between the graphemes and phonemes and hence this boosted their development of basic decoding skills. Learners who received training by using the DigLin program as supplement to their normal teaching, have gained significantly compared to the results from the learners in the control group who received only their normal teacher-directed learning. The majority of the learners have shown that some even preferred the use of the software over their traditional teaching. The results of this research are important since there is a gap in the literature regarding the development of decoding and phonemic awareness of adult second language learners acquiring basic literacy skills for the first time in a language other than their first, and for some even developing computer skills for the first time.

5.5.2 Limitations of the study

Although this study has important implications for second language decoding development and for pre-entry-level ESOL, there were a number of limitations. One of the major limitations in the study was the total number of participants involved in the study due to the difficulty in recruiting adult learners who have no literacy in their L1. This means that the results do not allow for generalizability due to the small sample size. It would be interesting if a large number of learners were recruited in order to make generalizations.

While this study evaluated the efficacy of a computer-based phonics training software yielding some significant findings, certain other limitations need to be discussed. In addition, one of the major drawbacks of the software was the availability of all the technical requirements for it to be used. For example, the software can only be used if there is a computer or any tablet along

with a secure Wi-Fi connection that can allow the users to connect to the server at Friesland College in the Netherlands. This has caused a major problem when collecting the data, which was not diagnosed until partway through the treatment. Moreover, not all the colleges and programs in the region were able to give every learner access to a computer to work on his/her own. For this reason, the study ended up with only two colleges that agreed to participate and could provide learners with access to a computer in a computer room which then allowed every learner to use the software on his/her own.

Another problem was that the intervention was meant to include the feature of providing aural corrective feedback to the learners in a number of questions as seen in Chapter 3, namely, Automatic Speech Recognition. During the intervention, few weeks after it had started, it turned out there were firewall issues that did not allow the colleges to receive the data from Friesland College, where the developers were based. This has caused frustration and delay to the training process which ended up with the learners not being able to work on all the exercises in the DigLin software. These were addressed by completing the project without using the automatic speech recognition and focusing on the main goal which is providing the learners with a systematic tool specifically catered to their need that would help them develop decoding and hence reading.

It must be remembered that the DigLin program was developed based on the idea that learners would be able to work on their own and at their own pace. This includes working on the software outside of class. However, not all learners were able to do so, either because they were not able to afford it, or they were not able to configure the software for use on another device. Although some learners were able to use it outside the classroom, not all were able to access all the features that are available in a fully functioning software.

Another limitation faced was due to the learners' heterogeneity in terms of their literacy levels in their L1, their literacy level in English, and their different language backgrounds. It was difficult

to determine how much each learner should be required to achieve or whether the software was too simple for some of them. This relates to setting expectations appropriately for individual students. Thus, while some learners who were somewhat literate in their L1 found the software useful, others showed signs of boredom after a number of weeks of using it. The researcher found that the best way to improve this issue was by providing them with additional exercises (high expectations –similarly as in Appendix P) as mentioned in the methodology section. Learners would scroll through the software and find answers to the questions. This helped the learners to challenge themselves by working individually or in groups to see whether they were able to achieve the best results.

5.5.3 Implications for future research

The results of the present study support the positive impact of the use of the computer software DigLin on decoding development and phonemic awareness for adult migrants who have limited or no literacy in their first language. One of the interesting implications for future research would be to conduct a delayed post-test after running a similar study with a pre- and post-test and to do so with, as homogeneous a group of learners as possible. This would enable the researcher to see whether use of the DigLin software has long-term effects.

While this research provides additional support for the findings of previous research, a number of questions still remain. Although DigLin provides a systematic approach for developing decoding for adult immigrant learners, due to the aforementioned limitations, it would be very useful to improve the software itself by providing a variety of materials. For example, similar phonemic tasks that were administered before the testing or additional advanced levels for more advanced learners who are able to complete the tasks faster than others and become bored, are all useful.

Despite all these limitations, we can still claim the main outcome of this study was that the LESLLA learners who used the CALL software program, which was designed specifically for them to receive phonics based-training, improved significantly in several important aspects of phonological awareness skills and in their ability to decode single words. Moreover, since the study examined the response to the use of the software, learners' and teachers' perceptions have showed positive attitudes towards utilizing CALL materials for enhancing their ability to decode and hence, develop basic reading skills.

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Appendix

Appendix A: Test #1- Rhyme Awareness

(AURAL)

Name _____

Does the learner identify the odd one out?

Example

*	kid	zoo	lid
*	gate	plate	tool

				Yes	No	Comments
1	sap	tap	limb	_____	_____	_____
2	set	man	fan	_____	_____	_____
3	ship	lip	lump	_____	_____	_____
4	cup	ten	pen	_____	_____	_____
5	sill	pill	lap	_____	_____	_____
6	bow	tow	knee	_____	_____	_____
7	fold	old	plate	_____	_____	_____
8	brown	clown	pray	_____	_____	_____
9	toast	fox	box	_____	_____	_____
10	pea	see	ear	_____	_____	_____

Appendix B: Test #2- Onset Awareness

(AURAL)

Name _____

Does the learner identify the odd one out?

EXAMPLE

*	knob	knit	light
*	roof	fizz	red

				Yes	No	Comments
1	jam	jog	zip	_____	_____	_____
2	room	band	rim	_____	_____	_____
3	chip	shot	shed	_____	_____	_____
4	gold	gown	each	_____	_____	_____
5	bun	dog	dish	_____	_____	_____
6	tape	tube	day	_____	_____	_____
7	wrist	rice	tub	_____	_____	_____
8	zoom	zip	sit	_____	_____	_____
9	foil	fish	van	_____	_____	_____
10	pen	path	bean	_____	_____	_____

Appendix C: Test #3- Phoneme Awareness

(AURAL)

			<u>word produced</u>		
			Yes	No	Comments
A. Take the FIRST sound away from:					
<div style="border: 1px solid black; padding: 5px;"> <u>Example</u> Star Crow </div>	1	price	_____	_____	_____
	2	<u>f</u> use	_____	_____	_____
	3	sm <u>i</u> le	_____	_____	_____
	4	cl <u>o</u> ud	_____	_____	_____
B. Take the LAST sound away from:					
<div style="border: 1px solid black; padding: 5px;"> <u>Example</u> tar<u>t</u> col<u>d</u> </div>	1	be <u>ar</u> d	_____	_____	_____
	2	k <u>i</u> lt	_____	_____	_____
	3	te <u>n</u> t	_____	_____	_____
	4	mi <u>l</u> k	_____	_____	_____
C. Take the MIDDLE sound away from:					
<div style="border: 1px solid black; padding: 5px;"> <u>Example</u> ma<u>r</u>ch ve<u>s</u>t </div>	1	salt	___sat___	_____	_____
	2	waist	___wait___	_____	_____
	3	band	___bad___	_____	_____
	4	lamp	___lap___	_____	_____

Appendix D: Test #4-Word Reading

monosyllabic

word produced

Yes No Comments

A. Read the following words:

1	street	_____	_____	_____
2	clap	_____	_____	_____
3	jump	_____	_____	_____
4	beef	_____	_____	_____
5	fold	_____	_____	_____
6	quiz	_____	_____	_____
7	thumb	_____	_____	_____
8	pan	_____	_____	_____
9	wren	_____	_____	_____
10	string	_____	_____	_____
11	roll	_____	_____	_____
12	chop	_____	_____	_____
13	blow	_____	_____	_____
14	lamb	_____	_____	_____
15	hook	_____	_____	_____

B. Read the following words:

bisyllabic

		<u>word produced</u>		
		Yes	No	Comments
1	picnic	_____	_____	_____
2	matter	_____	_____	_____
3	jumping	_____	_____	_____
4	boiler	_____	_____	_____
5	booklet	_____	_____	_____
6	cookie	_____	_____	_____
7	playful	_____	_____	_____
8	daily	_____	_____	_____
9	pencil	_____	_____	_____
10	bundle	_____	_____	_____
11	shipment	_____	_____	_____
12	pilgrim	_____	_____	_____
13	roller	_____	_____	_____
14	caplet	_____	_____	_____
15	juggle	_____	_____	_____

c. Read the following words:

bisyllabic

		<u>word produced</u>		Comments
		Yes	No	
1	funny	_____	_____	_____
2	pupil	_____	_____	_____
3	moment	_____	_____	_____
4	open	_____	_____	_____
5	implant	_____	_____	_____
6	kitten	_____	_____	_____
7	police	_____	_____	_____
8	basket	_____	_____	_____
9	planet	_____	_____	_____
10	olive	_____	_____	_____

D. Read the following words: (survival-daily):

bisyllabic

		<u>word produced</u>		Comments
		Yes	No	
1	picture	_____	_____	_____
2	farmer	_____	_____	_____
3	letter	_____	_____	_____
4	open	_____	_____	_____
5	chicken	_____	_____	_____
6	circle	_____	_____	_____
7	camel	_____	_____	_____
8	hotel	_____	_____	_____
9	visit	_____	_____	_____
10	zero	_____	_____	_____

E. Read the following words (survival daily):

trisyllabic

		<u>word produced</u>		Comments
		Yes	No	
1	hospital	_____	_____	_____
2	aspirin	_____	_____	_____
3	nursery	_____	_____	_____
4	pharmacy	_____	_____	_____
5	funeral	_____	_____	_____
6	customer	_____	_____	_____
7	lavender	_____	_____	_____
8	bakery	_____	_____	_____
9	energy	_____	_____	_____
10	alcohol	_____	_____	_____

Appendix E: The sample of consent form in English

Information about DigLin – The Digital Literacy Instructor

Dear participant,

Thank you for your helping us with the project *Digital Literacy Instructor* (DigLin).

Our team consists of partners from the UK as well as Finland, Germany and the Netherlands. We have developed a new way of learning to read using computer software. This software is aimed to speed up learning to read in a new language.

The material consists of fun interactive exercises with sounds and pictures. You can practise what you are learning in class to improve your silent reading and reading aloud. Doing these exercises will help you in many ways including teaching you new words and giving you basic computer skills. We know it will be challenging at first, but there is no pressure since you can work at your own pace.

An important part of the materials is to give each student their own feedback. For some of the exercises, you will be able to read aloud into a microphone and the computer will show you which letters and words you are reading correctly and which ones you need to keep practising.

Your participation

In September/October 2014, we are going to start testing these materials in beginners' classes to see whether students like working with them and to find out what we need to improve. We are therefore asking you to be one of the first students to experience a new way of learning.

The computer software will be made available to you and your classmates and you will then work at your own pace. With your permission, we want to see how each individual student learns and uses the software. This will help us improve the software to give other students like yourself new opportunities to learn to read more quickly.

You will be able to access to the software from any other computer, so you can practise outside of the classroom.

After the study

The overall results will be published by the end of 2015. Of course, you are welcome to contact us any time for further information. If the development of the software will be expanded after the initial study, we will gladly provide you with all required data for accessing and using it further on.

Dates and locations

Start: between September 2014 and February 2015

Duration: around a term

Location: at your college

Contact

Professor Martha Young-Scholten, Newcastle University martha.young-scholten@ncl.ac.uk

Dr Lucy Martin, Newcastle University lucy.martin@ncl.ac.uk

Enas Filimban, Newcastle University enas.filimban@ncl.ac.uk

Rola Naeb, Northumbria University rola.naeb@ncl.ac.uk

Consent

We ask you to fill out the Declaration of Consent below. This shows us that you will voluntarily participate in the testing of the software and it confirms to you that we will keep any data we collect from you anonymous, so your identity is never revealed.

Declaration of consent

Dear student,

We are asking for your consent for participation in the international project Digital Literacy Instructor (DigLin) as you test the software we have created. All recordings, survey answers and interviews will be documented in written form (transcribed). Details regarding the examined situation (location, date, level of proficiency etc.) will be documented as well. The details of your identity will only be kept with this information and will never be available to anyone outside the four contacts mentioned above. All of your data will be treated according to Newcastle University ethics and The British Association for Applied Linguistics (http://www.baal.org.uk/dox/goodpractice_full.pdf) Each recording will be marked with a code number rather than a name before being digitally stored. These anonymised recordings will then be accessible for researchers participating in the DigLin project and may be used as well for other research purposes, following BAAL guidelines.

We'd like to make a record of your activity at the computer while you're working with the DigLin software. The computer will track how you use the keyboard and the mouse, and how you read aloud.

Your consent is voluntary. It can be revoked for future activities at any moment according. You can demand the deletion of your data. No disadvantages will be caused if you refuse the consent. All information regarding the purposes of this research project has been explained to me and I agree to all mentioned proceedings.

Place, Date

Full name and signature (participant)

We'd like to give you three questionnaires and ask you some questions about your experiences with and opinions of the software. The questionnaires will be on the computer screen and one of the four of us will interview you in person.

Your consent is voluntary. It can be revoked for future activities at any moment according. You can demand the deletion of your data. No disadvantages will be caused if you refuse the

consent. All information regarding the purposes of this research project has been explained to me and I agree to all mentioned proceedings.

Place, Date

Full name and signature (participant)

We'd like to videotape your classroom and student using the software.

Your consent is voluntary. It can be revoked for future activities at any moment according. You can demand the deletion of your data. No disadvantages will be caused if you refuse the consent. All information regarding the purposes of this research project has been explained to me and I agree to all mentioned proceedings.

Place, Date

Full name and signature (participant)

I have translated all information to the participant and made sure the translation has been understood.

Place, Date

Full name and signature (interpreter)

Appendix F: Sample of learners' consent form in Arabic

معلومات عن (ديج لين) – معلّم القراءة الرقمي

عزيزينا المشارك/عزيزتنا المشاركة:

نشكر لك تعاونك معنا في مشروع معلّم القراءة الرقمي. (ديج لين)

يتكون فريق عملنا من شركاء من المملكة المتحدة وكذلك فنلندا وألمانيا وهولندا. وقد قمنا بتطوير طريقة جديدة لتعليم القراءة باستخدام برامج الكمبيوتر. ويهدف هذا البرنامج لتسريع تعلم القراءة في لغة جديدة.

تحتوي أدوات البرنامج على تمارين تفاعلية بالصوت والصورة. ويمكنك التدرّب عليها في الفصل لتحسين مهارة القراءة الصامتة أو القراءة بصوت مسموع. هذه التمارين ستساعدك في نواح كثيرة في تعلم كلمات جديدة وتحسين مهاراتك الأساسية في استخدام الكمبيوتر. نحن نعلم أن استخدام هذا البرنامج يعتبر تحدياً في بداية الأمر، لكن ستعتاد عليه سريعاً وبدون أية ضغوطات لأنك ستستخدمه في الأوقات التي تريحك ووفق السرعة التي تناسبك.

أهم ما يميز هذا البرنامج، أنه يقيّم كل طالب على أداؤه. ففي بعض التمارين يمكنك أن تقرأ بصوت مرتفع في الميكروفون وسيظهر لك الكمبيوتر تقييم نطقك للحروف ويوضح لك أي الحروف نطقتها بصورة سليمة وأيها يحتاج المزيد من التدريب.

مشاركتك معنا

في سبتمبر/أكتوبر ٢٠١٤، سنبدأ باختبار هذا البرنامج في فصول المتدربين لتحديد مدى تقبل الطلبة لاستخدامه، وما هي الجوانب التي تحتاج إلى المزيد من التطوير. ويسعدنا أن تكون أنت من أوائل الطلبة الذين يختبرون أسلوباً جديداً في التعليم.

سيكون هذا البرنامج متاحاً لك ولزملائك لتدربوا عليه وفق السرعة والزمن الذي يناسبكم. وبعد ذلك، يهمننا أن نتبع كيف يستخدم كل طالب منكم هذا البرنامج منفرداً، وكيف يتعلم من خلاله لأن ذلك سيساعدنا في تطوير البرنامج وتحسينه لئتمكن الطلبة الآخرون فرص جديدة لتعلّم القراءة بصورة أسرع.

إضافةً إلى ما سبق، ستتمكن من استخدام البرنامج من أي كمبيوتر، لتتمكن من التدريب خارج الفصول الدراسية.

بعد الدراسة

سيتم نشر النتائج النهائية بحلول نهاية عام ٢٠١٥، وبالطبع سنرحب بتواصلك معنا في أي وقت للحصول على المزيد من المعلومات. وإذا تقرّر تطوير البرنامج بعد الدراسة الأولية، فيشترنا أن نقدم لك كل المعلومات المطلوبة للدخول إلى البرنامج من جديد واستخدامه.

التاريخ والموقع

بداية تطبيق المشروع: ما بين سبتمبر ٢٠١٤ و فبراير ٢٠١٥

المدة: فصل دراسي واحد

الموقع: في مؤسستكم

بيانات الاتصال

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موافقة

نطلب منك تعبئة نموذج التصريح بالموافقة أدناه. حيث يؤكد لنا تطوعك الذاتي في المشاركة في اختبار البرنامج. ونضمن لك التزامنا التام في حفظ كل بياناتك بطريقة تمنع الكشف عن هويتك.

تصريح بالموافقة

عزيزتنا الطالبة / عزيزتنا الطالب

نطلب منك موافقتك التامة على المشاركة في المشروع الدولي "معلم القراءة الرقمي (ديج لين)" بصفتك مشارك في اختبار البرنامج وتجربته. كل التسجيلات وإجابات الاستبانات والمقابلات ستوثق كتابةً. كل التفاصيل المتعلقة بوضع الاختبار (مثال: الموقع، التاريخ، مستوى المتحن...إلخ) ستوثق أيضاً. أما المعلومات الدالة على هويتك ستُحفظ مع البيانات ولن يستطيع أحد الوصول إليها إلا الأشخاص المذكورة أسماؤهم أعلاه. سنتعامل مع البيانات وفق الضوابط الأخلاقية المعتمدة في جامعة نيوكاسل والجمعية البريطانية للسانيات التطبيقية (BAAL). http://www.baal.org.uk/dox/goodpractice_full.pdf فكل تسجيل صوتي سيمتد برقم خاص بدلاً من الاسم الشخصي ثم يُحفظ في قاعدة البيانات. ومن ثم هذه التسجيلات (مجهولة الهوية) سيستخدمها الباحثون المشاركون في المشروع (ديج لين) وقد تُتاح للاستخدام لأغراض بحثية أخرى ضمن ضوابط الجمعية البريطانية للسانيات التطبيقية (BAAL).

نودّ أن نُوثق نشاطك عند استخدام برنامج (ديج لين) على الكمبيوتر. فالكمبيوتر سيُسجّل طريقة استخدامك للوحة المفاتيح والفأرة وكيف تقرأ بصوت مرتفع.

موافقتك تطوعية، ويمكن أن تسحبها إذا استجد نشاط مستقبلي في حينها، ويمكن أن تطلب إلغاء جميع بياناتك. ولا يترتب على رفضك الموافقة أي تبعات سلبية.

كل المعلومات المتعلقة بأغراض هذا المشروع البحثي قد شُرحَت لي، وأنا أوافق على كل الإجراءات المذكورة.

الاسم الكامل والتوقيع (المشارك)

المكان، التاريخ

نودّ أن نقدم لك ثلاث استبانات ونسألك عدداً من الأسئلة المتعلقة بتجربتك وأريك في البرنامج. الاستبانات ستكون معروضة على شاشة الكمبيوتر وأحد الباحثين المشاركين سيقابلك شخصياً.

موافقتك تطوعية، ويمكن أن تسحبها إذا استجد نشاط مستقبلي في حينها، ويمكن أن تطلب إلغاء جميع بياناتك. ولا يترتب على رفضك الموافقة أي تبعات سلبية.

كل المعلومات المتعلقة بأغراض هذا المشروع البحثي قد شُرحَت لي، وأنا أوافق على كل الإجراءات المذكورة.

الاسم الكامل والتوقيع (المشارك)

المكان، التاريخ

نودّ أن تسجل على الفيديو فصلكم الدراسي والطلبة أثناء استخدامهم للبرنامج.

موافقتك تطوعية، ويمكن أن تسحبها إذا استجد نشاط مستقبلي في حينها، ويمكن أن تطلب إلغاء جميع بياناتك. ولا يترتب على رفضك الموافقة أي تبعات سلبية.

كل المعلومات المتعلقة بأغراض هذا المشروع البحثي قد شُرحَت لي، وأنا أوافق على كل الإجراءات المذكورة.

الاسم الكامل والتوقيع (المشارك)

المكان، التاريخ

لقد تُرجمت كل المعلومات للطلاب المشارك وتأكدت من فهمه للترجمة.

الاسم الكامل والتوقيع (المترجم)

المكان، التاريخ

Appendix G: Sample of learners' consent form in Bangla

‘ডিগলিন’ সম্পর্কিত তথ্য - ‘ডিজিটাল লিটারেসি ইনস্ট্রাকটর’

প্রিয় অংশগ্রহণকারীবৃন্দ,

এই ‘ডিজিটাল লিটারেসি ইনস্ট্রাকটর’ প্রকল্পে অংশগ্রহণ করার জন্য আপনাকে আন্তরিক ধন্যবাদ জানাচ্ছি। আমাদের এই প্রকল্পে বিভিন্ন দেশের সদস্যবৃন্দ সংযুক্ত রয়েছেন, যেমন, ইংল্যান্ড, ফিনল্যান্ড, জার্মানী এবং নেদারল্যান্ড। সহজে পড়তে পারার জন্য আমরা কম্পিউটারের মাধ্যমে নতুন একটি পদ্ধতি আবিষ্কার করেছি। এই কম্পিউটার প্রোগ্রামটি নতুন একটি ভাষা খুব সহজে পড়তে পারার জন্য সহায়ক হবে।

এই প্রকল্পের জন্য ব্যবহৃত ছবি ও শব্দের সাহায্যে, আনন্দদায়ক ভাবে খুব সহজেই আপনি পড়তে পারবেন। এই প্রোগ্রাম-এর সাহায্যে আপনি আপনার ক্লাশের পড়া বার বার চর্চা করতে পারবেন। এই প্রোগ্রামটি আপনার মনে মনে পড়া ও উচ্চস্বরে পড়ার ব্যাপারে সহায়ক হবে। এই অনুশীলনীগুলি নিয়মিত চর্চা করলে, আপনি বিভিন্ন ভাবে উপকৃত হবেন। আপনি অনেক নতুন শব্দ শিখতে পারবেন। এবং একই সঙ্গে কম্পিউটারের সহজ নিয়মাবলী শিখতে পারবেন। এই সব সহজ নিয়মাবলী শিখতে পারলে, আপনার পক্ষে কম্পিউটারের সাধারণ ব্যবহার শেখাটা আরো সহজ হবে। প্রাথমিক অবস্থায় এই সব শিক্ষণীয় বিষয়গুলো আপনার জন্য কঠিন মনে হতে পারে। কিন্তু এই সব শিখতে আপনাকে কোনো তাড়াহুড়া করতে হবে না। আপনি আপনার নিজস্ব গতিতে শিখতে পারবেন।

একটা মাইক্রোফোনের সাহায্যে, কিছু কিছু অনুশীলনী আপনি জোরে জোরে পড়তে পারবেন। কোন্ কোন্ শব্দ এবং অক্ষরগুলো আপনি সঠিক ভাবে পড়তে পারছেন, এবং কোন্ কোন্ গুলোতে আপনার ভুল হচ্ছে, তা বুঝতে কম্পিউটার আপনাকে সাহায্য করবে।

আপনার অংশগ্রহণ

২০১৪ইং সালের সেপ্টেম্বর অথবা অক্টোবর মাসে, আমরা এই প্রোগ্রামটি নীরিক্ষা করতে শুরু করবো। আমরা এই প্রকল্পটি একেবারেই নতুনদের নিয়ে শুরু করবো। আমাদের এই প্রচেষ্টার উদ্দেশ্য হলো, এই নীরিক্ষায় অংশগ্রহণকারীগণ এই প্রোগ্রামগুলি পছন্দনীয় মনে করছেন কি না, তা বোঝা ও জানার চেষ্টা করা। এই প্রোগ্রামের মধ্যে অন্য নতুন কোনো বিষয় যোগ করতে হতে পারে কি না, এবং তা কি কি হতে পারে, এই সব বিষয়ের প্রতিও আমাদের সজাগ দৃষ্টি থাকবে। এই নতুন প্রোগ্রামটিতে অংশগ্রহণ করার জন্য আমরা আপনাকে স্বাগত জানাচ্ছি।

এই কম্পিউটার প্রোগ্রামটি আপনার ও আপনার সহপাঠীদের জন্য সরবরাহ করা হবে। তাতে আপনি আপনার নিজস্ব গতিতে এই প্রোগ্রামটি ব্যবহার করতে পারবেন। বিভিন্ন অংশগ্রহণকারীগণ কি ভাবে পড়তে শেখেন এবং কি ভাবে এই প্রোগ্রামটি ব্যবহার করেন, সেই

দিকেও আমরা লক্ষ্য রাখবো। আপনি ও আপনার সহযোগী অন্যান্য অংশগ্রহণকারীগণ যাতে খুব তাড়াতাড়ি পড়তে শিখতে পারেন, সেটাই হবে এই প্রকল্পের মূল উদ্দেশ্য।

আপনি যে কোনো ধরনের কম্পিউটারে এই প্রোগ্রামটি ব্যবহার করতে পারবেন। এবং এই প্রোগ্রামটি ব্যবহার করার জন্য আপনাকে নিদৃষ্ট কোনো ক্লাশরুমে উপস্থিত থাকতে হবে না।

প্রকল্পের শেষে

এই প্রকল্পের বিষয়বস্তুর ফলাফল ২০১৫ইং সালে প্রকাশিত হবে। আপনি যে কোনো সময় এই প্রকল্পের ব্যাপারে আমাদের সাথে যোগাযোগ করতে পারবেন। যদি এই কম্পিউটার প্রোগ্রামটি পরবর্তী কোনো এক সময়ে আরো উন্নতমানের করা হয়, এবং আপনি সেটা ব্যবহার করার জন্য ইচ্ছা প্রকাশ করেন, তবে আপনি তা অবশ্যই করতে পারবেন।

তারিখ ও স্থান

শুরু:- ২০১৪ইং সালের সেপ্টেম্বর এবং ২০১৫ইং সালের ফেব্রুয়ারী মাসের মধ্যে যে কোনো সময়ে।

স্থিতিকাল:- এককালিন।

স্থান:- আপনার কলেজ।

যোগাযোগের ঠিকানা

অধ্যাপক মার্থা ইয়ং-সলটেন, নিউক্যাসল বিশ্ববিদ্যালয়।

ড: লুসি মার্টিন, নিউক্যাসল বিশ্ববিদ্যালয়।

ইনাস ফিলিমব্যান, নিউক্যাসল বিশ্ববিদ্যালয়।

রোলা নায়েব, নর্থামব্রিয়া বিশ্ববিদ্যালয়।

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সম্মতি

অনুগ্রহপূর্বক নিম্নলিখিত সম্মতি-পত্রটিতে সই করুন। এই সম্মতি-পত্রটিতে সই করার উদ্দেশ্য হলো যে, আপনি এই প্রকল্পে অংশগ্রহণ করতে ইচ্ছুক। আমরা অঙ্গীকার করছি যে, আপনার দেওয়া সকল তথ্য অত্যন্ত গোপনীয়তার সাথে সংরক্ষণ করা হবে। কেউ কখনো আপনার পরিচয় জানতে পারবে না।

সম্মতি-পত্র

‘ডিজিটাল লিটারেসি ইন্সট্রাকটর’ নামক একটি আন্তর্জাতিক প্রকল্পে অংশগ্রহণ করার জন্য, আমরা আপনার কাছ থেকে সম্মতি-পত্রের জন্য আহ্বান জানাচ্ছি। সব ধরনের রেকর্ডিং, পেশোত্তর সংবলিত তথ্য ও সাক্ষাৎকার, ইত্যাদি সব কিছুই লিখিত আকারে সংরক্ষিত থাকবে। এছাড়াও সব ধরনের স্থান, তারিখ ও সব ধরনের মানউন্নয়নের তালিকা, ইত্যাদি, লিখিত আকারে থাকবে। শুধুমাত্র আপনার নামটা এই তথ্যের সাথে জড়িত থাকবে। উপরে উল্লিখিত চারজন ব্যক্তি ব্যতীত, আপনার নামটি অন্য কারো জানা থাকবে না। বা জানানো হবে না। আপনার যাবতীয় তথ্য অত্যন্ত গোপনীয় ভাবে সংরক্ষিত থাকবে। এই ব্যাপারে আমরা নিউক্যাসল বিশ্ববিদ্যালয়ের ও ব্রিটিশ এসোসিয়েশন ফর এ্যাপ্লাইড লিঙ্গুইস্টিকস-এর নিয়ম-কানুন মেনে চলি (http://www.baal.org.uk/dox/goodpractice_full.pdf)। রেকর্ডিং করার পরে, সব তথ্য একটি কম্পিউটারে কোড আকারে জমা করা থাকবে। এবং কারো নামের উল্লেখ থাকবে না। বেনামী রেকর্ডিংগুলো ‘ডিগলিন’ প্রকল্পের গবেষকদের দ্বারা ব্যবহৃত হবে। এই তথ্যগুলো অন্যান্য গবেষণা প্রকল্পেও ব্যবহৃত হতে পারে। কিন্তু সেই ক্ষেত্রেও গোপনীয়তা রক্ষা করার একই নিয়ম-কানুনগুলো মেনে চলা হবে।

‘ডিগলিন’ প্রোগ্রাম ব্যবহার করা কালিন আমরা আপনার কার্যক্রম রেকর্ড করবো। এই ক্ষেত্রে কম্পিউটার লক্ষ্য রাখবে যে, কি ভাবে আপনি ‘মাউস’ ও ‘কি-বোর্ড’ ব্যবহার করেন। আপনি কি ভাবে গলা খুলে পড়েন, তাও এই কম্পিউটারে জমা করা থাকবে।

আপনার সম্মতি-পত্রটা ঐচ্ছিক ব্যাপার। যে কোনো সময়ে, আপনি আপনার এই সম্মতি-পত্রটা তুলে নিতে পারবেন। যে কোনো সময়ে আপনার ব্যক্তিগত তথ্যগুলোকে তুলে ফেলার আদেশ আপনি দিতে পারবেন।

এই প্রকল্পের সব উদ্দেশ্যগুলো আমার কাছে ব্যাখ্যা করা হয়েছে। আমি এই প্রকল্পে অংশগ্রহণ করার জন্য আমার অনুমতি দিলাম।

স্থান ও তারিখ

অংশগ্রহণকারীর পুরো নাম ও দস্তখত

Appendix H: Sample log file for overall exercises in one day

8b Drag the letters	2015-03-24 15:48:22	215 items	01ENG	1379aad365961fe52997 51a9b8d6daccda6dc7006 276eab24da41b8b1fff74 c73
8a Drag the letters	2015-03-24 15:40:24	189 items	01ENG	1e5bbfdc887112d74f3d ebeaf98e6a6fee0da4017 eb4274156a644b62dad9 5a5
7a Drag the letters	2015-03-24 15:31:27	218 items	01ENG	60fb4a7324c613e961def 9f205b88b1ca1305a5fca de2616fb2fb98d5dec44 05
6b Drag the letters	2015-03-24 15:22:19	228 items	01ENG	d882975ea904e87fd2af6 3c5fff568b5026048c4af4 59f006777d6312112ca9 8
7a Drag the letters	2015-03-24 15:22:11	Empty	01ENG	c8bd4b8b6f7d91cd92f3e 6e28921045cc83adc1ee 9e70e1a44160adfa7f1ea 56
6a Drag the letters	2015-03-24 15:10:06	176 items	01ENG	26450e752eb5b6528f1e 5beedb7437585cd99f72 ef55764962fdd7a652a92 704
5a Drag the letters	2015-03-17 15:53:33	123 items	01ENG	d569246bfeadef50e383e 67d2cde44fd84c31cc3e6 41e3e33bfcc122c05d383 5
4b Drag the letters	2015-03-17 15:48:35	150 items	01ENG	6fb4183ecb9609c6a595f c69119e18eec26451b5a 72ae06cdd01fc3bb4c4d d8f
2b Drag the letters	2015-03-17 15:42:03	145 items	01ENG	584ffdc110aac5cde0bb1 8a50999c3830e4fd1779f e2c3495b9fcc7bdf4126d e
1b Drag the letters	2015-03-17 15:36:28	147 items	01ENG	d80b85940010f96f814f6 7e17e2c2a37075bf94c80 2a1cc5fb2c45616319432 d
4a Drag the letters	2015-03-17 15:36:09	5 items	01ENG	1b5f391dcccfd7e6a12a c93d084d50b2d43de0e1 4a7f8f332cc53c923fe66e 4

Appendix I: Sample of log file for one minute

Session_id	1379aad365961fe5299751a9b8d6dacda6dc7006276eab24da41b8b1fff74c73		
User name	01ENG (272)		
Exercise	8b Drag the letters		
Timestamp	2015-03-24 15:48:22		
Event	Data	Extra data	Timestamp
Play the sound of a word	string		2015-03-24 15:48:29
Show picture from a whole word	string		2015-03-24 15:48:31
Hide picture from a whole word			2015-03-24 15:48:32
Play the sound of a word	string		2015-03-24 15:48:33
Show picture from a whole word	string		2015-03-24 15:48:36
Hide picture from a whole word			2015-03-24 15:48:37
Drag a letter	s		2015-03-24 15:48:39
Letter is correct	s		2015-03-24 15:48:41
Play the sound of a letter	t		2015-03-24 15:48:42
Drag a letter	t		2015-03-24 15:48:44
Letter is correct	t		2015-03-24 15:48:46
Play the sound of a letter	r		2015-03-24 15:48:47
Drag a letter	r		2015-03-24 15:48:49
Letter is correct	r		2015-03-24 15:48:52
Play the sound of a letter	i		2015-03-24 15:48:53
Drag a letter	i		2015-03-24 15:48:55
Letter is correct	i		2015-03-24 15:48:57
Play the sound of a letter	ng		2015-03-24 15:48:59
Drag a letter	n		2015-03-24 15:49:04
Letter is correct	n		2015-03-24 15:49:05

Appendix J: Sample of High expectations tasks during training

I expect you to	tell me how to pronounce <c> in English	in X time.
	tell me how you many ways to write /k/ in English	
	tell me how many ways to write /i/ in English	
	tell me how many ways to pronounce <ow> in English give examples per pronunciation	
	know how to read, write and tell me the meaning of 4 words that start with a capital letter	
	know how to read, write and tell me the meaning of 4 words that contain a di- or trigraph	
	to know how many and what ways there are to pronounce <e> and give me two examples per pronunciation	
	write 4 existing words with an <a> in them on the blackboard and to know what the words mean	
	write 4 existing words with an /a/ in them on the blackboard and to know what the words mean	
	distinguish <a>, <o>, <au> and <e>	
	point out <a>, <o>, <au> and <e> in words I read to you	
	read words that contain <a>, <o>, <au> and <e>	
	tell me how many and what ways there are to write /f/ read <a word that is not in the software>	
	point out the correct letters (with all letters from series X written on the blackboard) when I pronounce them	
	point out the correct letters (with all letters from series X written on the blackboard) when I read a word	
	know what the words in series X mean	
	to point out the written words from series X if I read them give examples of 2 different ways of writing /au/	

Appendix K: Pre-Entry Syllabus



PD1- Scheme of Work

Programme Title: ESOL JSA Pre-Entry		Year: 2015-2016
Level: Pre-Entry		Start date: 07/09/14 End Date: 18/12/14
Module/Unit Title: ESOL Group 1 (1072960)	Group: 1	Duration (GLH): 168
Staff name: Mark Hutchinson, Mark Biram, Laurie Purvis, Claire Harmer	Department: Access to Learning	Course Leader: Mark Hutchinson

Session	Topics, Skills or Competencies (embed opportunities for Eng, maths, FS, E&D, H&S, ELM, safeguarding, employability, sustainable development etc)	Beyond the classroom Directed study/VLE/ Homework etc	Assessment	Support/ Differentiation	Notes/updates
<p>Week</p> <p>1</p>	<p>Induction</p> <p>Check course agreements</p> <p>Introduce the Student Progress Booklet</p> <p>Safeguarding – emphasize the importance of wearing student badge</p> <p>Diagnostic Assessments (Reading, Writing, and Listening)</p> <p>Ice breaker activities</p> <p>Giving Personal Info Vocab</p> <p>Giving Personal Info Vocab 1c</p> <p><i>“What’s your name?”</i></p> <p><i>Where do you come from?</i></p> <p><i>What language do you speak?”</i></p>	<p>Homework: Getting organised with a file, pens, highlighter pens and paper</p> <p>Workshop: Course Handbook and activities, Tour of Riverside Dene and Personal Info vocab</p> <p>Lab: get students on NCG Online</p> <p>Get ILPs signed and completed for all students on the Generic code</p>	<p>Class monitoring and feedback</p> <p>Diagnostic Assessments</p>	<p>Assess the needs of students from the diagnostic for future planning</p>	

Session	Topics, Skills or Competencies (embed opportunities for Eng, maths, FS, E&D, H&S, ELM, safeguarding, employability, sustainable development etc)	Beyond the classroom Directed study/VLE/ Homework etc	Assessment	Support/ Differentiation	Notes/updates
	<p>Resources</p> <p>Diagnostic Tests</p> <p>K:\Admin all\SOW 2014-2015\Pre-Entry</p>				
<p>Week</p> <p>2</p>	<p><u>Topic: Countries and Finding out Personal information</u></p> <p>Monday – Vocational English – Cleaning Week 1</p> <p>Cleaning Materials</p> <p>Tuesday – Language Experience (personal info, family, and country)</p> <p>Wednesday – countries</p> <p>Thursday – literacy (letters of the alphabet) – capital letters and lower case letters, and phonics</p>	<p>Phonics: alphabet</p> <p>Phonics assessments for late arriving new students</p> <p>Check Ss are completing Student Progress Booklet</p> <p>Contact and ultimately withdraw ss who did not attend in week one.</p> <p>Workshop: countries and alphabet work</p>	<p>Class monitoring and feedback</p> <p>Progression booklet</p> <p>Oral skills (pron., fluency, accuracy confidence)</p>	<p>Write comments in Student Progress Booklet if they need extra support on a particular area in workshop.</p> <p>Graded language tasks</p>	

Session	Topics, Skills or Competencies (embed opportunities for Eng, maths, FS, E&D, H&S, ELM, safeguarding, employability, sustainable development etc)	Beyond the classroom Directed study/VLE/ Homework etc	Assessment	Support/ Differentiation	Notes/updates
	<p>Resources</p> <p>Cleaning Materials</p> <p>New English File Beginner Unit 1</p> <p>ESOL Activities Pre-entry 2c/3a/3b/3c</p> <p>Alphabet handwriting: ESOL Activities 1c</p> <p>First Resort pages 1-11</p> <p>Alphabet Activities</p> <p>K:\Resources - all\Scanned material\English for Life Beginner</p> <p>Phonics: K:\Admin all\SOW 2014-2015\Literacy SOWs and materials\Pre-Entry\Pre-entry materials\phonics</p>	<p>Lab: access NCG Online and review Language Experience materials</p> <p>Equality and Diversity -</p> <p>Gender Equality</p>	<p>Progression booklet</p>	<p>Graded language tasks</p>	

Session	Topics, Skills or Competencies (embed opportunities for Eng, maths, FS, E&D, H&S, ELM, safeguarding, employability, sustainable development etc)	Beyond the classroom Directed study/VLE/ Homework etc	Assessment	Support/ Differentiation	Notes/updates
<p>Week 3</p>	<p>Topic: daily routine</p> <p>Monday – <i>Vocational English</i> – Cleaning Week 2</p> <p>Cleaning Materials</p> <p>Tuesday – Language Experience (personal info, country, and daily routine)</p> <p>Wednesday – Telling the time (ex 4a)</p> <p>Thursday – literacy (letters of the alphabet) – daily routine words (spelling)</p> <p>Resources</p> <p>ESOL Activities Entry 1 – 4a (Telling the time)</p> <p>Alphabet Activities</p> <p>Cleaning Materials</p>	<p>Workshop: Telling the time, daily routine, and alphabet work</p> <p>Lab: access NCG Online and review Language Experience materials or English My Way online</p>	<p>Progression booklet</p> <p>Mini-Test: vocational English (update Course Tracker with results)</p> <p>Assess work done in Thursday literacy lesson and return on Wednesday</p>	<p>Graded language tasks</p>	

Session	Topics, Skills or Competencies (embed opportunities for Eng, maths, FS, E&D, H&S, ELM, safeguarding, employability, sustainable development etc)	Beyond the classroom Directed study/VLE/ Homework etc	Assessment	Support/ Differentiation	Notes/updates
	New English File Beginner Unit 1				
Week 4	<p>Topic: Free time</p> <p>Grammar: can/can't</p> <p>Monday – Vocational English – Cleaning Week 3</p> <p>Cleaning Materials</p> <p>Tuesday – Language Experience (personal info, country, daily routine, and free time)</p> <p>Wednesday – can/can't</p> <p>Thursday – literacy (letters of the alphabet) – free time account</p> <p>Resources</p>	<p>Workshop: free time and alphabet work</p> <p>Lab: access NCG Online and review Language Experience materials or English My Way online</p> <p>Equality and Diversity - Gender Reassignment</p>	<p>Progression booklet</p> <p>Mini-Test: vocational English (update Course Tracker with results)</p> <p>Assess work done in Thursday literacy lesson and return on Wednesday</p>	Graded language tasks	

Session	Topics, Skills or Competencies (embed opportunities for Eng, maths, FS, E&D, H&S, ELM, safeguarding, employability, sustainable development etc)	Beyond the classroom Directed study/VLE/ Homework etc	Assessment	Support/ Differentiation	Notes/updates
	Free time - New Cutting-Edge Elementary module 4 New English File Elementary 4B can/can't - ESOL Activities Pre-entry 11a Total English Elementary Alphabet Activities Cleaning Materials New English File Beginner				
Week 5	<u>Housing Vocab</u> "I have got" Monday – Vocational English – Cleaning Week 4 Cleaning Materials	Workshop: housing vocab, "I have got", and alphabet work Lab: access NCG Online and review Language	Class monitoring and feedback Progression booklet	Graded language tasks	

Session	Topics, Skills or Competencies (embed opportunities for Eng, maths, FS, E&D, H&S, ELM, safeguarding, employability, sustainable development etc)	Beyond the classroom Directed study/VLE/ Homework etc	Assessment	Support/ Differentiation	Notes/updates
	<p>Tuesday – Language Experience (personal info, country, daily routine, free time, and house)</p> <p>Wednesday – Housing vocab (unit 2)</p> <p>Thursday – literacy (letters of the alphabet) – writing about the home</p> <p>Phonics: ch,sh,th,ph</p> <p>Resources</p> <p>ESOL Activities Pre-entry 8b/8c</p> <p>ESOL Activities Entry 1 Unit 2</p> <p>Alphabet Activities</p> <p>Cleaning Materials</p> <p>New English File Beginner</p>	<p>Experience materials or English My Way online</p>	<p>Mini-Test: vocational English (update Course Tracker with results)</p> <p>Assess work done in Thursday literacy lesson and return on Wednesday</p>		
	<p><u>Catch up and Review of half terms work</u></p>				

Session	Topics, Skills or Competencies (embed opportunities for Eng, maths, FS, E&D, H&S, ELM, safeguarding, employability, sustainable development etc)	Beyond the classroom Directed study/VLE/ Homework etc	Assessment	Support/ Differentiation	Notes/updates
6	<p>Monday – Vocational English – Cleaning Week 5</p> <p>Tuesday – Language Experience (personal info, country, daily routine, free time, and house)</p> <p>Wednesday – Overall review (countries, telling the time, daily routine, free time, can/can't, house vocab, and “I have got”)</p> <p>Thursday – literacy: using the learned vocab to give personal information</p> <p>Resources</p> <p>ESOL Activities Pre-entry 8b/8c</p> <p>ESOL Activities Entry 1 Unit 2</p> <p>Alphabet Activities</p> <p>Cleaning Materials</p>	<p>Workshop: housing vocab, “I have got”, free time vocab, daily routine vocab, can/can't, and alphabet work</p> <p>Lab: access NCG Online and review Language Experience materials or English My Way online</p> <p>Equality and Diversity - Marital Status and Civil Partnership</p>	<p>Progression booklet</p> <p>Mini-Test: vocational English (update Course Tracker with results)</p> <p>Assess work done in Thursday literacy lesson and return on Wednesday</p>	<p>Graded language tasks</p>	

Session	Topics, Skills or Competencies (embed opportunities for Eng, maths, FS, E&D, H&S, ELM, safeguarding, employability, sustainable development etc)	Beyond the classroom Directed study/VLE/ Homework etc	Assessment	Support/ Differentiation	Notes/updates
	New English File Beginner Free time - New Cutting Edge Elementary module 4 New English File Elementary 4B can/can't - ESOL Activities Pre-entry 11a				
7	<p><u>Progress Tests</u></p> <p>Mid-term tutorial: Students evaluate their progress in their Student Progress Booklets</p> <p>Monday – Vocational English Revision and Test</p> <p>Tuesday – Vocational English Test results and review, and Language Experience (personal info, country, daily routine, free time, and house)</p>	<p>Workshop: housing vocab, “I have got”, free time vocab, daily routine vocab, can/can’t, and alphabet work</p> <p>Lab: access NCG Online and review Language Experience materials or English My Way online</p>	Vocational English Test and Progress Test (and feedback)	Graded language tasks	Check paperwork for any new students is up-to-date. Update course tracker

Session	Topics, Skills or Competencies (embed opportunities for Eng, maths, FS, E&D, H&S, ELM, safeguarding, employability, sustainable development etc)	Beyond the classroom Directed study/VLE/ Homework etc	Assessment	Support/ Differentiation	Notes/updates
	<p>Wednesday – General English Revision and Progress Test (including short writing section)</p> <p>Thursday – General English Progress Test results and review</p> <p>Resources</p> <p>ESOL Activities Pre-entry 8b/8c</p> <p>ESOL Activities Entry 1 Unit 2</p> <p>Alphabet Activities</p> <p>Cleaning Materials</p> <p>New English File Beginner</p> <p>Free time - New Cutting Edge Elementary module 4</p> <p>New English File Elementary 4B</p>				

Session	Topics, Skills or Competencies (embed opportunities for Eng, maths, FS, E&D, H&S, ELM, safeguarding, employability, sustainable development etc)	Beyond the classroom Directed study/VLE/ Homework etc	Assessment	Support/ Differentiation	Notes/updates
	can/can't - ESOL Activities Pre-entry 11a				
Reading Week					
8	<p><u>Health and Exercise</u></p> <p>Parts of the body. Asking what is wrong and saying how you feel.</p> <p>“I’ve got a headache”</p> <p>Phonics: dr gr tr pr</p> <p>Completing basic information on a form at a doctor’s</p> <p>Writing an email to college/ calling college to say you are unwell</p> <p>Resources</p>	<p>Workshop: health and parts of the body</p> <p>Lab: access NCG Online and review Language Experience materials or English My Way online</p>	<p>Class monitoring and feedback</p> <p>Progression booklet</p>		<p>Remind ss about attendance and arriving on time to workshop and class.</p>

Session	Topics, Skills or Competencies (embed opportunities for Eng, maths, FS, E&D, H&S, ELM, safeguarding, employability, sustainable development etc)	Beyond the classroom Directed study/VLE/ Homework etc	Assessment	Support/ Differentiation	Notes/updates
	Skills for Life E1 Unit 5 Health				
9	<u>Getting Around</u> Buying a ticket at the train station How do you come to class? Resources Skills for Life E1 Unit 4 Local Transport	Workshop: places in a town and getting tickets Lab: access NCG Online and review Language Experience materials or English My Way online	Spelling test about health/illnesses and parts of the body Individual and group monitoring Progression booklet	Visuals of materials	
10	<u>Around Newcastle</u> Describing the place where you live Directions Asking for shop opening times	Workshop: places in a town/ writing about Newcastle Lab: access NCG Online and review Language	Class monitoring and feedback Reading skills	Visuals of materials	

Session	Topics, Skills or Competencies (embed opportunities for Eng, maths, FS, E&D, H&S, ELM, safeguarding, employability, sustainable development etc)	Beyond the classroom Directed study/VLE/ Homework etc	Assessment	Support/ Differentiation	Notes/updates
	<p>Writing about a neighbourhood (there is/there are)</p> <p>Resources</p> <p>Skills for Life E1 Unit 6 The Neighbourhood</p>	<p>Experience materials or English My Way online</p> <p>Equality and Diversity - Armistice Day</p>	<p>Spelling/phonics tasks</p> <p>Progression booklet</p>		
11	<p><u>Homes</u></p> <p>Review of Rooms/Kitchen Vocab from previous half-term</p> <p>Vocab about the dining room/living room</p> <p>Grammar – questions</p> <p>Resources</p> <p>Skills for Life E1 Unit 7 The Home</p>	<p>Workshop: places in a town/ writing about Newcastle</p> <p>Lab: access NCG Online and review Language Experience materials or English My Way online</p>	<p>Class monitoring and feedback</p> <p>Progression booklet</p> <p>Spelling test about places in a town</p>	Visuals of materials	

Session	Topics, Skills or Competencies (embed opportunities for Eng, maths, FS, E&D, H&S, ELM, safeguarding, employability, sustainable development etc)	Beyond the classroom Directed study/VLE/ Homework etc	Assessment	Support/ Differentiation	Notes/updates
12	<p><u>Buying things from shops</u></p> <p>Vocab – things you can buy from a local shop and shop names</p> <p>Grammar – some/any</p> <p>“I would like”</p> <p>Questions to ask in a shop</p> <p>Resources</p> <p>Skills for Life E1 Unit 3 Going Shopping</p>	<p>Workshop: buying things from shops</p> <p>Lab: access NCG Online and review Language Experience materials or English My Way online</p> <p>Equality and Diversity - Sexual Orientation</p>	<p>Class monitoring and feedback</p> <p>Progression booklet</p>	<p>Visuals of materials</p>	
13	<p><u>Progress Test and Revision</u></p> <p>Review of Progress Test (Health, Parts of the Body, Writing about your Neighbourhood, Asking for Train Tickets, Dining Room/Living Room Vocab)</p> <p>Christmas Activities</p> <p>Resources</p>	<p>Workshop: Christmas activities</p> <p>Lab: access NCG Online and review Language Experience materials or English My Way online</p>	<p>Class monitoring and feedback</p> <p>Progression booklet</p> <p>End of term Progress Test</p>	<p>Visuals of materials</p>	

Session	Topics, Skills or Competencies (embed opportunities for Eng, maths, FS, E&D, H&S, ELM, safeguarding, employability, sustainable development etc)	Beyond the classroom Directed study/VLE/ Homework etc	Assessment	Support/ Differentiation	Notes/updates
	Course Leader will make the Progress Test				
14	<u>Tutorial Week</u> Enrolment and individual tutorials with students – with their progression handbooks Ss enrol for next term.				
	Resources				

Appendix L: Tabulation of the log file data

Name and Date	Category	Type of exercise	actions	time spent	right	wrong
Nadia						
18-Nov	dl	1a drag the letters	2	1	0	0
	dl	1a drag the letters	0	0		
	dl	1a drag the letters	311	13	22	19
	dl	2a drag the letters	23	2	3	2
25-Nov	d	1a drag the letters	164	10	22	6
	d	2a drag the letters	150	7	21	4
	d	3a drag the letters	98	5	8	3
	w	1 the words	19	2	n/a	n/a
	w	2 the words	0	0	n/a	n/a
	w	3 the words	2	1	n/a	n/a
	w	4 the words	2	1	n/a	n/a
	w	5 the words	4	1	n/a	n/a
	w	6 the words	4	1	n/a	n/a
	w	6 the words	2	1	n/a	n/a
	w	7 the words	10	1	n/a	n/a
	w	8 the words	1	1	n/a	n/a
	w	9 the words	0	0	n/a	n/a
	w	9 the words	0	0	n/a	n/a
	w	10 the words	2	1	n/a	n/a
	w	11 the words	4	1	n/a	n/a
	w	12 the words	0	0	n/a	n/a
	w	13 the words	2	1	n/a	n/a
	w	14 the words	0	0	n/a	n/a
	w	15 the words	0	0	n/a	n/a
	dl	4a drag the letters	77	4	13	3
28-Nov	w	1 the words X10	0	0	n/a	n/a
	dl	1a drag the letters	0	0	0	0
	dl	1a drag the letters	2	1	0	0
	dl	1a drag the letters	0	0	0	0
	dl	1a drag the letters	0	0	0	0
	dl	1a drag the letters	0	0	0	0
	dl	1a drag the letters	0	0	0	0
	dl	1a drag the letters	0	0	0	0
	dl	1a drag the letters	0	0	0	0

Appendix M: Questionnaire data Analysis Outcome for all the countries in the DigLin project ⁸

Quantitative evaluation

- **Learners' questionnaires**

Learners' questionnaires were administered automatically after learners worked on the system for 10 hours. 58 participants filled the questionnaire as indicated in the table below, however, only 50 were used for the analysis as some data was missing or invalid.

Questionnaires			
		Frequency	%
Male = 16	Dutch	27	46.6
	German	11	19.0
Female =22	English	4	6.9
	Finnish	16	27.6
Not known= 20		Total	58
			100.0

Table (AppendixM-1): Results of learners' questionnaire

The questionnaire had 9 statements ([Appendix M-2](#)) that focused on the usefulness of the system as a whole and also on individual exercise types. A 5-point Likert scale was used to record responses.

1	I like working with these lessons on the computer
2	I find this exercise useful. (Drag the letters)

⁸ Deliverable 5.5 (2015). Questionnaire data analysis outcome for all the countries in the DigLin project. Unpublished manuscript

3	I find this exercise useful. (Listen and drag the words)
4	I find this exercise useful.(Form and drag the words)
5	I find this exercise useful.(Listen and type)
6	I find this exercise useful.(The words)
7	I find this exercise useful.(Read the words)
8	It is fun to work with these lessons on the computer.
9	I would like to practice more with these lessons on the computer.

Table (Appendix M-2): items on the learners' questionnaire

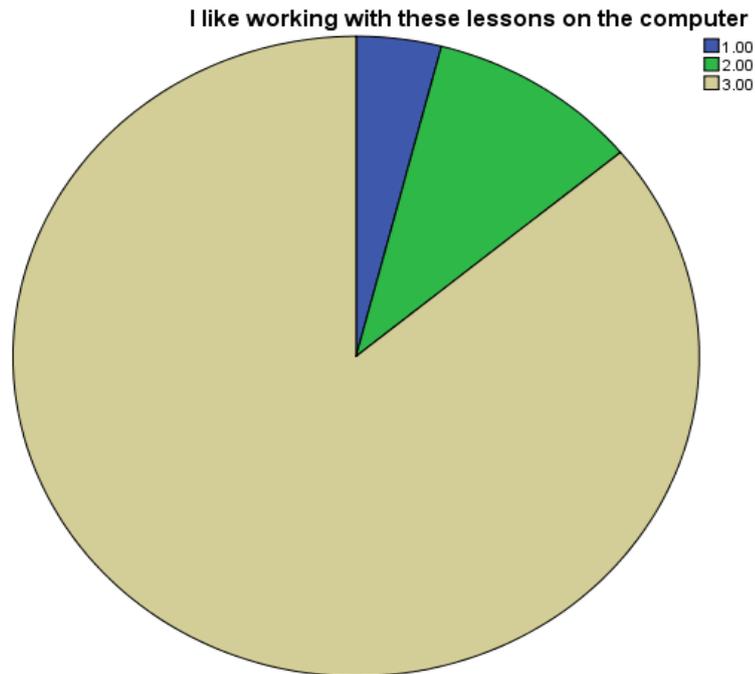
Items 1, 8 and 9 were used to measure overall views about the system as a whole. These will be reported on before we explore individual exercise types.

- **Software –all exercises**

As can be seen from the pie chart and the frequency table below, most participants (83%) agreed or strongly agreed that they like working on the system. This indicates a high positive response which could be easily linked to motivation and satisfaction about the materials.

I like working with these lessons on the computer				
		Frequency	Percent	Cumulative Percent
Valid	neither agree nor disagree	2	3.4	4.0
	agree	5	8.6	14.0
	strongly agree	43	74.1	100.0
	Total	50	86.2	

Table (AppendixLM-3): Result of Question 1 of learners' questionnaire

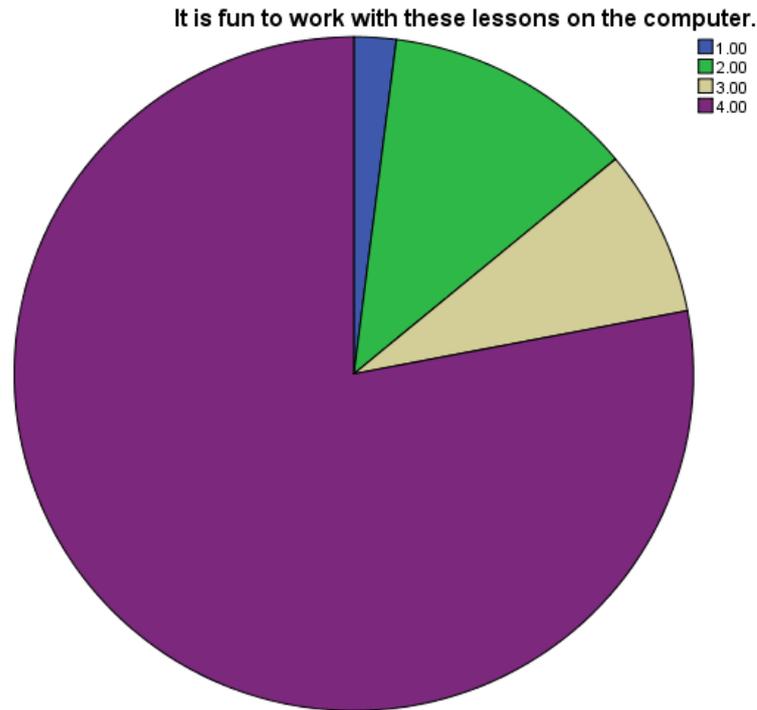


- **All exercise -Fun**

Item 8 focused on whether learners find it fun to work on these exercises. The responses were quite positive again with more than 72% (43 learners) agreeing or strongly agreeing with the statement.

It is fun to work with these lessons on the computer.				
		Frequency	Percent	Cumulative Percent
	strongly disagree	1	2.0	2.0
	neither agree nor disagree	6	12.0	14.0
	agree	4	8.0	22.0
	strongly agree	39	78.0	100.0
	Total	50	100.0	

Table (AppendixM-4): Result of Question 2 of learners' questionnaire



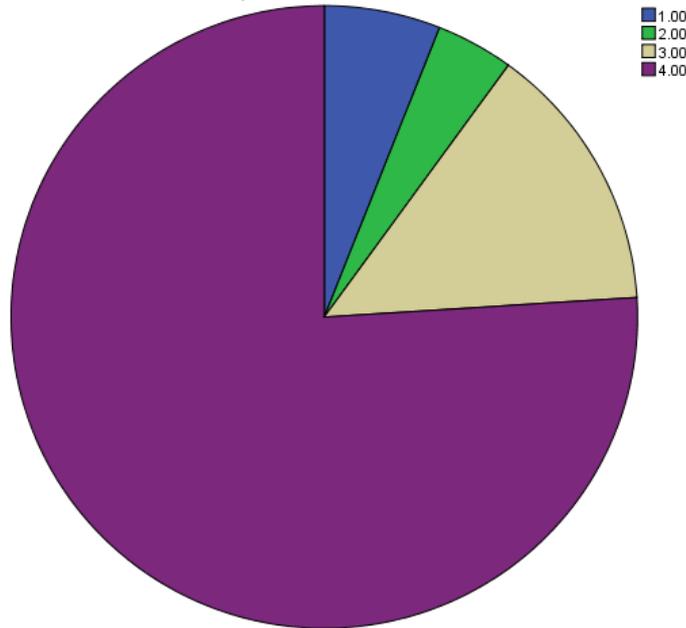
- **More exercises**

The final statement measured their motivation and willingness to work on more similar exercises. 90% of learners expressed their interest in more exercises. Therefore, regardless of some technical and logistic difficulties that were present at the field study, participants liked the materials and wanted to practice more. This means that we should interpret with caution some of the negative comments made in the interviews as they were more an expression of frustration **at the process of getting all elements/ features to work than the product itself.**

I would like to practise more with these lessons on the computer.				
		Frequency	Percent	Cumulative Percent
Valid	disagree	3	6.0	6.0
	neither agree nor disagree	2	4.0	10.0
	agree	7	14.0	24.0
	strongly agree	38	76.0	100.0
	Total	50	100.0	

Table (AppendixM-5): Result of Question 3 of learners' questionnaire

I would like to practise more with these lessons on the computer.



Now, we will have a closer look at how learners perceived each of the exercise types.

- **Drag the letters exercise**

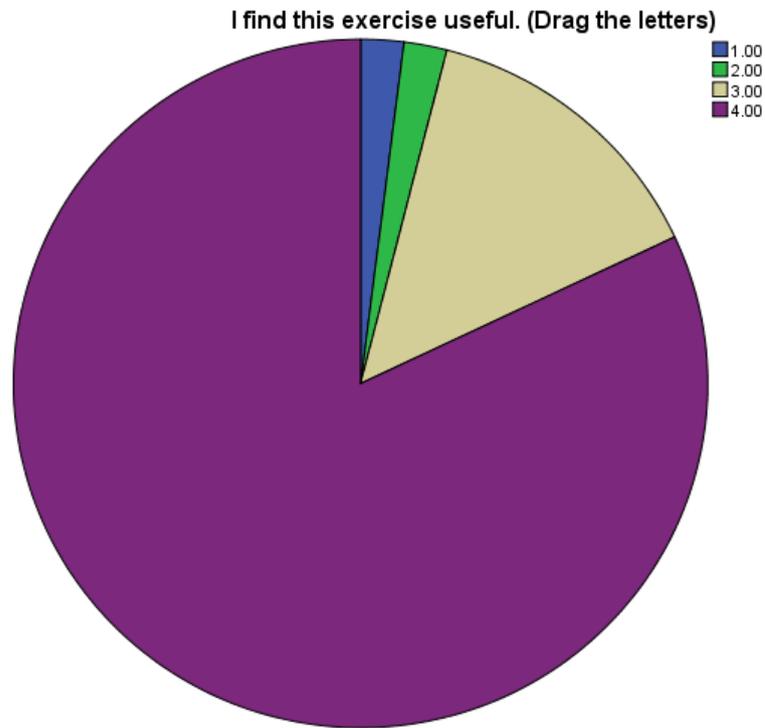
96% of learners found the *drag the letters* exercise useful with only 1 learner out of 50 disagreeing.

This result is in line with the results of the interview where most learners indicated a preference to the drag and drop exercise type.

I find this exercise useful. (Drag the letters)				
		Frequency	Percent	Cumulative Percent
Valid	strongly disagree	1	2.0	2.0
	neither agree nor disagree	1	2.0	4.0
	agree	7	14.0	18.0

	strongly agree	41	82.0	100.0
	Total	50	100.0	

Table (AppendixM-6): Result of Question 4 of learners' questionnaire



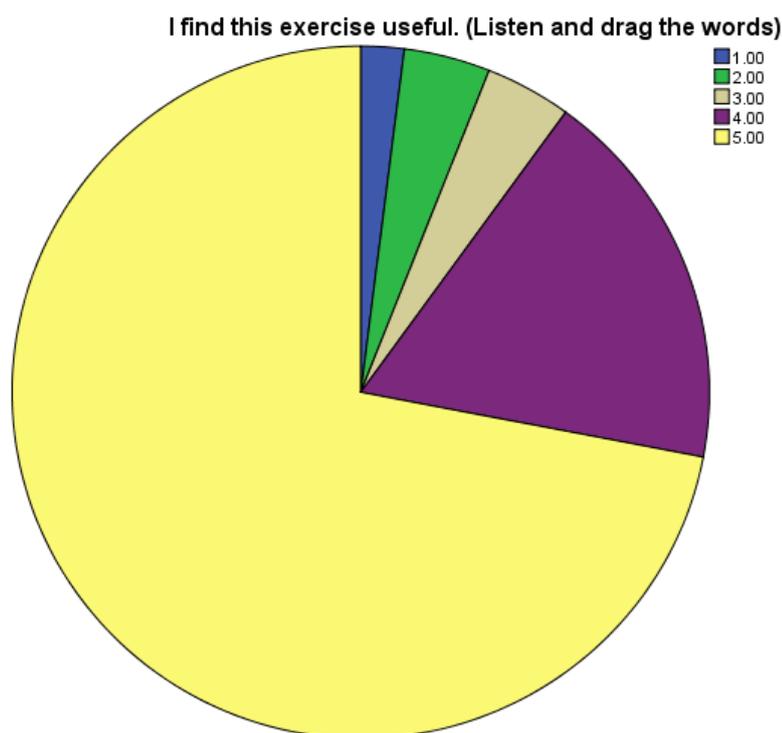
- **Listen and Drag**

Similar to the previous exercise type, most learners have responded positively to the *Listen and Drag the letters* exercise with 45 (90%) out of 50 learners agreeing/strongly agreeing that they found it useful.

I find this exercise useful. (Listen and drag the words)				
		Frequency	Percent	Cumulative Percent
Valid	strongly disagree	1	2.0	2.0
	disagree	2	4.0	6.0

	neither agree nor disagree	2	4.0	10.0
	agree	9	18.0	28.0
	strongly agree	36	72.0	100.0
	Total	50	100.0	

Table (AppendixM-7): Result of Question 5 of learners' questionnaire



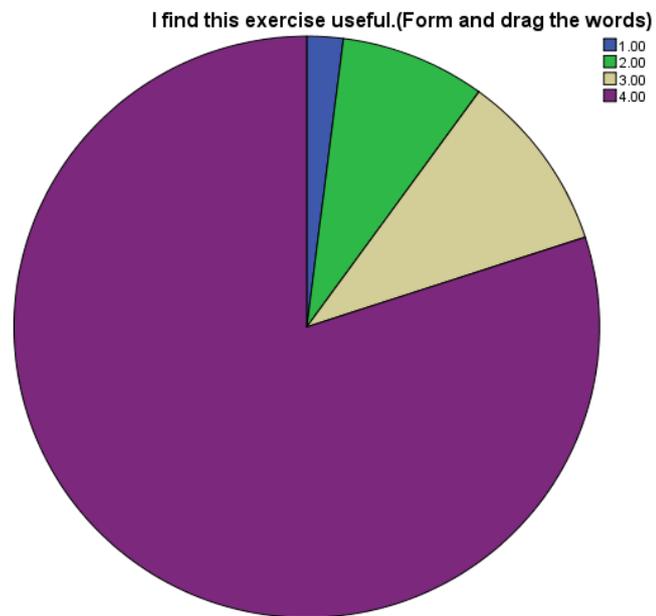
- **Form and drag the words**

Learners expressed a preference to the *form and drag the words* exercise type with 90% agreeing that it was useful. The results echo those of the previous exercise type and also the results from the interviews with the teachers and learners that the 'drag and drop' type of exercise was preferable by learners.

I find this exercise useful.(Form and drag the words)			
	Frequency	Percent	Cumulative Percent

Valid	disagree	1	2.0	2.0
	neither agree nor disagree	4	8.0	10.0
	agree	5	10.0	20.0
	strongly agree	40	80.0	100.0
	Total	50	100.0	

Table (AppendixM-8): Result of Question 6 of learners' questionnaire

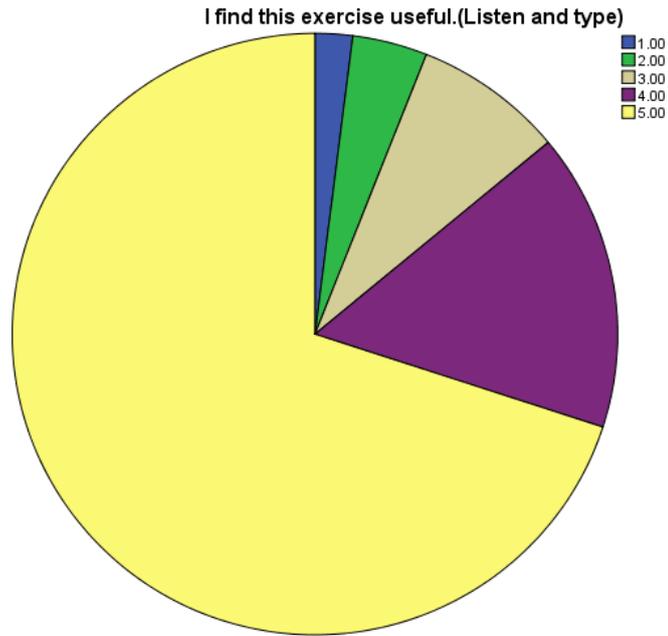


- **Listen and Type**

Learners also responded positively to the *listen and type* exercise, though their responses indicate less preference of this type of exercise. This could be justified by the fact that such exercise is cognitively more demanding than the drag and drop one since they require learners to focus on production and comprehension and given the learners' educational background, it is obvious that they would find this more difficult.

I find this exercise useful.(Listen and type)				
		Frequency	Percent	Cumulative Percent
Valid	strongly disagree	1	2.0	2.0
	disagree	2	4.0	6.0
	neither agree nor disagree	4	8.0	14.0
	agree	8	16.0	30.0
	strongly agree	35	70.0	100.0
	Total	50	100.0	

Table (AppendixM-9): Result of Question 7 of learners' questionnaire

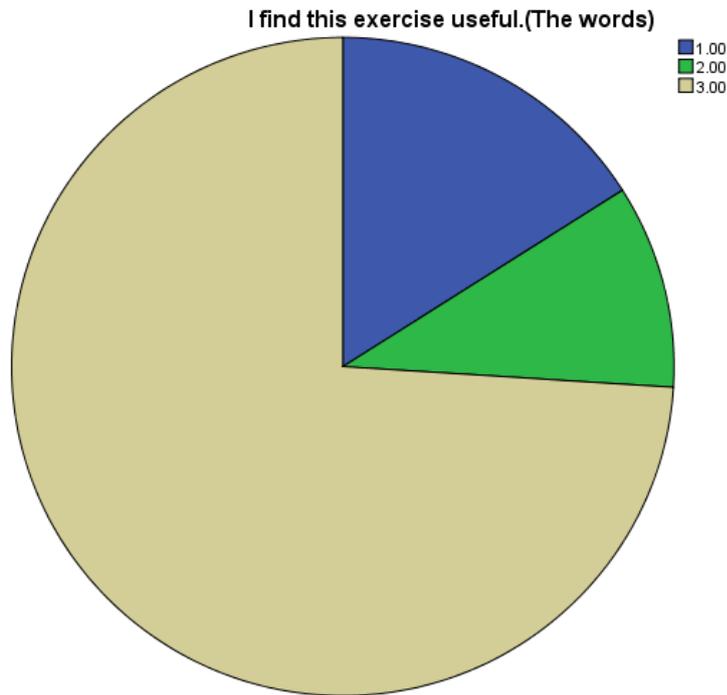


- **The words**

84% of learners agreed that the words exercise is useful while 16% neither agreed or disagreed. Although the response is still positive but in comparison with the other type of exercise, it seems that this type was the least favourite. This could be linked to many factors. First, this exercise was mainly presenting the words and letters, so learners were not required to do anything other than play around to familiarise themselves with the system and content. Second, they might have not realised the importance of this exercise to the completion of other exercises.

I find this exercise useful. (The words)				
		Frequency	Percent	Cumulative Percent
Valid	neither agree nor disagree	8	16.0	16.0
	agree	5	10.0	26.0
	strongly agree	37	74.0	100.0
Total		50	100.0	

Table (AppendixM-10): Result of Question 8 of learners' questionnaire



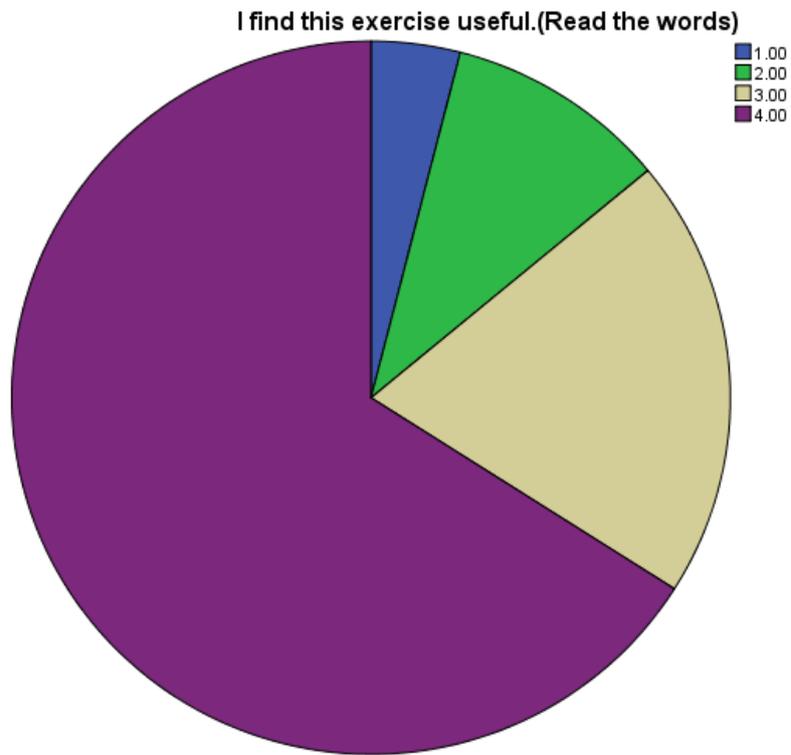
- **Read the words**

Similar responses were obtained for the read the words exercise. 86 % agreed that they found it useful while 10% neither agreed nor disagreed and 4% (2 learners) disagreed. Again, results could be interpreted in light of the design of the exercise as this was one of the exercises that did not offered immediate feedback to the learners. Learners needed to complete all the items to see how they've done. It could also be that the learners viewed this as a testing exercise. Most importantly, as this exercise had ASR functionality and due to some technical difficulties (explained in section ***), sometimes, learners were not able to get it to work to their satisfaction and this in itself frustrated them.

I find this exercise useful.(Read the words)				
		Frequency	Percent	Cumulative Percent
Valid	disagree	2	4.0	4.0
	neither agree nor disagree	5	10.0	14.0
	agree	10	20.0	34.0

	strongly agree	33	66.0	100.0
	Total	50	100.0	

Table (AppendixM-11): Result of question 9 of learners' questionnaire



- **Summary of responses to learners' questionnaires**

It is quite obvious that most learners have responded very positively towards the system as a whole and also towards individual exercises. However, a preference to the drag and drop exercise type is evident in the marginal difference in mean score of responses towards each type of exercise as can be seen in the table below.

Individual Exercise Types	Mean	Mode	Std. Dev	Min	Max
I find this exercise useful. (Drag the letters)	4.7400	5.00	.69429	1.00	5.00
I find this exercise useful. (Listen and drag the words)	4.5400	5.00	.90824	1.00	5.00
I find this exercise useful.(Form and drag the words)	4.6800	5.00	.71257	2.00	5.00
I find this exercise useful.(Listen and type)	4.4800	5.00	.95276	1.00	5.00
I find this exercise useful.(The words)	4.5800	5.00	.75835	3.00	5.00
I find this exercise useful.(Read the words)	4.4800	5.00	.83885	2.00	5.00
Whole system					
I like working with these lessons on the computer	4.8200	5.00	.48192	3.00	5.00
It is fun to work with these lessons on the computer.	4.6000	5.00	.85714	1.00	5.00
I would like to practise more with these lessons on the computer.	4.6000	5.00	.83299	2.00	5.00

Table (AppendixM-12): Summary of responses to learners' Questionnaires

Appendix N: Sample of the Learners' Interview

Participant: 34ENG (04/06/2015) interview after 8 + of working with DigLin		
Pseudonym: Iftikar	Age: 55	Gender: F
Country of origin: Pakistan	LOR in UK: 35	
Education in L1 : No schooling	L1: Urdu	
Literacy in L1: No		
Oral competence in L2: < A		

Learners' coping with the software

INT: How did you find the software?

A: Because I was computer illiterate initially it was a bit tough, but I was happy to take up the challenge because it was interesting but initially it was difficult to operate everything, but it was not because of the software it was because of the machinery itself. She has not gone to formal schooling in Pakistan nor even wherever she has done in Newcastle for in terms of training she hasn't really dealt with computers as such so the computer was more intimidating than the software itself. This is what she's saying, and she liked it, the software.

The phonics had helped her. It was good that she could hear.

INT: Did you have any difficulties If so, what?

A: She says that although I understand how it works, I still don't have the confidence to do it on my own, so I asked the teacher to click the button or place the mouse and things so that I don't really mess the thing up. So I need my teachers a lot.

What she is saying is what if I don't do the computer-based learning and I just learnt English as I am used to doing it. How different would that be? So my answer was because the software is particularly to make you autonomous in being able to read and that is more effective than a text based or a teacher learning based kind of a program. So I have become the expert of this also. The interpreter should be neutral person. So what it seems is that she is wary of the computer. She is not a very keen computer learner, but she is taking up the challenge. This is what she is saying.

INT: What did find most useful?

A: She likes the matching activities more. She can read but she can't speak. What she is saying is that I can read and if there is a match doctor up at the image (if there is an image I'm not sure) I can do that but I can't speak.

Learners' learning process

INT: In what way do you think working with the learning programme has helped you improve your reading skills?

A: She said that it was incredibly different because when she was given hand-outs and books she didn't know what ABC was but through this it is much more easier because that program speaks to her so it is easier for her so it is easier for her and she said that within a year when I've become more confident in using the machine itself but as a reader she has become much more autonomous and now she can read but then again the problem is with speaking. But she said hand-outs and teachers, the software has done more than those hand-outs and teachers.

INT: Which (exercise) part of the programme did you like the most?

A: I liked the drag the letters kind of things, all these three and she says I can read but it just is very hard ones that I don't understand. Other than that she can read and she likes them. I saw her and she used to always like that drag them.

She says that hearing aids her more in reading and then she drags it. So when the software speaks to her she knows where to find that and read it and then she can sort of I think that it is more of a confidence issue that she gets confirmation that it is the right word that she is hearing. So she says that she enjoyed that the best.

She says that I do get confused but she is concerned about it.

How has this helped you (this program)?

She said that although now I can log myself in without any help, but once I'm in the program I need my teacher beside me.

She says that now I can identify and can point things out but I still don't operate the mouse itself so someone else comes and puts the mouse where I want them to put it.

She says that now I can recognise things I can arrange them the way they want me to arrange it but then to go onto the next exercise I need help.

INT: (SOUNDBAR) Do you know what it is? And have you used it?

A: No

No I haven't used it.

She said that if I put myself onto it I could but I haven't really.

I can read it but she doesn't know how to use it.

Focus on learners' motivation and autonomy

INT: Have you used the software outside of the classroom?

A: No because she does not have a computer

If you had a computer would you work at home like this? No because she needs assistance all of the time.

INT: Do you have fun with the program or do you think it's boring?

A: Boring, she doesn't like the computer, it is not the software it's the computer that's the problem.

INT: What do you have suggestions on how to improve the programme?

A: What she is saying is that more reading and speaking exercises may be needed. It reads and speaks back to her and then because operating this is much more cumbersome for her and if I can speak to it and it speaks back to me that would be a better way.

Appendix O: Sample of the Data Analysis of Interviews

The screenshot displays the MAXQDA 11 software interface. At the top, the menu bar includes Project, Edit, View, Documents, Codes, Analysis, Mixed methods, Visual tools, and Help. The main window is divided into several panes:

- Document System:** A tree view on the left showing a hierarchy of documents. Under 'Students', there are folders for 24ENG-Imtiaz (45), 25ENG-Sajida (35), 32ENG-Berhune (21), 35ENG-Ghourban (30), and 34ENG-Isa (22). Under 'Teachers', there are folders for Teacher- Claire (39), Teacher- Sue (41), and Teacher- Tony (29). A 'Sets' folder is also visible.
- Code System:** A tree view on the left showing a hierarchy of codes. Under 'Code System', there are folders for Other (4), Suggestions for changes (15), Learning strategies (12), Motivation (0), Other (0), Negative (2), Positive (26), Autonomy (0), Other (4), Negative (6), Positive (22), Difficulty (10), and Easy (10).
- Document Browser:** A central pane showing a list of interview transcripts with their corresponding analysis codes. The list includes:
 - Country of origin: Russia (LOR in UK: 15)
 - Education in L1: No schooling (L1: Russian)
 - Literacy in L1: a little
 - Oral competence in L2: < A
 - 2 **Learners' coping with the software**
 - 3 INT: How did you find the software?
 - 4 A: He believes that the programme is very useful and it gives a lot in terms of writing and reading. The only thing is that it requires time. He feels that he needs more time but generally it's great.
 - 5 INT: Did you have any difficulties if so, what?
 - 6 A: so, one of the main advantages of the programme is that you can see and you can hear and he believes that it's really the best aspect of it. There are no difficulties as such as far as I understood.
 - 7 INT: What did find most useful?
 - 8 A: He says that I personally believe (as I already said) the best aspect of the programme is I can hear and I can see at the same time.
 - 9 **Learners' learning process**
 - 10 INT: In what way do you think working with the learning programme has helped you improve your reading skills?
 - 11 A: He said from one side, yes, definitely it helped me to read, no question about that. But on the other side, you need to spend time on that and stay at home and go through this. So you literally need some times memorising it.
 - 12 INT: Which (exercise) part of the programme did you like the most?

Appendix P: Sample of High expectations

- Write 3 words with <ch> :

- _____
- _____
- _____

- Write 3 words with <sh>

- _____
- _____
- _____

- Read the following words:

<input type="radio"/> knife	
<input type="radio"/> knit	
<input type="radio"/> top	
<input type="radio"/> tip	
<input type="radio"/> tap	
<input type="radio"/> ten	
<input type="radio"/> tent	
<input type="radio"/> sweat	
<input type="radio"/> sweet	
<input type="radio"/> lump	
<input type="radio"/> lamp	
<input type="radio"/> set	
<input type="radio"/> rip	
<input type="radio"/> rib	
<input type="radio"/> rob	